
NATIONAL REPORT OF THAILAND
CONVENTION ON NUCLEAR SAFETY

The 8th Review Meeting

Office of Atoms for Peace
Ministry of Higher Education, Science, Research and Innovation

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1. Introduction

Thailand deposited the instrument of accession for the Convention on Nuclear Safety (CNS) with the Director General of IAEA on July 3, 2018. Thailand has been a contracting party since October 1, 2018.

Currently, Thailand does not have any nuclear installations. Its latest Power Development Plan (PDP) which was issued in 2018 no longer contains nuclear energy in its energy mix. However, Thailand had once included a nuclear power with different capacities in its previous three versions of PDP from 2007 to 2015.

Thailand has only one research reactor, the Thai Research Reactor-1/Modification 1 (TRR-1/M1), which has been operated since the nuclear energy was first introduced to Thailand in 1962. Currently TRR-1/M1 is under operation of Thailand Institute of Nuclear Technology (TINT), which is a governmental public organization under Ministry of Higher Education, Science, Research and Innovation. Since TRR-1/M1 has been in operation for over 50 years, a feasibility study for establishing a new research reactor which is expected to operate at 10 to 30 MW is underway. Suranaree University of Technology which locates in the north eastern part of Thailand has applied for a site license for a new small research reactor. This reactor is a 45 kW Miniature Neutron Source Reactor designed by China Nuclear Energy Industry Corporation. The construction is expected to begin in 2020.

The Office of Atoms for Peace (OAP) has been designated by the Cabinet of Thailand to take primary responsibility for the implementation of Thailand's obligations under CNS. OAP is duly responsible for preparing the National Report according to INFCIRC 572 Rev. 6 2018, working in consultation with TINT as a nuclear research operating organization.

2. Reporting Article by Article

ARTICLE 6 EXISTING NUCLEAR INSTALLATIONS

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

Thailand has not had any nuclear power plant installation. Currently, the only nuclear installation in Thailand is the 2-MW (thermal) research reactor (TRR-1/M1) located at TINT in Bangkok as shown in Figure 2.1.

TRR-1/M1 is a research reactor with maximum steady state power of 2 MW (thermal). It can be operated in the pulse mode with the maximum power of 2,000 MW for 10.5 milli-seconds. It was constructed by the General Atomics, USA, who commercializes this reactor type as “TRIGA MARK-III”. It is located in the reactor pool inside the reactor building. Some areas of this building are also used as laboratories by scientists for research and experiments.

Reactor pool wall is built with high density concrete. The uppermost part of the pool wall is 1.5 ft. thick and the wall increased in thickness with the increment of 1 ft. depending on its elevation. The lowest part of the pool wall is the thickest part which is 4.5 ft. thick. The dimension of the reactor pool is, approximately, 3.5 m. × 12 m. × 8.5 m. The

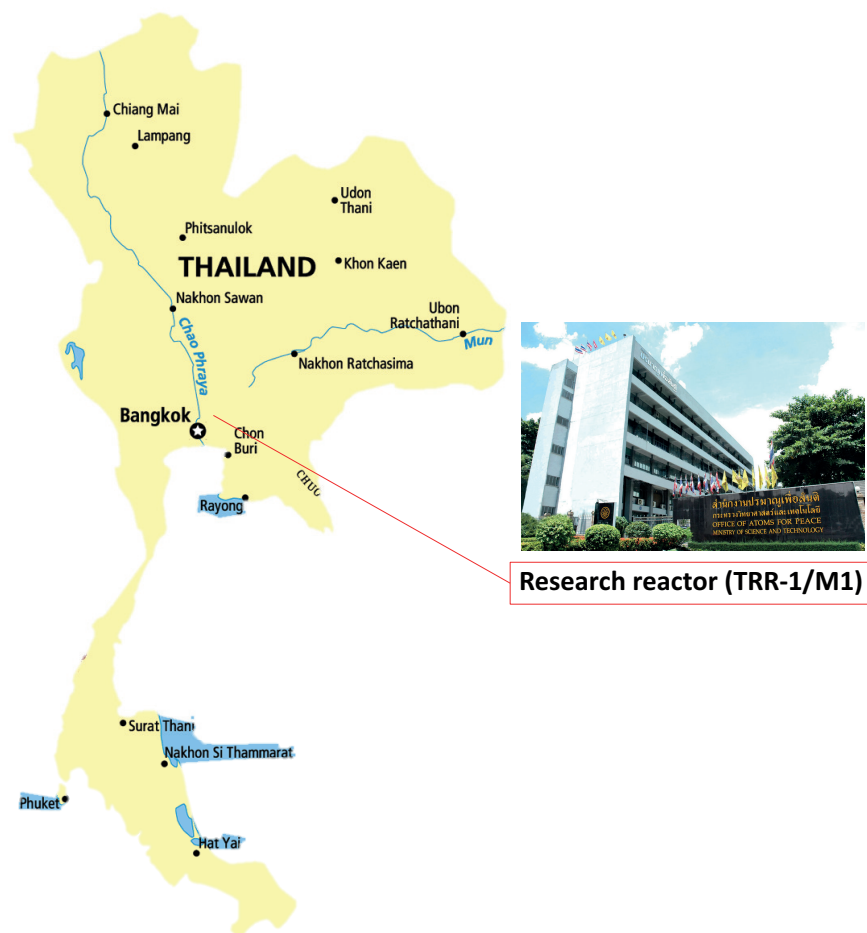


Figure 2.1: Research reactor (TRR-1/M1) is located in Bangkok, Thailand

reactor pool is equipped with the reactor bridge which is used to support the structure of the reactor core.

Reactor core is arranged in hexagonal array and is contained in a cylindrical aluminium tank (called “core shroud”) having the size of 55 cm. in diameter and the height of approximately 2 m. The fuel element is loaded and aligned vertically in the core shroud. The upper and the lower parts of the fuel element are graphite bars which serve as the neutron reflector. The reactor core and its components are completely submerged under water.

TRR-1/M1 has been utilized for services and R&D purposes in many applications and the utilization continues to increase steadily. The utilization of TRR-1/M1 can be categorized into several broad areas as follows:

- Neutron Activation Analysis (NAA): For performing both qualification multi-element analysis in samples. For instance, NAA can be used to analyze the composition of rare earth sample.
- Radioisotope production: For producing radioisotope such as I-131 and Sm-153 employed in the medical sector for diagnosis and therapy and P-32 for agricultural applications.
- Gemstone coloration: Values of gemstone can be increased by using neutron irradiation. For example, the color change of topaz or tourmaline by neutron irradiation could increase its value by 5–30 times.
- Neutron experiments, Nuclear Physics, Reactor Engineering studies, and Neutron Radiography which is a non-destructive testing method (NDT).
- Reactor Operator Training: For developing the knowledge, skill, competency of the reactor operator in handling and operating the research reactor.

The operation of TRR-1/M1 is according to the terms and conditions of the reactor safety which is licensed by the Nuclear Energy Commission for Peace (NEC). The schedule of TRR-1/M1's operations are:

- On Monday, no operation (weekly maintenance)
- On Tuesday, operated the reactor at 1,200 kW for 7.5 hours (8:30 a.m. – 4:00 p.m.)

- On Wednesday, operated the reactor at 1,200 kW for 7.5 hours (8:30 a.m. – 4:00 p.m.)
- On Thursday, operated the reactor at 1,200 kW for 7.5 hours (8:30 a.m. – 4:00 p.m.)
- On Friday, no operation (for testing)
- On Saturday and Sunday, no operation

At each operating session of TRR-1/M1, the staff consists of:

- One reactor supervisor is responsible for monitoring and analyzing the condition of reactor to ensure that the reactor is safe
- Two reactor operators are responsible for checking and controlling the reactor status in relation to the reactor conditions
- One health physicist is responsible for investigating and assessing the safety of radiation during operating the reactor in order to ensure that the reactor is safe for the surrounding people and environment

ARTICLE 7 LEGISLATIVE AND REGULATORY FRAMEWORK

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.

Primary legislative framework

The Nuclear Energy for Peace Act B.E. 2559 (2016), which replaced the Atomic Energy for Peace Act B.E. 2504 (1961), entered into force on February 1, 2017. The Act provides basic law governing the development and utilization of nuclear energy and radiation. The objectives of the Act are to protect people and the environment from harmful radiation; to regulate radiation and nuclear activities on safety, security and safeguards; and to comply with necessary international legal instruments. Additional requirements and provisions are given in the subsidiary laws in the form of Ministerial Regulations, Nuclear Energy Commission for Peace (NEC) Rules and Notifications and OAP Notifications. The Act was amended by the Nuclear Energy for Peace No. 2, B.E. 2562 (2019). The amended Act creates more regulatory flexibility while maintaining high level of nuclear and radiation safety standards.

Ratification of international conventions and legal instruments

Recognizing that nuclear safety is a responsibility shared among international community, Thailand has committed to the following international instruments relating to nuclear and radiation safety.

- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (ASSIST), enforced on April 21, 1989
- Convention on Early Notification of a Nuclear Accident (NOT), enforced on April 21, 1989
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (RADW), enforced on October 1, 2018
- Convention on Nuclear Safety (CNS), enforced on October 1, 2018

2. The legislative and regulatory framework shall provide for:
i. the establishment of applicable national safety requirements and regulations;

Process of establishing and revising regulatory requirements, including the involvement of interested parties

In order to establish the nuclear regulatory framework, it is necessary to develop the act which is the highest hierarchical law. Therefore, the Act has been developed and become effective since February 1, 2017. OAP is responsible for drafting subsidiary laws under the Act and driving them through mandated legal processes before they become effective. Legislative processes for developing the subsidiary laws under the act are the followings.

Legislative process for subsidiary regulations

1. OAP is responsible for drafting the subsidiary regulation based on technical issues, relevant domestic laws, compatible international laws and IAEA Safety Standards. Regulations from countries with comparable nuclear and radiation infrastructure and utilization were also considered.
2. The draft regulation is presented to the Sub Commission on law development under NEC for revision accordingly.
3. In a case of developing ministerial regulation, the draft must be presented to NEC for suggestions. This practice is according to Section 8 of the Act.
4. OAP conducts public hearings on the draft through a website and meetings or seminars to compile comments from relevant stakeholders.
5. In a case of developing NEC Rules and Notifications or OAP Notifications, the draft can be signed by NEC Chairperson or OAP Secretary General, respectively and becomes an effective law.
6. In a case of developing ministerial regulation, the draft must be presented to the Minister. The Minister submits the draft for the Cabinet's consideration through the Vice Prime Minister who is assigned to oversee the Ministry.
7. The Cabinet agrees in principle with the draft and sends the draft to OCS for examination.
8. OCS invites all key responsible agencies to examine the draft.
9. After OCS examination process, the Minister signs off the draft.
10. The ministerial regulation is published in the Royal Gazette and becomes effective.

Verification process of the regulations

Section 5 of the Royal Decree on Revision of Law B.E. 2558 (2015) provides a provision for the Minister of Higher Education, Science, Research and Innovation who is responsible for the execution of the Act to review, modify or cancel the regulations after they have become effective for five years if one or more conditions specified under the Section 5 are met.

ii. a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a license;

According to Section 45 and Section 71 of the Act, licensing processes of nuclear installations comprise of all stages of the nuclear lifecycle, including nuclear facility site, construction and equipment installation, commissioning and operation and decommissioning. In addition to safety, strong emphasis is given to both security and safeguards.

Based on the expected new research reactor in Thailand, OAP has recognized the need from the applicants; therefore, OAP has established a licensing process for siting and has planned to develop licensing processes for the other stages at later time. However, they are expected to closely resemble the licensing process for siting with references to their respective regulations.

Licensing process of nuclear installations

Licensing processes of all stages of nuclear lifecycle follow the same steps as described below. However, the only exception is that a licensing process for siting requires two additional steps which are clearly identified in parentheses.

1. A license applicant submits an application along with necessary documents as prescribed in the relevant regulations.
2. OAP performs an initial review on the application and, in some case, requests additional documents.
3. OAP performs a safety analysis and develops its findings on the applications.
 - OAP consults the Committee on Site Safety Evaluation for Nuclear Facility. The Committee comprised of experts in geology, seismology, civil engineering, hydrology, and meteorology. (for Siting only)

- OAP hosts a public hearing from people who live around the site area to gather opinions from the local. (for Siting only)
4. OAP submits its findings and results from the open forum to the Nuclear Facility Regulatory Sub-Commission for further recommendations.
 5. NEC considers the application along with recommendations from the Sub-Commission to make a decision on the application.
 6. The Secretary General of OAP carries on the decision by NEC by either granting a site license or rejecting the application.

Regulations for siting

- Draft Ministerial Regulation to Specify Rules, Procedures and Conditions for Granting a Site License (Section 51, 52, 53)
- Draft Ministerial Regulation to Specify Technical and Financial Qualifications of an Establisher of a Nuclear Facility (Section 8 (8), 46 (2))
- Notification of the Nuclear Energy for Peace Commission on Preparing the Site Evaluation Report B.E. 2560 (2017) (Section 51 Paragraph 3)

Regulations for construction and equipment installation

The following regulations are for construction and equipment installation.

- Draft Ministerial Regulation to Specify Rules, Procedures and Conditions for Obtaining a Construction License (Section 55, 58)
- Draft Ministerial Regulation to Specify the Details of a Preliminary Safety Analysis Report (Section 8 (10), 56)

Regulations for commissioning and operation

The following regulations are for commissioning and operation.

- Rule of the Atomic Energy for Peace Commission on Implementation to Provide Safety for Nuclear Research Reactor Operation B.E. 2558 (2015) (Section 9 of the Atomic Energy for Peace Act B.E. 2504 (1961))

- Rule of the Atomic Energy for Peace Commission on Radiation Safety Control for Nuclear Research Reactor Operation B.E. 2558 (2015) (Section 9 of the Atomic Energy for Peace Act B.E. 2504 (1961))
- Draft Ministerial Regulation to Specify Rules, Procedures and Conditions to Obtain an Authorization for Loading Nuclear Fuel, Nuclear Material or Spent Nuclear Fuel, for a Commissioning Test of a Nuclear Reactor, or for a Loading Test of Nuclear Material or Spent Nuclear Fuel, and to Submit a Report of Such Test (Section 8 (11), 63)
- Draft Ministerial Regulation to Specify Rules, Procedures and Conditions for Granting License, Renewing License and Granting License Substitute for Operating License (Section 64, 65)
- Draft Ministerial Regulation to Specify Security of Nuclear Material and Nuclear Facility (Section 8 (18), 91)
- Draft Ministerial Regulation to Specify Review and Update on Safety Analysis Report (Section 67)

Regulations for decommissioning

The following regulations are for decommissioning.

- Draft Ministerial Regulation to Specify Rules, Procedures, Conditions and Periods of time for a Submission of a Decommissioning Application and the Details of a Decommissioning Plan (Section 8 (12), 70, 72)
- Notification of the Nuclear Energy for Peace Commission to Specify Safety Radiation Level for Releasing a Nuclear Facility of Regulatory Control B.E. 2560 (2017) (Section 73 Paragraph 2)

Other Subsidiary Regulations

- Rule of the Atomic Energy for Peace Commission on Certification of Nuclear Research Reactor Operator B.E. 2558 (2015) (Section 9 of the Atomic Energy for Peace Act B.E. 2504 (1961))

- Rule of the Atomic Energy for Peace Commission to Specify Procedures Regarding Security of Nuclear Material and Nuclear Facility B.E. 2559 (2016) (Section 9 of the Atomic Energy for Peace Act B.E. 2504 (1961))
- Rule of the Atomic Energy for Peace Commission on Quality Assurance for Nuclear Research Reactor B.E. 2559 (2016) (Section 9 of the Atomic Energy for Peace Act B.E. 2504 (1961))
- Rule of the Nuclear Energy for Peace Commission to Specify the Allocation of Revenue and Expenses Incurred during the Takeover Period B.E. 2560 (2017) (Section 68 Paragraph 4)
- Rule of the Nuclear Energy for Peace Commission to Specify Rules, Procedures and Conditions of Requesting for Compensation for Damages Caused by the Authority B.E. 2560 (2017) (Section 68 Paragraph 3)
- Ministerial Regulation on Licensing Application of Nuclear Material Technical Officer B.E.2561 (2018) (Section 8 (19), 95, 97)
- Draft Ministerial Regulation to Specify Rules, Procedures and Conditions for Obtaining, Issuing and Renewing Nuclear Operator License (Section 8 (19), 95, 97)

Involvement of the public and interested parties

In regard to any activity which may severely affects the natural resources, environmental quality, health, sanitation, quality of life or any other essential interests of the people or community or environment, Section 58 of the Constitution of the Kingdom of Thailand B.E. 2560 (2017) requires the State to undertake a study on possible impacts on environmental quality and health of the people or communities and to arrange a public hearing with participations from relevant stakeholders, people and communities. The results from the public hearing will then be taken into consideration during the licensing process. In a case of nuclear installation which is perceived to potentially have negative impacts on people and the environment, Section 52 of the Act requires a public hearing and OAP specifies in the draft of Ministerial Regulation on site licensing that a public hearing must be performed before reaching a conclusion on granting a site license.

Preventing the operation of a nuclear installation without a valid license

The Act provides provision on suspension and revocation of licenses in the case where a licensee violates or fails to comply with the Act and its subsidiary laws and defines punitive provisions with fine and imprisonment. In addition, OAP is always in a good communication with the existing licensees to ensure that they are well aware of their license status and legal obligations.

iii. a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licenses;

Inspection is an indispensable regulatory activity to ensure compliance by licensees. The Act provides provisions for inspection at various stages of a nuclear lifecycle which can be summarized as follows:

1. Before applying for an operating license, a licensee must, at least 15 days prior to the testing date, notify OAP of time and the test duration of the installed machines and equipment so that an inspector can perform inspection of such testing (Section 62 of the Act).
2. During the initial loading of nuclear fuel, nuclear material or spent nuclear fuel, an inspector assigned by the Secretary General of OAP must perform inspection on those activities (Section 63 of the Act).
3. In performing duties under the Act, a competent official has the following authorities:
 - (a) To enter an establishment related to, or a place that possesses, or a place where there is a reasonable cause to suspect that such place is an establishment related to or possesses radioactive material, a radiation generator, nuclear material, radioactive waste or spent nuclear fuel, or a nuclear facility during sunrise and sunset or during the working hours of such facility, or to enter a vehicle that carries or that there is a reasonable cause to suspect that such vehicle carries radioactive material, a radiation generator, nuclear material, radioactive waste or spent nuclear fuel or a vehicle that is nuclear-powered or that there is a reasonable cause to suspect that such vehicle is nuclear-powered,

for an inquiry about the facts, an inspection of activities, documents, and any other concerned evidences and equipment, including an investigation of any violation of or failure to comply with this Act, or for suppression or prevention of harm to people or properties, or for protection of personal health, or for other actions as entrusted by the Commission;

- (b) To enter a construction site of a nuclear facility or a waste management facility to inspect the construction of the nuclear facility or waste management facility, or to inspect the testing of machines and equipment under section 62, and to inspect the testing of loading of nuclear material or operating of a nuclear reactor under section 63;
- (c) To search, retain, seize, or attach radioactive material, a radiation generator, nuclear material, a nuclear facility, radioactive waste, spent nuclear fuel, and a document or other related objects in the case of violation or failure to comply with the Act;
- (d) To take radioactive material, nuclear material, radioactive waste, spent nuclear fuel, or other objects suspected of being radioactive material, nuclear material, radioactive waste, or spent nuclear fuel in a reasonable quantity as a sample for examination;
- (e) To install equipment or a tool for the purpose of tracking radioactive material, nuclear material, radioactive waste, or spent nuclear fuel;
- (f) To summon in writings a person involved to give a statement or deliver a document and an evidence as necessary for the consideration of the competent official;
- (g) To issue an order to a license holder under the Act or to a person responsible for performing the duties under the Act to do or to refrain from doing an Act for the purpose of nuclear and radiation safety or security; and
- (h) To allow a representative from the International Atomic Energy Agency to work with a competent official under international obligations under section 113.

When a competent official has entered a place under paragraph (a) or (b) and performed under paragraph (a), (b) or (c) but not to completion, the competent official shall have the authority to carry on after sunset or beyond the working hours of such facility as necessary and reasonable.

In a case of an emergency or necessity for the purpose of nuclear and radiation safety and security, a competent official shall have the authority to enter a premise under paragraph (a) or (b) at any time as necessary and appropriate, and shall have the authority to order a person involved to do or to refrain from doing an Act for the purpose of nuclear and radiation safety or security. In any case, the competent official shall notify the possessor of the premise about the entry to the premise at the earliest convenience (Section 107 of the Act 2016).

4. A license holder to possess radioactive material, a license holder to operate a nuclear facility, an authorized person to load nuclear material in an enrichment facility or a spent nuclear fuel reprocessing facility and an authorized person to load nuclear fuel in a nuclear reactor and to commission a nuclear reactor shall provide convenience to a representative of the IAEA who are working with a competent official under international obligations in conducting the followings:
 - (a) Inspect a nuclear facility
 - (b) Inspect nuclear material
 - (c) Collect a sample of the material suspected as being related to a nuclear activity
 - (d) Install equipment or tools for the inspection and surveillance purposes of nuclear material and spent nuclear fuel
 - (e) Inspect a loading of nuclear material or an operation of a nuclear reactor under section 63 (Section 113 of the Act).

Regulatory inspection and assessment process

OAP is responsible for the inspection of all nuclear facilities which have been licensed. In general, OAP follows the inspection guidelines which are based on safety standards or guidelines from IAEA and other well-regarded regulatory organizations and are adapted to better suit nuclear activities and regulatory framework in Thailand.

The safety inspection of nuclear research reactor can be categorized to eight aspects: 1)

Nuclear safety 2) Radiation Safety 3) Maintenance and Testing 4) Fire Protection System 5) Nuclear Security and Physical Protection System 6) Emergency Preparedness and Response 7) Management System and 8) Safety Culture.

Procedures of nuclear facility inspection

1. Planning of the inspection

Inspection Division, OAP sets up a preparatory meeting two weeks prior to the end of fiscal year to discuss on the implementation plan for the succeeding year inspection. The plan specifies the number of inspections to be carried out, which is typically four times a year including at least one unannounced inspection, as well as topics and details of each inspection. Furthermore, the inspection details will be in line with OAP's strategic plan.

There are two types of nuclear facility inspections which are announced inspection (A.I.) and unannounced inspection (U.I.). Such types of inspections can be divided into two subtypes as follows:

(a) Planned inspection

(b) Reactive inspection—to be carried out in the following irregular situations.

- i. In a case of exercise—Inspection officers will be involved with the exercise or scenario as assessors
- ii. In a case of incident—Inspection officers might access and inspect nuclear facility without early notification to identify the causes of the abnormality
- iii. In a case of accident—Inspection officers will access and inspect nuclear facility without early notification to identify initial causes and severity of the accident prior to further in-depth inspection

2. Arrangement for nuclear facility inspection

(a) Announced inspection—OAP will notify relevant agencies the inspection arrangement, including plan, specific date, time as well as technical details, two weeks prior to the proposed arrangement.

(b) Unannounced inspection—OAP is authorized to access nuclear facility and conduct inspection without early notification. Technical details related to the inspection will be acquired from the agency holding of license when inspecting.

(c) Reactive inspection—The inspection will be conducted case by case based on specific situations.

3. Preparation of radiation measurement equipment and other inspection-related tools

(a) Check the number of inspection-related tools and equipment

(b) Ensure the well-function of the radiation measurement equipment

(c) Check the calibration status of the radiation measurement equipment and other related tools

4. Nuclear facility inspection

Nuclear facility inspection mainly consists of an inspection of safety document obtained from a license holder, on-site observation and the interview of related technical officers.

Required documents for the inspection comprised of inspection manual, inspection form, and inspection checklist. If problematic issues related to either OAP internal divisions or external organizations arise, inspection officer may seek further clarifications before recording findings in the report. Any other operational findings supporting the inspection will be recorded as supportive information.

5. Preparation of a safety report

After the inspection, inspection officer team prepares a report considering inspection findings and other related document. The report consists of inspection details, summary, recommendations as well as follow-up actions from a previous inspection.

6. Preparation of the annual report

OAP prepares the annual report within two months after the end of the fiscal year. The report consists of inspection plan and summary, inspection findings, problems, equipment efficiency, guidelines to develop inspection procedure, guidelines to develop the documentation such as regulations, guidelines, manuals for inspection and recommendations for enhancing inspecting competency. The report will be reviewed and then submitted to supervisors. Any comments towards the report will be applied to further develop regulatory system.

iv. the enforcement of applicable regulations and of the terms of licenses, including suspension, modification or revocation.;

The Act provides legal actions and enforcement measures to OAP as follows:

1. In a case where a license holder violates or fails to comply with the Act, the Ministerial Regulations or the Notifications issued under the Act or the conditions set forth in the license, the Secretary General shall have the power to order the suspension of activities leading to such violations and order the license holder to make corrections within a permissible time period. If it is found that a compliance is not achieved within the time period, the Secretary General may suspend the license in whole or partially for a period not exceeding one hundred twenty days. If the license is previously issued with the approval of NEC, the license suspension must be approved by NEC. The Secretary General may accompany the suspension order with conditions to provide for radiation protection or for nuclear and radiation safety and security or nuclear safeguards, or for any other necessary public interests (Section 102 of the Act).
2. In a case where a license holder whose license has been suspended fails to make corrections within the permissible time period, the Secretary General may revoke the license. If the license suspension previously requires the approval of NEC, a license revocation must be approved by NEC (Section 103 of the Act).
3. In a case where an order of license suspension or an order of license revocation is issued, the Secretary General may also order a competent official to take control of the radioactive material, radiation generator, nuclear material, nuclear reactor, radioactive waste or spent nuclear fuel associated with the activities under that license as deemed necessary for radiation protection, for nuclear and radiation safety and security, or for nuclear safeguards. Any expense incurred shall be taken from the guarantee. If the guarantee is insufficient, the license holder shall be liable for the remaining expense (Section 104 of the Act).
4. When it appears to a competent official that a person violates or fails to comply with the Act, the competent official shall have the authority to order that person to refrain from such violation, or to correct, or to improve, or to comply accordingly. In this regard, if it is the case of a reasonable cause, the competent official may order such person to export radioactive material, a radiation generator, nuclear material,

radioactive waste or spent nuclear fuel, which has not been licensed, back to the manufacturer or supplier of such object in accordance with the rules, procedures, and conditions prescribed by the competent official.

If it appears that the person who violates or fails to comply under the Act either because of incapability or because of the other reasons, the competent official shall have the power to order that person to hand over the object to the competent official at a determined location for destruction or treatment as appropriate to the case, considering the harm that may result from such object.

In a case where the object may be salable, the competent official shall prepare a sale by auction or a sale to a state agency within three months from the day of receipt. The sale proceeds, after deducting the expense of storage, sale, and other related overheads, shall be returned to the owner. After the lapse of three months, if the object is unable to be sold and the competent official is of the opinion that further delay may cause harm or an undue burden, the competent official shall have the authority to order the object destroyed or treated as appropriate to the case.

In the case of destruction or treatment as appropriate to the case, if an expense arises, the owner or importer of such object shall pay or reimburse that expense to the authority (Section 108 of the Act).

3. For radioactive material, a radiation generator, nuclear material, a nuclear facility, radioactive waste, spent nuclear fuel and a documents or other object that is seized or attached under the Act, if the storage of the seized or attached object possesses a risk of damage or harm resulting from such object or the expense is in excess of the value of such object, a competent official shall have the power to have the object destroyed or treated as appropriate to the case, considering the harm that may result from such object as well. The provisions under section 108 shall be applied *mutatis mutandis* (Section 109 of the Act).
4. In the performance of duties under this Act, a competent official shall be an official under the Penal Code.(Section 114 of the Act)

In addition, one chapter with thirty sections under the Act is solely devoted to clearly define penalties in the forms of fine and/or imprisonment of all offenses committed under the Act.

ARTICLE 8 REGULATORY BODY

1. *Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority competence and financial and human resources to fulfill its assigned responsibilities.*
2. *Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.*

The Act established the NEC which is the regulatory authority of Thailand responsible for licensing and regulating radiation and nuclear facilities and activities. The NEC consists of:

1. the Prime Minister as Chairperson
2. the Minister of Higher Education, Science, Research and Innovation as Vice Chairperson
3. Ten ex officio members: Eight Permanent Secretaries (the Ministry of Defense, the Ministry of Foreign Affairs, the Ministry of Natural Resources and Environment, the Ministry of Energy, the Ministry of Interior, the Ministry of Higher Education, Science, Research and Innovation, the Ministry of Public Health and the Ministry of Industry), the Secretary General of the Office of the National Economy and the Social Development and the Secretary General of the National Security Council.
4. No more than six qualified members who possess knowledge, skill and experience relating to nuclear energy and radiation with extensive background in science, engineering, medicine, agriculture or law and are appointed by the Cabinet.
5. Secretary General of OAP serves as a member and a secretary to the Thai NEC and Secretary General may appoint up to two government officials from OAP to be assistant secretaries.

By virtue of OAP being the secretary of the commission, OAP performs regulatory functions such as developing regulation, licensing and performing assessment and inspection. The NEC has the following authorities and duties:

1. To propose policies and recommendations to the Cabinet on the following issues:
 - (a) The use of nuclear energy

- (b) Nuclear and radiation regulation for safety and for the purpose of preventing or suppressing nuisance, damage, or harm that affects persons, animals, plants, properties or the environment, or determining the guidelines or procedures on nuclear and radiation regulatory in accordance with the economic and social conditions
- 2. To advise the Minister of Higher Education, Science, Research and Innovation on issuing the Ministerial Regulations under the Act.
- 3. To specify rules and oversee compliance with the terms or conditions in a license issued under the Act.
- 4. To develop specific standards on nuclear energy
- 5. To promote and disseminate the knowledge on nuclear safety
- 6. To determine the Nuclear and Radiation Emergency Plan, a supporting plan in the National Disaster Protection and Relief Plan under the law on disaster protection and relief
- 7. To decide on an appeal against the order of the Secretary General of OAP under the Act.
- 8. To perform other Acts as prescribed in the laws to be the powers and duties of the Commission or as entrusted by the Cabinet.

Structure of nuclear regulatory organizations in Thailand is shown in Figure 2.2.

Main responsibilities of OAP

As a secretary and functioning unit for the NEC, OAP, which is a governmental office, has been tasked with the following responsibilities:

- 1. To be the Secretariat of the NEC
- 2. To perform legal actions according to laws, regulations and rules relating to nuclear energy utilizations and others of relevance
- 3. To regulate safety, security and safeguards of nuclear energy and radiation

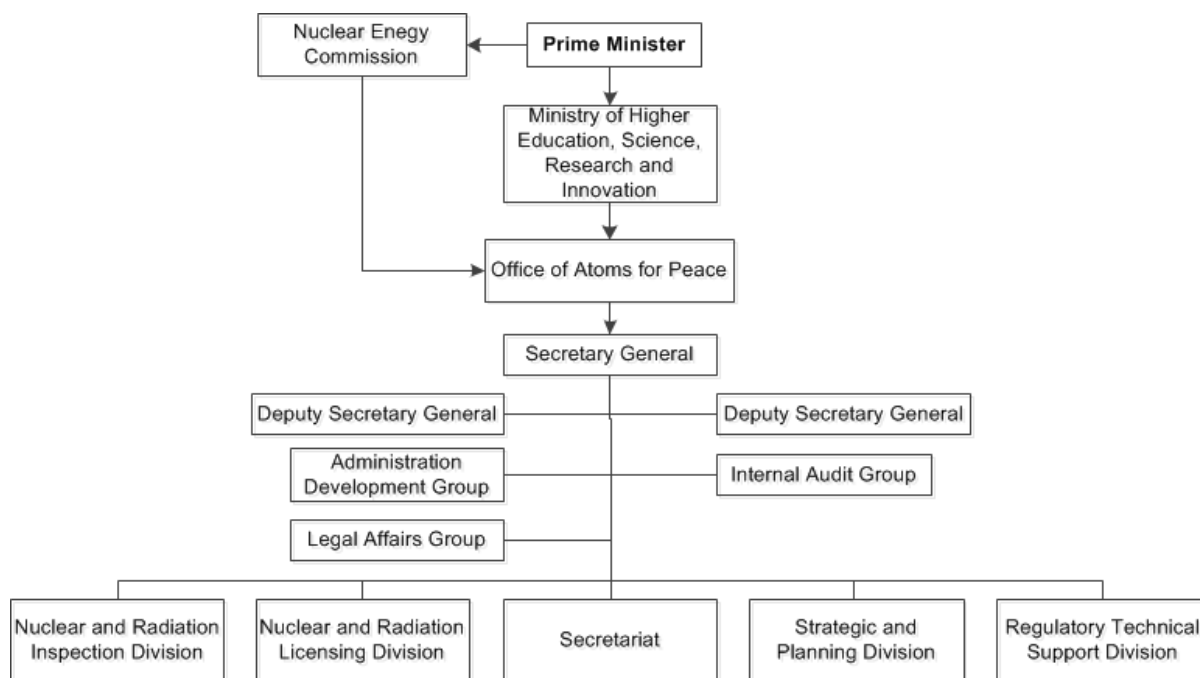


Figure 2.2: Nuclear Regulatory Structure in Thailand

4. To formulate national policy and strategic plans on peaceful uses of nuclear energy and radiation
5. To perform research and development in the areas relating to safety, security and safeguards
6. To coordinate and carry out technical co-operation with organizations in Thailand and abroad in accordance with international obligations and agreements

Currently, the organizational structure of OAP is according to the Ministerial Regulation on Reorganization of the Office of Atoms for Peace B.E. 2561 (2018).

Place of the regulatory body in the governmental structure

On April 25, 1961, The Royal Thai Government proclaimed the enactment of the Atomic Energy for Peace Act, B.E. 2504 (1961) resulting in the establishment of the Atomic Energy for Peace Commission (AEC) and the Office of Atomic energy for Peace (OAEP). Since its inception, OAEP has been under different Ministries as follows:

1961 - 1963: The Office of Prime Minister

1963 - 1972: Ministry of National Development

1972 - 1979: Ministry of Industry

1979 - 1992: Ministry of Science Technology and Energy

1992 - 2002: Ministry of Science Technology and Environment

2002 - 2019: Ministry of Science and Technology

2019 - Present: Ministry of Higher Education, Science, Research and Innovation

The issuance of Government Reorganization Act in 2002, Article 39 and 39(2) renamed the "Office of Atomic Energy for Peace" to "Office of Atoms for Peace" or OAP.

Financial Resources

OAP has been allocated sufficient funds from the Government budget to meet program needs and routine functions. As a governmental office, OAP must strictly observe budget and procurement regulations laid out by the Budget Bureau and the Comptroller General's Department. In addition, OAP is subject to auditing by the State Audit Office.

Human Resources

Currently, OAP has 308 employees. 202 of which are government officials. 81 of which are government employees. And 25 of which are OAP project employees.

Realizing the importance of human resource development for regulating rapidly growing nuclear and radiation technology, OAP continuously enhances its technical capabilities through cooperations with a number of external affiliations. With IAEA, staff from OAP regularly attend training courses, workshops and meetings under national technical cooperation projects and other programs offered by other departments of the IAEA. In addition, OAP fosters cooperations with leading organizations in the area of nuclear safety, including European Commission, United States Nuclear Regulatory Commission (U.S. NRC.), United States Department of Energy (U.S. DOE.), Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) and Nuclear Safety and Security Commission (NSSC) of Republic of Korea. While cooperations with various partners are different in nature in terms of implementation and activeness, they provide OAP with essential technical enhancements on nuclear safety.

Furthermore, national human resource development policy allows for OAP to dispatch its government officials to pursue graduate degrees relating to nuclear safety in advancing countries.

Means for the effective separation

Prior to April 21, 2006, OAP was assigned the functions of both utilizing nuclear energy and radiation as well as regulating its safety. The Royal Decree Establishing the Nuclear Institute of Technology (Public Organization) (TINT) 2006 which became effective on April 21, 2006 allowed OAP to become an effective national nuclear and radiation regulator. To fully complete the establishment of TINT, The Cabinet resolution on November 21, 2006 ordered the transfer of functions, business, property, authority, liability and budget involving nuclear research and development from OAP to TINT.

ARTICLE 9 RESPONSIBILITY OF THE LICENSE HOLDER

Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant license and shall take the appropriate steps to ensure that each such license holder meets its responsibility.

In addition to Section 45 and Section 71 of the Act which requires licenses for nuclear facility site, construction and equipment installation, commissioning and operation and decommissioning, the Act stipulates in Section 91 that all license holders must strictly be in compliance with the rules and procedures regarding nuclear safety, security and safeguards as prescribed by the Ministerial Regulation.

Description of the main means by which the license holder discharges the prime responsibility for safety

In regard to safety, TINT has established a committee for managing and supervising the whole process of the facility's operation as well as a sub-committee for imposing the safety policies and regulating all activities in TINT by launching the regulations regarding safety, security and safeguards. Moreover, the division of nuclear safety has been set up in order to provide necessary technical support on safety-related matters. The main responsibilities performed by TINT concerning safety are the followings:

- A radiation safety officer, licensed by OAP, must be on duty in all sections that have functions related to nuclear and radioactive materials.
- The sections must be at least twice a year monitored and reviewed for their operations and performances by the division of nuclear safety.
- During the operation of the nuclear research reactor, a health physicist, assigned by the division of nuclear safety, must monitor the radiation emission and the release of radioactive materials in order to maintain safety of the workers, the environment and the public.
- All workers must be monthly assessed for the external and internal radiation exposures.
- Emergency preparedness and response drill is scheduled to be performed on an annual basis by all sections. The exercise with external organizations; the Civil Defence Volunteer, the Department of Disaster Prevention and Mitigation, military, police and medical personnel, is also taken place.

Mechanism by which the regulatory body ensures that license holder discharges its prime responsibility for safety

OAP conducts the inspection of nuclear facility to regulate the operation and performance of the license holder to be conformed to the international safety standard. The inspection of nuclear research reactor for safety can be categorized into 8 aspects; 1) nuclear safety 2) radiation safety 3) maintenance and testing) 4) fire protection system 5) nuclear security and physical protection system) 6. emergency preparedness and response 7) management system 8) safety culture.

Mechanism whereby the license holder maintains open and transparent communication with the public

The public relations division in TINT has been formed to provide knowledge and understanding on nuclear energy and radiation to the public. The main activities include setting up local public hearings and providing range of opportunities for the general public to visit the site and the nuclear research reactor. Futhermore, the information about the research reactor including the operating schedule and the safety in operation and maintenance is publicized in the webstie (www.tint.or.th).

Moreover, nuclear installation is subject to the Notification of the Ministry of Natural Resources and Environment on Rules, Procedures, Practices and Guidelines for Preparing Environmental Impact Assessment (EIA) Report for Projects or Activities that May Cause Severe Impact on Quality of Environment, Natural Resources and Health of Community (No.4), B.E. 2560 (2017). The nuclear licensee prospect must arrange three public hearings with different objectives. The first public hearing is devoted to focus on defining a scope of the EIA report. The second public hearing is a part of the assessment and development of the EIA report. And the third public hearing is aimed to review the results of the EIA report as well as to receive further comments and recommendations from the public.

Mechanism by which the Contracting Party ensures that the license holder of the nuclear installation has appropriate resources (technical, human, financial) and powers for the effective on-site management of an accident and mitigation of its consequences

Section 46 of the Act requires that an establisher of nuclear facility must possess technical and financial qualifications as prescribed by the Ministerial Regulation.

ARTICLE 10 PRIORITY TO SAFETY

Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

Safety policy

Safety is an issue with the first priority as TINT establishes the safety policy to govern all of its operations and functions. The safety policy is aimed to not only provide safe working conditions within TINT and the environment but also build the public confidence.

Safety culture programme and development

Concerning the importance of safety culture, TINT has requested a service mission, the Independent Safety Culture Assessment (ISCA), from IAEA to obtain advice and assistance in enhancing the safety culture of a nuclear facility.

Independent safety assessment

The division of nuclear safety which directly reports to the executive director of TINT performs an independent safety assessment concerning all aspects of research reactor operations. As a part of the assessment program, water, air and soil samples around the facility are collected to evaluate radiological contamination in the environment.

A process oriented (quality) management system

Section 91 of the Act provides a legal ground to establish the Ministerial Regulation regarding quality assurance of nuclear research facility. In addition, TINT has been certified with ISO 9001 and OHSAS 18001 and is in the process of acquiring ISO 45001.

ARTICLE 11 FINANCIAL AND HUMAN RESOURCES

Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.

Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.

Regulatory requirements

Section 46 of the Act requires a licensee for nuclear facility to have technical and financial qualifications throughout its life. The qualifications will be elaborately prescribed in a corresponding Ministerial Regulation on Specifying Technical and Financial Capability of an Applicant for a License Concerning Nuclear Installation.

Section 95 and 97 require that a reactor operator must obtain a license or a license renewal, respectively from the OAP. Corresponding rules, procedures and conditions will be prescribed in a Ministerial Regulation.

Section 69 also requires a guarantee from a licensee to ensure that radioactive waste, spent nuclear fuel and all activities under the decommissioning plan are properly managed or carried out.

Competency development for reactor operators and safety officers

TINT has occasionally performed competency and gap analysis on reactor operators and other related safety officers. This practice is not done in a systematic fashion because all reactor operators and safety officers are mostly responsible for routine functions for which they have been well trained and licensed. However, unusual circumstances such as specific maintenances, system modifications might require special knowledges and skills which prompt TINT to perform competency assessment on its reactor operators and related staff. In a case of inadequacy, reactor operators and staff will get trained to

acquire necessary skill and competency to complete the task.

In order to legally operate a research reactor, one must obtain an operating license required by law. TINT provides an in-house training for its operator prospects. The training program must conform with requirements set forth by OAP. Having met qualifications for reactor operator prescribed in the related Ministerial Regulation, the operator prospects then apply for a test to obtain a license for a reactor operator. The test, including written examination and practical exercise, is administered by OAP.

It is required by law that TINT provides a refreshing course for licensed reactor operators at least once every two years. The course is intended to cover radiation protection, maintenance, fuel loading/unloading, reactor operation and parameter calculations. TINT usually plans to organize the course before a license renewal with OAP as the course will help reactor operators prepare for the test better.

In addition, TINT requires all newly employed staff to take an in-house basic safety training. It is called Radiation Protection Program.

National supply of and demand for experts in nuclear science and technology

Currently, Chulalongkorn University is the only academic institution which offers undergraduate and graduate degrees in nuclear engineering; however, it tends to focus on the nuclear applications and technology. Kasetsart University has degree programs in applied radiation and isotopes while several universities have health physics departments. After being employed by the OAP or the TINT, graduates from the universities are expected to take part in on-the-job training before they can fully function at their respective nuclear-related employers.

ARTICLE 12 HUMAN FACTORS

Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

Regulator requirements

Section 45 of the Act stipulates that any person who wishes to establish a nuclear facility shall obtain, in order to, a site license, a construction license and an operating license from the Secretary General with the approval of the NEC.

Section 46 of the Act stipulates that an establisher under section 45 shall have the qualifications and shall not be under the prohibitions as follows:

- (1) being a limited company, a public limited company, or other juristic person under a specific law;
- (2) having technical and financial qualifications as prescribed by the Ministerial Regulation;
- (3) not being bankrupt or under the financial protection;
- (4) not having the license suspended under this Act;
- (5) never having the license revoked under this Act, except the license has been revoked for more than five years before the license application date;
- (6) never being sentenced by a final judgment to imprisonment for an offence committed under this Act, except the punishment has undergone for more than five years before the license application date.

ARTICLE 13 QUALITY ASSURANCE

Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

Regulatory requirements

A licensee is required by the Act to submit a safety analysis report for nuclear facility site, a preliminary safety analysis report and a final safety analysis report corresponding to siting, construction and operating processes, respectively. Quality assurance is a required section that must be addressed by a licensee in all three safety reports. This section must contain at least the following topics.

- Chart of organizational structure and responsibilities
- Indication of units responsible for quality assurance
- Operating procedures
- Management and filing of documents
- Document control and review process

Status of implementation of quality assurance programs at a nuclear installation

TINT has been certified with ISO 9001 and OHSAS 18001 and is in the process of acquiring ISO 45001.

Overview of auditing system

TINT internal auditing system related to research reactor operation is as follows:

- Radiation safety protocols at the nuclear research reactor are internally audited by a health physicist from the division of nuclear safety.
- Operations and performances at the nuclear research reactor are reviewed by the division of nuclear safety twice a year.

- During the operation of the nuclear research reactor, the health physicist monitors the radiation emission and the release of radioactive materials in order to maintain safety of the workers, the environment and the public.
- As a part of the auditing program, water, air and soil samples are collected and assessed for the environmental contamination by the division of nuclear safety.
- Corrective actions resulting from the audit are followed up twice a year.

ARTICLE 14 ASSESSMENT AND VERIFICATION OF SAFETY

Each Contracting Party shall take the appropriate steps to ensure that:

(i) comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

(ii) verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

The Act requires that an establisher of nuclear facility submit safety reports for regulatory assessments and verifications when applying for licenses during the lifetime of nuclear facility. Types and descriptions of safety reports are prescribed in either relevant Ministerial Regulations or Notification of the Nuclear Energy for Peace Commission.

A site evaluation report must be submitted during a site license process. A preliminary safety analysis report (PSAR) must be a part of an application for construction license. A final safety analysis report must be included in an application of operating license. The Act also stipulates that a safety analysis report must be updated to reflect changes that might affect safety of a nuclear facility or periodically reviewed in order to conform to present circumstances. The decommissioning plan must also include safety analysis for decommissioning activities. Draft Ministerial Regulation to Specify Review and Update on Safety Analysis Report also specifies that the SAR must be reviewed every ten year. The decommissioning plan must also include safety analysis for decommissioning activities.

ARTICLE 15 RADIATION PROTECTION

Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

TINT implements a radiation protection program to ensure that radiation levels experienced by its workers are within national legal limits. TINT establishes personal dosimetry programs for workers who might be exposed to radiation from nuclear and radioactive materials. Both external and internal exposures are evaluated against personal dose limits specified by the law. In order to keep the radiation exposures as low as reasonably achievable for all operational and maintenance activities, TINT has installed area radiation monitors to provide a continuous monitoring. Annunciation will go off when the radiation exceeds a pre-set level.

In addition, TINT ensures that radioactive levels of all releases to the environments are within permissible limits.

The division of nuclear safety monitors the radiation emission and the release of radioactive materials to the environment by collecting and analyzing samples of surface water, air, soil, sediment, plant and aquatic animals within a 10-kilometer radius from the operation buildings. It has been evident so far that naturally occurring radioactive materials (NORM) from samples are in the natural levels and no man-made radioactive material is detected.

Regulatory Technical Support Division of OAP also monitors the release of radioactive materials to the environment by collecting and analyzing samples of surface water and air around the office which is in the same vicinity as the operation building. Furthermore, it also operates a real-time radiation monitoring station on the 7th floor of the main building of OAP which is about 100 meters from the operation building.

ARTICLE 16 EMERGENCY PREPAREDNESS

1. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency. For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low authority level agreed by the regulatory body.

2. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

3. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

It is required by Section 100 of the Act that a license holder has the duty to initially suppress the incident under the radiation protection plan and immediately notify a competent official as well as provide information and cooperate with the competent official in order to resolve, mitigate and abate such harm and damage.

Furthermore, Section 101 provides a provision in case of the harm or damage extending to a public damage or in case where a competent official finds that conducting an activity under a license may cause a public damage, as official with the authority under the law on disaster protection and relief shall have the authority to immediately suppress the cause of such public damage, including the authority to declare measure for the purpose of suppressing such cause. In suppressing the cause of the public damage, the official performs under the law on disaster protection and relief with the National Nuclear and Radiological Emergency Plan as a support plan under the National Disaster and Relief Protection Plan. OAP has the duty to provide recommendations and support personnel for such performance. Similar approach is taken if a nuclear or radiation incident take place in a foreign state that affects Thailand.



Figure 2.3: Key Ministries in the National Nuclear and Radiological Emergency Plan

OAP has formulated the National Nuclear and Radiological Emergency Plan ¹ which involves a number of agencies as shown in Figure 2.3. Their roles and responsibilities are clearly defined as follows:

1. The Prime Minister's Office

(a) Office of the National Security Council

- Follow the national security and other relevant laws
- Propose recommendations to the National Security Council or the Cabinet to formulate the policies and strategies or implementation plans in connection with the national security

¹Office of Atoms for Peace, Ministry of Science and Technology. 2014. National Nuclear and Radiological Emergency Plan

- Coordinate with government agencies, private sectors and academic institutions on implementations and activities according to the National Security Policies and Strategies to ensure they are consistent and integrated
- Manage security circumstances, including evaluate and develop policies and strategies in pursuant to all national security-related matters and peaceful strategies
- Formulate intelligence policies
- Formulate national security policies
- Perform other duties as required by laws by virtue of the Office of National Security Council or as required by the Prime Minister or the Cabinet

(b) Government Public Relations Department

- Disseminate information to the public
- Coordinate with the regulatory government agencies related to confidential information and news broadcasting which may be a threat to security
- Support communication equipment and materials in terms of public relations to provide security information services

2. Ministry of Interior

- Be responsible for providing temporary shelters, and other remuneration package to the victims radically and expeditiously
- Control and maintain normal state during a disaster

(a) Department of Disaster Prevention and Mitigation

- Draft and propose the National Disaster Prevention and Mitigation Plan to the National Disaster Prevention and Mitigation Committee (NDPMC)
- Conduct research on procedures and measures to prevent and mitigate all impacts of disasters
- Provide assistance to government agencies and relevant stakeholders
- Provide training to government agencies and relevant stakeholders on disaster prevention and mitigation
- Follow up all activities related to disaster prevention and mitigation
- Perform other duties as required by Commander in Chief, Prime Minister, NDPMC, and the Cabinet

3. Ministry of Defence

- Establish measures on prevention and mitigation of nuclear and radiological disaster as well as a plan for evacuation
 - Provide aids to those affected by nuclear and radiological disaster
 - Warn and report updated events
 - Support civil prevention in the areas
- (a) Defence Mobilisation Department
- Provide aids to those affected by nuclear and radiological disaster
 - Provide support on resources information of military forces, military arms, devices, equipment, communication tools for nuclear and radiological disaster prevention and mitigation
- (b) Directorate of Civil Affairs
- Propose the policy and implementation plan on prevention and resolution of nuclear and radiological disaster
 - Support the operational sectors of the Royal Thai Armed Forces Headquarter
 - Serve as coordinating centers among military agencies of the Royal Thai Armed Forces Headquarter
 - Disseminate information regarding nuclear and radiological disaster
- (c) Royal Thai Army Chemical Department
- Procure forces, equipment, and tools to assist on emergency operations to prevent, mitigate, and suppress nuclear and radiological threats
- (d) The Naval Science Department
- Procure forces, equipment, and tools relating to preliminary nuclear and radiological public disaster mitigation to provide aids to the victims
- (e) Research and Development Centre for Space and Aeronautical Science and Technology, Royal Thai Air Force
- Deploy the Nuclear-Biological-Chemical (NBC) Team to join the operation as requested

4. Ministry of Higher Education, Science, Research and Innovation

(a) The Office of Atoms for Peace (OAP)

- Be responsible for preliminary assessing situations for mitigating nuclear and radiological accidents and emergencies
- Receive notification and report nuclear and radiological incidents and accidents
- Coordinate with the Nuclear and Radiological Suppression Forces Operations and other local and international relevant agencies
- Follow up and collect information on nuclear and radiological accident to eventually suppress emergency situations
- Manage database and statistics of nuclear and radiological emergencies
- Provide training to relevant organizations on emergency preparedness and response

(b) Thailand Institute of Nuclear Technology (TINT)

- Support response activities of nuclear and radiological emergency
- Provide consultancy and recommendations on formulating nuclear and radiological emergency plan to other agencies

5. Ministry of Public Health

- Provide support on the formulation of National Nuclear and Radiological Emergency Plan
- Collaborate with other relevant agencies to formulate Capability Building Implementation Plan

6. Ministry of Natural Resources and Environment

- Provide recommendations and guidelines on the formulation of Chemical Substances and Hazardous Materials Emergency Plan in the risk areas
- Coordinate with other agencies according to the Disaster Prevention and Mitigation Plan to prevent explosion, fire, and chemical and hazardous material leaks to the public and the environment
- Follow up the effects of hazardous residuals on the environment
- Plan and develop permanent and sustainable natural resources and environment

(a) Pollution Control Department

- Provide recommendations on guidelines of the National Nuclear and Radiological Emergency Plan
- Coordinate with relevant agencies to prevent potential hazards
- Provide recommendations on guidelines to rehabilitate and remedy damages on the environment

7. Ministry of Transport

- Support transportation vehicles, drivers, transportation equipment, and supply fuel
- Prepare back-up routes and fix damaged roads, rails or bridges

(a) Department of Land Transport

- Support information of vehicle registration and drivers

8. Ministry of Foreign Affairs

- Coordinate with international organizations, especially when support on civil defence is needed

9. Ministry of Finance

- Allocate budget as needed in urgent situations
- Provide recommendations on allocation and integrated utilization of budget

10. Ministry of Information and Communication Technology

- Support communication resources
- Coordinate on information and relevant communicative infrastructure for disaster warning, aide, and suppression of nuclear and radiological emergency
- Provide weather information to support a decision support system (DSS)

(a) National Disaster Warning Centre

- Simulate various scenarios of disasters to make a better decision
- Exchange of disaster information both domestically and internationally
- Provide accurate information on the severity of the disaster via the Television Pool of Thailand, radio, telephone, and other government and private media

- Monitor disaster situations closely to assess causalities of both lives and assets
- Guide and cooperate training to the officials and public to have knowledge on guidelines and means of minimizing losses, evacuation, avoidance, and mitigation of disaster

11. The Royal Thai Police

- Control and maintain peaceful state, safety of lives and properties of the people and provide social services
- Evaluate the situation and disseminate disaster warning to the public
- Organize traffic systems to mitigate the disaster
- Set up Frontline Operational Center to facility operational activities
- Deploy Mobile Medical Team to provide medical services to the people

12. Bangkok Metropolitan Administration

- Direct and control the operational activities in the Bangkok Metropolitan areas
- Support the operational activities of relevant agencies
- Coordinate with relevant agencies in the Bangkok Metropolitan areas

ARTICLE 17 SITING

Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

(i) for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;

(ii) for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;

(iii) for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;

(iv) for consulting Contracting Parties in the vicinity of a proposed nuclear installation, in so far as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

Section 51 of the Act states that in establishing a nuclear facility, the establisher shall obtain a site license from the Secretary General with the approval of the Commission. When applying for a license, an applicant shall submit a license application together with a site evaluation report.

The site evaluation report shall be prepared in accordance with the specifications prescribed by the Commission with at least the following details:

- (1) The effect of external events on the nuclear facility site either of natural origin or human induced
- (2) The characteristics of a site
- (3) A site environmental report
- (4) Population demography surrounding a nuclear facility site
- (5) Evacuation routes for the population in the case of radiological or nuclear emergency

(6) Protection and mitigation of possible harm to people and the environment

Applying for a license, granting a license, and granting a license substitute for a site shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 52 of the Act states that during the consideration to issue a site license, the Office shall arrange a public hearing for the people living in the site vicinity. The public hearing results shall be used in the consideration to issue the site license. The arrangement for a public hearing shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 53 of the Act states that a site license is valid for the term specified in the license, but not exceeding ten years. Its extension may be requested and approved for a term not exceeding ten years at a time.

If a site license holder wishes to renew the license, the license holder shall submit a request not less than one year in advance but not exceeding three years before the current license expires. The request shall be accompanied by an updated site evaluation report.

Applying for a license renewal and a renewal of a license shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 54 of the Act states that after the Secretary General with the approval of the Commission has issued a site license, if it later becomes apparent that any changes have occurred or the site characteristics have changed, and such changes may affect people and the environment, the Secretary General with the approval of the Commission shall order the license holder to submit a revised site evaluation report reflecting such changes within an imposed period.

If the license holder cannot submit the revised site evaluation report as ordered within the imposed period, the license holder shall make an extension request to the Secretary General. The Secretary General shall have discretion to extend the submission period of such report up to two times. Each time, the period shall not exceed than one hundred and eighty days. If the license holder does not submit the revised site evaluation report within the imposed period or the extended period, the Secretary General with the approval of

the Commission shall issue an order to revoke the site license.

If the Secretary General with the approval of the Commission has considered the site evaluation report and is of the opinion that the site no longer meets the site license conditions for a nuclear facility site, the Secretary General with the approval of the Commission shall revoke the site license.

ARTICLE 18 DESIGN AND CONSTRUCTION

Each Contracting Party shall take the appropriate steps to ensure that:

(i) the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defense in depth) against the release of radioactive materials, with a view to prevent the occurrence of accidents and to mitigating their radiological consequences should they occur;

(ii) the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

(iii) the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

Section 55, Part 3 Construction and Equipment Installation, Chapter 5 Nuclear Facility, of the Act states that a site license holder who wishes to construct a nuclear facility shall apply for a construction license from the Secretary General with the approval of the Commission.

When applying for the license, the applicant shall submit the application together with the site license, a preliminary safety analysis report, and financial documents or evidence.

The financial documents or evidence that the applicant has to submit shall be in accordance with the Ministerial Regulation and may be prescribed according to the different types of nuclear facilities.

Applying for a license, granting a license, and granting a license substitute for a construction license shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 56 of the Act states that the preliminary safety analysis report shall provide information on a construction drawing, nuclear and radiation safety and security, and other information prescribed by the Ministerial Regulation.

The Ministerial Regulation may prescribe requirements according to the different types of nuclear facilities.

Section 57 of the Act states that after the Secretary General with the approval of the Commission has issued a construction license and it later becomes apparent that any changes have occurred and such changes may affect the safety analysis in the preliminary safety analysis report, the Secretary General with the approval of the Commission shall order the construction license holder to submit a revised preliminary safety analysis report reflecting such changes within an imposed period. The license holder shall also perform safety analysis for the changes that have occurred.

If the license holder cannot submit the preliminary safety analysis report as ordered within the imposed period, the license holder shall make an extension request to the Secretary General. The Secretary General shall have discretion to extend the submission period of such report up to two times. Each time, the period shall not exceed than one hundred and eighty days. If the construction license holder does not submit the revised preliminary safety analysis report within the imposed period or the extended period, the Secretary General with the approval of the Commission shall issue an order to revoke the construction license.

If the Secretary General with the approval of the Commission has considered the revised preliminary safety analysis report and is of the opinion that the construction may no longer be continued, the Secretary General with the approval of the Commission shall revoke the construction license.

Section 58 of the Act states that a construction license is valid for the term specified in the license, but not exceeding ten years. Its extension may be requested only once for a term not exceeding ten years.

If a construction license holder wishes to renew the license, the license holder shall submit a request not less than one year in advance but not exceeding three years before the current license expires. The request shall be accompanied by an updated preliminary safety analysis report.

Applying for a license renewal and a renewal of a license shall be in accordance with

the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 59 of the Act states that a construction license holder shall report updates on construction progress to the Secretary General according to the schedule specified in the preliminary safety analysis report.

Section 60 of the Act states that a construction license holder shall not carry out construction that deviates from what is authorized in the license unless the Secretary General with the approval of the Commission authorizes a change in the construction plan in the preliminary safety analysis report.

If the construction has deviated from what is authorized in the license, the Secretary General with the approval of the Commission shall have the power to suspend such construction. If the Secretary General with the approval of the Commission is of the opinion that such deviations are still acceptable according to the safety standards, the Secretary General with the approval of the Commission may order the license holder to revise the construction plan.

If the construction that has deviated from what is authorized in the license may cause harm to people and the environment, the Secretary General with the approval of the Commission has the power to cease such construction and order the license holder to dismantle the whole or part of the construction within the imposed period.

Section 61 of the Act states that if the installations of equipment, machines, and tools are different from what are specified in a preliminary safety analysis report, section 60 shall be applied *mutatis mutandis*.

ARTICLE 19 OPERATION

Each Contracting Party shall take the appropriate steps to ensure that:

i. the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;

ii. operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;

iii. operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;

iv. procedures are established for responding to anticipated operational occurrences and to accidents;

v. necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;

vi. incidents significant to safety are reported in a timely manner by the holder of the relevant license to the regulatory body;

vii. programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;

viii. the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

Section 62, Part 4 Commissioning and Operation, Chapter 5 Nuclear Facility, of the Act states that after the completion of the construction and before applying for an operating license, a construction license holder shall test the installed machines and equipment. The date and time of the testing, together with the testing duration of the installed machines and equipment, shall be notified in advance to the Secretary General not less than fifteen days in order that a competent official comes to inspect such testing.

When the testing of the machines and equipment is completed, the construction license holder shall prepare and submit a test report to the Secretary General for approval.

Section 63 of the Act states that for the following activities, a construction license holder shall acquire an authorization from the Secretary General:

- (1) an initial loading of nuclear fuel into a nuclear reactor and a commissioning test of a nuclear reactor
- (2) an initial loading of nuclear material in an enrichment process or an initial loading of spent nuclear fuel in a reprocessing process. The Secretary General shall authorize the activities only after the test report under section 62 has been approved.

During the initial loading of nuclear fuel, nuclear material or spent nuclear fuel, the Secretary General or a competent official assigned by the Secretary General shall also inspect such activities.

When the authorized activity is completed, the construction license holder shall prepare and submit a test report to the Secretary General for approval.

An authorization request, loading of nuclear fuel, nuclear material or spent nuclear fuel, a commissioning test of a nuclear reactor or a loading test of nuclear material or spent nuclear fuel, and reporting such tests shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 64 of the Act states that a nuclear facility establisher who wishes to operate a nuclear facility shall obtain an operating license from the Secretary General with the approval of the Commission.

When applying for the license, an applicant shall submit an application together with

financial documents and evidence, the construction license, and a final safety analysis report.

The final safety analysis report shall at least contain the updated content of the preliminary safety analysis report, the testing report under section 62, and, if the activity under section 63 has been conducted, the commissioning report under section 63.

The documents that the applicant shall submit shall be prescribed by the Ministerial Regulation. The documents and the periods of time for submission may be prescribed according to the different types of nuclear facilities.

Applying for a license, granting a license, and granting a license substitute for an operating license shall be in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 65 of the Act states that an operating license is valid for the term specified in the license, but not exceeding sixty years. Its extension may be requested in accordance with the rules, procedures, and conditions prescribed by the Ministerial Regulation.

Section 66 of the Act states that in issuing an operating license, the Secretary General with the approval of the Commission may order a modification of the operating limits of the nuclear reactor as appeared in the final safety analysis report before granting the license.

Section 67 of the Act states that an operating license holder is responsible for reviewing and updating the safety analysis report at the periods and under the cases prescribed by the Ministerial Regulation or when the Secretary General is of the opinion that there is a cause rendering the final safety analysis report no longer suitable for present circumstances.

If the license holder cannot submit the revised safety analysis report as requested within the imposed period, the license holder shall make an extension request to the Secretary General. The Secretary General shall have discretion to extend the submission period of such report up to two times. Each time, the period shall not exceed one hundred and eighty days. If the license holder does not submit the revised safety analysis report within

the imposed period or the extended periods, the Secretary General with the approval of the Commission shall issue an order to revoke the operating license.

If the Secretary General with the approval of the Commission has considered the safety analysis report and is of the opinion that it is necessary to reevaluate the safety analysis of the nuclear facility in order to continue the operation of the nuclear facility, the Secretary General with the approval of the Commission shall order the license holder to revise the safety analysis report.

If the Secretary General with the approval of the Commission disapproves the safety analysis report or the license holder does not revise the safety analysis report, the Secretary General with the approval of the Commission shall issue an order to suspend the operating license until the license holder revises the safety analysis report and the report is approved.

Section 68 of the Act states that in the case where an operating license holder of a nuclear facility utilizing a power reactor cannot continue the operation, the Secretary General with the approval of the Commission may ask a state or private agency with experience and expertise to take over the operation until another operating license holder of a nuclear facility utilizing a power reactor takes over the operation, or may issue an order to terminate the operation of that nuclear facility.

The state or private agency taking over the operation shall be regarded as a license holder, having the rights and duties under this Act.

The state or private agency that takes over the operation for the license holder shall have the rights to enter and use the nuclear facility as necessary. The state or private agency shall exercise caution to keep and protect the properties of the license holder in the same manner as a nuclear facility operator or a person with such a profession should do. If damages occur to the license holder, the license holder shall have the right to claim for such damages from the Office in accordance with the rules, procedures, and conditions prescribed by the Commission.

The allocation of revenue and expenses incurred during the takeover period between when the person who takes over the operation and the license holder shall be in accordance

with the rules, procedures, and conditions prescribed by the Commission.

Section 69 of the Act states that Section 31 and section 32 shall be applied *mutatis mutandis* to the guarantee provided by an operating license holder to ensure radioactive waste management, spent nuclear fuel management, and the activities under the decommissioning plan.

Section 31 of the Act states that 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 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 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. 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 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.

Section 32 of the Act states that the state agencies, prescribed by the Ministerial Regulation, as the license holder under section 19 and section 26 shall be exempted from providing the guarantee under section 31.

3. Appendix

I. LIST OF ABBREVIATIONS

AEC	Atomic Energy Commissions for Peace
ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
CNS	Convention on Nuclear Safety
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organization
EC	European Commission
EIA	Environmental Impact Assessment
IAEA	International Atomic Energy Agency
ISCA	Independent Safety Culture Assessment
MHESI	Ministry of Higher Education, Science, Research and Innovation
MOST	Ministry of Science and Technology
NAA	Neutron Activation Analysis
NDPMC	National Disaster Prevention and Mitigation Committee
NEC	Nuclear Energy Commission for Peace
NEPA	The Nuclear Energy for Peace Act B.E. 2559 (2016)
NEPC	National Energy Policy Council
NIMT	National Institute of Metrology
NPP	Nuclear Power Plant
NSSC	Nuclear Safety and Security Commission
OAEP	Office of Atomic Energy for Peace
OAP	Office of Atoms for Peace
OCS	Office of the Council of State
PDP	Power Development Plan
RWM	Radioactive Waste Management
TINT	Thailand Institute of Nuclear Technology
TRR-1/M1	Thai Research Reactor-1/Modification 1
U.S. DOE.	United States Department of Energy
U.S. NRC.	United States Nuclear Regulatory Commission