

## THE CONSIDERATION OF SECURITY ASPECT IN REVIEW FOR NUCLEAR INSTALLATION OF SITING STAGE

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### Abstract

The security of the nuclear installation is an important criterion for site selection and for establishing plant configuration and plant operational procedures. Plant security is ensured primarily through features that are built into the strength of the structures, configuration of the systems and layout of the buildings, and barriers and security systems which are set up to restrict access and entry into the plant. Nuclear installation has often been designed without considering nuclear security until late in the design stage or after operational and safety features had already been determined. Nuclear security measures were added later, often resulting in the application of measures that were not integrated or fully compatible with measures relating to safety, safeguards, and operations. The facts are nuclear security in siting also influence safety aspect, therefore nuclear security must be reviewed in the site stage of nuclear installation. This paper will present consideration of the result of evaluation for site characteristics for nuclear security purposes, including review of regulation on security aspect especially for site stage when applied in Indonesia.

Keywords: security aspect, review, siting of nuclear installation

### 1. INTRODUCTION

The lifetime of a nuclear installation extends from the earliest planning stages through to its decommissioning. Various requirements apply to a nuclear installation during all stages in its lifetime, including nuclear safety, nuclear security, safeguards and operational requirements. The fact that nuclear installation has often been designed without considering nuclear security until late in the design stage or after operational and safety features had already been determined. Nuclear security measures were added later, often resulting in the application of measures that were not integrated or fully compatible with measures relating to safety, safeguards, and operations. Moreover, implementing new or additional security measures after a nuclear facility is in operation may be difficult and costly.

Some publication report that aspect nuclear safety must be considered in stages the installation site, which considers several provisions of the national and international requirements and involves competent parties on a national scale. The security of the installation is an important criterion for site selection and for establishing plant configuration and plant operational procedures. Site selection is the method used to describe the series of sites to choose where installations will be built, and whether the chosen location is appropriate, which involve multi-process activity and many types of site characteristics. In general, aspects of nuclear security are included in the consideration of site characteristics that can affect the ability to implement physical protection measures and the ability to obstruct, detect, delay and respond to nuclear security events. [1]

### 2. METHODS

This is a literature study that will present consideration of the result of evaluation for site characteristics for nuclear security purposes, including review of regulation on security aspect especially for site stage.

### 3. RESULTS AND DISCUSSION

#### 3.1 Nuclear Security Legislation and Regulation. [2]

##### A. Ratification of international legal instruments.

Nuclear security is one of the most important topics for regulatory purposes in Indonesia. Indonesia participates in bilateral and multilateral cooperation and international events such as the Nuclear Security Summit. Indonesia has also ratified several international instruments related to nuclear security. Based on commitment to international events and ratification, Indonesia has developed nuclear security infrastructures by strengthening legislation and regulation, enhancing building capacity, and strengthening equipment and facilities. Table 1 shows the ratification of international legal instruments.

Table 1. Ratification of International Legal Instruments

No	Title legal instruments	Ratification instruments
1.	Non-Proliferation Treaty	Act No. 8 Year 1978
2.	South East Asia Weapon Free Zone	Act No. 9 Year 1997
3.	Comprehensive Nuclear Test Ban Treaty	Act No. 1 Year 2010
4.	International Convention on Suppression Act of Nuclear Terrorism	Act No. 10 Year 2014
5.	Convention on Physical Protection of Nuclear Materials	Presidential Regulation No. 49 Year 1986
6.	Amendment of Convention on Physical Protection of Nuclear Materials	Presidential Regulation No. 46 Year 2009

##### B. Establishment of regulatory body.

BAPETEN is Indonesia's nuclear energy regulatory agency that establishes regulations, processes licenses, and conducts safety, security, and safeguard inspections. BAPETEN was established based on Act No. 10 on Nuclear Energy, year 1997 and is directly subject to the President of Indonesia. The regulatory activities for nuclear energy accomplish several things. First, they strive to assure the welfare, security, and peace of the people, as well as the health and safety of workers and the public. They also endeavor to protect the environment. Second, they strive to maintain legal order for implementing the use of nuclear energy. Third, they strive to increase the legal awareness of nuclear energy users and develop a safety culture in the nuclear field. Fourth, they attempt to keep the goals for using nuclear material in alignment. Finally, they strive to maintain and increase worker discipline when using nuclear energy.

##### C. Development of regulation and legislation

Indonesia bases the development of any act, law, or regulation on the implementation of international legal instruments, referred to as international standard publications. These acts, laws, and regulations cover topics such as the physical protection of nuclear installations and materials, radioactive source security, and safeguards. International legal instruments include the International Treaty Convention in the UN and International Atomic Energy Agency Information Circular (IAEA INFCIRC) documents.

Indonesia has issued regulatory acts related to nuclear security as a basis for BAPETEN's regulatory activities, namely Act No. 10 on Nuclear Energy (1997). The basic policy in Article 16 of Act No. 10 states: "Any nuclear energy uses shall be implemented to ensure the safety, security and safeguards." Another regulatory act, Act No. 15 on the Establishment of the Government Regulation (2003), replaced Act No. 1 on Terrorism (2002). There are several government regulations (GR) regarding nuclear security. These regulations include:

- a. GR No. 54 on the Safety and Security of Nuclear Installations and Material (2010);
- b. GR No. 2 on Licensing of Nuclear Installations and Materials (2014);
- c. GR No. 33 on Safety of Ionizing Radiation and Security of Radioactive Sources (2007); and
- d. GR No. 29 on the Licensing of Ionizing Radiation Sources and Nuclear Material (2008).

Besides acts and government regulations, there are some BAPETEN Chairman Regulations (BCR) pertaining to nuclear security as well. These regulations include:

- a. BCR No. 1 on the System of Physical Protection of Nuclear Installations and Materials (2009);
- b. BCR No. 4 on Safeguards system (2011); and
- c. BCR No. 2 on Design Information Questionnaire (DIQ) (2009), and BCR No. 6 on Security of Radioactive Sources (2015).

### 3.2 Procedures for Application and Issuance of Permits for site license in Indonesia. [3, 4]

The Government of Indonesia takes necessary efforts to ensure that the future of nuclear installation site will comply with established requirements. In accordance with Government Regulation (GR) Number 2 Year 2014 on Licensing of Nuclear Installations and Nuclear Materials Utilization, site evaluation approval application shall be submitted together with its administrative and technical requirement documents. Site evaluation activity is one of the pre-requisites for issuing site license. Site evaluation approval application shall be submitted together with its administrative and technical requirement documents, as described in Figure 1 and Figure 2.

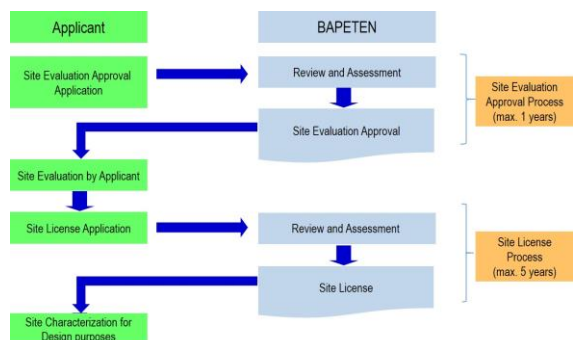


FIG 1. Flowchart of site license application

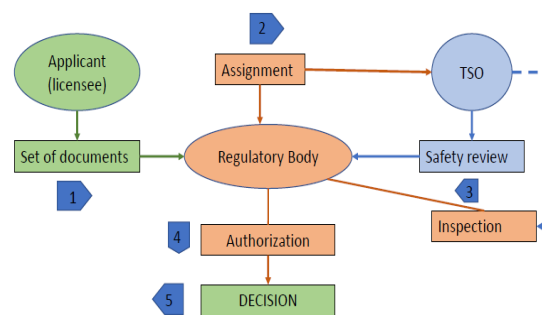


FIG 2. Interaction between applicant and BAPETEN during nuclear installation licensing process

Applicant shall submit a written application to Chairman of BAPETEN and meet technical and administrative requirements to obtain site license. Site Evaluation activities should be carried out by the applicant before applying for a Site license. Site Evaluation activities shall be done after obtaining the Site Evaluation approval of the BAPETEN’s Chairman. Review of Indonesia regulation on security aspect for nuclear installation in siting stage is delivered in article 3.4.

### 3.3 Review and assessment during site stage: Consideration of the result of evaluation for site characteristics for nuclear security purposes

The siting stage for a nuclear facility generally comprises the concern of candidate sites, considering various factors such as available infrastructure and workforce as well as geographical and security considerations. This would then be followed by a detailed evaluation of the candidate sites. The location of the nuclear facility is identified during the siting stage. The siting of a nuclear facility has the potential to increase or decrease its vulnerability to external security threats as well as to increase or decrease the potential consequences that could result from malicious acts. During site selection, nuclear security considerations should be evaluated by regulatory body alongside safety and other considerations, such as seismic activity, geology, meteorology hydrology, and Hazardous material in vicinity/on-site or nearby facilities (see table 2). [5].

The competent authority and the operator include evaluating: (a). Any local or regional threats that could impact the facility; (b) Security interfaces and interdependencies with existing nearby nuclear facilities; (c) Topography that may enhance or increase the vulnerability of the security of site; (d) Potential impact of radiological releases to the environment or populated areas (e.g. population centers, critical infrastructure, airports and other transport assets, and international borders); (e). The availability of enough response forces to respond in a timely manner to a nuclear security event; and (f) Free space for site reconfiguration, including expansion, if security needs increase.

The review involves the evaluation of the site characteristics to provide reasonable assurance that an adequate physical protection system (PPS) and associated nuclear security measures can be developed to meet applicable requirements. The site evaluation addresses the physical dimensions of the nuclear facility (including support facilities) and its surrounding environment:

- Description of the physical land characteristics should indicate that adequate distances exist between vital equipment and vital areas and the probable location of a security boundary.

- Description of the site characteristics that indicates that adequate space exists for design and implementation of the security plan, e.g. construction and installation of: physical barriers, isolation zones and associated intrusion detection and assessment equipment & access control points limited area access control points and associated vehicle search areas and alarm stations.
- Description of the site characteristics that may require measures in order to control approaches to the facility: Openings within the limited access area (LAA), Main access road from LAA to the protected area (PA), Transportation routes, cliffs, depressions, hills, mounds, open waterways, and roadway or railroad that penetrate the LAA boundary.
- Description of nearby facilities and pipelines to identify potential hazards in the site vicinity.
- Description of planned culverts and unattended openings that extend from outside to inside the proposed PA, the area for power block structures, and the area for safety-related water sources (e.g. cooling towers, water intakes).
- Description of site-specific meteorological conditions, including extremes.
- Description of social-economic situation in the area surrounding the site.

Table 2. Review and assessment during siting by regulatory body

Site Location	Hazardous Material in Vicinity/On-Site or Nearby Facilities
<p>The regulatory body should verify that:</p> <ul style="list-style-type: none"> <li>a) Information is sufficiently detailed to demonstrate site characteristics will support the development of a security plan;</li> <li>b) Sufficient spatial separations exist for physical barriers and the designations of security boundaries;</li> <li>c) Highways, railroads, and waterways that pass through LAA are sufficiently distanced from planned facility location; and</li> <li>d) If the proposed site is at a remote location, the off-site contingency plans and measures can be developed adequately.</li> </ul>	<p>The regulatory body should verify that:</p> <ul style="list-style-type: none"> <li>a. Potential hazardous materials in the vicinity or on-site do not present impediments to planned PPS engineered and administrative controls.</li> <li>b. Postulated accidents and consequences are analyzed for determining possible impediments to maintaining adequate nuclear security. <ul style="list-style-type: none"> <li>i. Security structures or fighting positions are spatially separated at safe distances to resist against effects of hazards.</li> <li>ii. PPS engineered features are designed to protect against hazardous and corrosive environments to assure continued nuclear security functions.</li> </ul> </li> <li>c. Nearby facilities (e.g. chemical plants), mining/quarrying operations, transportation routes, oil and gas pipelines, drilling operations, wells and underground gas storage facilities identified in the vicinity are considered for potential impediments.</li> </ul>
<b>Floods and Low Water Conditions (1/2)</b>	<b>Floods and Low Water Conditions (2/2)</b>
<p>The regulatory body should verify that:</p> <ul style="list-style-type: none"> <li>a) Probable maximum flood conditions and combination of flood producing phenomena are analyzed and established for design of PPS.</li> <li>b) Designs, specifications, and configurations of the PP elements including the following, can be developed and maintained to perform their intended functions in the event of flood: <ul style="list-style-type: none"> <li>- Central and backup alarm stations.</li> <li>- Security posts or fighting positions.</li> <li>- Engineered physical protection systems and structures.</li> <li>- Digital, electronic, and communication signal transmission lines.</li> </ul> </li> <li>c) Contingency plans meeting the regulatory requirements can be established.</li> </ul>	<p>The regulatory body should verify that:</p> <ul style="list-style-type: none"> <li>a. Site locations subject to flooding are identified and any challenges or impediments to designs of engineered controls and implementation of operational requirements are considered.</li> <li>b. Changes to topography of the site caused by low water conditions (e.g., drought, set down) are considered for determining if they challenge the design of engineered and administrative controls for security</li> </ul>
<b>Regional Climatology and Local Meteorology</b>	<b>Geology and Seismology</b>
<p>The regulatory body should verify that identification and consideration of acute and prolonged exposure to severe weather and resulting environmental conditions is considered in order to:</p> <ul style="list-style-type: none"> <li>a. Develop and implement the security plan</li> <li>b. Ensure that the following PPS components perform as designed:</li> </ul>	<p>The regulatory body should verify that:</p> <ul style="list-style-type: none"> <li>a. The geology and seismology characteristics have been considered to determine the suitability of the site;</li> <li>b. The ground motion environment for seismic design of the nuclear facility has been considered for engineered and administrative controls required for the PPS;</li> <li>c. Security plan can be developed.</li> </ul>

<ul style="list-style-type: none"> <li>i. intrusion detection.</li> <li>ii. surveillance and assessment cameras.</li> <li>iii. communications equipment.</li> <li>iv. Illumination.</li> <li>v. defensive fighting structures or enclosures.</li> <li>vi. active and passive vehicle barrier systems.</li> <li>vii. search and access control systems.</li> </ul>	
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### 3.4 Review of Indonesia regulation on security aspect for nuclear installation in siting stage

The licensing for siting stage of nuclear installation are stipulated on Government Regulation (GR) Number 2 Year 2014 on Licensing of Nuclear Installations and Nuclear Materials Utilization. Applicant shall submit a written application to Chairman of BAPETEN and meet technical and administrative requirements to obtain site license. The technical requirements for obtaining a site license, include:

- I. Site Evaluation report on the implementation, which contain among others, includes: (1) introduction; (2) Site Evaluation management; (3) Site evaluation results and analysis of data on: (a) the effect of natural events and human activities on the incidence of nuclear installation safety in the Site and surrounding area; (b) Site characteristics and surrounding area to the transfer of radioactive substances released by Nuclear Installation to man and the environment; and (c) population demographics and other characteristics of the site and surrounding area related to the evaluation of risks to members of the public and the feasibility of nuclear preparedness program; and (4) conclusion;
- II. Report on the implementation of Site Evaluation management systems;
- III. Documents containing the main data of Nuclear Installation, which contain information of (a) number, type, and degree of thermal power nuclear reactors to be built; (b) Nuclear installation layout and amenities at site; (c) The maximum rate estimates radiological and thermal effluent that will be generated by any nuclear reactors and facilities; and (d) type of cooling system, cooling water intake point and discharge of effluent that is associated with each facility (for nuclear reactor), and;
- IV. Design Information Questionnaire (for siting license), which contain information of: (a) description of the facility or the main features; (b) the purpose of the facility; and (c) outline the layout of the facility on the site.

Document of (I), (II), and (III) are technical document informing safety aspects and/or related to safety of nuclear installation, however document (IV) – on operation stage, describing nuclear materials, including shape, number, location and flow of nuclear material used, features facilities including a description of the facilities, layout and confinement facilities, and control procedures of Nuclear Material. [6, 7]

In addition to GR 2-year 2014, the applicant shall fulfill on GR 54-year 2012 regarding Safety and Security of Nuclear Installations, as stated on article 44, that “(1) During site monitoring before design and construction, the Licensee in performing safeguards shall: (a) submit declaration on general plan of the development of nuclear fuel cycle, research, and development that are related to the nuclear fuel cycle; and (b) arrange preliminary design information list; (2) During the site monitoring before design and construction, the Licensee in performing physical protection shall establish local design basis threat (DBT) that is based on the national design basis threat. (3) The arrangement and establishment of the national design basis threat are performed based on the national legislation”. [8]. Document of DBT describes information of the characteristics of internal and external enemies that are used to design and evaluate physical protection system. Further requirements on the procedures of safeguards and physical protection system of nuclear installation and Material during the site monitoring before design and Construction are regulated by a Chairman of BAPETEN Regulation. [9, 10]

Therefore, the data collection gathered during site characteristic activities, besides in review and assessment for safety purposes can also be apply for security purposes, including the determination of design basis parameter as an input for designing and constructing a nuclear installation. Furthermore, conducting nuclear installation site selection and evaluation, must be done by those with skill and competent in nuclear safety and security simultaneously. Site selection must not only consider installation utilization, but also compensate the risk that may arise from security and safety aspect within the site area. Vulnerable area for people or social conflict must be exclude from the site selection.

Indonesia has issued several government regulations and BCRs addressing nuclear security. Nowadays, nuclear security aspect has been implemented during review and assessment in siting stage of nuclear installation. However, several regulations should be updated, in the future.

#### 4. CONCLUSION

Indonesia has issued several government regulations and BCRs addressing nuclear security. Nowadays, nuclear security aspect has been implemented during review and assessment in siting stage of nuclear installation. However, several regulations should be updated, in the future.

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