Hungarian Atomic Energy Authority

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Guideline PP-19

Physical protection related assessment of the site of a nuclear facility or a radioactive waste repository planned to be constructed, as required for the application to be submitted to obtain the design basis threat

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FOREWORD FROM THE DIRECTOR GENERAL

The Hungarian Atomic Energy Authority (hereinafter referred to as HAEA) is a central state administration organ (a so-called government office) having nation-wide competence in the field of peaceful use of atomic energy; it operates under the direction of the Government, it has independent tasks and scope of authority. The HAEA was established in 1990 by the Government of the Republic of Hungary with Govt. decree 104/1990. (XII. 15.) Korm. on the scope of tasks and competence of the Hungarian Atomic Energy Commission and the OAH.

The public service of the HAEA as defined in law is to perform and coordinate, independently of organizations having interest in the application of atomic energy, the regulatory tasks in relation to the peaceful and safe use of atomic energy, including the safety of nuclear facilities and materials, nuclear emergency response and nuclear security, and the corresponding public information activity, and to make proposal to develop and amend, and to offer an opinion on proposed legislations corresponding to the use of atomic energy.

The fundamental nuclear safety objective is to ensure the protection of individuals and groups of the population and of the environment against the hazards of ionising radiation. This is ensured with effective safety measures implemented and adequately maintained in the nuclear facility.

The radiation protection objective is to keep the radiation exposure of the operating personnel and the public all times below the prescribed limits and as low as reasonable achievable. This shall be ensured in the case of radiation exposures occurring during design basis accidents, and as far as reasonably possible during beyond design basis accidents and severe accidents.

The technical safety objective is to prevent or avoid the occurrence of accidents with high confidence, and the potential consequences occurring in the case of every postulated initiating event taken into account in the design of the nuclear facility shall remain within acceptable extent, and the probability of severe accidents shall be adequately low.

The HAEA determines the way how the regulations should be implemented in guidelines containing clear, unambiguous recommendations in agreement with the users of atomic energy. These guidelines are published and accessible to every members of the public. The guidelines regarding the implementation of nuclear safety, security and non-proliferation requirements for the use of atomic energy are published by the director general of the HAEA.

FOREWORD

The internationally accepted bases of physical protection are represented by the Law Order 8 of 1987 on the promulgation of the International Convention on the Physical Protection of Nuclear Materials, the Act LXII of 2008 on the promulgation of the Amendment to the Convention on Physical Protection of Nuclear Materials approved in the frame of the International Atomic Energy Agency and promulgated by Law-decree 8 of 1987 amended by a Diplomatic Conference organized by the IAEA signed on July 8, 2005, and the Act XX of 2007 on the promulgation of the International Convention for the Suppression of Acts of Nuclear Terrorism.

The realization of the stipulations undertaken by Hungary, at the highest level, is represented by the Act CXVI of 1996 (hereinafter referred to as Atomic Act), which includes the fundamental security principles and establishes the frame of the detailed physical protection regulations.

The Govt. decree 190/2011. (IX. 19.) Korm. published based on the authorization of the Act (hereinafter referred to as Government Decree) establishes the legal requirements for the physical protection of the use of atomic energy and for the connecting licensing, reporting and inspection system.

The HAEA is authorized to develop recommendations regarding the implementation of requirements established in laws, which are published in the form of guidelines and made accessible on the website of the HAEA.

For the fast and smooth conduct of licensing and inspection procedures connecting to the regulatory oversight activity, the Authority encourages the licensees to take into account the recommendations of the guidelines to the extent possible.

If methods different from those laid down in the regulatory guidelines are applied, then the Authority shall conduct an in-depth examination to determine if the applied method is correct, adequate and full scope, which may entail a longer regulatory procedure, involvement of external experts and extra costs.

The guidelines are revised regularly as specified by the HAEA or out of turn if initiated by a licensee.

The regulations listed are supplemented by the internal regulations of the licensees and other organizations contributing to the use of atomic energy (designers, manufacturers etc.), which shall be developed and maintained according to their quality management systems.

Before applying a given guideline, always make sure whether the newest, effective version is considered. The valid guidelines can be downloaded from the HAEA's website: http://www.oah.hu.

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1. INTRODUCTION

1.1. Scope and objective of the guideline

The guideline contains recommendations on how to comply with the regulations established in the Decree.

This document supports the compilation of the physical protection related assessment during the design of a nuclear facility or a radioactive waste repository *(i.e. an interim storage or a final disposal facility)* planned to be constructed (hereinafter referred to as facility) as required for the application to be submitted to obtain the site related design basis threat.

This guideline does not discuss in detail those requirements for the installation and operation of the facility physical protection system, which are determined in a separate law and discussed in detail in separate guidelines and recommendations.

The PP-8 and PP-17 guidelines provide support for the design of the physical protection of nuclear facilities (with the exemption of nuclear facilities operating with reactors having a thermal power lower than 1 MW) and radioactive waste repositories.

1.2. Corresponding laws and regulations

The legal background of the nuclear security requirements is established in the following documents:

a) Act CLV of 2009 on the protection of classified data

b) Guideline PP-8: Designing the physical protection system of nuclear facilities (with the exemption of nuclear facilities operating with a reactor having thermal power lower than 1 MW) and radioactive waste repositories, Hungarian Atomic Energy Authority, Budapest, 2011

c) Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities (INFCIRC/225/Revision 5), IAEA Nuclear Security Series No. 13, IAEA, 2011.

d) Nuclear Security Recommendations on Radioactive Material and Associated Facilities, IAEA Nuclear Security Series No. 14, IAEA, 2011.

e) Convention on The Physical Protection of Nuclear Material and Nuclear Facilities, IAEA, CPPNM/AC/L.1/1, 2005.

f) US NRC Regulatory Guide 4.7 - General Site Suitability Criteria for Nuclear Power Stations

g) Objective and Essential Elements of a State's Nuclear Security Regime, IAEA Nuclear Security Series No. 20, IAEA, 2013.

2. TERMINOLOGY

This guideline uses the following terminology in addition to the terms determined in Section 2 of the Atomic Act and Section 2 of the Decree.

Administrative measures:

The entirety of all those procedures, which determine the operation and use of the facility, nuclear and other radioactive material.

Unacceptable radiological consequences:

The consequence of sabotage against a nuclear facility, nuclear material, radioactive source or radioactive waste is unacceptable, if it causes or may cause a nuclear emergency; and if the sabotage entails significant exceedance of the dose limit of certain individuals or a group of individuals, or it can induce such overexposure.

Authority:

The HAEA and the Hungarian Police Headquarters.

3. RECOMMENDATIONS OF THE GUIDELINE

3.1. Physical protection requirements

3.1.1. Goal

Subsection (1) of Section 32/A of the Decree states that

„In the case of a nuclear facility or a radioactive waste repository planned to be constructed, the obligant shall request the determination of the design basis threat pursuant to Point b) of Subsection (1) of Section 3 at the HAEA".

The design basis threat (DBT) for a new facility is determined by the authority at the request of the licensee, which should include the following:

a) the type, quantity and activity of the used, stored or transported nuclear material, radioactive source, and processed, stored or transported radioactive waste, and the list of systems and components important from the viewpoint of radiological consequences, and

b) physical protection assessment of the suitability of the site.

This document provides guidance on the physical protection assessment of the suitability of the site.

3.1.2. Fundamentals of the physical protection system of a new facility

The goal of physical protection is to prevent (deter), detect, delay and respond to:

(1) sabotage acts entailing radiological consequences,

(2) unauthorized removal of nuclear and other radioactive material (radioactive sources and waste),

on the site of the facility, and during use, storage and transport of nuclear and other radioactive material.

The physical protection of the facility, and the nuclear and other radioactive material used, stored or transported on the site of the facility is ensured by a complex system consisting of technical means, administrative procedures and security guards.

The physical protection should apply a graded approach, taking into account the actual threat, the applicability of the nuclear and other radioactive material to build a nuclear or radiological weapon and to use for a malicious

act, the physical and chemical properties of the material, as well as the potential consequences in relation with the unauthorized removal of or sabotage against the nuclear and other radioactive material.

Consequently, the threat categories of the nuclear and other radioactive material planned to be used or stored in the facility to be constructed on the site should be determined during the design phase, and the relevant physical protection requirements established in separate law should be identified.

Fundamentals:

a) The physical protection system shall be appropriate for the effective and timely deterrence, detection, delay of and response to malicious acts postulated based on the design basis threat; at the same time, the requirements for minimal physical protection levels established in separate law in line with the danger meant by the material to be protected shall also be complied with.

b) The construction of the physical protection system shall take into account the significance of the equipment to be protected, the operational states of the facility and the possible environmental conditions.

c) The physical protection system shall apply the defence in depth concept, the protection layers shall be mutually independent, the various adversary pathways shall be protected at almost the same protection level.

d) The adequate harmony of prevention/deterrence, detection/observation, delay and response physical protection functions shall be ensured.

The physical protection system implemented by the licensee should be capable of providing protection against the design basis threat determined for a particular material, facility. Accordingly, after detection of the attempt of sabotage or unauthorized removal and alerting of the response forces, the applied technical barriers should provide sufficient delay for the response force having sufficient number, equipment and capabilities in order to allow the response force arriving at the scene before the successful performance of an unauthorized removal or sabotage and interrupting and preventing the malicious act.

At the request of the licensee, the design basis threat of a new facility is determined by the Authority within 6 months after the receipt of the application and then it is delivered to the licensee.

In accordance with Subsection (2) of Section 32 of the Decree the application for licensing the Physical Protection Plan describing the implementation of the physical protection system of the new facility should be submitted to the Authority together with the construction license application.

The characteristics of the site determine certain elements of the physical protection system to be implemented (e.g. deterrence means, realization of delay, operable detection systems, capabilities of off-site response forces, the time needed for their arrival); therefore the Authority should take into account the topographic, meteorological, environmental and accessibility specifics of the site during the determination of the design basis threat.

Consequently, in addition to the assessment of the technology and materials to be applied, the applicant should present, in its application, the physical protection related assessment of the suitability of the site.

The licensee has the exclusive responsibility for the implementation of an effective physical protection system against the design basis threat. The threats beyond the design basis threat and the protection against them, as well as the capabilities of the state organizations should also be assessed. In the case of a threat requiring physical protection higher than that required for the protection against the design basis threat (i.e. larger number of adversaries, better equipped adversaries, more trained adversaries then those defined in the design basis threat, or an attempt of sabotage instead of unauthorized removal) the physical protection of the licensee, if justified, should be supported by state forces. The state actions to be implemented in the case of a threat beyond the design basis threat are initiated based on the proposal of the HAEA.

3.1.3. Content requirements for the assessment of the physical protection related suitability of the site

The physical protection related suitability of the site should be demonstrated based on credible threats, possible adversary pathways and tactics, through the assessment of the following aspects.

3.1.3.1. Topography of the site

The assessment of the topography of the site should cover and present the following:

a) civil engineering structures planned to be constructed on the site (building, fences, roads),

b) topology of the site and its environment,

c) surrounding transport routes (public road, water and air),

d) surrounding pipelines,

e) existing and planned pipelines on the site (e.g. sewage discharge line),

f) placement of systems and components important from the viewpoint of radiological consequences,

g) surrounding hazardous facilities,

h) location of surrounding settlements,

i) location of the planned water intake plant,

j) boundary of the planned protected area,

k) planned control and access points,

l) planned placement of the guard force.

The topography of the site should be assessed also from the viewpoints of view, hidden access, possible construction of external physical barriers (fences, access points), and implementation of area protection. Such aspects are whether hidden tunnels or holes exist under the surface, which allow hidden, even undetected access to the site.

The topography of the site should be assessed also from the viewpoints of the possible installation of the elements (detection, delay and response) of the physical protection system. For example, should the boundary of the controlled zone constructed in compliance with the principle of balanced protection (e.g. in the case of a brook or river flowing through the site, electric network cables or other civil structures). In addition, the assessment of the topography should be used for the development of credible threat scenarios. For example, in the case of a site surrounded by natural high lands, the potential of a stand-off attack should also be taken into account.

3.1.3.2. Meteorological conditions of the site

The extreme meteorological conditions postulated on the proposed site should be assessed, whether they can influence the continuity of physical protection.

The principle of balanced protection does not mean only that the physical protection system should ensure timely detection and delay for each adversary pathway, but it should be independent of the weather, part of the

day and the phase of operation. The extreme weather conditions (e.g. fog, snow, extreme high or low temperature) can adversely influence the operation of the applied detectors and may cause a false alarm or reduce their sensitivity to such a level that they would not be capable of detecting an intrusion. Consequently, the occurrence probability and frequency of extreme weather conditions should be assessed during the process of site selection.

3.1.3.3. Extreme water levels in the environment of the site

The design of the physical protection system should take account of extreme water levels occurring in the given area. The physical protection measures should be implemented in a way to ensure that the elements of the physical protection system remain capable of performing their function in the case of a flood. In addition to floods, low water level should also be assessed. Such scenarios should also be assessed, when the adversary pathway is only accessible in the case of low water level (otherwise inaccessible). Complementary physical protection measures should ensure the adequate level of physical protection in such cases.

3.1.3.4. Geology and seismology conditions of the site

During the design of the physical protection system and development of physical protection measures it is important to consider the geology and seismology conditions of the site. The geology and seismology conditions can influence the physical protection system of the site. An earthquake may make certain elements of the physical protection system inoperable; thus, the principle of balanced protection and the principle of defence in depth might be violated.

3.1.3.5. Land-use, population and economic activities in the environment of the site

The land-use, the settlements of the population and the resulting risks should be assessed in the immediate vicinity of the site.

The population density in the immediate vicinity of the site, and e.g. the resulting traffic is important not only from nuclear safety, but also from nuclear security point of view, since (in harmony with the defence in depth principle) in addition to the designation of protection zones is important within the site, the timely detection of adversaries off the site, before they reach the site has great relevance in increasing the effectiveness of response.

A site surrounded with intensive traffic means greater risk from physical protection point of view, than a site located in a less populated area. On the other hand a site located on a remote, abandon area, which cannot be easily accessed also entails a security risk (see Section 3.6).

The influence on physical protection of the planned facility of economic activities (hazardous industrial facilities, airports, power plants) conducted in the wider vicinity of the proposed site should be assessed. An accident occurring at these hazardous facilities may negatively influence the physical protection system of the site. An explosion or airplane accident can make a part of the system inoperable for a shorter or longer period of time, and thus both the principle of balanced protection and defence in depth might be compromised. It should be then assessed whether the domino effect of the sabotage committed against a hazardous facility in the vicinity of the site could endanger the planned facility (external domino effect).

The following considerations should be taken into account during the design of the physical protection system to prevent risks resulting from the operation of a hazardous facility being in the vicinity of the site, in order to maintain the necessary physical protection measures operable, reliably available and effectively functioning:

a) The placement of physical protection related civil structures; shooting positions in adequate distance should prevent potential negative effects.

b) Placement of physical protection instrument in a way that the continuous operation of the physical protection system is sustained even in the case of an accident.

c) The protection of the physical protection instrument (including digital and electronic systems) with such engineering solutions, which should provide adequate protection even in the case of the most severe accident within the design basis.

d) The weapons and armed personnel in the hazardous facility should be considered.

3.1.3.6. Accessibility of the site

The accessibility of the site is closely linked to the assessment aspect discussed in Section 3.5, which has prime importance from the viewpoint of response.

During the assessment of the accessibility of the site the applicant should take into account the following:

a) Accessibility of the area on foot,

b) Accessibility of the area by a vehicle,

c) Accessibility of the area by rail,

d) Accessibility of the area via waterway.

Based on the performance based regulatory framework, the physical protection system of the facilities should be designed against the design basis threat. If the threat is beyond the design basis threat, then the state level means are also essential part of the response. The accessibility of the site basically determines the time, which is needed for the off-site response forces to reach the site. Consequently, the assessment of the physical protection suitability of the site should take into account whether the off-site response forces are able to reach the site in due time and intervene to the event.

3.1.3.7. Physical protection related suitability of the site relating to adversary pathways

The physical protection related suitability of the site should be assessed from the viewpoint of accessibility, possible adversary pathways, adversary tactics and their consequences. The assessment should cover the following potential adversary pathways:

a) Via waterway,

b) Via land road (public road, rail, dirt road),

c) Via subsurface pathways,

d) Via air.

The facility level design basis threat includes the potential adversary pathways, which should be taken into account during the design of the physical protection system of the site; thus, the physical protection related suitability of the site should be assessed taking account of the above listed potential adversary pathways.

3.1.3.8. Land site available for the site

An effective physical protection system requires that adequate size of land should be available around the inner zone, in order to allow efficient application of the necessary physical protection measures and systems.

Currently, internationally accepted norm for the minimum land size required for an effective physical protection system does not exist. The regulatory

guide of the NRC (Regulatory Guide 4.7 - General Site Suitability Criteria for Nuclear Power Stations) recommends 110 m between the inner zone and the closest zone boundary, above which the size characteristics cannot negatively affect the effective implementation of the physical protection functions (i.e. detection, delay and response).

It should be demonstrated based on the assessment that the physical protection systems and measures of the planned nuclear facility or radioactive waste repository can be implemented in compliance with the requirements, taking account of the adversary pathways identified for the proposed site.

3.1.4. Data classification

The data relating to the internal procedures, construction and operation of the technical systems, and the cooperation with off-site organization of the physical protection system of nuclear facilities and radioactive waste repositories, the recommended level of their classification based on the public task and protected public interest to be considered during the classification process, as well as the justification of the classification level are compiled in the below table.

Classification level			
Public task	**Protected public interest**	**Classification level**	**Justification**
Fulfilment of international obligations in relation to physical protection of nuclear facilities	National security Crime prevention	Secret	Causes direct danger to life Endangers the safety systems of nuclear facilities The physical protection requires significant additional financial resources Causes stress between Hungary and other states

Fulfilment of international obligations in relation to physical protection of radioactive waste repositories	National security Crime prevention	Confidential	Endangers the safe operation of radioactive waste repositories The physical protection requires significant additional financial resources Causes stress between Hungary and other states

Accordingly:

a) the data justifying the physical protection requirements for the nuclear facility should be protected at least at secret classification level, the recommended period for maintaining the classification lasts 30 years.

b) the data justifying the physical protection requirements for the radioactive waste repository should be protected at least at confidential classification level, the recommended period for maintaining the classification lasts 20 years.