

## **Part II**

### **Periodic Safety Review for Nuclear Power Plants**

- **Announcement of the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) of 25<sup>th</sup> June 1998**
- **Guideline Deterministic Physical Protection Analysis**

**Announcement**  
**of the Guideline Deterministic Physical Protection Analysis**  
**for the Performance of Periodic Safety Reviews (PSR)**  
**for Nuclear Power Plants in the Federal Republic of Germany**

**of 25<sup>th</sup> June 1998**

With the announcement of the guidelines for the performance of periodic safety reviews (PSR) for nuclear power plants in the Federal Republic of Germany of 18<sup>th</sup> August 1997 (Federal Gazette No. 232a of 11<sup>th</sup> December 1997), the following guidelines have been published:

- Basics of the Periodic Safety Review for Nuclear Power Plants (Dec. 1996),
- Periodic Safety Review for Nuclear Power Plants - Guideline Safety Status Analysis (Dec. 1996),
- Periodic Safety Review for Nuclear Power Plants - Guideline Probabilistic Safety Analysis (Dec. 1996).

As an additional part of the periodic safety review for nuclear power plants, the examination of the physical protection of these plants is also required in the basics for the PSR. A guideline for the performance of a deterministic physical protection analysis within the framework of the PSR has been developed, beginning in 1991, by the Federal Government-/*Länder*- (federal states) working group "Physical Protection" of the *Länder* Committee for Nuclear Energy - technical committee "Nuclear Safety" -with the participation of the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) mbH and the Reactor Safety Commission (RSK); the Ministries of the Interior of the *Länder* approved the draft of the guideline in the committee on "Security and Protection of Nuclear Installations" of the permanent conference of the Federal and State Ministers and Senators of the Interior on 2<sup>nd</sup> January 1997.

The guideline specifies the individual elements of the physical protection analysis and serves to standardise the work to be carried out by the licensee and the assessment to be made by the authorities and experts.

The nuclear supervisory authority assesses the presentation of the security status including the ensuring of the requirements for nuclear security within the boundaries set by Articles 17 and 19 of the Atomic Energy Act (AtG). In this respect, the principle of proportionality as well as the current and apparent future threat situation have to be taken into account; possible backfitting measures have to represent appropriate, necessary and reasonable solutions in accordance with the situation of the respective individual case.

During the development of the guideline, the utilities have been given the opportunity to comment on the draft several times.

The licensing and supervisory authorities of the *Länder* responsible for the execution of the Atomic Energy Act and the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety approved the "Guideline Deterministic Physical Protection Analysis" (as of 22<sup>nd</sup> May 1997) within the scope of the periodic safety review for nuclear power plants in the General Committee of the *Länder* Committee for Nuclear Energy on 18<sup>th</sup>/19<sup>th</sup> June 1998. It is the opinion of the General Committee of the *Länder* Committee for Nuclear Energy that the guideline has been drafted for plants with a valid operating licence, but that the basic ideas of the guideline can also be applied during the post-operational or decommissioning phase in particular cases.

As a supplement to the basics of the periodic safety review for nuclear power plants and the other already published guidelines for the performance of periodic safety reviews for nuclear power plants, I herewith announce the "Guideline Deterministic Physical Protection Analysis" (as of 22<sup>nd</sup> May 1997)

Bonn, 25<sup>th</sup> June 1998  
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Federal Ministry for the Environment, Nature Conservation and Nuclear Safety  
by order

D r . F e c h n e r

**Periodic Safety Review  
for Nuclear Power Plants**

**- Guideline Deterministic Physical Protection Analysis -**

**22<sup>nd</sup> May 1997**

# **Periodic Safety Review for Nuclear Power Plants**

## **- Guideline Deterministic Physical Protection Analysis -**

(as of 22<sup>nd</sup> May 1997)

### **1 Introduction**

The deterministic physical protection analysis is part of the periodic safety review, in addition to the analysis of the safety status, the operating experiences and the demonstration of operational reliability, as well as the probabilistic safety analysis. It is its objective to examine, on the basis of an up to date overall description and a complete assessment of the physical protection system (security status, actual condition), whether the physical protection measures provided by the operator against malicious acts are appropriate to achieve that the objectives of nuclear security can be met. The furnishing of proof is oriented towards defined requirements for nuclear security. In case that requirements for nuclear security are not ensured to the full extent, measures to compensate for this deficiency with respect to the literal fulfilment of the requirements for nuclear security or the planned measures for the improvement of the security status are to be described. The time schedule for the planned implementation of these measures shall correspond to their significance in nuclear security.

The guideline specifies the individual elements of the physical protection analysis and serves to standardise the work to be carried out by the licensee and the assessment to be made by the authorities and experts.

## 2 Extent and Procedure

The deterministic physical protection analysis extends to all areas of the structural, other technical, personnel and administrative-organisational measures of physical protection. The licensee has to prepare:

- a) a description of the current security status, stating the general and special objectives of nuclear security on which the security concept is based;
- b) information on security-relevant results of the safety status analysis/event sequence analysis, and the consequences derived from it for the security concept;
- c) a report on measures to ensure the requirements for nuclear security<sup>1</sup>, including the planned measures and the consequences according to b);
- d) a compilation of planned measures for the improvement of the security status, including the time scheduled for their realisation.

The deterministic physical protection analysis has to be classified as restricted in accordance with its information content.

### 2.1 Description of the security status of the plant

The current security status of the plant has to be described as a compact survey of the overall state of the facility with regard to nuclear security. It serves as a basis for the subsequent description of the fulfilment of the objectives of nuclear security by means of the measures provided to ensure the requirements for nuclear security pursuant to Annex 2.

Backfitting measures for physical protection elements or for plant components requiring physical protection, which have been applied for, licensed or which are already being implemented, have to be included in the description of the current security status.

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<sup>1</sup> see Annex 2

The following items are to be specified together with the relevant individual physical protection measures and the essential requirements for their design:

- the general objectives of nuclear security,
- the special objectives of nuclear security or the functions of the plant to be ensured,
- the areas to be protected;
- the surveillance and the barrier concept;
- the technical, personnel and administrative-organisational control, surveillance and alarm measures, including the measures against interference of persons with authorized access;
- other plant operating procedures related to physical protection and plant-internal regulations, e.g. related to training and further qualification of the guarding service, to quality assurance, and
- the assistance for the response measures of the police forces, and the cooperation with external organisations.

Aspects of the safety-related design, which also contribute to the physical protection of a plant, and from which credit is taken for the physical protection, are to be included in this description. A compilation of the topic areas which are to be dealt with in particular at least, is included in Annex 1.

The description of the security status may be based on quotations (summary in catchwords, date, file number) from already available documents from the licensing or supervisory procedure (e.g. security plan, application documents, licensing documents), if a conclusive overall picture of the security status is ensured by it.

The description of the security status has to be supplemented by a comprehensive evaluation of the experiences with function and behaviour of the technical, the personnel and the organisational-administrative measures of the considered 10-years interval.

Kind and extent of compensatory measures in case of failure of the physical protection measures are to be stated likewise. This evaluation of operating experience shall make feasible practice-based statements on the previous and future ensuring of the required level of physical protection.

## **2.2 Security relevant results of the safety analysis**

Should the deterministic or the probabilistic safety analysis result in insufficiently controlled event sequences, or event sequences not considered before, which require additional safety-related measures (e.g. additional redundant trains of particular systems), these event sequences and the safety-related measures to be taken in addition have to be stated. Further, it has to be stated, whether these event sequences and the additional measures also require additional physical protection measures and, if necessary, when these will be realised, or whether the security status as presented

under No. 2.1 remains unchanged even in view of the new findings from the safety analyses.

### **2.3 Assessment of the security status with regard to ensuring of the requirements for nuclear security and presentation of the results including the measures considered**

On the basis of appropriate analyses of the security status pursuant to No. 2.1 and 2.2, the licensee has to describe how the requirements for nuclear security listed in Annex 2 are ensured. Planned measures for the improvement of the security status (see No. 2.4) can be included in the assessment. The efficiency of the measures against the following interferences has to be shown:

- violent interferences from outside the protected area perimeter (including violent crowds),
- violent interferences after having overcome the protected area perimeter, with or without the assistance by a Person with authorized access,
- interferences by an Person with authorized access,
- duress situations.

In this context it is postulated that interferences from outside the physical barrier of the inner area shall not be superimposed with incidents, as far as there is no causal connection between the two event groups.

The result of the analysis and the ensuring of the requirements for nuclear security pursuant to Annex 2 have to be presented in sufficient detail for the re-evaluation. For the same purpose, reference may be made to requirements in the relevant guidelines, rules and recommendations from Annex 3, which have been met.

Alternative measures not mentioned in the regulations of Annex 3 are to be emphasized.

### **2.4 Planned measures for the improvement of the security status**

Measures for improving the security status which are planned by the licensee due to identified deficiencies of the actual condition of the physical protection system with regard to the ensuring of the requirements for nuclear security, have to be described in such a detail that their contribution to ensuring the requirements for nuclear security can be verified and assessed.

The time schedule intended for the various steps to implement the planned measures in conformity with their significance in nuclear security has to be included in the description.



### 3 **Execution**

The licensee is responsible for carrying through the parts of the deterministic physical protection analysis mentioned under No. 2 and for documenting them in an assessable manner.

The competent nuclear regulatory authority and the expert consulted by the authority will assess the analysis pursuant to No. 2.1 and 2.3, and the planned measures pursuant to No. 2.4.

The Minister of the Interior takes part in the assessment of the physical protection analysis within the scope of re-assessing the response system (the so called integrated security and protection concept).

## **Compilation of the Topic Areas to be Dealt with Regarding the Security Status**

The presentation of the security status at least has to deal with the following measures including essential design data (as far as relevant):

New documents do not have to be prepared in each case; already existing application or licensing documents can be referred to.

### **1. Aspects of the safety-related design, as far as credit is taken from them for the physical protection measures; these may concern:**

- The design of the plant against postulated incidents with
  - the redundancy and physical separation of safety systems,
  - the redundant emergency power supply,
  - the containment;
- the measures against airplane crash, pressure waves from chemical reactions and fires;
- the operating and accident instrumentation;
- the measures related to radiation protection (in particular, the access restrictions and controls), occupational health and safety, work permit and release for operation, and
- the measures of system and component monitoring by rounds of the shift personnel and periodic inspections.

It has to be stated against what kind of interference by third parties the safety-related measures above are considered to be efficient.

## 2. **Physical protection measures related to buildings and systems outside the protected area**

in order to avoid

- an impermissible impairment of the water supply by blockings in the area of the intake structures with connecting pipes generated by explosives, as well as
- an impermissible stress of the emergency auxiliary cooling water pumps (PWR), or the auxiliary cooling water pumps (BWR), and the nuclear heat exchanger through underwater shock waves generated by explosives.

## 3. **Protected area**

### 3.1 **Course, design and detection of the protected area perimeter**

- Description of the course of the protected area perimeter including information on the properties of the surrounding area (field outside the protected area perimeter) with regard to clear zones and natural obstacles (e.g. ditches, forest);
- information on artificial obstacles (e.g. fencing of the limited access area) related to the protected area perimeter;
- description of the design of the protected area perimeter;
- description of measures to impede the intrusion of a violent crowd;
- description of the physical protection measures at the protected area perimeter (e.g. protection against trespassing of a detection zone by crawling underneath or undermining it, barbed wire coils, diverters);
- information on the detection of the protected area perimeter (technical, personnel; detection systems, alarm assessment, localisation);
- measures for the separation of plants at multi-unit sites.

### 3.2 **Lighting**

- presentation of the design and layout of the lighting areas;
- description of the technical design of the lighting, including operating time (depending on the operating conditions)

### 3.3 **Vehicle barrier**

- information on the course of the vehicle barriers
- description of the barrier provided as vehicle barrier, if necessary with justification in case of deviations from the design load (e.g. when considering site-specific conditions, such as embankments, ditches);

- description of the measures against the destruction or removal of the vehicle barrier, stating the postulated technical aids.

### 3.4 Access points, gateways, penetrations

#### 3.4.1 Security checkpoint building with personnel access point

- description of the location;
- explanation of task and description of functional sequences, separately for inner and outer security checkpoint; including alarm notification and communication connection with the police and with the central alarm station;
- description of the structural design with barrier classification;
- description of the technical equipment of the security checkpoint building;
- specification of the physical protection systems monitored or operated from the security checkpoint, including precedence specifications; including the technical equipment for the control and surveillance of the access of personnel, material and vehicles;
- description of the concept of entry and exit procedures, given separately for operating personnel and for visitors.

#### 3.4.2 Vehicle portal

- description of the location;
- description of the design and function of the vehicle gateway;
- information on the barriers provided as vehicle barrier in the area of the vehicle gateway, if necessary, with justification of deviations from the design load (e.g. in case of additional obstacles).

#### 3.4.3 Rail gate

- description of the location;
- description of the design and function of the rail gate;
- information on physical protection measures of the rail gate when it is in closed position;
- description of the vehicle barrier in the area of the rail gate (e.g. buffer, derailment device), indicating provided/used barriers, if necessary, with justification of deviations from the design load (e.g. in case of additional obstacles).

#### 3.4.4 Escape gates

- description of the location;
- description of the design;

- description of the physical protection measures for the escape gates against unauthorized actuation;
- description of the vehicle barrier in the area of the escape gates.

#### 3.4.5 Penetrations

- type of penetration (e.g. cable or piping ducts, cooling water inlet);
- description of the location of the penetrations;
- description of the physical protection measures for these penetrations;
- description of the design.

## 4 **Inner area**

### 4.1 Buildings and structures in need of protection against violent attacks

The buildings and structures in need of protection against violent attacks at plants with PWRs ("Konvoi" type) and plants with BWRs (1969 design) are listed under No. 5.2 of the guideline referred to under No. 1 of Annex 3. For other plant concepts, the respective buildings and structures in need of protection, which differ from those mentioned before, have to be stated.

### 4.2 Location and assignment

- clear drawings of all buildings, parts of buildings or rooms belonging to the inner area, indicating the distance to the protected area perimeter;
- clear drawings of all piping and cable ducts belonging to the inner area, indicating the distance to the protected area perimeter.

### 4.3 Physical barrier of the inner area

- course and design of the physical barrier of the inner area with structural and other technical barriers of the civil engineering structures, including doors, closures of other openings and piping or cable ducts, as well as penetrations;
- lighting of the physical barrier of the inner area;
- surveillance of the physical barrier of the inner area and of the access points;
- technical installations for the control and monitoring of the personnel and material access into the inner area;
- technical measures against insider assistance at the access points;
- clear drawings of the areas protected against intrusion and penetration;
- description of the channels and their structural design; data on the burial depth and the covering material.

### 4.4 Central alarm station

- description of the intended functions of the central alarm station;

- clear location plan of the central alarm station, including room layout;
- description of the structural design with barrier classification including the safety-relevant cable ducts in the building;
- information on all penetrations (windows, ventilation openings, cable ducts) with a description of their physical protection measures and barrier classification;
- alarm notification paths and communication connections to the police and to the security checkpoint building; specification of physical protection systems monitored or operated from the central alarm station, including power supply;
- description of the precedence measures/ precedence of the central alarm station;
- for multi-unit plants, description of the cooperation between the central alarm station, the inner security checkpoint, and the security checkpoint building;
- safe for keys;
- technical installations for the control and monitoring of personnel access.

## 5 **Measures against interference of persons with authorized access**

For PWR plants ("Konvoi" type) and BWR plants (1969 design), the measures for the systems in need of protection as listed under No. 5.5 of the guideline referred to under No. 1 of Annex 3, have to be dealt with.

For other plant concepts, the respective systems in need of protection, which differ from those just mentioned, the physical protection measures have to be stated.

For PWR plants, the measures for maintaining access capabilities to the emergency feedwater building, to the annulus and to the valve room have to be dealt with additionally.

For plants with BWRs and PWRs, the measures to impede setting fire to cable ducts, which lead to the above-mentioned systems to be protected, as well as measures to prevent manipulations at computer systems - including their software - relevant to safety or security have to be stated.

## 6 **Personnel, procedural, and administrative security measures**

### 6.1 Guarding service

- description of the integration of the physical protection commissioner and the guards into the operational organisation of the nuclear facility, including the arrangements for deputy physical protection commissioners;
- listing of the regulations and service instructions for the guards;

- description of the tasks, the training and further qualification, equipment and number of guards;
- nuclear security manual or corresponding individual instructions, such as guarding service instruction, instructions for operation or behaviour in case of threat situations.

## 6.2 Regulations for the access of personnel, material and vehicles

### 6.2.1 Protected area

- description of the access control measures for personnel, material and vehicles prior to their entry into the protected area, separately for each group of persons (operating personnel, external personnel, visitors) and operating phases (operation, maintenance outages);
- description of the access control measures for persons, material and vehicles prior to their exit from the protected area, separately for each group of persons (operating personnel, external personnel, visitors) and operating phases (operation, maintenance outage);

### 6.2.2 Inner area

- regulations for the personnel, material and vehicle access, as well as description of the access control measures for personnel, material and vehicles prior to their entry into the inner area, separately for each group of persons (operating personnel, external personnel, visitors) and operating phases (operation, maintenance outages);
- description of the access control measures for persons, material and vehicles prior to their exit from the inner area, separately for each group of persons (operating personnel, external personnel, visitors) and operating phases (operation, maintenance outages);

## 6.3 Regulations for the inspection and maintenance of the physical protection measures (e.g. in-service inspection, preventive maintenance), as well as for a constant level of physical protection.

### 6.4 Documentation

Listing of the documentation to be kept within the scope of the physical protection measures.

## 7 Assistance for efficient response measures of the police forces

- description of the equipment kept ready by the facility for response measures of the police forces;
- description of the command post kept ready for the police, including the technical equipment and means of communication, as well as the regular checking of this equipment;

- description of the rooms including their equipment for the accommodation of police forces in action;
- description of the current status of the local conditions (site map and constructional drawings), as well as helispots;
- description of the regular exercises of the guarding service.



## **Requirements for Nuclear Security for Nuclear Power Plants with PWR and BWR**

The ensuring of the requirements for nuclear security under No. 1. to 19. has to be shown on the basis of the design basis threat and other requirements being valid at the time of issuance of this guideline.

1. Impeding the intrusion of a violent crowd into the limited access area;
2. preventing the forcible intrusion by means of a truck into the protected area;
3. surveillance of the field surrounding the protected area perimeter with regard to attack preparations;
4. preventing the initiation of plant states which cannot be controlled within the plant design, as well as preventing other direct releases of significant amounts of radioactive material resulting from violent interferences from outside the protected area perimeter and from outside the physical barrier of the inner area;
5. reliable detection, identification and localisation of intrusion attempts at the protected area perimeter, even in case of unfavourable light and weather conditions;
6. working conditions for the guards and the police forces appropriate for efficient actions, irrespective of the hour and the weather conditions within the entire protected area and at the entire inner area;
7. preventing the intrusion of violent adversaries from outside into the inner area during the response time of police forces mentioned under No. 3.1 of the guideline referred to under No. 1 of Annex 3;
8. reliable and complete overall overview of the security status of the facility and the actual condition of the physical protection system, as well as activation of all essential physical protection systems and elements and reliable, redundant alarm notification and communication with the police from a central station sufficiently protected against interferences by third parties, which is given precedence over other work stations;
9. capability to open the access to the inner areas from outside, which is sufficiently protected against interferences by third parties;
10. employment of guarding service personnel which is capable, by its number, equipment and qualification, to supplement the structural and other technical measures in an efficient and reliable way;
11. protection of the guards at the main access point against violent attacks;
12. reliable access control, identification, documentation and access permission for persons, goods and vehicles in accordance with the authorized access at the access points of the protected area perimeter with the capability to obstruct and impede the bringing in of prohibited items;

13. reliable access control, identification, documentation and access permission for persons to the inner area in accordance with the authorized access with the possibility to obstruct and impede the bringing in of prohibited items by means of checks;
14. prevention or timely detection of unauthorized removal of nuclear fuel in amounts relevant to physical protection;
15. prevention, impediment or timely detection of such interferences by persons with authorized access, including single outsiders, who
  - might trigger off beyond-design basis accidents or might prevent the control of design-basis accidents; indirect impacts (provoked fire, flooding, chemical changes) are to be taken into consideration;
  - might assist the intrusion of adversaries into the inner areas in case of a violent attack, or might prevent the alarm notification of the police forces;
16. possibility to perceive the taking of hostages or blackmailing situations at the protected area perimeter and impediment of the further performance of the adversary action;
17. maintenance of a sufficient level of physical protection, even in case of disturbances or failure of physical protection systems and elements, by compensatory measures;
18. employment of trustworthy personnel,
19. provision of the technical and organisational infrastructure which is required for efficient response measures of the police forces.

## **Compilation of Current Guidelines, Rules and Recommendations**

1. Guideline for the protection of nuclear power plants with light-water reactors against malicious acts  
dated: December 1995
2. Requirements for the external security lighting of nuclear facilities of physical protection Category I  
dated: May 1987
3. Requirements relating to the guarding service at nuclear facilities of physical protection Category I  
dated: April 1986
4. Requirements relating to the physical protection commissioner for nuclear facilities of physical protection Category I  
dated: April 1986
5. Communications means for nuclear power plants, Safety Standard of the Nuclear Safety Standards Commission (KTA) 3901  
dated: March 1981
6. Alarm systems for fire, burglary and assaults,  
German Technical Standard VDE 0833  
Part 1 of January 1989, Part 2 of July 1992, Part 3 of August 1982
7. Anti-attack glazing  
German Technical Standard, DIN 52 290;  
Parts 1, 2 and 4 of November 1988, Part 3 of June 1984 and  
Part 5 of December 1987
8. Outline requirements for periodic inspections of physical protection devices in nuclear facilities  
dated: March 1988  

Other guidelines, versions or drafts of standards, pre-standards and Euronorms may be declared valid by the decision of the technical committee "Nuclear Safety" of the *Länder* Committee for Nuclear Energy.