

Physical Protection of Nuclear Installations After 11 September 2001

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I. Introduction

The terrorist attacks against the WTC in New York and the Pentagon in Washington on 11 September 2001 have triggered a variety of activities in the area of physical protection of nuclear installations in Germany, as well as in many other countries; some of them were of limited scope and temporal duration, others will have a long lasting impact on the physical protection philosophy in our country. This paper will describe the activities and the changes they have caused up to now. Because of the sensitive nature of information on physical protection details of the design basis threat (DBT) and of physical protection measures will not be given.

II. Assessment of the Terrorist Threat Situation

The assessment of the terrorist threat situation in Germany is an ongoing process executed by the Federal Criminal Investigation Office (BKA) in close cooperation with the Federal Office for Protecting the Constitution (BfV) and the Federal Intelligence Service (BND); these federal authorities incorporate information and evidence collected through their own work and information obtained from partner services in other countries into their daily assessment work. Immediately after 11 September 2001 their work force for threat assessment was substantially enlarged. With respect to nuclear installations in Germany the result of the threat assessment since 11 September 2001 has been:

”There are no indications for concrete threats from terrorists to nuclear installations in Germany. Terrorist attacks against such installations cannot be excluded in principle; however, such attacks are not assessed as being probable events.”

This statement is also valid for terrorist attacks utilizing hijacked civil airplanes.

The aforementioned assessment result has remained valid until today even during

the military activities in Afghanistan since early October 2001, after the terrorist assaults on the island of Djerba and in Pakistan, and also during times of intensified travel activities of suspect terrorist individuals reported in the news media in April/March 2002. However, the assessment of the threat situation by security and intelligence agencies is mainly based on information and evidence from the past; therefore, the prognostic prediction of events in the future will be difficult and of limited validity. It cannot be denied, that in spite of this perception of the general threat to nuclear installations the characteristics of potential adversaries, their objectives and the tools they may use for their aggressive acts have changed significantly since 11 September 2001. Enhancing the physical protection level at German nuclear installations at present and for the future therefore is necessary.

III. Short Term Additional Physical Protection Measures

Immediately after the terrorist assaults of 11 September 2001 all nuclear installations were ordered by the competent nuclear supervisory authorities to implement additional administrative and personnel physical protection measures. Examples for these measures taken by the operators are:

- Enhanced patrolling by security guards;
- Intensified security at operational entrances;
- Intensified guarding of sensitive areas;
- Access restrictions for visitors and off-site personnel; permanent escorting by screened on-site personnel.
- Intensified search of personnel and material transports for offensive equipment.

These operator measures were complemented by enhanced police patrols. The additional physical protection measures are still in force for nuclear installations that represent a significant nuclear risk potential; criteria for revoking these additional measures have been specified and transmitted to the operators by the end of January 2002.

The additional personnel and administrative physical protection measures of the operators had been further intensified from the outset of the military operations in Afghanistan on 07 October 2001 until the end of December 2001, in particular by

excluding visitors completely and by admitting off-site personnel only when needed for ensuring safe operation of the respective plant.

With regard to the potential insider threat from “sleeping terrorists” all personnel working at nuclear installations as well as those actively engaged in transports of nuclear material were subjected to a pre-selection process which applied criteria (age, nationality and others) specified by the BKA by the end of September 2001. Some 730 individuals have been selected through this process out of a total work force of about 30.000 individuals and were then security screened for trustworthiness by the competent police, criminal investigation and nuclear supervisory authorities; for about 20 individuals out of this group the access permissions to nuclear installations were revoked because the results of the security screening had casted doubts upon the trustworthiness of these persons.

With respect to intentional aircraft crashes by hijacked civil airplanes the nuclear supervisory authorities have been instructed by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) that operators can be ordered on the basis of the Atomic Energy Act to shut down their nuclear power plants as a precautionary safety measure in case the assessment of the threat situation by the security and intelligence authorities (BKA, BfV, BND) should indicate that such an assault is imminent. A precautionary shutdown about 2 hours (for PWR) or ½ hour (for BWR) prior to the aircraft crash will ensure that the safety goal of criticality control can be maintained and will provide for more time for plant-internal accident management measures.

German authorities did not establish flight exclusion zones around nuclear installations as a protective measure against intentional aircraft crashes by terrorists; such exclusion zones are mere administrative restrictions of the air traffic which will be inefficient against terrorists without military enforcement measures. Decisions on military interception actions against hijacked civil airplanes attacking nuclear installations have not been taken up to now. In this field security measures by the airport and by the aircraft operators, and by the police on the ground as well as in the airplanes have received first priority.

IV. Analysis Work Regarding Intentional Aircraft Crashes

As the terrorist attacks of 11 September 2001 used civil airplanes a means of attack the potential consequences of such kinds of attack against nuclear

installations - in particular nuclear power plants and interim storage facilities for irradiated fuel - had to be analysed; vulnerabilities of the installations for this kind of scenario and possible protective measures at the facilities needed to be investigated. BMU therefore contracted several expert organizations on 01 October 2001 for carrying through the respective analyses and investigations: Company for Reactor Safety (GRS), Federal Office for Material Testing, Civil Engineering Bureau S&P, Fire Protection Institute Prof. H., commercial flight simulator centre; GRS was responsible for coordinating the project.

The structure of the project addressed all essential subjects :

- types of commercial airplanes to be considered and characteristic parameters (for instance total mass, mass distribution, contents and location of fuel tanks, impact areas, approach and impact angles, approach speed);
- mechanical impact (for example load vs. time function for aircraft and for heavy components);
- thermal impact (for instance percentage of fuel in spray plume deflagrating upon impact, percentage of fuel available for subsequent pool fires, quantity of fuel inside buildings, fire scenarios, temperatures and duration of pool fires);
- consequences for buildings and systems (for instance penetration of walls, stability of buildings, induced vibrations); safety functions affected (vulnerability analysis); in a second step:
- incident sequences and potential radiological consequences;
- protective safety measures; mitigation of consequences.

These analyses were completed for interim storage facilities for irradiated fuel using cast iron transport and storage casks in June 2002. They led to the conclusion, that the integrity of these casks will be maintained when subjected to the mechanical impact loading by the large civil airplanes, and that there will be no substantial release of radioactive material as a consequence of the thermal loading caused by the cerosine pool fire following the aircraft crash. It can be added that according to earlier assessments supported by experimental results there will also be no substantial release of radioactive material through a terrorist attack using shaped charge devices.

For nuclear power plants five different plant designs (PWR, BWR) of different age generic analyses have been performed by the project group mentioned above with

respect to potential consequences of intentional aircraft crashes, using the parameters for the mechanical and thermal impact loading determined by the previous investigations. These analyses showed that for nuclear power plants, which had been designed against the accidental crash of a military Phantom fighter aircraft in accordance with the requirements specified in Chapter 19.1 of the RSK-guidelines, probably no catastrophic consequences will result from the intentional crash of a civil airplane; plant-specific analyses of the consequences of shock induced vibrations of vital systems still have to be performed. For the other nuclear power plants and for research reactors, for Uranium enrichment and fuel fabrication facilities plant-specific analyses still have to be performed by the operators of these plants in order to identify potential vulnerabilities and consequences as well as protective features.

V. Review of the Design Basis Threat (DBT)

In early October 2001 a working group of representatives from security and intelligence agencies (BKA, BfV, BND), State and Federal Ministries for Internal Affairs (Police), nuclear licensing and supervisory authorities on state and federal level, expert organisations for physical protection and for police techniques and from the utilities was established; this working group was tasked with reviewing the national DBT against the results of an evaluation of terrorist events – in particular including the attacks of 11 September 2001 -, with identifying amendments to the current DBT, and with proposing additional physical protection measures for new DBT-elements that are not covered by present physical protection concepts yet.

The work of this group was accomplished on the basis of a greater number of new scenarios for terrorist attacks developed by the security and intelligence authorities. Examples for these scenarios are:

- Acts of sabotage by a “sleeping” insider terrorist;
- Suicidal attack by a truck or by a railway vehicle loaded with explosives;
- Attack by means of missile-type weapons;
- Intentional crash of hijacked civil airplane.

The examination of these new scenarios had led to an amendment of the DBT by several new elements and to the identification of additional physical protection

measures meant to cover these new DBT-elements. Because of their sensitive nature, details of the new DBT-elements and of the additional physical protection measures cannot be given here.

The competent nuclear licensing and supervisory authorities have endorsed the new DBT-elements – except the intentional aircraft crash for civil airplanes which needs further consideration – and the proposed additional physical protection measures. These authorities have been instructed by the BMU on 31 July 2002 to review and assess the physical protection concepts and measures of nuclear installations subject to their supervision, taking into account the new DBT-elements. This review shall be done plant-specifically and shall take into account the type of the plant, its security category, the risk potential of the plant, as well as the safety and physical protection measures which already exist. As all these facilities have valid operating licences, back-fitting of additional physical protection measures which result from this review and assessment process will have to take into account work safety and fire protection measures already in place and will have to satisfy the principle of proportionality. The meaning of this principle is that the respective back-fitting measures have to be necessary, appropriate, effective and reasonable, for instance in terms of costs.

VI. A New Dimension?

The answer to the question whether the terrorist attacks of 11 September 2001 have added a new dimension to physical protection considerations in Germany is “Yes, they did!”. This is obvious when looking at the new DBT-element “readiness of the terrorist attackers to commit suicide”. It becomes even more evident when looking more closely at the additional scenario “intentional crash of a hijacked civil aircraft”, which in Germany may have to be treated as a licensing prerequisite under Article 7, para.2, no. 5 Nuclear Energy Act (“the necessary protection against intrusion or other interference by third parties”), as well as the other new DBT-elements identified.

As the terrorist attack postulated under this scenario assumes that the attackers may launch their attack from the air and not on the ground or from near-by waterways only as anticipated before 11 September 2001, the delay time for protective actions by police response forces may be practically zero and there will

be no effective and timely counter-measures by police response forces at all, which were an important element of the physical protection in the past. This is also true for protective actions by on-site guard services. Furthermore, for licensed and operating facilities additional safety and security measures in the technical and civil engineering field (for instance back-fitting barriers around vital areas) meant to improve protection against this new DBT-element can only be back-fitted to a rather limited extent for obvious technical reasons.

By including the intentional crash of a hijacked civil aircraft into the DBT an extremely severe new element will have found its way into what was understood to be intrusion or other interference by third parties prior to 11 September 2001. Therefore, for some old and less protected plants with a high risk-potential new protective measures or response actions will have to be specified. The distribution of responsibilities for physical protection measures by the licensee, for response actions by police forces, for emergency management measures, and for other protective or response actions will have to be re-analysed and possibly modified, at least for potentially catastrophic scenarios like the intentional crash of a hijacked aircraft.

As protection against intrusion and other interference by third parties is a licensing prerequisite under the German Nuclear Energy Act, it also has to be specified how this requirement can be fulfilled for the new DBT-element “intentional aircraft crash”. The results of the analyses of the consequences of an intentional crash of a hijacked civil aircraft and further assessment of the legal background, taking into account the improbable nature of this kind of event and the air-traffic security measures implemented by the authorities, will have to be considered.

VII. Concluding Remark

Let me conclude by adding a positive element of the consequences of 11 September 2001 for physical protection: facilitated by several joint proposals during the work at the IAEA in Vienna on amending the CPPNM the representatives of seven European authorities responsible for the physical protection of nuclear materials and nuclear facilities met for the first time on 12 October 2001 as the so-called “Group of 7” to discuss physical protection after 11 September 2001: B, CH, D, E, F, SWE, UK. This group has met twice up to now

in Bonn and Paris and a third meeting may be convened in London before the end of 2002, in order to exchange information and experience on the respective national approaches taken with respect to physical protection and to investigate the potential for harmonization in this area.