

Design basis threat for the use of nuclear energy and use of radiation

30.5.2013

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Design basis threat for the use of nuclear energy and use of radiation

1 The design basis threat is used as a basis for the design and assessment of nuclear security arrangements

101. According to Section 7 l of the Nuclear Energy Act, arrangements for security during the use of nuclear energy shall be based on threat scenarios involved, and analyses of the need for protection /1/. It is enacted in Section 3 of the Government Decree on the Security in the Use of Nuclear Energy that the design of security shall be based on the design basis threat, risk analyses of the activity to be secured, and protection requirements assessed on the basis thereof /2/. Section 3 of the Decree also lays down the general principles for the design bases of the security arrangements in the use of nuclear energy.

102. According to Section 31 c of the Radiation Act, when using high-activity sealed sources the responsible party shall take particular care in protecting sources from illegal activities, loss or damage and in taking available measures to ensure or restore secure conditions after a source has been damaged, lost or subject to illegal activities /3/.

103. In keeping with the risk-informed, graded approach, nuclear security arrangements shall be scaled based on the potential consequences and probability of unlawful action targeting nuclear material or other radioactive material. The potential consequences depend, for example, on the enrichment level and quantity of the nuclear material, the radiation characteristics and quantity of the radioactive material, and the chemical and physical form and state of the material. While the probability of unlawful action cannot be calculated, it can be estimated based on threat assessment.

104. Design basis threat (DBT) is a method whereby the design basis for nuclear security arrangements is derived from the threat assessment and the potential consequences of unlawful action /4/.

105. A DBT defines the threat to be used as a basis for the requirements for, and design and assessment of, the nuclear security arrangements that fall under the responsibility of the operator. The DBT contains the definitions of the capabilities of the persons or groups potentially engaging in unlawful action that are to be used as the design basis for the security arrangements. The DBT contains a number of threats ordered by various levels of severity.

106. The requirements set for the operator in the use of the DBT are presented in chapter 3.

107. In their respective areas of responsibility, authorities engage in the prevention of the threat and in the protection, preparedness and response necessitated by it. With regard to threats beyond the DBT, the responsibility for prevention, protection, preparedness and response mainly rests with the State and authorities, and the operator's task is to assist the authorities to the best of its abilities.

2 Preparation, use and maintenance of the design basis threat

2.1 The design basis threat is based on the threat assessment and the potential consequences of unlawful action

201. The National Police Board is responsible for the maintenance of the threat assessment concerning unlawful action and covering the use of nuclear energy and use of radiation to be prepared for the design basis threat. The threat assessment is a description of the threat environment and the characteristics of persons and groups potentially engaging in unlawful action /5/. In addition, other assessments drawn up by authorities /such as 6-7/ are used in the preparation of the design basis threat, and known events of unlawful action and similar events which have targeted the use of nuclear energy and use of radiation are considered /including 8-9/.

202. In addition to the threat assessment, the potential radiological consequences are used as a basis for the DBT. The capabilities, motivation and intentions of the persons or groups potentially engaging in unlawful action discussed in the threat assessment are evaluated in terms of the potential targets and consequences of the action. Based on the evaluation, a definition of unlawful action is drawn up, forming the DBT. Existing security measures do not affect the definition of the DBT.

203. The Radiation and Nuclear Safety Authority (STUK) is responsible for the preparation and maintenance of the DBT. STUK requests statements on the DBT from the Ministry of the Interior and from the Advisory Committee in Nuclear Security. As part of the preparation process, STUK consults the nuclear licensees concerned.

204. The DBT is used as a basis for

- the regulatory requirements concerning nuclear security arrangements
- the design of nuclear security arrangements
- the evaluation of nuclear security arrangements.

2.2 The design basis threat contains progressive levels of threat, is applied in a risk-informed manner, and is updated when necessary

205. The threats included in the design basis threat have been divided into levels. The highest levels contain the threats with the most serious potential consequences. For each threat, the capabilities of a person or group potentially engaging in unlawful action have been defined. Protection objectives have been defined for each level. The protection objectives set for nuclear facilities have been derived from the radiological consequence limit values laid down in the Government Decree on the Safety of Nuclear Power Plants /10/ and in the Government Decree on the Safety of Disposal of Nuclear Waste /11/ for normal operation, anticipated operational occurrences and accidents of nuclear power plants and nuclear waste facilities. The threat levels are applied as the design basis threat to different classes of nuclear facilities, nuclear materials, and use of radiation by

considering the magnitude of the potential consequences of the unlawful action targeting them.

206. The structure of the design basis threat, limit values for radiological consequences, protection objectives and application to nuclear facilities and transport of nuclear fuel are presented in Appendix A1 (classified, Section 24(1)(7) of the Act on the Openness of Government activities [621/1999], Section 78 of the Nuclear Energy Act [990/1987]). The protection objectives for radiation sources, nuclear materials outside nuclear facilities, and other nuclear use items are presented in Appendix A2 (classified, Section 24(1)(7) of the Act on the Openness of Government Activities [621/1999], Section 78 of the Nuclear Energy Act [990/1987]).

207. The inclusion of different – also very severe – levels of threat in the DBT aims to ensure that the DBT is a more long-lasting design basis than a threat assessment bound to a specific moment in time. Particularly when defining the DBT for facilities that will remain in operation for a long period of time, the long-term assessment accuracy of the threat assessment is compensated by making conservative choices.

208. The DBTs applying to nuclear facilities are listed in Appendices B, C and D. The DBT for a uranium extraction facility is described in Appendix E. The DBT for radiation sources, nuclear materials outside nuclear facilities, and other nuclear use items is described in Appendix F. These DBTs contain the definitions of the capabilities of the persons/groups potentially engaging in unlawful action that are to be used as a basis for the requirements, design and evaluation of nuclear security arrangements. They are classified (Section 24(1)(7) of the Act on the Openness of Government Activities [621/1999], Section 78 of the Nuclear Energy Act [990/1987]).

209. While the DBT is intended to serve as a tool with a period of use longer than the current threat assessment, the need for updating it must be reviewed and it must be updated when necessary. STUK regularly considers the need to update the DBT in connection with the updating of the threat assessment, and at other times, when necessary, if changes in the threat assessment or the operating environment so require. The updating of the DBT is carried out following the same process as the original preparation of the DBT.

3 Operators' requirements

3.1 Nuclear facilities

301. The licensees and licence applicants of nuclear facilities, and the operators who have been granted a positive decision-in-principle concerning a nuclear facility, must use the DBT as a basis of

- the design of nuclear security arrangements
- the evaluation of nuclear security arrangements.

302. The licensee/licence applicant/operator with a positive decision-in-principle must design the nuclear security arrangements in such a way that the DBT can be countered in accordance with the protection objectives laid down in the Appendices to this document as effectively as is reasonably achievable.

303. The design of the nuclear security arrangements by the licensee/licence applicant/operator with a positive decision-in-principle includes the planning of cooperation with the relevant authorities with regard to prevention, protection and response.

304. In connection with submitting the construction licence application for a nuclear facility, the licence applicant must submit to STUK for approval, in accordance with Section 35 of the Nuclear Energy Decree, the preliminary plans for the nuclear security arrangements. The preliminary plans must present how the DBT has been used as a design basis for the nuclear security arrangements, and it shall contain an assessment on how the planned nuclear security arrangements can counter the DBT in accordance with the protection objectives as effectively as is reasonably achievable.

305. In connection with submitting the operating licence application for a nuclear facility unit, the licence applicant must submit to STUK for approval, in accordance with Section 36 of the Nuclear Energy Decree, the plans for the nuclear security arrangements. The plans must contain an assessment on how the security arrangements can counter the DBT in accordance with the protection objectives as effectively as is reasonably achievable, and on how the DBT will be used during operation as a basis for design and evaluation of the nuclear security arrangements.

306. In the self-assessments of security arrangements and information security, as laid down in Guides YVL A.11 and YVL A.12, the DBT must be used to ensure that the nuclear security arrangements are effective. The licensee must assess how well the security arrangements fulfil the protection objectives of the DBT, assess the potential to improve and need to introduce changes to the security arrangements, and prepare an action plan. The licensee must submit to STUK a report on the self-assessments and their results.

307. The licensee must use the results of the DBT assessments in the continuous improvement of its nuclear security arrangements.

308. In its YVL Guides (YVL A.11, YVL A.12), STUK sets the prescriptive nuclear security requirements governing nuclear facilities. When setting these requirements, STUK uses the DBT.

3.2

Use of radiation, nuclear materials outside nuclear facilities, other nuclear use items, and transport of nuclear material and nuclear waste

309. In the ST Guides (ST 1.11), STUK sets the security arrangement requirements to be followed in the use of radiation in healthcare, industry and research. Guidance on the security arrangements during the transport of radioactive materials is given in separate guides prepared in cooperation by the Ministry of Transport and Communications and STUK. When defining the requirements and guidance, STUK uses the DBT.

310. In the YVL Guides (YVL D.1), STUK sets the requirements for nuclear non-proliferation concerning nuclear use items and nuclear weapon technology as well as the requirements for the security arrangements of nuclear materials outside nuclear facilities and other nuclear use items. When defining the requirements, STUK uses the DBT.

311. In the YVL Guides (YVL D.2), STUK sets the requirements for security arrangements to be followed in the transport of nuclear material and nuclear waste. When defining the requirements, STUK uses the DBT. Additionally, the relevant DBT is directly applied to the transport of nuclear fuel, as is the case with nuclear facilities.

4 The DBT application procedure for existing and new activities

401. The entry into force of a DBT does not affect any previous decisions made by STUK. Having heard the parties concerned, STUK issues a separate decision on how a new or updated DBT applies to existing nuclear facilities or to those under construction, and to licensees' operational activities. The DBT applies as such to new nuclear facilities.

402. The DBT-based security arrangement requirements laid down in the ST guides are applied to all use of radiation for which a licence is required. The guidance on the transport security arrangements issued in cooperation by the Ministry of Transport and Communications and STUK will complement the existing transport regulations, and they will be applied to all transports of radioactive materials.

5 References

1. Nuclear Energy Act (990/1987)
2. Government Decree on the Security in the Use of Nuclear Energy (734/2008)
3. Radiation Act (592/1991)
4. Development, Use and Maintenance of the Design Basis Threat, IAEA Nuclear Security Series No. 10, IAEA (2009)
5. Threat Assessment for DBT, Finnish Security Intelligence Service (classified, secret)
6. Technical Analysis on Threats of Unlawful Activity related to the Use of Nuclear Energy and Use of Radiation, Helsinki Police Department, Special Operations Unit, 28 June 2010 (classified, confidential)
7. Technical Analysis in support of DBT, Finnish Defence Forces Technical Research Centre, 30 September 2010 (classified, confidential)
8. Interpol Analysis of Global and Finland Area Nuclear Trafficking and Terrorism, Project Geiger, Interpol, April 2010 (classified, restricted)
9. IAEA Incident and Trafficking Database (ITDB) 2013 Fact Sheet, IAEA; IAEA ITDB report, IAEA

10. Government Decree on the Safety of Nuclear Power Plants (733/2008)
11. Government Decree on the Safety of Disposal of Nuclear Waste (736/2008).

6**Appendices**

- A1. DBT for the use of nuclear energy and use of radiation – structure, protection objectives and application to nuclear facilities and transport of nuclear fuel (restricted)
- A2. DBT for the use of nuclear energy and use of radiation – protection objectives for radiation sources, nuclear material outside nuclear facilities and other nuclear use items (restricted)
- B. Nuclear facility class specific DBT – class 1 nuclear facility (confidential)
- C. Nuclear facility class specific DBT – class 2 nuclear facility and transport of spent nuclear fuel (confidential)
- D. Nuclear facility class specific DBT – class 3 nuclear facility and transport of fresh nuclear fuel (confidential)
- E. DBT for the use of nuclear energy and use of radiation – uranium extraction facility (confidential)
- F. DBT for the use of nuclear energy and use of radiation – radiation sources, nuclear material outside nuclear facilities and other nuclear use items (confidential).