Terrorist Threat Analysis for Nuclear Infrastructure: Case Studies and Lessons for Safety

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Nuclear infrastructure, including nuclear power plants, uranium enrichment plants, radioactive waste storage facilities and research centres, is a key element of energy and strategic security of countries. In the face of the growing threat of terrorist attacks, the protection of these facilities is of particular importance. An analysis of actual and potential terrorist threats related to nuclear infrastructure was carried out, taking into account both physical and cyber attacks, as well as attempts to obtain fissile material by terrorist organizations. Case studies, including m.in attack on a nuclear power plant in Belgium (2016), attempted sabotage in Iran (2010) and the incident of 13-14 February 2025, during which a Russian strike drone hit the sarcophagus above the destroyed reactor of the Chernobyl nuclear power plant, also analysed the mechanisms of carrying out attacks and their consequences. An assessment of the effectiveness of existing security measures and threat detection is also presented. According to data from the International Atomic Energy Agency (IAEA), from 1993 to 2023, there were 4243 confirmed incidents related to the uncontrolled trade in nuclear materials and other radioactive substances. Among them: 350 incidents (8.3%) were related to illicit trafficking or potential use for terrorist purposes, 1045 incidents (24.6%) were unspecified, 2848 incidents (67.1%) involved materials that were outside regulatory control but did not demonstrate a connection to smuggling or intended use in terrorist acts. The data also shows that 14% of all incidents involved nuclear materials, and 52% of theft of radioactive materials occurred during their transport. Incidents of this type pose a significant threat, especially in the context of the possibility of using fissile materials in terrorist attacks or the production of the so-called dirty bombs (radiological dispersing devices).

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