

**TECHNICAL CONSIDERATIONS FOR DETECTION OF AND RESPONSE TO
ILLICIT TRAFFICKING IN RADIOACTIVE MATERIALS**

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The need for guidance and recommendations explicitly directed to the problem of illicit trafficking in nuclear materials and other radioactive sources was raised by the IAEA Director General at the IAEA General Conference in December, 1994, and measures were agreed by the IAEA Board of Governors in March, 1995. Measures that might be taken to prevent, detect, and respond to illicit trafficking will be common for all radioactive materials, including nuclear materials. However, nuclear materials are, or should be, subject also to safeguards for nuclear non-proliferation purposes and to physical protection to prevent diversion. The IAEA has established close co-operation with intergovernmental and non-governmental organizations, in particular the World Customs Organization (WCO) and INTERPOL to conduct joint studies, meetings and training programs to support Member States in their border control activities. Within this programme technical information has been derived on requirements and methods to detect and respond to events involving inadvertent movement of and illicit trafficking in radioactive materials. The paper summarises the most important results and the experience obtained in this field.

Concerning "detection" information on strategy of detection, selection of an investigation level, techniques for radiation monitoring at borders, verification of alarms, search techniques and identification of radionuclides has been developed. This includes recommended minimum requirements for monitoring equipment, derived from the results of an extended international pilot study on border monitoring equipment ITRAP [1] [2], conducted by IAEA in co-operation with the Austrian government.

In order to discover illicit trafficking or inadvertent movement in radioactive materials, the following steps are required: detection of any abnormal radiation level, verification of such

detection, localisation of the origin of the radiation, radiation safety measurement, and identification of the radioactive material. Specialised equipment is required for performing one or more of the steps indicated above, which can be divided into three categories: Pocket type instruments, used to detect the presence of radioactive materials and to inform the investigator about the radiation level; hand-held and mobile instruments, required to detect, locate or identify radioactive materials; and fixed installed, automatic instruments, designed to be located stationary at road and rail border crossings, airports, seaports, etc.

Detailed recommendations for technical specifications and operation of this equipment have been derived. A particular problem is the definition of an “investigation level”, at which an alarm is triggered and consequent investigation of individuals, vehicles or goods should be established. This level has to be sufficiently high to avoid frequent false alarms, however, also sufficiently low to detect significant radiation sources or nuclear materials, even if they are inside shielded containers and possibly buried in metal scrap.

“Response” covers all necessary actions required after radioactive materials have been detected. Detailed recommendations have been derived for the procedures of operational response by the first responder, as well as for tactical response, when a serious radiological situation develops or detection of nuclear materials requires outside expert assistance.

Operational response, after activation of a detection alarm, initiates with the assessment of radiation hazard, verification measurements that the alarm is genuine and subsequent localisation of the radioactive material. If the radiological hazard is not to be considered very significant, i.e. if the dose rate is below 0.1 mSv/h at a distance of one meter from the item containing the source, no indication of neutron radiation is present and no suspicion of contamination exists, the first responder may continue to identify the radioactive material and determine, if it is illicit or “innocent”. Innocent materials are typically medical radionuclides administered to patient, legal shipments or naturally occurring radioactive materials (NORM).

If the radiological hazard is significant, neutron radiation is observed, indicating the presence of nuclear materials or mechanical damage of the item containing the source raises suspicion of contamination, it will be necessary to adopt a tactical response mechanism. A detailed generic model has been developed for a tactical response plan including incident command structures, cordon control areas, casualty handling at the scene, requirements for seizure and temporary storage of radioactive materials, considerations on liaison with the media and incident investigation techniques.

Further important information relates to mitigation of health hazards, casualty management, needs for planning, equipment and training, transport arrangements for radioactive materials, decontamination procedures and hints for working with the media.

REFERENCES

- [1] BECK, P., DUFTSCHMID, K.E., “ITRAP – The Illicit Trafficking Radiation Detection Assessment Program”, Proc. International Conference on the Safety of Radiation Sources and the Security of Radioactive Materials, Dijon (1998), IAEA TECDOC-1045, 265 (1998)
- [2] Beck, P. “ITRAP - Illicit Trafficking Radiation Detection Assessment Program, Final Report, OEFZS-G -- 0005, October 2000, to be published as IAEA TECDOC (2001)