

PROBLEMS AND MANAGEMENT OF RADIOACTIVE SOURCES AND MEASURES AGAINST ILLICIT TRAFFICKING OF NUCLEAR MATERIALS IN BULGARIA

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**Abstract**

Illicit trafficking of nuclear materials continues to pose a danger to public health and safety and to nuclear non proliferation efforts. The majority of cases so far have involved only small amounts of fissile materials or mainly radioactive sources in Bulgaria. A proper scheme for analysis of seized nuclear materials will be developed based on existing equipment for NDA analysis of nuclear materials supplemented by new system through PHARE project assistance by EU experts.

1. Introduction

The suitable geographical situation of Bulgaria on the crossroads between Europe and the Middle East puts it in the routes of different illegal traffics – jewels, drugs, arms etc. that have operated several decades.

During the last nine years after the big political and economical changes in the whole Eastern Europe there is a sharp increase in migration of people and goods in the Balkan region including Bulgaria. In the recent years however a new and hazardous traffic appeared on the surface – illicit trafficking of nuclear materials.

2. Status of radioactive sources and illicit traffic

In the period after the 60-ies a lot of nuclear sources were imported mainly from the former Soviet Union and applied in different fields of industry, agriculture, medicine, science etc. The lack of proper procedure for management, collection and disposal of spent sources especially the high radioactive sources resulted to the accumulation of great number of radioactive materials all over the country. The political and economical changes in the last seven – eight years led to reorganization in the industry – many companies and industry installations were shut down, people retired and in this manner at many plants the used radioactive sources had to be dismantled and disposed of.

The financial resources of the user however did not allow him to pay for the collection and disposal of the sources. In some cases the reduced control and administrative chaos led to theft and attempts for illicit trafficking of various radioactive sources – Co-60, Cs-137 sources, Ra ampoules, smoke detectors etc. Trafficant routes and connections were tested to organize channels for radioactive materials transfer in the country and across the borders.

The traffic of nuclear materials can be divided into two main parts - internal and transit.

The internal traffic includes the transportation of stolen nuclear materials or sources within the country mainly for personal profit. The stolen sources were mainly used in the industry as

- level meters
- dense meters
- devices for removing static electricity
- electronic balances
- smoke detectors etc.

Many of these are high radioactive sources whose transportation and handling needs special equipment and trained personnel. In most of the cases however, the illegal traffic of these nuclear materials is far outside the restrictions of the nuclear legislation in Bulgaria and is carried out by incompetent people who endanger their own health and subject innocent people to harmful doses.

Judging from the revealed by the police cases of illicit trafficking of nuclear materials so far the organizers are people with low qualification in the nuclear field trying to make profit and sell radioactive sources that are radioactive waste. In one case Plutonium capsules from smoke detectors were brought to a central hotel in Sofia to be sold to foreign citizens. In some of the cases the people involved in the trafficking have obtained substantial doses from outside irradiation.

The transit traffic of illicit nuclear materials is connected with the transfer mainly of raw materials from the former Soviet union and the Middle east towards Western Europe and vice versa. This traffic includes

- Plutonium
- Red mercury
- Osmium
- Scandium
- Cesium etc.

The Institute for Nuclear Research and Nuclear Energy of the Bulgarian Academy of Sciences has established a collaboration with the responsible authorities from the Bulgarian police and Customs in handling and analyzing nuclear materials seized in illicit nuclear trafficking cases. The Institute possesses the necessary equipment - (Hot chambers, heavy shielded boxes, multichannel gamma spectrometry equipment with alpha and gamma detectors etc.) and trained personnel to perform the necessary analyses. The Institute also applies Atom absorption analysis and X-ray fluorescence analysis for qualitative and quantitative determination of the sample composition.

The detection and handling of both the internal and transit traffics raises serious problems to the controlling organs in Bulgaria both for equipment and qualified personnel at the borders of the country and inside.

3. Scheme for combating Illicit Trafficking

The first step in illicit nuclear trafficking after the seizure is the classical forensic at the crime scene accompanied by special precautions to avoid any danger. Specialists have to apply high resolution gamma spectroscopy to determine the composition of the nuclear material and indicate the category in which it falls (Weapon grade, weapon utilisable, nuclear fuel, radioactive sources with no fissile material etc.). This information is handed to the law enforcement to recognize the severity of the case.

In the second step the material is transported for further characterization in a specialized laboratory. All sample features that can reveal the intended use, age, origin and possibly, the smuggling route have to be measured. A variety of techniques have to be applied and if necessary foreign help can be included. To get best results the obtained results have to be compared to known materials, processes and specific environments so access to common (international) data base is necessary.

In the developing countries it is recommended that a proper scheme should be developed to combat illicit nuclear trafficking. First, it is necessary to identify and prioritize techniques and methods for forensic analysis to determine source attribution and intended use of the seized material. Next techniques and methods should be identified and prioritized for forensic analysis of non-nuclear materials to determine the geolocation and possible route. Then identification and evaluation of the available technical equipment for the initial hazard and preliminary assessment of nuclear material composition has to be done. After that supplement and improvement of the technical capabilities should be done as well as implementation of proper laws, protocols for collection and preservation of evidence etc. International cooperation and help is mostly needed in combating illicit nuclear trafficking.

It is also necessary to develop and apply such a system for control to eliminate the possibility of criminal loss of control on the radioactive sources, which will increase the safety of the sources and reduce the potential risk of accidents.

Raising the potential for the detection and identification abilities at the borders and inside the country is a task that stands in front of the state authorities in Bulgaria - Government, police, customs, licensing and controlling body - Committee on the Use of Atomic Energy for Peaceful Purposes etc. and this task has to find proper and competent solution. The interrelations between all the above authorities is also an important step in setting a barrier against all illicit all trafficking including the one with nuclear materials.

4. International collaboration

In Bulgaria a PHARE project is contracted for improvement by consulting and training the capacities for analysis of seized nuclear materials containing Uranium and Plutonium. Assistance will be provided by EU experts (Institute for Transuranium Elements ITU, Karlsruhe Germany) to improve analytical techniques for destructive analysis of seized vagabonding material and also organize intercomparisons of NDA measurements and equipment.

The exchange of technical experience related to illicit nuclear trafficking will improve the capacities of analysis of nuclear samples in Bulgaria and the option of assistance by destructive analysis of seized nuclear material in EU upon request from Bulgaria will be of great importance for the country's efforts to combat illicit nuclear trafficking in the line of nuclear non-proliferation.