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Role of Nuclear Forensics in Supporting National Organizations in Combating Against Smuggling of Nuclear Materials

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Introduction

The state is responsible of forming a solid infrastructure for nuclear security to detect and prevent any deviation of the nuclear materials from regulatory control by criminal intentional acts such as theft or smuggling and illicit trafficking of nuclear or radioactive materials of these materials as well as non intentional acts such as loss.

The responsibility of undertaking the necessary measures to prevent nuclear security violations, discovering and responding to it if it occurred in a reasonable way, rests with the state.

Nuclear forensics (NF) play an important role in combating nuclear smuggling and Smuggling and illicit trafficking of nuclear and radioactive materials. Nuclear Forensics can be very effective in identifying the caught nuclear materials by police or the customs officers in such a way to furnish answers related to when, where and how these materials were produced, the reasons of their diversion and their future use if possible.

In order to solve the problems related to the criminal actions such as smuggling and illicit trafficking of nuclear materials the state shall establish effective nuclear security forensics laboratory within the state's infrastructure of nuclear security.

International efforts have been initiated to assist vulnerable states against smuggling and Smuggling and illicit trafficking of nuclear and radioactive materials. These efforts are mainly directed to exchange of information with the member states, helping then in increasing their ability in these fields and alerting them to intensify their awareness about combating smuggling and illicit trafficking of these materials.

Nuclear forensics complement the role of other national authorities working on preventing nuclear smuggling or illicit trafficking of nuclear materials.

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IAEA emphasizes the important role of nuclear forensics as a complementary effort to the role of specialized international organizations e.g. International Police Organization (IPO) and the International Customs Organization (ICO) which are deeply involved in combating against nuclear smuggling and Smuggling and illicit trafficking of nuclear materials.

This presentation is to be divided to two sections:

The first deals with the national efforts for combating against smuggling and illicit trafficking of nuclear materials and the second deals with the International efforts to assist different states in combating against smuggling of nuclear materials.

National efforts to combat with smuggling and illicit trafficking of nuclear materials

In spite of the fact that most states in the world became members of the Non-proliferation Treaty to reduce or stop the spread of Nuclear Weapons and that 63 countries joined the Convention on Physical protection of nuclear materials, in 1993, IAEA reported on the occurrence of 85 Smuggling and illicit trafficking events of nuclear materials. Although most of the quantities seized were small and their use in making nuclear weapons was questionable, reports showed that in 13 cases the seized materials were of strategic importance as for example highly enriched uranium or plutonium. This emphasized the importance of fostering international cooperation to help member states to take strong and coordinated measures to prevent smuggling and illicit trafficking of nuclear materials.

Conforming with the requirements in combating against smuggling and illicit trafficking of nuclear materials, the state shall form a governmental body for coordinating all organization related to combating against smuggling and illicit trafficking nuclear materials or radioactive sources. Moreover, the international community realized the importance of reinforcing the national customs organization and national police in the states and also the importance of the support conveyed to these organizations from the IAEA, (ICO) and (IPO). The international community more recently realized the importance of using nuclear forensics to support investigations carried out in cases of nuclear smuggling in order to find out the origine of the seized nuclear or radioactive materials and determine the place of their production, and if possible the processes used in their production. In addition, it is always necessary to try to know the intended use of the seized material.

Role of the state in combating against Smuggling and illicit trafficking of nuclear materials

The state shall take the necessary steps and put forward the necessary regulations related to combating against smuggling and illicit trafficking of nuclear materials as follows:-

1- Physical protection of nuclear materials

Governmental rules, legal documents and technical measures that aim at preventing diversion or loss of nuclear materials are applied by the operators of nuclear or radioactive installations and controlled by the regulatory body to foster physical security of these materials in the country.

2- Detection technologies of smuggling crimes

All possible governmental steps and technologies shall be used to detect smuggling and illicit trafficking of nuclear materials at all the points through which these materials pass into or out of the country (Customs, transport routes)...etc. The state shall raise the efficiency and professioncy of the customs officers as well as the police officers and also the members of the nuclear forensics laboratory in detecting and analyzing the smuggling and the illicit trafficking incidents of nuclear materials.

In Egypt, the regulatory body organizes regular training courses for customs officers and criminal police officers to improve their skills in detecting the crimes related to malevolent actions towards nuclear and radioactive materials.

3- Sanctions

All violations pertaining to smuggling and illicit trafficking operations are subject to severe punishments according to the provisions of the law.

4- Identification and verification operations (Nuclear Forensics)

Governmental and technical operations are always applied to identify the caught nuclear materials and to analysis the criminal violations discovered while taking the nuclear materials under custody.

Along that line nuclear forensics involve many other measures including legislation, regulatory control, collection of intelligent information, evaluation of potential threats together with administrative and technical systems in addition to preparation of response forces.

Role of nuclear forensics in supporting criminal investigation in smuggling and accident prevention

The role of nuclear forensics includes examination of physical, biological and documentary evidence in order to understand how, when and where the nuclear materials were produced, their planned use. Moreover, examination of the contaminated items emerging in a nuclear or radioactive accident can assist in finding out the relation between persons, places and subjects involved and related to the accident, as explained in the following:

- 1- Nuclear forensics are carried out to respond to the questions, raised by the investigating authorities, related to the nature, origin and history of the nuclear or radioactive material in the nuclear security event. The results of the nuclear forensics and their interpretations may provide valuable information on the nature of the nuclear or radioactive material related to the accident or event under investigation and the relationship between these materials and working personnel and places as well as the production process and the intended use of these materials in malevolent actions.
- 2- Nuclear forensic results could be vital in eliminating the occurrence of malevolent actions in the future since they may reveal that the nuclear or radioactive materials were taken from places that have been considered before as safe places. This also can reveal any deficiencies in the safeguards measures, material accountancy and security in the facility or in the state as a whole. This shows that nuclear forensic investigations could lead, after a nuclear security event, to valuable improvements in the nuclear security systems.
- 3- Nuclear forensics could have a great effect in deterring criminal groups or individuals from initiating or participating in nuclear security malevolent actions knowing that nuclear forensics assists the authorities responsible of carrying out investigations for effectively identifying and finding these criminal groups.

Role of the state in fostering nuclear forensics processes

The increase in the smuggling and the illicit trafficking of nuclear and radioactive materials and the relevant security threat to the state attracted the attention of states to start considering nuclear forensics as a main constituent of the basic infrastructure of the national nuclear security system together with other measures undertaken to detect, prevent and respond to nuclear security events. This is due to the fact that the competent state authorities shall need information concerning the smuggled materials, when and where and how they were produced.

The state should annex a nuclear forensics plan to the national response plan in case of nuclear security accidents. The nuclear forensics plan defines the role and responsibilities of personnel and also the supply of experts and equipment and methods, necessary to execute the nuclear forensics plans.

The state shall take care to foster close cooperation, coordination and integration among different relevant parties in the state in order to build eminent nuclear forensic abilities based on knowledge, education and training.

The state should establish nuclear forensics infrastructure at first by reviewing the existing personnel in the state, particularly in the relevant organizations in order to make use of the competent personnel in the investigations.

The state should establish a library for nuclear forensics to contain reference materials or reference documents in order to help the workers in reaching rational evaluations and decisions or conclusions concerning the caught nuclear material – out of regulatory control – and whether it is similar or different from any nuclear material stored, produced or used in the country.

Suitable work force can be also attracted from radiation protection institutions, nuclear chemistry and nuclear physics departments in universities, radiation measurement laboratories, nuclear fuel cycle facilities, environmental monitoring laboratories and nuclear control institutes...etc.

Governmental authorities shall make the necessary contacts with other countries, relevant international organizations, and customs organization in other countries, about any theft or loss of any sensitive nuclear material such as highly enriched uranium or plutonium.

Nuclear Forensics Plan

Since nuclear forensics can play an important role in the investigations performed in any nuclear security event, particularly in case of smuggling, and illicit trafficking of nuclear materials, nuclear forensics plans should be formulated and amalgamated in the national response plan to nuclear security accidents.

The plan shall define the tools and procedures necessary to execute the nuclear forensics plan, the role and responsibilities of personnel and their qualifications, As follows:-

The official person in the crime scene is responsible of all decisions related to public safety, environmental protection, safety of personnel participating in the response actions and those involved in collection and

protection of evidences. He has to secure the crime scene, manage the ingoing or outgoing items or personnel in the crime scene, protect the radioactive or nuclear materials-out of regulatory control – and protect the personnel and those working in the response actions, the public and environment as well as organizing the radiation protection in the site and also evaluating the risk of nonradioactive nature that can occur due to weather, explosion of unexploded materials and reflexion of all these risks on the workers in the response operations or on the nuclear materials which are subjected to nuclear forensic investigations.

The nuclear forensic plan shall include the means used for safe transport of radioactive and nuclear materials from the crime scene to the store used to keep the evidence.

The plan also shall include the specifications of the interim storage places of the evidence to be kept until dispatched to the relevant nuclear analytical laboratory.

Prior to the conservation of evidence, the caught material should be segregated. Nuclear materials should be separated from radioactive materials. This facilitates the process of defining the adequate physical protection measures necessary for transporting the caught material as rapidly as possible to the nuclear forensic laboratories for analysis.

International efforts to assist different states in combating against smuggling and illicit trafficking of nuclear materials.

There has been a common understanding among states in the international community that the problem of smuggling and illicit trafficking of nuclear or radioactive materials should be effectively addressed through applying strict measures to protect and secure nuclear and radioactive materials in addition to fostering nuclear forensic measures to support all security arrangements used in states members of IAEA. This is carried out through intensive international cooperation between IAEA, ICO and IPO. The roles of these organizations are treated in some detail in what follows.

1- Role of IAEA

The number Smuggling and illicit trafficking incidents has greatly increased since the collapse of the soviet unions. Due to the fact that the smugglers are not aware of the dangers or risks imposed by the radioactive materials they are handling, their health as well as the public health also could be at great risks.

In 1996 the Interpol participated with the IAEA and ICO in preparing a safety guide on prevention, detection and response to

smuggling and illicit trafficking of nuclear materials. This guide is supposed to be very useful in assisting national responsible organizations in member states.

IAEA assist member states in formulating legal documents that aims at preventing theft, smuggling and illicit trafficking of nuclear materials as follows:-

- 1- The convention on physical protection of nuclear materials (1987) and its amendments that were issued by IAEA in 1997 under the title "physical protection of nuclear materials and installations" and was finally issued and the physical protection of Nuclear and installation material INFCIRC/225/Rev.5 in 2004.
- 2- IAEA assist member states by offering them training guidance in order to improve the physical protection measures of nuclear materials applied in member states, (IPPAS Mission).
- 3- IAEA assists member states in establishing State systems of accounting and control of nuclear materials. The existence of that system can provide an efficient deterring factor that aims at preventing nuclear materials theft. This system complements the physical protection system.

In addition IAEA sponsors other measures to combat smuggling and illicit trafficking of nuclear materials, as could be realized from the following:

Supporting nuclear forensics operations

IAEA emphasized to member states the important role of nuclear forensics as a tool that can support the special investigations to be undertaken in nuclear security events particularly in case of smuggling and illicit trafficking of nuclear material crimes. In these cases, analytical forensic studies of confiscated materials need to be carried out in order to determine the nuclear nature of the caught materials their properties and their origine if possible. That will helps in determining the radioactive risk involved in the process.

Building nuclear forensics capabilities in member states through several elements: the know how, gained experience and training.

The know-how and experience could be acquired through international cooperation, assistance in supplying knowledge and experience as well as assistance in training on how to deal with events such as Smuggling and illicit trafficking of nuclear or radioactive materials that exists outside regulatory control.

IAEA has established, since 1995, Seibersdorf labs in Vienna which are in close collaboration with other specialized labs in other member states

for analyzing the confiscated materials, for identifying the radioactive isotopes present and its isotopic composition. The agency has portable radioactivity measuring and monitoring equipments such γ -spectroscopy systems that could be used directly in the crime scene.

IAEA has issued in 2013 a draft document entitled "Nuclear forensics in support of investigations" including a model plan for nuclear forensics investigations in which are defined the measures and steps that has to be adopted in defining the role of nuclear forensics in the national nuclear security infrastructure. However, that document does not contain any detailed guidance on the design and equipment supply of nuclear forensics analytical laboratories and also the ways and actions to be performed in the crime scene.

IAEA also formed an international working group on nuclear forensics ITWG to provide the member states with the nuclear forensics systems and to transfer information and guidelines as well as technical guidance on the analysis of nuclear materials.

IAEA established and maintains a data base that includes records of events related to smuggling and illicit trafficking of nuclear materials and radioactive sources. The official points of contacts in different IAEA member states participating in that data base are declared to facilitate exchange of information about smuggling and illicit trafficking incidents. 2331 cases were reported since the year 1993 up to 2012. In sixteen cases highly enriched uranium or plutonium were caught together with 615 cases in which nuclear materials were stolen or lost.

IAEA issued a document on the "Basic Safety standards for protection against ionizing radiations and safety of radioactive sources. These measures are the basis of the safety guide for detection and response against smuggling and illicit trafficking of nuclear and radioactive materials.

IAEA provide assistance to member states in developing their national legislations.

IAEA organized an international conference on "Advances in Nuclear Forensic" during the period 7-10 July 2014 to exchange information concerning capacity building of infrastructure needed for nuclear forensics.

It would be suitable to offer assistance and relevant information exchange through the contact points in case of nuclear forensic investigations.

2- Role of the International Customs Organization in combating against smuggling

The International Customs Organization objectives are to stops any smuggling actions at the boundaries of the states. In May 13th 1998 a

memorandum of understanding between IAEA ICO was signed to foster active cooperation for combating smuggling and illicit trafficking of nuclear materials. Consequently the state should develop and train personnel working in the customs and raise their awareness about smuggling crimes and illicit trafficking of nuclear and radioactive materials.

The International Customs Organization (ICO) assists member states in reinforcing their competence through technical training programs aiming at resisting any customs violations.

The ICO has put forward a model program for facing smuggling and illicit trafficking of nuclear materials and radioactive sources aiming at raising the awareness of customs personnel in different states. That program includes some guidelines to develop national training programs and develop a data base to help the states in exchanging information related to smuggling or illicit trafficking of nuclear materials and radioactive sources rapidly.

Exchange of information can assist the customs authorities in identifying the developments occurring on the international level for smuggling nuclear materials and also to achieve a more rapid way of contact to exchange information related to smuggling of nuclear materials.

In Egypt the nuclear and radiological control authority regularly organizes training programs for the working staff in the customs organization to raise their awareness about ways of discovering smuggling of nuclear materials and radioactive sources through Egyptian borders.

3- Role of international police organizations

National police is responsible of preventing or reducing the occurrence of the crimes against nuclear materials and radioactive sources in the country. Special attention should be given to smuggling or illicit trafficking of nuclear materials. Consequently, the state has to raise the ability of police personnel in that respect.

The International Criminal Police organization (INTERPOL) aims at supporting the international cooperation with the local police in IPO member states within the framework of the local legislations existing in each member state to prevent or reduce the criminal violations against nuclear materials or radioactive sources and to support exchange of information among different states in that respect.

In 1993 the INTERPOL organized an international meeting for the first time to discuss the problems related to smuggling and illicit trafficking of nuclear materials. The meeting released a document which contained the data that should be reported by the criminal police personnel when they report on seizures of out of control nuclear materials or when they require

information or help from other member states of the Interpol or from the Interpol secretariat.

That document aims also at assisting the law enforcement officers in reporting about Smuggling and illicit trafficking of nuclear materials events. The Interpol participated in 1996 in the meeting organized by IAEA, EU and IPO. These organizations agreed to foster proper training programs for the personnel in IPO ICO.

Conclusion

- 1- States, member of IAEA, shall establish contact points between themselves and between themselves and the IAEA for prompt information exchange in cases of security violations such as smuggling, illicit trafficking and also for exchange of expertness and assistance in case of nuclear forensic investigation
- 2- States shall establish efficient nuclear forensics laboratories.
- 3- All states shall organize training programs on nuclear forensics practice possibly with the assistance of the IAEA and other countries.
- 4- The state shall train the police personnel and customs officers on the proper ways of handling and storing the confiscated nuclear materials until being sent to the competent laboratories.

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