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INTERNATIONAL TECHNICAL WORKING GROUP COOPERATION TO COUNTER ILLICIT NUCLEAR TRAFFICKING

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The Nuclear Smuggling International Technical Working Group (ITWG) is an international body of nuclear forensic experts that cooperate to deter the illicit trafficking of nuclear materials. The objective of the ITWG is to provide a common approach and effective technical solutions to governments who request assistance in nuclear forensics. The ITWG was chartered in 1996 and since that time more than 28 nations and organizations have participated in 9 international meetings and 2 analytical round-robin trials. Soon after its founding the ITWG adopted a general framework to guide nuclear forensics investigations that includes recommendations for nuclear crime scene security and analysis, the best application of radioanalytical methods, the conduct of traditional forensic analysis of contaminated materials, and effective data analysis to interpret the history of seized nuclear materials [1]. This approach has been adopted by many nations as they respond to incidents of illicit nuclear trafficking.

DEFINITIONS

Nuclear forensics is the analysis of intercepted illicit nuclear or radioactive materials and any associated materials to provide evidence for identifying, attributing, and prosecuting those responsible for their unauthorized diversion or use. The goal of nuclear forensics analysis is to identify forensic indicators in interdicted nuclear and radiological samples or its surrounding environment. These indicators arise from known relationships between material characteristics and process history.

Nuclear forensic interpretation is the process of correlating the material characteristics with its production history. The goal of nuclear forensic interpretation is to determine the method, time, and source of production. The ability to match analytical data with existing information on methods used to produce radioactive materials, and with prior cases involving smuggled and interdicted nuclear materials, will aid in the analysis.

THE INTERNATIONAL NATURE OF THE NUCLEAR TRAFFICKING PROBLEM

Nuclear terrorism remains a real threat due to the supply of radioactive materials in the industrialized and developing world and the motivations of those individuals and groups intent on using these unique supplies for malfeasant purposes. The nuclear fuel cycle generates an abundance of radioactive stocks sourced in the extraction of uranium ores, milling and concentration steps, isotope enrichment, fabrication into nuclear fuels, irradiation in a reactor, reprocessing of irradiated nuclear fuels, fabrication into special nuclear materials and nuclear weapons, disposition of excess supply, and disposal of radioactive wastes. Due to the complexity of the cycle, there is the chance that materials might be diverted outside of channels authorized for their legitimate manufacture, handling, and protection. The potential for the use of radioactivity in a terrorist act is further compounded by the growing international nature of the problem. The end of the Cold War has introduced many nations each with their own inventories of and controls over nuclear materials; in other nations asymmetric political forces also contribute to global incidents of terrorism. Circumstances that combine unsecured supplies of nuclear materials with international political environments susceptible to trafficking are a destabilizing influence throughout the world.

AVAILABILITY OF NUCLEAR MATERIALS

The source and nature of the nuclear materials is varied. Nuclear materials may include uranium with ^{235}U enrichments greater than 20% and plutonium with less than 7 % of the ^{240}Pu isotope that can be used to construct a nuclear weapon. Other direct usable nuclear materials are unirradiated or irradiated nuclear reactor fuels including uranium and plutonium oxides that can be used as part of a radiological dispersal device (RDD) or so called "dirty bomb". Commercial radioactive sources consist of chemically purified isotopes that decay by emission of alpha, beta, or gamma rays. They are produced either as a product of the fission process, e.g., ^{137}Cs, ^{90}Sr, or as a result of neutron capture, e.g., ^{60}Co , ^{241}Am. These radioactive isotopes are useful sources of radioactivity for medical diagnostics and therapy, non-destructive analysis of materials, sterilization of medical equipment and food, and generation of electricity in remote locations. The significant level of radioactivity in many commercial radioactive sources makes them attractive components of a RDD.

EPISODES OF ILLICIT NUCLEAR TRAFFICKING

The International Atomic Energy Agency (IAEA) has been maintaining its Illicit Trafficking Database (ITDB) on cases of contraband with nuclear and other radioactive materials since 1995. It includes incidents dating back to 1993. The ITDB records incidents, which have been officially reported or confirmed by Member States, but also incidents, which are still awaiting confirmation. As of December 31, 2003, the ITDB has recorded a total of 540 confirmed events involving illicit trafficking in nuclear and other radioactive materials. 205 of those cases involved nuclear materials. The annual number of confirmed nuclear trafficking incidents was highest in 1993-1994. Since then it has stabilized at a lower level and further decreased in 2002 and 2003. In addition to confirmed cases of nuclear trafficking, more than 90 incidents, which are yet to be confirmed, allegedly involved nuclear materials.

Although it is difficult to predict the future course of illicit trafficking in nuclear and radiological materials, increasingly such activities are viewed as significant threats that merit the development of special capabilities. As early as April, 1996, nuclear forensics was recognized at the G-8 Summit in Moscow as an element of the response to illicit nuclear trafficking. The value and need for nuclear forensics addresses international non-proliferation and threat reduction goals.

INTERNATIONAL COOPERATION

The challenge associated with thwarting international illicit trafficking demands international solutions. Nuclear forensics laboratories around the world are already cooperating to develop

common technical strategies and databases to this end. The Nuclear Smuggling International Technical Working Group (ITWG) was chartered in 1996 to foster cooperation in combating illicit trafficking of nuclear materials. The ITWG has grown steadily since that time to include 28 member nations and organizations. The technical priorities of the ITWG include the development of accepted and common protocols for the collection of evidence and laboratory investigations, the prioritization of techniques and methods for forensic analyses for nuclear and non nuclear samples, the organization of inter-laboratory forensic exercises, the development of forensic knowledge bases to assist in interpretation, and technical assistance for requesting countries. In addition the ITWG regularly participates in nuclear trafficking cases.

The nuclear forensics laboratories participating in ITWG are committed to undertake the characterization of nuclear or other radioactive materials, which have been confiscated and submitted to analysis by legal prosecution authorities. These laboratories have pledged to cooperate closely among themselves and with prosecuting authorities in order to facilitate the elucidation of illicit events involving nuclear and other radioactive materials.

The ITWG works closely with the IAEA to provide requesting states with assistance in a nuclear forensics investigation. A requesting state can contact the IAEA to evaluate the need for nuclear forensics and to obtain information of ITWG capabilities. In addition to the evaluation, the IAEA can provide additional support including transporting materials from holding sites to laboratories capable of nuclear forensic analysis.

A core capability of the ITWG is a model action plan that specifies a consensus approach to conducting nuclear forensics investigations. The model action plan provides recommendations governing incident response, laboratory sampling and distribution of samples, radioactive materials analysis including categorization and characterization of samples, traditional forensics analysis, and case development including nuclear forensics interpretation of signatures. Participating countries - recently including Poland and Hungary - have adopted the plan and used it successfully to prosecute their own forensics investigations. Through the multi-lateral partnerships promoted by the ITWG, response can be tailored. The ITWG offers requesting states a significantly larger collective pool of expertise in radioactive and traditional forensic analyses and case development than an individual nation pursuing an investigation in isolation.

The mission of the ITWG has expanded in recent years beyond just technical assistance to nuclear forensics investigations. From its inception, ITWG members have included policy and decision makers, law enforcement personnel, as well as scientists with expertise in, and responsibility for, nuclear forensics. Support from the ITWG to policy-makers and law enforcement officials have increased through the years. The ITWG remains an association of active practitioners of nuclear forensics underwritten by funding from sponsoring countries and organizations. While its primary mission continues to be advancing the science and techniques of nuclear forensics and sharing technical and information resources to combat nuclear trafficking, the ITWG has recently focused on improvements to its organization and outreach.

To promote the science of nuclear forensics within the ITWG, the ITWG Nuclear Forensics Laboratories (INFL) was organized in 2004. The INFL is that piece of the ITWG where the core nuclear forensics science capability resides distinct from other more administrative functions. The INFL will promote technical development applied to the nuclear forensics problem including guidelines for best practices in nuclear forensics, conducting international exercises, evaluation of new isotopic and elemental signatures, identification of relevant international data and expertise to aid in nuclear forensics interpretation, communications with external organizations and publishing INFL reports, technical peer-review and mutual assistance in nuclear forensics investigations.

CONCLUSION

By its very nature nuclear trafficking is a transboundary problem; nuclear materials may be manufactured in one location, diverted at a second location, and detected at a third. By encouraging the participation of those states where nuclear materials are interdicted, the ITWG brings nuclear forensics expertise and capabilities closer to the states affected by these cases. Only by sharing information about nuclear processes and materials can participants benefit from collective experience and knowledge to evaluate and prosecute nuclear trafficking cases. Exchange of forensic databanks of information and collaboration in the international nuclear forensic enterprise will resolve cases faster and with greater confidence. Through a common approach to the problem and the ability to draw on international experience, the ITWG is a significant force in the fight against illicit nuclear trafficking.

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FUTURE COORDINATED RESEARCHES BY ARGONNE (USA), TASHKENT (UZBEKISTAN) AND ALMATY (KAZAKHSTAN) NUCLEAR CENTRES ON THE NUCLEAR REACTIONS AND ASTROPHYSICS

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Main points of the report:

- Problems and Methods used for study of the nuclear astrophysical reactions
- Activity of scientists of the three Institutions in this field
- Experimental possibilities of these institutions
- Nuclear Astrophysics reactions which would be studied.

I. PROBLEMS OF NUCLEAR ASTROPHYSICS

An actual problem of modern nuclear astrophysics is realistic evaluation of astrophysical S-factors and rates of the nuclear reactions, which is responsible for the energy generation and nucleosynthesis in universe at different stages of its evolution. Essential progress in understanding some of these processes has been made in the last decade [1-4]:
-development of the indirect methods for obtaining astrophysical relevant data;
-using Radioactive Ion Beams and inverse kinematics in measurements;