**Nuclear Forensics Role and capabilities in the Romanian nuclear security infrastructure**

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Nuclear security is now become an global issue and nuclear forensics is one of the very important part in an on-going national programme for nuclear security.

The potential consequences of any malicious use of nuclear or other radioactive material could be catastrophic and can put in a danger the peaceful uses of nuclear technology and applications. Criminals or terrorists could acquire and use radioactive material for malicious purposes in a different way: acquire nuclear explosive devices; use nuclear material to build an improvised nuclear explosive device or to construct a radiological dispersal device; or disperse radioactivity through sabotage of installations.

All the events, terrorist attacks in the last decade have demonstrated that the States have to take into consideration the nuclear threat and have to re-evaluate the actions and the asymmetric scenarios used by the terrorists against a nuclear facility. Romania, as Member State of the IAEA, is very active in committing actions at national and international level and has taken measures to strengthen the physical protection regime for nuclear material and nuclear facilities.

Romania has the capacity to prevent and combat illicit trafficking of nuclear materials, including through cooperation with the IAEA, INTERPOL and theWorld Customs Organization. Preventing and combating illicit trafficking of nuclear and radioactive materials are essential components of preventing and combating nuclear and radiological terrorism. Romania is one of the states that voluntarily reports to the IAEA database on illicit trafficking of radioactive substances in the event that such developments ever occur.

No high-risk events regarding illicit trafficking in dual use (civilian and military) nuclear items occurred in Romania so far. Since the launch of the IAEA database, Romania only reported some minor incidents. In recent years, the frequency of recorded events was about 1 or 2 per year. They are, nevertheless, insignificant in what concerns their impact on the environment and for the population.

Romania ’s current capability to respond to radiological and nuclear (RN) threats is focused on detection, prevention, interception and mitigation, as well as enabling the necessary resources for subsequent investigation, interdiction and prosecution.

The National Commission for Nuclear Activities Control (CNCAN) is the competent authority responsible for regulation, licensing and control in the nuclear field in relation to safety, security and safeguards. CNCAN issues legally-binding regulations in all these areas and is responsible for review and assessment, authorization, inspection and enforcement activities.

Nuclear forensics is one element of nuclear security regime that is viewed as the opportunity and challenge for Romania and CNCAN.

Nuclear forensics is the examination and evaluation of discovered or seized nuclear materials and devices or, in cases of nuclear explosions or radiological dispersals, of detonation signals and post-detonation debris. Nuclear forensic evidence helps law enforcement and intelligence agencies work toward preventing, mitigating, and attributing a nuclear or radiological incident.

For nuclear forensics to play its role, qualified personnel must be able to access sites for prompt sample collection. Some of those sites will be within the affected areas and highly radioactive; others will not. Repeat visits, while to be avoided wherever possible, may be needed as understanding is developed. Prompt, safe, protected transport of samples to the laboratories is essential, as is protecting the chain of custody.

Responsabilities to investigate nuclear security incidents belong thru  NBC Team of the Directorate of Firearms, Explosives and Dangerous Substances (DAESP) of the General Inspectorate of Romanian Police (IGPR DAESP NBC Team).

The IGPR DAESP NBC Team was founded in 2001 within the Organized Crime Countering Directorate and from 2009 has formed part of the Directorate of Firearms, Explosives and Dangerous Substances of the General Inspectorate of Romanian Police. This is the only unit within the Romanian Police with competences regarding crime scene investigation in cases of illegal use of Chemical Biological Radiological and Nuclear (CBRN) agents.

Intelligence support for such a kind of event came from the Romanian Intelligence Service (SRI) which is the leading national authority in preventing and countering terrorism and from the Department for Intelligence and Internal Protection (DIPI) within the Ministry of Internal Affairs.

For the most cases of illicit trafficking of nuclear materials happend in Romania, the nuclear forensics tasks were performed by the the Institute for Nuclear Research and the National Institute for R&D in Physics and Nuclear Engineering-Horia Hulubei. The Institute for Nuclear Research – ICN has the following main research facilities:

* Two materials testing reactors: TRIGA- 14 MW SSR and Annular Core Pulsing Reactor (ACPR).
* Post-irradiation examination laboratory with hot cells
* Radioactive waste treatment facility
* Out of pile testing facility
* Laboratories for physical-chemical and radiological characterization of materials

The ICN also has a Radiation Protection Laboratory. The ICN also supports nuclear forensic examinations.

The National Institute for R&D in Physics and Nuclear Engineering Horia Hulubei (IFIN-HH) cooperates with the national authorities with competencies in nuclear security and upon request ensures technical support for intervention, measurements, identification of radioactive and nuclear materials, management of the institutional radioactive waste (collection, transportation, treatment, conditioning, storage and disposal).

Laboratories from IFIN-HH maintain the quality assurance system complying with international standard ISO/IEC 17025:2005 and are accredited by National Association for Laboratories Accreditation-RENAR with recognition both as national and international level. Quality assurance system is based to the Quality Manual and Written Procedures. The specialists and technician are periodically trained accordingly with the approved Training Plan. The all activities of accredited laboratories are controlled and surveyed by RENAR and periodically it is planned audit. Yearly the laboratories participate in the inter-comparison campaign with other similar laboratories at national and international level. The laboratories make the measurements, issued the Measurement Bulletin, Technical Report.

In these laboratories are performed the characterization of the samples by:

* Radiological techniques for estimation the total activity, dose rate, surface contamination by portable dose meters, contaminometer - beta-gamma, alpha-beta, Isotopic Analyses by Gamma Spectrometry with HPGE spectrometer portable or in laboratory, Alpha Spectrometers, Ultra low level liquid scintillation spectrometers, Underground laboratory for high-resolution gamma spectrometry in ultralow background
* Physical characterization : visual inspection, photography, weight, dimension, density, X-ray diffraction (XRD), X Ray Fluorescence (XRF), Ion Beam Analysis (IBA)- Micro Particle Induced X-ray Emission (μPIXE), Particle Induces Gamma Ray Emission (PIGE), Elastic Recoil Detection Analysis (ERDA), Rutherford Backscattering (RBS) are implemented for elemental analysis, material characterization and ion implantation, Mass Spectrometry with Accelerator-AMS, Gas Chromatography coupled with Mass Spectrometry (GC/MS), Inductively Coupled Plasma Mass Spectrometry (ICP-MS).

The samples are collected by the specialized team with Mobile unit for in-situ gamma spectrometry, preliminary radiological characterization of the area (dose rate, contamination, visual inspection, photography, weight, dimension, density, isolation of the contaminated area, technical assistance of the first responders, cooperation with CNCAN and Inspectorate General for Emergency Situations with technical support based of the Mobile Unit for CBRN emergencies situations coupled with mobile unit for decontamination . For the first responders IFIN-HH has the capabilities for establish the exposure at radiation – effective dose radiation accumulated by external or internal exposure, dose assessment, reconstruction of the dose.

IFIN-HH also cooperates with ICN Pitesti in the technical and scientific field as exchange of the experience, practices, techniques, methods, in inter-comparison campaign.

The cooperation among the all participants in intervention is coordinated by CNCAN follow-up the National Response Plan for Illicit Trafficking of the Nuclear and Radiological Materials.

The IFIN-HH also ensure the training basic, advanced, theoretical and practical domain for participants involved in nuclear security field in a specialized Training Center in Nuclear Field.