



# **Nuclear forensics as deterrence method in nuclear security**

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# Nuclear security

is the prevention, detection of, and response to theft, sabotage, unauthorized access, illegal transfer, or other malicious acts involving nuclear or other radioactive material or their associated facilities.



# Nuclear forensics

is the examination of nuclear and radioactive materials, or of evidence contaminated with radionuclides in context of legal proceedings under international or national law related to nuclear security

**It aim to:**

answer questions regarding any smuggled material.

**The objectives are to find out:**

- the origin/source of the material,
- date and place of production,
- age of the material, i.e. the date when it was last chemically processed or purified and
- if possible, the intended use of the material

It can help to answer questions like:

- What material is it?
- Does it pose a threat?
- Who is responsible for the loss?
- Where did the material originate?
- Have national laws been broken?

**it is in a State's interest to have an awareness and understanding of nuclear forensics in support of law enforcement and nuclear security investigations.**

- Nuclear forensics requires the ability to measure data characteristics or ‘signatures’ of nuclear and other radioactive materials — including isotopic content, chemical composition and physical attributes — with the ability to present this evidence in a court of law in support of a criminal prosecution.
- Research in nuclear forensics focuses on identification of priority signatures bearing on the origin and history of nuclear and other radioactive materials. Better knowledge of the ‘science of signatures’ is particularly important for the development of a national nuclear forensics library as one way to determine whether seized material is or is not consistent with nuclear or other radioactive materials used, produced or stored by the State.

- By providing clues to where and when illicit materials were manufactured as well as potential points of division and trafficking routes, nuclear forensics helps States to make informed decisions about improvements to their nuclear security regime.
- By potentially providing information on those responsible for unauthorized acts involving nuclear or other radioactive materials, nuclear forensics may serve as a preventive measure to deter future nuclear security incidents.
- It points and help states to put their hands on the defects in their physical protection systems which lead to improving the nuclear security system

To enhance nuclear forensics, we need to:

focus on the recommended analytical methods can be used to characterize the radioactive materials. (non-destructive methods and destructive methods)

- focus on the non – destructive methods to preserve evidence to gain more support in the court of law and to be able to recreate the crime scene later to be sure that we have accurate results specially if we have a small amount of evidence sample,
- use destructive analysis any ways as the accuracy of the measurements become higher than that in case of non-destructive analysis. We need to decide the standards that should be applied to ensure the accuracy of the result and decide what kind of vital information that helps to reach the facts leading to what actually happened to the material.

Also, we still have difficulty especially in developing countries in establishing nuclear forensics libraries to be able to compare with the results of the analysis. This library should include a full categorization and characterization of every nuclear and other radioactive material may exists.

All the above and more of questions needed to be answered in this new science or in other words “new commitment”.

There is no one country can provide all the needs for this science. So, International cooperation is certainly a must under all the surrounding circumstances and threats.

The Nuclear Smuggling International Technical Working Group (ITWG) was formed in 1995 to foster international cooperation in combating illicit trafficking of nuclear materials. More than 28 nations and organizations have participated in seven international meetings and round-robin analytical trials to-date. Technical priorities for the ITWG include development of accepted and common protocols for the collection of evidence and laboratory investigations, prioritization of techniques and methods for forensic analyses for nuclear and nonnuclear samples, inter laboratory forensic exercises, development of forensic databanks to assist in interpretation, and technical assistance for requesting countries.

- The Egyptian Nuclear and Radioactive Regulatory Authority (ENRRA) is aware of the great importance of nuclear forensics as tool can be used to prevent smuggling of nuclear and radioactive materials and also help to reevaluate the threat against nuclear and radioactive materials and their facilities.
- Therefore, ENRRA works on applying training for the responders for crime scenes under the care of IAEA.
- Also, provide the techniques and laboratories provided with the best equipment and tools. It is looking forward to establish nuclear security training center that will provide training in nuclear security and all its tools including nuclear forensics.

# Conclusion:

- Nuclear forensics science uses the analytical techniques that not only help to bring the perpetrator to trial, but also to find and improve the defects in the states security system.
- It relies on the expertise and experience of the investigating scientists knowledge in areas such as radiochemistry, nuclear physics, reactor physics, material science and in the nuclear fuel cycle for interpretation of the results.
- However, there is a great need to supported by reference data presented in the form of nuclear forensics library.

**Questions??**