

Understanding Nuclear Forensics

in **5** QUESTIONS



IAEA

International Atomic Energy Agency

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What is nuclear forensics?

Forensic science, commonly referred to as forensics, is the examination of physical, biological, behavioural and documentary evidence. The goal of forensics is to discover linkages among people, places, things and events.

A sub-discipline of forensic science, nuclear forensics is the analysis of intercepted illicit nuclear or radioactive material and any associated material, which can assist in law enforcement investigations as well as assessments of the potential vulnerabilities associated with the use, production and storage of these materials as part of a nuclear security infrastructure.

The analysis of nuclear or other radioactive material seeks to identify what the materials are, how, when, and where the materials were made, and what their intended uses were. Nuclear forensics is an important tool in the fight against illicit trafficking in nuclear and radiological material.

Nuclear forensics can help answer questions including: 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?

To answer these questions, it is in a State's interest to have awareness and understanding of nuclear forensics in support of law enforcement and nuclear security investigations.

2.

Why is nuclear forensics important?

A nuclear forensics examination provides insight into the origin and history of nuclear and other radioactive materials. Nuclear forensics is a capability for States to assess whether material encountered outside of regulatory control is or is not consistent with nuclear or other radioactive material produced, used or stored within the State. Because nuclear forensics supports investigations of unauthorized acts involving diversion of nuclear and other radioactive material out of regulatory control, it is an important capability for States to maintain in order to respond to a nuclear security incident.

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.

3.

What is required to develop a nuclear forensics capability?

Awareness and understanding of the elements and proper sequencing of a nuclear forensics examination, including the gathering and protection of evidence utilizing a chain of custody, and sequenced analysis (nondestructive followed by destructive analysis) in a laboratory equipped and authorized to analyse nuclear and other radioactive material, are essential. Technical capabilities already maintained by the State, such as analytical laboratories established within research institutes, or radiation measurement instrumentation used for environmental monitoring, may also be applied to a nuclear forensics examination consistent with trained personnel, documented procedures and the use of calibrated equipment and standards.

States can incorporate nuclear forensics into their existing national nuclear security regimes as an effective means to identify and remedy nuclear security vulnerabilities.

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What are the scientific challenges for nuclear forensics?

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 and associated databases, 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 diversion and trafficking routes, nuclear forensics allows States to make informed decisions about improvements to their nuclear security regime. Accurate and precise analysis is essential.

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What is the IAEA's role in nuclear forensics?

The responsibility for establishing and maintaining a nuclear forensics capability rests with the State. The IAEA, upon request, provides assistance to States to develop a national nuclear forensics capability through a programme of developing and publishing guidance, delivering introductory and applied training, conducting research through technical contracts, capacity building through provision of experts and access to leading international laboratories, and partnerships with key international partners in nuclear forensics. The IAEA also develops technical guidance to assist States to use consistent laboratory techniques and analytical approaches to strengthen nuclear forensics practices.

By working together with its Member States and international partners, the IAEA recognizes the importance of nuclear forensics as a tool for States to securely and confidently use nuclear and other radioactive materials in energy, medicine, industry and research.



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