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Using a National Nuclear Forensics Library to Address Gaps within a Nuclear Security Infrastructure

Introduction

Seizures of nuclear and other radioactive material out of regulatory control (MORC) have created widespread concern over the possibility of a non-state actor acquiring sufficient nuclear or other radioactive (R/N) material for malicious use. Anytime MORC is recovered, law enforcement and nuclear security investigators rely on an examination of the forensic characteristics of the material for identification and to assess its provenance.

One mechanism states can adopt that provides a record of nuclear material characteristics and subject matter expertise key to the identification and assessment of MORC is a National Nuclear Forensics Library (NNFL).

What is an NNFL and how is it applied during a nuclear smuggling investigation?

An NNFL, as an integral element of a state's nuclear security architecture, is a national system for the identification of MORC and assessment of material provenance. It is composed of the technical and administrative information on R/N material produced, used, or stored in the state, and the associated subject matter expertise necessary to use that information to answer investigative questions.

Providing valuable support to investigators of MORC incidents, an NNFL enables investigators to make rapid comparisons of interdicted R/N material with domestic holdings and can help to exclude domestic materials that are inconsistent with measured materials characteristics. A variety of important questions can be addressed with help from an NNFL, including:

- What is the material and what threat does it pose?
- From which part of the fuel cycle was the material derived?
- List item material consistent with the state's holdings?
- Is there more material missing?

How can an NNFL be used in a wider nuclear security context?

As illicit trafficking of R/N material is largely transnational in nature, determining where R/N material left regulatory control is essential in identifying nuclear security gaps. For example, uranium may be mined and milled at one location, isotopically enriched at a second location, manufactured into fuel pellets at a third location, shipped to a fourth location for assembly, and finally transferred to the site of end use. The material could be diverted from any of these locations or transit routes. If the characteristics of the uranium in question are comparable to domestic inventories, then this data may facilitate the identification of possible diversion points or points-of-entry.

When R/N material is found outside of regulatory control, the capability to determine the origin of material and process history can prove invaluable in identifying and addressing weaknesses in a state's nuclear security infrastructure. It is also potentially important for identifying previously unknown historic security weaknesses that may have resulted in the diversion of other R/N material still circulating outside of regulatory control.

While the utility of an NNFL remains essential throughout law enforcement and nuclear security investigations, it also provides states with strong mechanisms to make important determinations about the health of their domestic nuclear security infrastructure. The information gleaned from use of an NNFL can be leveraged to develop targeted nuclear security remediations for identified gaps.

Conclusion

The ability to include or exclude likely origins of MORC provides a state with the information it needs to both respond effectively to MORC and determine whether there are current or historic gaps within its operational nuclear security system. As such, an NNFL supports all three nuclear security pillars -prevention, detection, and response - and is a key nuclear security investment by any state that produces, uses, or stores R/N materials.

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