Development, Implementation, and Sustainability of a National Nuclear Forensics Library Capability to Address Nuclear and other Radioactive Material out of Regulatory Control

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The National Nuclear Forensics Library Concept

- If nuclear material is found outside of administrative controls anywhere in the world, then each country should be able to answer the question:

"Is it consistent with material used, produced or stored within our borders?"

A ***national nuclear forensic library (NNFL)*** is extremely valuable for answering this question with timeliness and confidence – it can also help investigators answer questions regarding material production history and provenance
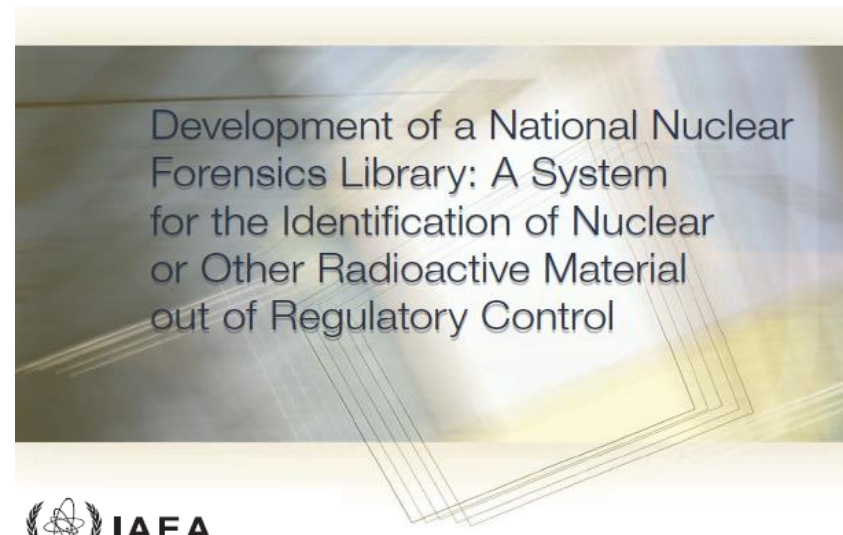
The general awareness and understanding of NNFLs and their role in investigations has improved in the last year:
- IAEA TechDoc on NNFLs
- Nuclear Forensics: Beyond the Science conference
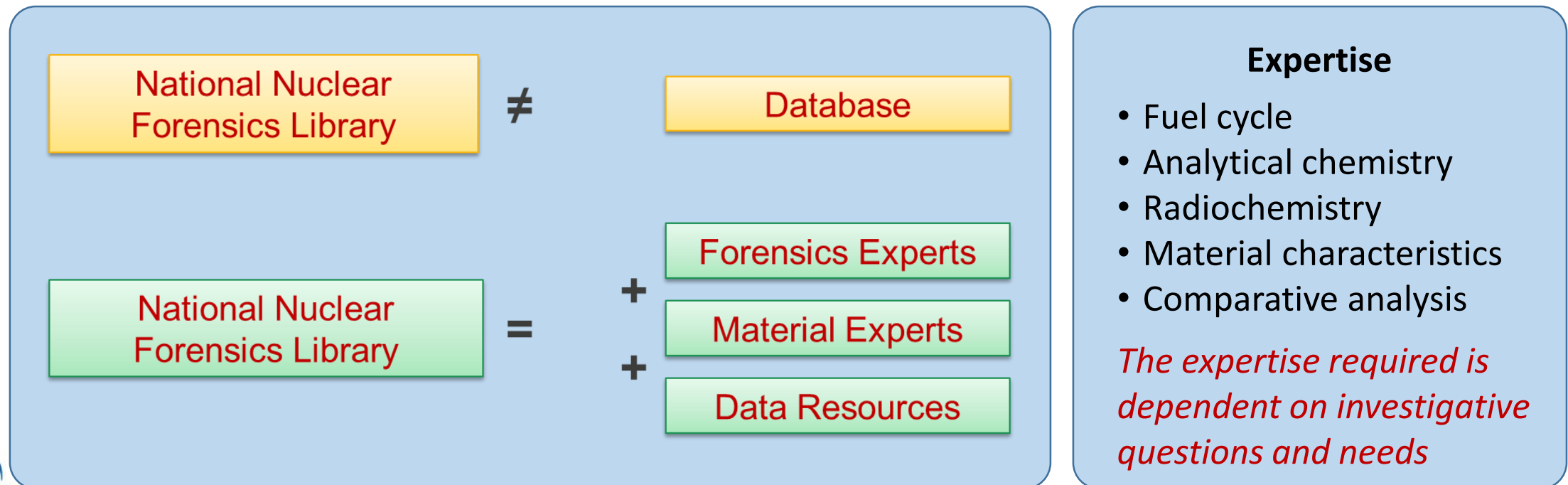- Nuclear Forensics ITWG Galaxy Serpent Exercises

IAEA Definition

- A 'National Nuclear Forensics Library' is a national system for the identification of nuclear and other radioactive materials found out of regulatory control. It comprises reference information and subject matter expertise on nuclear and other radioactive materials produced, used, or stored within a State that may be used to identify the materials out of regulatory control.

In early 2019, the IAEA published NNFL guidance in the form of a new TECDOC resulting from 9 years of work!

Development of a National Nuclear Forensics Library: A System for the Identification of Nuclear or Other Radioactive Material out of Regulatory Control

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International Atomic Energy Agency

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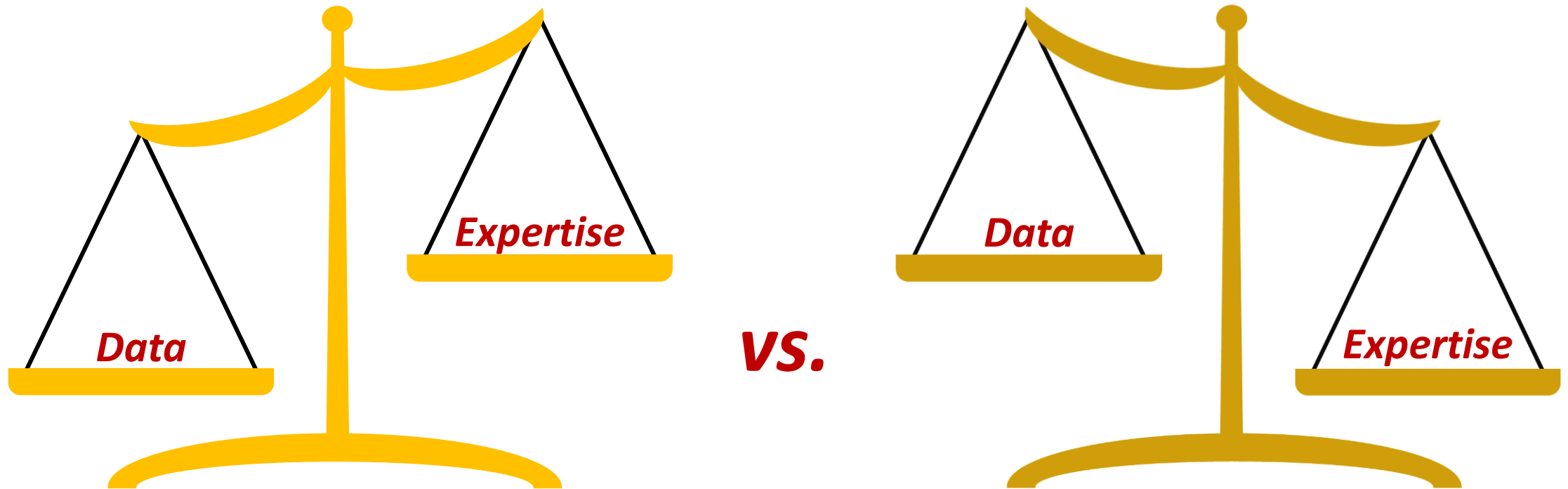EST.1943

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NNFLs require data and expertise

- Material identification and provenance assessments take more than data – expertise is an essential part of the equation

National Nuclear Forensics Library ≠ Database

National Nuclear Forensics Library = + Forensics Experts + Material Experts + Data Resources

Expertise

- Fuel cycle
- Analytical chemistry
- Radiochemistry
- Material characteristics
- Comparative analysis

The expertise required is dependent on investigative questions and needs

Balancing data resources and expertise

There is no single right answer – each country must decide the right balance based on material holdings, resident expertise, desired response times, and data resources
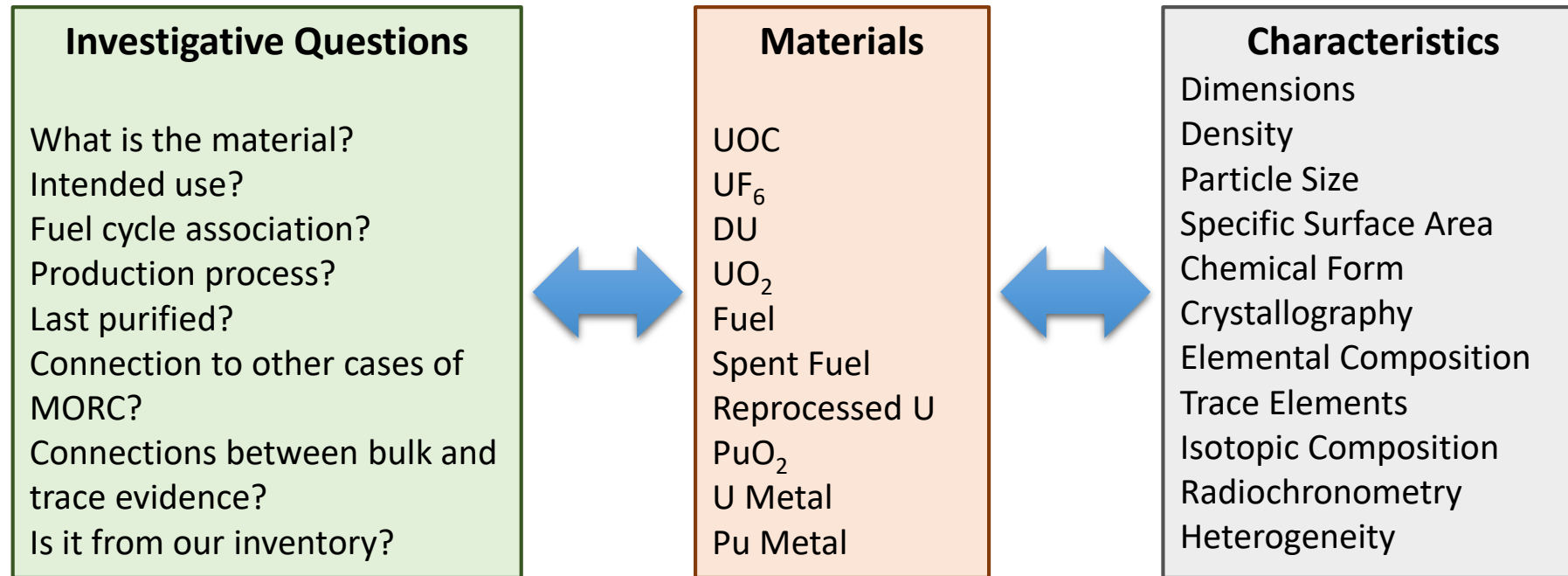
However, identification of materials always requires data

Complexity of Radioactive and Nuclear Material Holdings

Data is required at all levels of complexity

Expertise generally scales w/ complexity

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International engagement

- Direct support to MORC investigations through a query process
  - Technical exchange to identify materials and answer investigative questions
  - Cross-border investigations, or assistance to identify provenance

- Mechanism to advance nuclear forensic science
  - Studies of material characteristics useful for identification
  - Data science to evaluate connections between materials

- Exercises centered on NNFL assessments

The NNFL concept does ask countries to be prepared to accept a query or request for investigative assistance, but does not obligate any country to share sensitive or proprietary information with another country or the IAEA.

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Summary

- The NNFL is an important capability that supports investigations
    - Provides the resources to identify material and address questions of provenance
    - Requires data and expertise to be effective

- Development of an NNFL capability does require resources
    - Understanding of relevant data and expertise to identify materials
    - Exercise NNFL to ensure timely and quality responses to investigative questions

- Important mechanism to support multi-national investigations
    - Countries not obligated to share information

The NNFL concept is becoming better understood and more widely adopted as illustrated by the number of countries participating in Galaxy Serpent NNFL Virtual Exercises