Waste Safety Standards Committee

37th Meeting

23-27 June 2014

Agenda Item: W 10.2

NST014

Draft Implementing Guide:
Nuclear Forensics in Support of Investigations

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What is ..... nuclear forensics??

• Nuclear forensics helps to identify the origin and history of nuclear and radiological materials out of regulatory control

• Likely questions asked
  – Was a law broken?
  – What are materials?
  – Who is responsible?
  – Is there more?
  – Where was material diverted?
  – What route did the material take?

Nuclear forensics is the examination of nuclear and other radioactive material in support of law enforcement investigations or nuclear security vulnerability assessments
Model Action Plan

• What is the MAP?
  • A guide to an appropriate response to incidents involving nuclear or other radioactive materials out of regulatory control, when a nuclear forensic examination is required
  • Describes process to go from incident to report, covering analysis of both nuclear or other radioactive material and other evidence

The conduct of a nuclear forensics examination
Model Action Plan

Awareness of nuclear forensics drives the conduct of an investigation

- Because of the sequenced approach to nuclear forensics, awareness is required throughout.
- What occurs at the radiological crime scene and early phases of the examination may compromise the results.
- Requires input from policymakers, nuclear forensic experts and law enforcement.

A defensible plan is required before you open the vial!
Model Action Plan

**Nuclear Forensics NST014**

- Conduct of Operations
- Transport of Evidence
- Examination and Analytical Plans
- Nuclear and Other Radioactive Material Analysis & Interpretation

**Iterative process:**
Analyses & Interpretation lead to Conclusions

- Traditional Forensics Analysis & Interpretation – radionuclides present
- Traditional Forensics Analysis & Interpretation - no radionuclides present

**Forensic Conclusions**

*Radiological Crime Scene Management (NST013)*
An approach to the conduct of a nuclear forensic examination

- Incident Response
- Crime Scene Analysis
- Forensic Examination Plan
- Traditional Forensics
- Nuclear Forensic Analytical Plan
- Nuclear Forensic Analysis
- Nuclear Forensic Interpretation
- Nuclear Forensic Findings

Radiological Crime Scene Management (NST013)

Nuclear Forensics (NST014)
The Nuclear Forensics International Technical Working Group (ITWG) formulated the “Model Action Plan”

Published by the IAEA as Nuclear Security Series #2, ‘Nuclear Forensics Support’ in 2006

To incorporate recent advances, revision was deemed necessary; NST014 ‘Nuclear Forensics in Support of Investigations’ is proposed for publication within the Nuclear Security Series
An array of forensic evidence can be examined

Traditional forensics
- Wax type
- Wax colorant
- Paper origin
- Lead metallurgy
- Lead isotopes
- Ampoule material

Nuclear material forensics
- Morphology
- Chemical form
- Impurity elements
- Residual radionuclides
- Age-dating
- U & Pu isotopes

Highly-enriched uranium (~3.96 grams uranium oxide)
Trace plutonium (2.8 parts per billion)
NST014: Nuclear Forensics In Support of Investigations

1) Nuclear forensics in a national response plan
2) Development of the forensic examination plan
3) Forensics examination of evidence contaminated with radionuclides
4) Nuclear forensics laboratory analysis
5) Nuclear forensic interpretation
6) Nuclear forensics findings
7) International cooperation
8) Nuclear forensics capacity building
9) Appendix: Forensic science techniques
10) Appendix: Techniques for characterization
11) Appendix: Examples of education, exercises and research
12) Glossary

Differentiate NST014 from radiological crime scene management (NST013)
## Development of NST014

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<td>May 2010</td>
<td>IAEA Research Coordination Meeting</td>
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<tr>
<td>December 2011</td>
<td>Consultancy – First Draft</td>
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<tr>
<td>April 2012</td>
<td>Technical Meeting (First)</td>
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<td>November 2012</td>
<td>Technical Meeting (Second)</td>
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<td>March 2013</td>
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