International Atomic Energy Agency

Recent Activities of the International Atomic Energy Agency to Combat Illicit Trafficking of Nuclear and Other Radioactive Material

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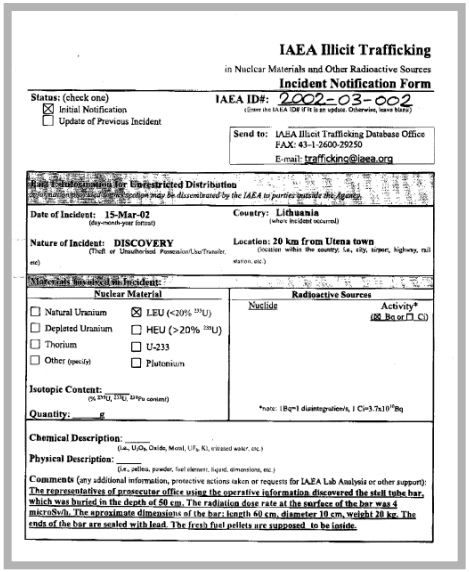
Events involving nuclear and radioactive material outside of regulatory control persist in 2010

- In March of 2010, Georgian authorities halt the sale of ~14 grams of highly enriched uranium
- In July of 2010, ~1700 grams of depleted uranium was confiscated by law enforcement officials in Moldova
- In February 2009, Argentina authorities recovered at 74GBq (~2.5Ci) 137Cs well-logging source stolen at gunpoint from a storage facility
- In 2009 and 2010, uranium – with variable enrichment – is detected in European metal scrap yards

From July 2009 to June 2010, 222 incidents were confirmed to the IAEA. 21 involved illegal possession; 61 involved thefts; and 140 involved other unauthorized activities. Of these, 5 involved HEU or plutonium.

Introducing the IAEA's Illicit Trafficking Database

- Established in 1995
- Unique network of points of contact
- As of 1 September 2010, 111 states participate in the ITDB Programme
- Information collected from *official sources* supplemented by open-source reports
- ITDB information is restricted to State POCs; no public dissemination



IAEA Illicit Trafficking
in Nuclear Materials and Other Radioactive Sources
Incident Notification Form

Status: (check one)
☒ Initial Notification
☐ Update of Previous Incident

IAEA ID#: 2002-03-002

Send to: IAEA Illicit Trafficking Database Office
FAX: 43-1-2600-29250
E-mail: trafficking@iaea.org

Date of Incident: 15-Mar-02 (day-month-year format)
Country: Lithuania (where incident occurred)

Nature of Incident: DISCOVERY (Theft or Unauthorized Possession/Use/Transfer, etc)
Location: 20 km from Utena town (location within the country, i.e., city, airport, highway, rail station, etc.)

Materials Involved in Incident:

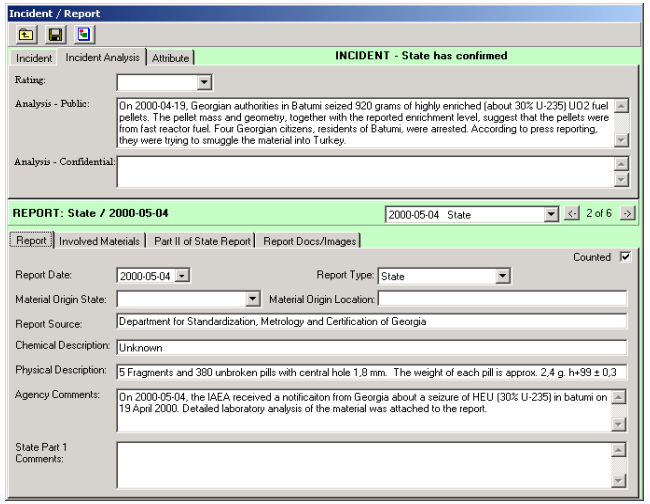
Nuclear Material
☐ Natural Uranium ☒ LEU (<20% ^{235}U)
☐ Depleted Uranium ☐ HEU (>20% ^{235}U)
☐ Thorium ☐ U-233
☐ Other (specify) ☐ Plutonium

Isotopic Content: (% ^{234}U, ^{235}U, ^{238}U or ^{239}Pu content)
Quantity: ____ g

Radioactive Sources
Nuclide | Activity* (☐ Bq or ☐ Ci)

*note: 1Bq=1 disintegration/s, 1 Ci=3.7x10^{10}Bq

Chemical Description: (i.e., U_3O_8, Oxide, Metal, UF_6, KI, irradiated waste, etc.)
Physical Description: (i.e., pellets, powder, fuel element, liquid, dimensions, etc.)
Comments (any additional information, protective actions taken or requests for IAEA Lab Analysis or other support):
The representatives of prosecuter office using the operative information discovered the steel tube bar, which was buried in the depth of 50 cm. The radiation dose rate at the surface of the bar was 4 microSv/h. The approximate dimensions of the bar: length 60 cm, diameter 10 cm, weight 20 kg. The ends of the bar are sealed with lead. The fresh fuel pellets are supposed to be inside.



Incident / Report

Incident | Incident Analysis | Attribute | INCIDENT - State has confirmed

Rating:

Analysis - Public: On 2000-04-19, Georgian authorities in Batumi seized 920 grams of highly enriched (about 30% U-235) UO2 fuel pellets. The pellet mass and geometry, together with the reported enrichment level, suggest that the pellets were from fast reactor fuel. Four Georgian citizens, residents of Batumi, were arrested. According to press reporting, they were trying to smuggle the material into Turkey.

Analysis - Confidential:

REPORT: State / 2000-05-04 — 2000-05-04 State — 2 of 6

Report | Involved Materials | Part II of State Report | Report Docs/Images

Counted ☑

Report Date: 2000-05-04 Report Type: State

Material Origin State: Material Origin Location:

Report Source: Department for Standardization, Metrology and Certification of Georgia

Chemical Description: Unknown

Physical Description: 5 Fragments and 380 unbroken pills with central hole 1,8 mm. The weight of each pill is approx. 2,4 g. h+99 ± 0,3

Agency Comments: On 2000-05-04, the IAEA received a notificaiton from Georgia about a seizure of HEU (30% U-235) in batumi on 19 April 2000. Detailed laboratory analysis of the material was attached to the report.

State Part 1 Comments:

Goals of the Illicit Trafficking Database…..

- To facilitate exchange of *authoritative* information among States on incidents of illicit trafficking and other related unauthorized activities involving nuclear and other radioactive materials
- To *collect*, *maintain* and *analyse* information on such incidents with a view to identifying common threats, trends, and patterns; use this information for internal planning and prioritisation and provide this information to Member States
- To provide a *reliable* source of basic information on such incidents to the media, when appropriate

Scope of the ITDB information……..

- ITDB includes incidents involving illegal trade and movement of nuclear or other radioactive material across national borders
- Scope also covers the unauthorized acquisition (theft), provision, possession, use, transfer or disposal of nuclear and other radioactive materials – intentional or unintentional – with or without crossing international borders
- ITDB also compiles unsuccessful or thwarted acts, the loss of materials, and the discovery of uncontrolled materials

Why does the ITDB have such a broad scope?

Threat related:

- Availability of materials
- Material characteristics
- Quantities
- Organizational aspects
- Motives, intentions and threats
- Destinations
- Supply/demand relationship (black market)

Protection related:

- Origins
- Vulnerabilities and weaknesses in protection and control
- Stealing techniques and means of defeating security systems
- Insider involvement

Detection related:

- Trafficking routes
- Smuggling techniques
- Weaknesses in detection systems and technologies
- Means of defeating detection systems
- Vulnerabilities at borders and other nodal points

From January 1993 to December 2009, 1773 incidents were reported to the ITDB

- 351 incidents involved unauthorized possession and related criminal activity (illegal possession, movement, or attempts to illegally trade in or use nuclear or radioactive sources) – Group 1
  - 15 of the 351 incidents involved highly enriched uranium or plutonium
- 500 incidents were reported involving the theft or loss of nuclear and other radioactive material – Group 2
- 870 incidents involved other unauthorized activities including unauthorized disposal of radioactive materials or discovery of uncontrolled sources – Group 3

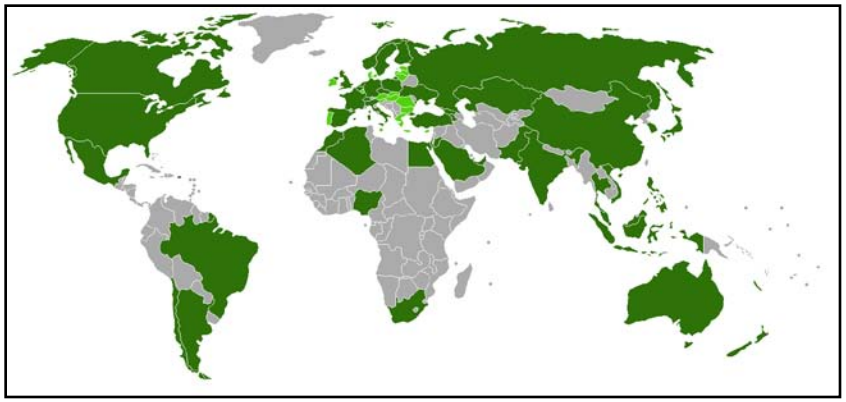
Some Conclusions from the ITDB…..

- The availability of unsecured nuclear and other radioactive material persists
- Effective border control measures help detect illicit trafficking, although effective control is not implemented at all international border points
- Individuals, and groups, are prepared to engage in trafficking this material
- Deployment of detection and monitoring equipment by States in increasing – higher reporting of Group 3 incidents
- Regional cooperation to address the problem is improving

The link between nuclear trafficking and nuclear forensics……

- Nuclear forensics supports the three pillars of nuclear security – prevention, detection, and response
- All incidents of illicit trafficking must be pursued vigorously by States; "zero tolerance" is the only message
- By returning information on the origin, history, age, and the source of radioactive material outside of regulatory control, nuclear forensics allows quantitative insights into illicit trafficking
- Nuclear forensics enables informed response

The IAEA program in nuclear forensics was endorsed at the April, 2010 Nuclear Security Summit



47 States attended the
April, 2010 Nuclear Security Summit plus
delegations from the European Union,
IAEA, and United Nations

"….. Participating States will explore ways to work together to develop national capacities for nuclear forensics, such as the creation of national libraries and an international directory of points of contact, to facilitate and encourage cooperation between States in combating illicit nuclear trafficking, including relevant IAEA activities in this area..."

The CY2010 – CY2011 IAEA program in nuclear forensics

1) Training: "Introduction to Radiological Crime Scenes and Nuclear Forensics"
2) Coordinated Research Project: "Application of Nuclear Forensics in Illicit Trafficking of Nuclear and Other Radioactive Material
3) Assist in the development of State's national nuclear forensics libraries and an international directory with ITWG and GICNT partners

Promoting nuclear forensics through training

- In 2009 the IAEA developed a comprehensive, 5-day training workshop entitled "Introduction to Radiological Crime Scenes and Nuclear Forensics"
- The course covers fundamentals of crime scene management, techniques for forensic examinations, and best laboratory practices using a combination of lectures, case studies, and exercises
- Courses can be either national, regional or international
- Expert faculty from leading international nuclear forensics institutes
- Courses held in Singapore, India, and Canada in 2009 and Argentina and Canada in 2010

A key outcome is the ability of law enforcement, response, and atomic energy experts to work together

Ottawa, Canada November 2009

IAEA nuclear forensics workshop curricula

Day 1	• Welcome • IAEA and Nuclear Security • Radiation Fundamentals • Threat Overview • Traditional Forensics on Contaminated Evidence • Radiation Instrumentation • Processing a Radiological Crime Scene • Table – Top Exercise
Day 2	• Overview of Nuclear Forensics Signatures • Nuclear Forensic Case Studies (Part I) • Radiological Evidence Sampling and Transport • Table – Top Exercise
Day 3	• Nuclear Forensic Analysis • Ionizing Radiation and Nuclear Forensic Evidence • International Agreements for Nuclear Forensics • Nuclear Forensic Case Studies (Part II) • Table – Top Exercise
Day 4	• Nuclear Forensic Case Studies (National Experience) • International Developments • Table – Top Exercise
Day 5	• National Perspectives • Table – Top Exercise Conclusion • Course Evaluation and Conclusion

Confidence building through a table-top exercise

- To raise participants' awareness of issues that will likely arise during an event involving a crime involving radioactive materials:
  - traditional forensic investigation procedures requiring examination of radiologically-contaminated evidence
  - the need to perform an analysis of the radiological material(s) involved
  - enhancing the understanding of first responders, forensic examiners, and law enforcement of each other's missions, responsibilities, and requirements
  - the ability of the players to make decisions based on limited information and under time pressure

Addressing nuclear forensic needs of Member States: Coordinated Research Project (CRP)

- IAEA Coordinated Research Projects (CRPs) offer a mechanism for collaborative research and development through international team building
- CRPs are developed in relation to a well defined research topic
- Over 100 CRPs are now active: http://cra.iaea.org/
- Research contracts and agreements are placed with qualified institutes in Member States
- A CRP is planned normally over 3 years; this CRP is in its 2nd year

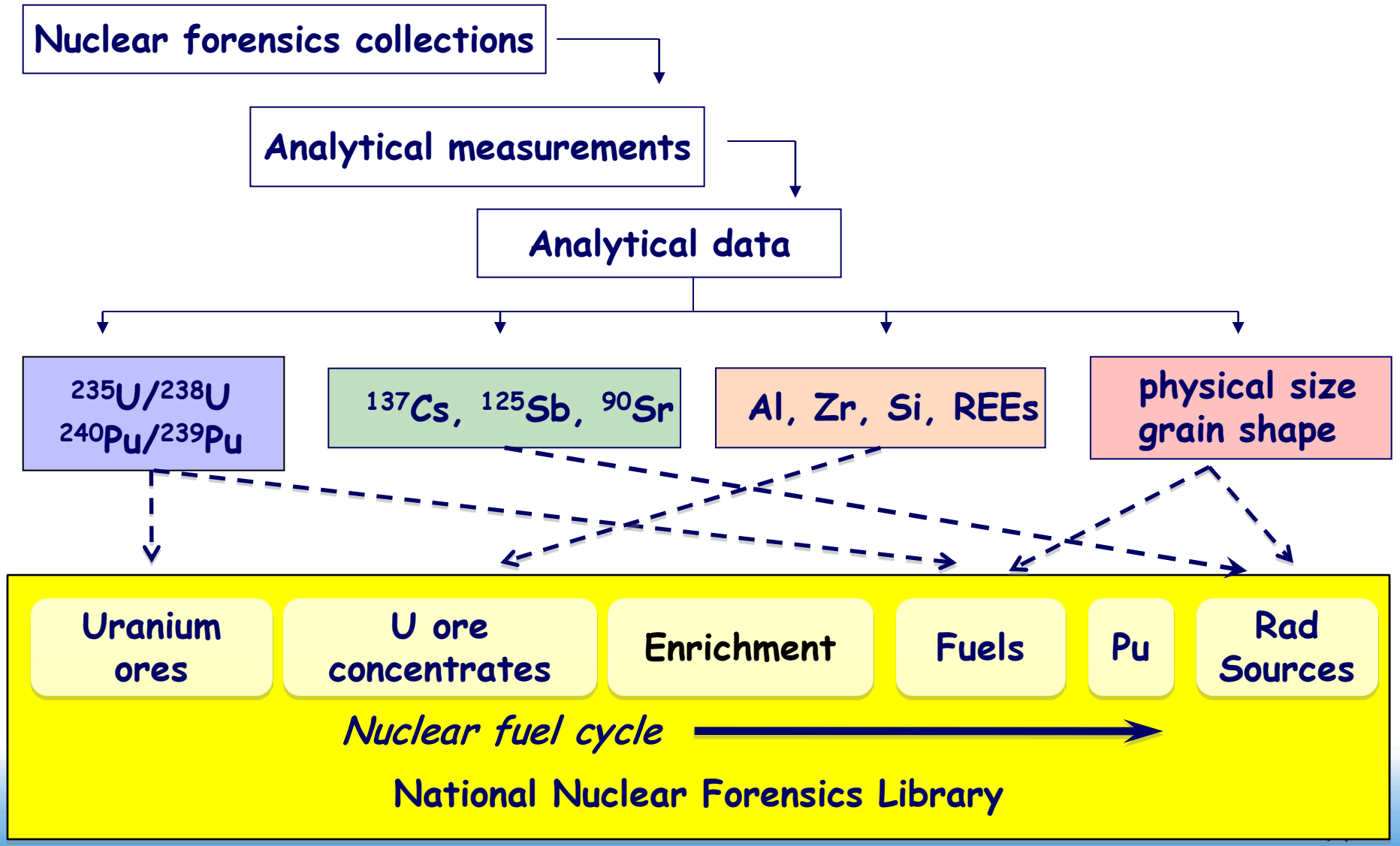
Each CRP is a network of 5 – 15 national research institutions which work within an operational framework with a similar goal using nuclear technology

Application of Nuclear Forensics in Illicit Trafficking of Nuclear and Other Radioactive Material

CRP contracts and agreements currently in place

Member-State	PI	Title
Australia	M. Colella	Exploiting Critical Evidence Contaminated with Alpha-Emitting Radionuclides
Brazil	J. De Souza Sarkis	Establishment of Procedures and Techniques for Nuclear Forensic Investigations Part II – Workshop on Nuclear Forensics
Germany (European Commission)	M. Wallenius	Procedures and Techniques for Nuclear Forensic Investigations
Germany	H.R. Doerfel	Identification, Localization, and Categorization of RDD
Greece	G. Nikolaou	Determination of the Origin of Unknown Nuclear Material Through an Isotopic Fingerprinting Method
Hungary	L. Lakosi	Development of Nuclear Forensics Methods and Techniques for Combating Illicit Trafficking of Nuclear and Other Radioactive Material
Republic of Korea	S.K. Kim	The Development of IT-Based In-Situ Mobile Response Supporting System for Deterring Illicit Trafficking of Nuclear and Radioactive Materials

Nuclear forensics requires a library to enable analysis of comparative signatures



A critical need to is begin to structure nuclear forensics libraries agreeable to States

	Uranium Ore	Ore Concentrate	UF4 UF6	Nuclear Fuel	Spent Fuel	Plutonium
Isotopes	$^{87}Sr/^{86}Sr$, $^{207}Pb/^{204}Pb$ $^{143}Nd/^{144}Nd$ $^{235}U/^{238}U$, age	$^{234}U/^{238}U$	^{235}U	$^{235}U/^{238}U$, $^{18}O/^{16}O$	^{232}U, ^{236}U, fission products	$^{239}Pu/^{240}Pu$, $^{241}Pu/^{241}Am$, age, fission products
Trace Elements	REEs	Cl,S,Br, anions	Ca, Fe, Al, K	Pu, U	Al, Zr, cladding	Pu, U
Physical	mineralogy	UO_2/U_3O_8	color	UO_2, dimension grain size, grain shape	spent fuel assemblies	Rod and plate particles

IAEA is working with Member-States to develop national nuclear forensics libraries

- National nuclear forensics libraries requires States to identify their own holdings of nuclear and radioactive materials across the nuclear fuel cycle (as applicable)
  - Catalogue nuclear and radioactive materials
  - Collect and assess information supporting a national library
  - Identify a point of contact to represent this library data internationally

The importance of a nuclear forensics libraries framework is recognized by then Senator Joe Biden (2007), AAAS/APS, the Nuclear Forensics and Attribution Act (2010), the 2010 Nuclear Security Summit, the IAEA General Conference and many others……

Considerations affecting the structure of national nuclear forensics libraries and an international directory

- Other information on the location, completeness & gaps, accuracy & precision, information restrictions of data and availability of subject matter experts are essential to the national library construct

States will administer and control their own national libraries

The expectations for nuclear forensics …. and the IAEA …. continue to grow

- The international nuclear forensics community needs to look outwards since all States – large and small – are affected by illicit trafficking
- IAEA training, research, leadership in nuclear forensics libraries, and publications are helping Member States develop national response plans
- The partnership of the International Atomic Energy Agency (IAEA), the Nuclear Forensics International Technical Working Group (ITWG), and Global Initiative to Combat Nuclear Terrorism (GICNT) provides international access, technical best practice, and political impetus necessary to meet these expectations

Thank You!!