

IAEA Efforts to Enhance Global Nuclear Security

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IAEA

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The threat

- **Nuclear Explosion – highest concern, catastrophic consequences**
 - Nuclear material
 - “Know-how”
- **Dispersal of radioactivity – major concern; disruption, health, loss of confidence**
 - Radioactive dispersal device (RDD)
 - Sabotage against facilities, locations, transports
- **Concern for all; portability of material**
- **Significantly changed view on radiological self-protection**
- **Evidences of terrorist interest**

Two major challenges

- Securing all vulnerable materials, facilities and transports
- Establishing an effective nuclear security platform, along with nuclear safety and safeguards, to enable the expanded use of nuclear energy
- Sustainable and effective nuclear security systems in all States

The materials

Estimates of inventory of Pu and HEU in the world (open source info.):

- Plutonium: 1,830,000 kg
- HEU: 1,900,000 kg

Equivalent to about 305,000 SQs

(about 50% in civil stocks, 50% in military stocks)

IAEA Safeguards Implementation Report

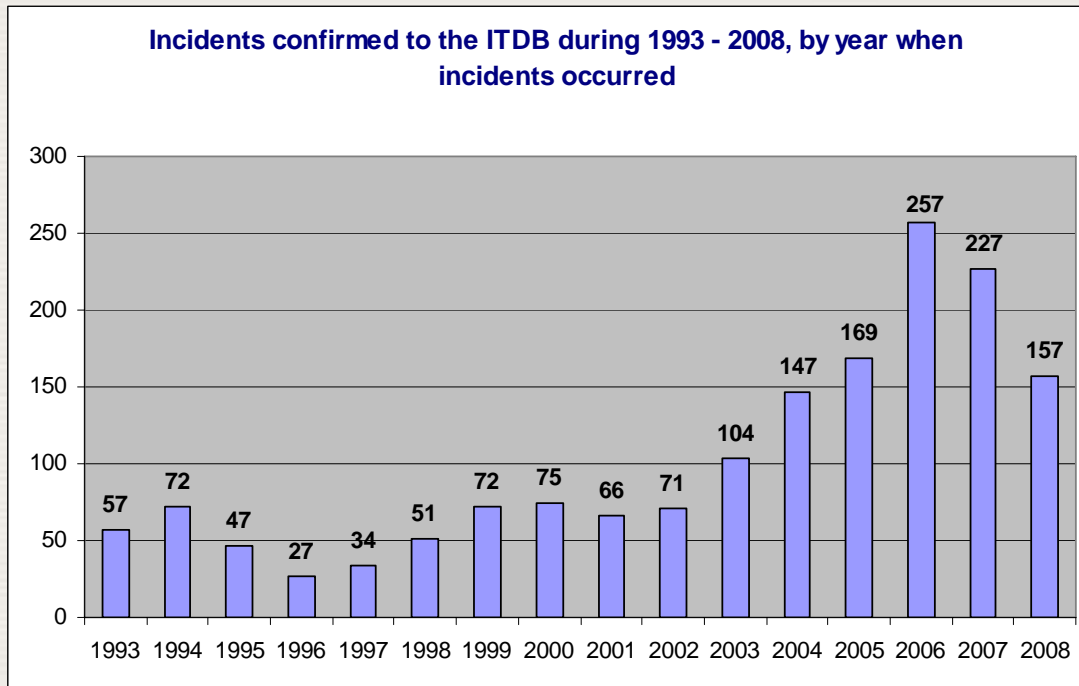
- IAEA safeguards Nuclear materials : About 160,000 SQs
- Number of nuclear facilities and locations: 1130

Security of materials is a national responsibility,



Illicit Nuclear Trafficking ITDB

- Network of 110+1 States and international organizations
- Over 1980 incidents confirmed; 207 for 2010.
Interaction with *inter alia* Interpol, Europol, UNICRI, WCO



Material is circulating in illegal/criminal circumstances

Insufficient security arrangements at facilities/locations

The International response

**Solid platform of international legal instruments,
binding and non-binding**

Safeguards agreements, additional protocols

Convention on the Physical Protection of Nuclear Material , and amendment

Nuclear Terrorism Convention,

UNSC Resolutions (1540, etc.)

Nuclear Safety conventions

Codes of conduct (non-binding)

Effective implementation requires: internationally accepted guidance, common principles and values, strategies and assistance programmes

Essential Elements of Nuclear Security

National level:

- Effective legislative system, allocation of responsibilities

Facility level:

- Effective security measures
- Securing vulnerable materials

Outside facilities

- Detecting illegal movement of materials
- Effective border control, protection of major public events

Supporting infrastructure

- Human resource development
- Technical support,
- R&D, advanced methodology



***Sustainability
nuclear security
culture***



Nuclear Security Plan 2010—2013

Objective:

Contribute to global efforts to achieve worldwide, effective security wherever nuclear or other radioactive material is in use, storage and/or transport, and of associated facilities, by supporting States, upon request, in their efforts to establish and maintain effective nuclear security through assistance in capacity building, guidance, human resource development, sustainability and risk reduction



IAEA nuclear security programme

- **Needs assessment, information collation and analysis**
- **Enhancing the global nuclear security framework**
- **Providing nuclear security services, including human resource development**
- **Risk reduction and security improvement**

Priorities

- Comprehensive information platform
- **International guidance: Nuclear Security Series** (including INFCIRC/225/Rev.5)
- Modular nuclear security services, used by all
- Accelerated assistance for risk reduction and capacity building
- Effective border control arrangements in a global context, including the necessary technical support
- **IAEA coordinated research projects**
- Increased coordination & cooperation with Member States, international organizations, initiatives and industry
- *N.B. Confidentiality of sensitive information*

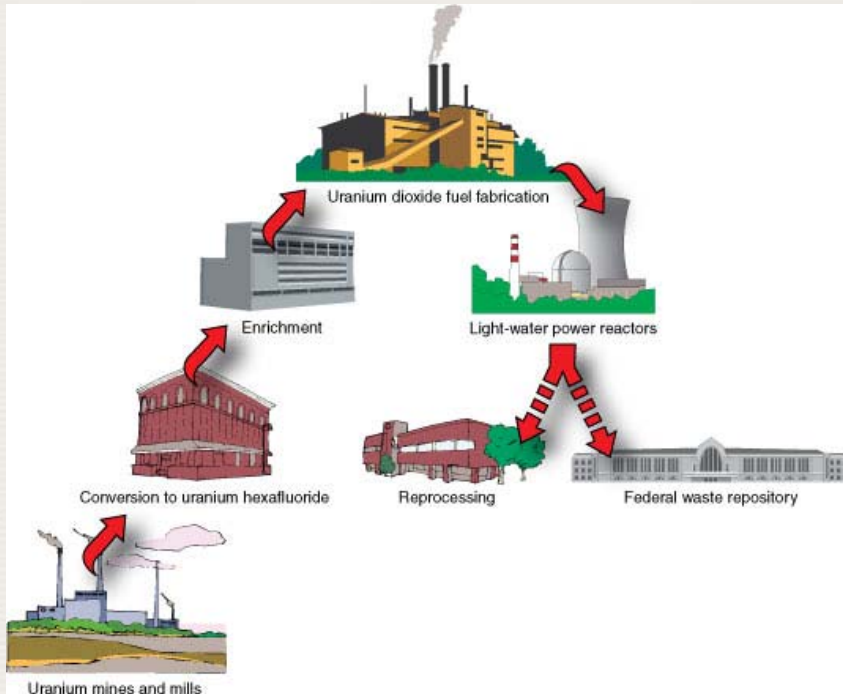
Nuclear forensics development

- **To meet obligations in the CPPNM/A**
 - Criminalization of illegal movements of material
 - Cooperation on the recovery of lost material
 - Cooperation on the return of seized material
- **Building libraries on nuclear material signatures**
 - Supporting the law enforcement process
 - Finding the legitimate owner of seized/stolen material
- **Identifying capacities at**
 - National level
 - Regional
 - International level
- **Establishing common networks of laboratories, available to all**
- **Clear concept, approach and global organization**

An expanding energy sector

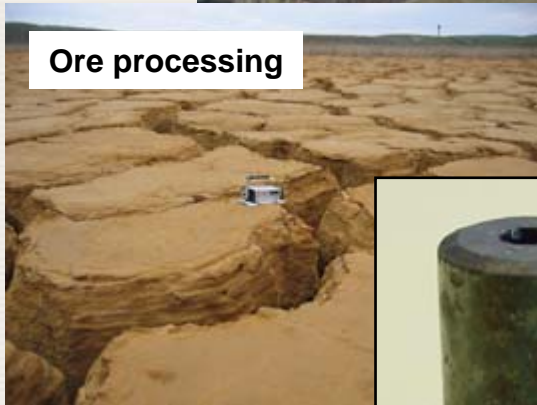
- > 60 countries interested in nuclear power
- Much wider use of nuclear technology
- Engineering improvements & material signatures
- Control of materials throughout the fuel cycle
- Sustainable approach for radioactive waste treatment

The science of signatures



Understanding the prevalence and persistence of isotopic, chemical, and physical signatures throughout the nuclear fuel cycle

Signatures throughout the nuclear fuel cycle



- **Multiple signatures are required; including for each phase of the civilian nuclear fuel cycle**

New research and development tools to establish nuclear forensics signatures

Tools

Radiochemistry

Chronometry

Microanalysis

Environmental isotopes

Route attribution

Forensic science on contaminated materials



Suspect nuclear or radioactive material

Signatures

Major and minor nuclear isotopes

Molecular form of nuclear material

Trace elements and impurities

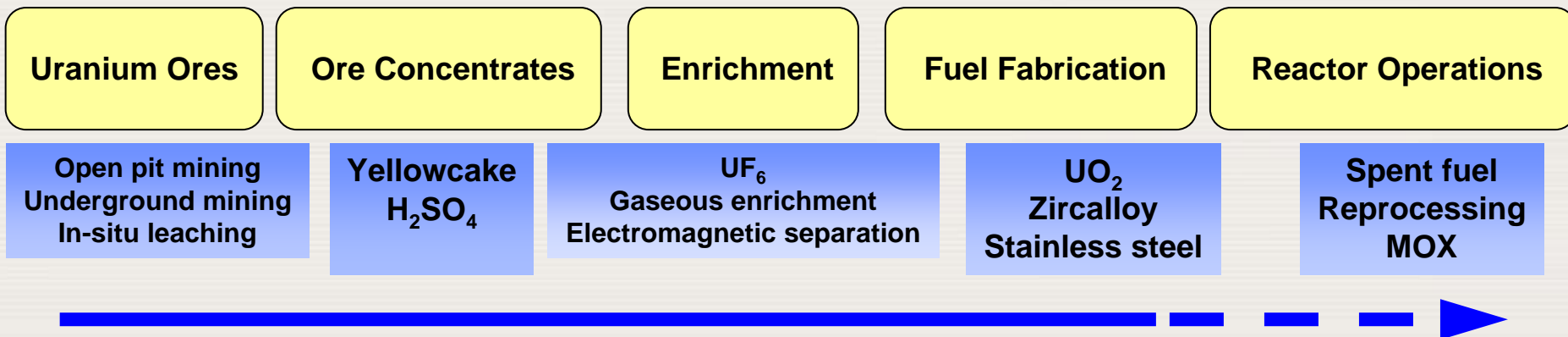
Size and shape of particulates

Packaging

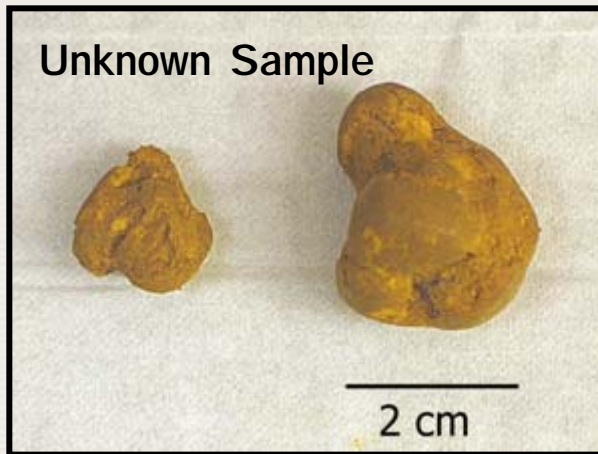
Label and printing

The goal: reliable insights into the source and history of nuclear material

- Establishing minor isotope ratios to indicate
 - The origin of natural uranium
 - Details on the feed material and enrichment process
- Presence of fission products
- Plutonium isotope ratios ($^{240}\text{Pu}/^{239}\text{Pu}$); to indicate fuel burn-up
- Radioactive parent-daughter ratios (e.g. $^{241}\text{Am}/^{241}\text{Pu}$) a chronometer to determine time for last chemical separation



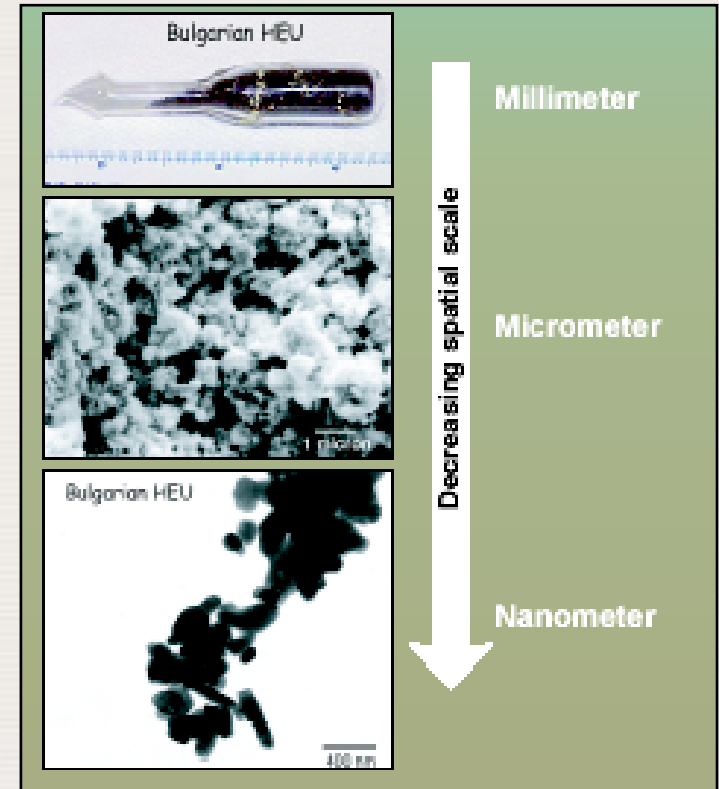
National nuclear forensics libraries



- Identify core sample attributes for
 - Law enforcement
 - Recovery and return of material To compare signatures of seized material with known materials
- Routine analysis for new material
- Dedicated analysis of past materials, including archive samples.
- Identify procedures for access to information; in State deposition and in IAEA possession.

Research to enable new, powerful signatures

- Increased reliability
- New frontiers for the nuclear forensic scientist may contribute more sophisticated analysis



IAEA Coordinated Research Projects

Development of Methodologies for **Risk Assessment** and State Management of Nuclear Security Regime

Development and Implementation of Instrument and **Methods for detection** of unauthorized acts involving nuclear and other radioactive material

Application of **Nuclear Forensics** in illicit trafficking of nuclear and other radioactive materials



Major Achievements

- Risk reduction in some 30 States
- Improved measures to combating illicit nuclear trafficking
- Improved border control in some 50 States
- 11 IAEA Nuclear Security Series guides published
- Broad use of Nuclear Security advisory missions (~170)
- Solid education and training programme established
- Information, outreach and coordination reaching ~ 90 States, international organizations & initiatives
- Some 50 Integrated Nuclear Security Support Plans

Challenges: Cooperation and Assistance

- Recognizing that nuclear security is broad, beyond the nuclear sites
- Coordination beyond nuclear establishment is required;
- A significant build-up of information is required for an effective response system; law enforcement and for return of material
- An international architecture is required for nuclear forensics
- Information is key to success

Conclusion

- The IAEA, with its 150 Member States, is the most appropriate international organization to take on a leading role to build up nuclear forensics, available for all States
- The Nuclear Security Series provides a platform for a common global approach to nuclear security and to the nuclear forensics work
- The IAEA has the mechanisms to coordinate international work
- IAEA is strengthening its coordination with States, other international organizations and non-governmental organizations
- Effective nuclear security is a long-term effort