

The JRC support to EU Policy in the field of nuclear and radiological security

European Commission / Joint Research Centre (JRC)

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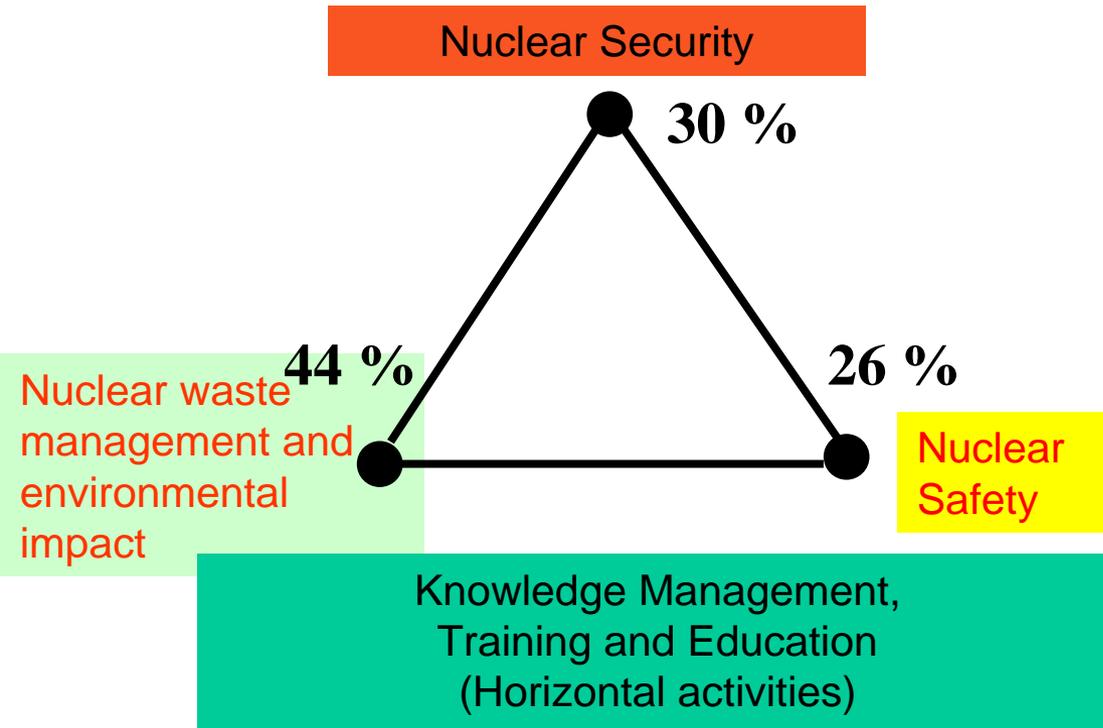
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**Budget 539 M€
(2007-2011)**



JRC Nuclear Security Programme

- Development / support to Euratom and IAEA (evolution of verification technology, services, training)
- Additional protocol (information analysis, Environmental sample analysis)
- Illicit trafficking / Nuclear forensics
- Open source Information collection on Nuclear Non Proliferation
- Reference materials and quality assurance
- Risk assessment methodology (enhanced proliferation resistance of Gen IV nuclear reactors)

CBRN Task Force: Compiles a list of measures to mitigate the RN risk – part of the Commission's 2009 CBRN policy package

- **Prevention**
 - control over radioactive sources (e.g. staff awareness; import/export of sources; security categorisation of sources)
 - exchange of information (e.g. reporting loss/theft of sources to law enforcement; early warning system)
 - physical protection of sources (e.g. security vetting of personnel; transport; dealing with insider threats)
- **Detection**
 - scenario development on the use of detection technologies
 - criminal investigations on stolen/lost sources
 - Enhancing awareness among first line officers on what to look for when searching for radioactive/nuclear sources
 - **Certification, testing and trialling schemes; and standardisation**
- **Response**
 - national response plans
 - **nuclear forensics**
 - communication and cleanup
 - exchange of information among the organisations involved/cross-border cooperation
- **Horizontal areas**
 - **Training**

A large number of equipment is already in operation today and experience has been gathered with respect to innocent alarms, due to Naturally Occurring Radioactive Materials (NORM) and medical isotopes. Shielded and masked isotopes remain being a serious problem.

The EU through the JRC is organising the new “ITRAP + 10” project (2009+)

JRC will involve experts from two institutes (IPSC and ITU),

Potential Partners:

- The Austrian Research Centre (Seibersdorf) and the IAEA (repeating the ITRAP collaboration scheme).
- Experts from EU Member States
- DHS, DoE/SLD: Participation of US equipment to ITRAP+10
Joint US/EU expert Team
- Russia, China,...

ITRAP lab test (May 1998 -September 1998)

Fix-installed Monitoring Systems

- Only 2 of 14 fix-installed monitoring systems could fulfil the minimum requirement for neutron detection.
- A period of 6 months given to suppliers to improve their fix installed.
In May 1999, 7 of 14 fix-installed monitoring systems (50%) passed the ITRAP lab test.

Pocket Type and Hand Held Instruments

13 of 24 instruments or instrument combinations have passed the ITRAP lab tests.

Concerning the Isotope identification no instrument has fulfil the minimum requirement particular concerning the shielding of radioactive material.

Major Results

- Sensitivity specifications for portal monitors can be lowered for nuclear materials by an order of magnitude (relative to the ITRAP minimum requirements).
- For hand-held isotope identifiers new and more stricter specifications were established and tested: Pu source in 10 mm lead container, mixtures: Pu/Ba-133, Cs-U, NORM
- New specifications were established and tested for:
 - Neutron/gamma pagers
 - Hand-held neutron search devices
 - Identification of lead shielded Pu samples
 - NORM detection limits
 - New NORM suppression method used in portal monitors

Specifications/test procedures for other instruments were validated

Lessons Learned

- Workshop-type tests joining experts, users and vendors is the most effective way to move ahead in improving specifications and technology
- Access to nuclear material (Ispra, Perla) and other sources is essential
- Drafting of specifications and test procedures without practical verification is not valid

- Avoid duplication of activities across the Member States resulting in waste of public resources and private sector resources (testing is a costly, time consuming process requiring well qualified staff).
- Enable access to information for Member States which do not have their own capacities to perform testing.
- Assessment of technology: what is affordable and what is wishful thinking of the users? (Significant gaps between the requirements and performance of the equipment)
- Results of equipment testing - will bring the equipment closer to the required performance
- Launch new R&D projects that bring new equipment and new software and advanced technology to the field of the detection and the identification of nuclear materials.
- Development of Procedures and standards
(Harmonization of various standard documents e.g., ANSI, IEC, IAEA, future EC...)

- Requested by MS and EC/DG-JLS, the centre will focus on training on nuclear security. It may later broaden its scope to include training on Dual use and export control. The JRC will involve the MS expertise in these domains.
- Beneficiary countries of the TACIS and Instrument of stability programme will also benefit from it.

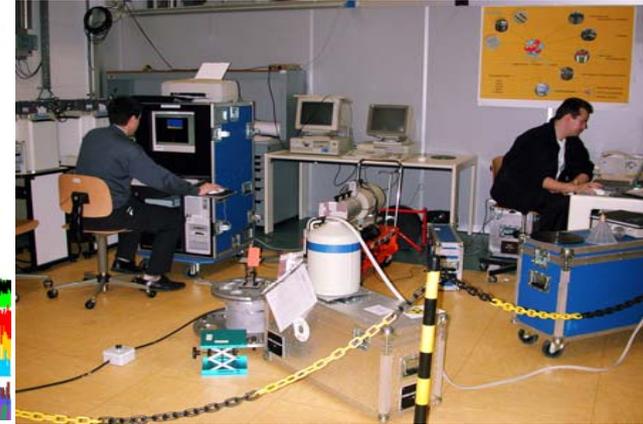
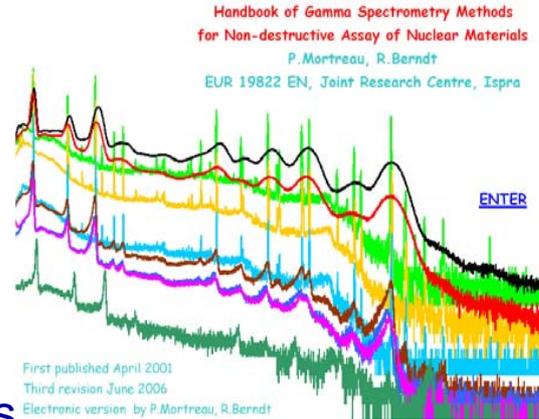


NDA

Neutron, gamma

PERLA (Performance Laboratory)

(with well characterised U/Pu)



MASS/VOLUME

Density and level determinations
and process/behaviour follow-up

CONTAINMENT/SURVEILLANCE

Camera observation with image treatment
and image review tools

COMPLEMENTARY ACCESS

Novel training courses
for enhancing the nuclear
inspectors observation
and soft skills



Nuclear Destructive Analysis (DA)

Examples:

Training of a number of IAEA staff for work at Rokkasho OSL.

This training has mainly taken place at the LSS in La Hague, France and at ITU.

In addition other training activities has taken place in both nuclear and environmental sample analysis at JRC- ITU laboratories for IAEA staff.



Sample loading for mass spectrometry measurements at Rokkasho reprocessing plant.

- **Target audience:**
 - ✓ Customs
 - ✓ Border Guards
 - ✓ Police
 - ✓ Security Service

Main topics

- Procedures for detection
- Verification of alarm
- Securing material
- Self and site protection
- Preservation of evidence

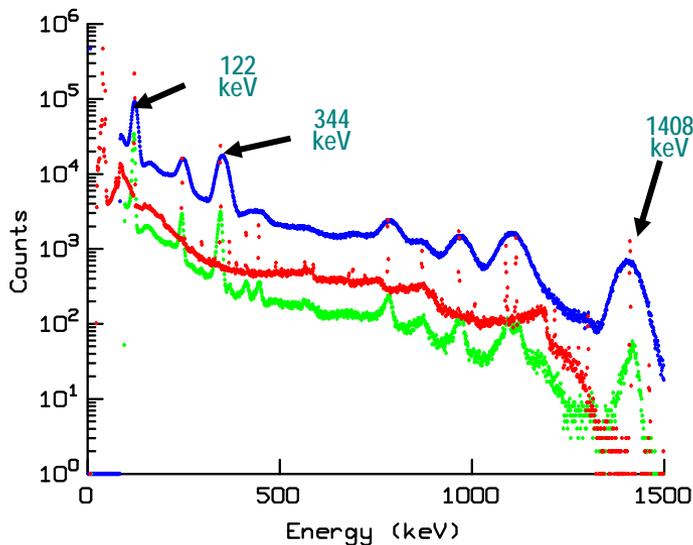


Training programme

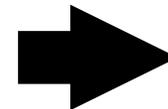
- Basics on nucleonics.
- Radiobiological Basics.
- Perspectives of Law Enforcement Services.
- Basic on Detection and Identification of Nuclear and radioactive Materials.
- Description of hand-held devices to identify radio-nuclides in radioactive and/or nuclear materials for on-site categorisation
- Training with the handheld Isotope Identifiers : categorisation of nuclear material on the spot

- Target audience:
 - ✓ Research Institute
 - ✓ Environmental Protection
 - ✓ Health & Safety
 - ✓ Radiation Protection

- Main topics
 - Categorisation
 - Preservation of Evidence
 - Sample taking/ Shipment
 - Radiological advice



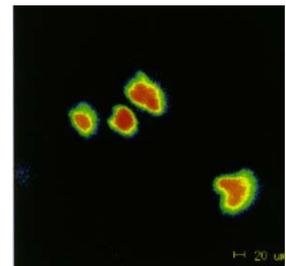
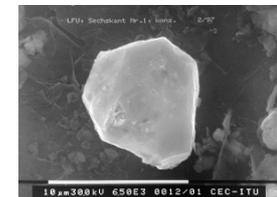
Medical	Industrial	Naturally Occurring	Special Nuclear
⁶⁷ Ga	²² Na	⁴⁰ K	²³⁵ U
^{99m} Tc	⁵⁷ Co	²²⁶ Ra	²³⁸ U
¹⁰³ Pd	⁶⁰ Co	²³² Th	²³⁸ U
¹¹¹ In	¹³⁷ Cs	²³⁵ U	²³⁹ Pu
¹²³ I	¹⁵² Eu	²³⁸ U	
¹²⁵ I	¹³³ Ba		
¹³¹ I	¹⁹² Ir		
¹³³ Xe	²⁰⁷ Pb		
¹⁹² Ir	²²⁶ Ra		
²⁰¹ Tl	²³² Th		



¹⁵²Eu

Nuclear Forensics : aim at identifying origin and intended use using information inherent to the (nuclear) material

- Target audience:
 - ✓ Research Institute
 - ✓ Measurement Laboratory



Training Programme

- **Non-destructive analysis techniques**
 - **K-Edge, X-Ray Fluorescence**
 - **Neutron Counter**
 - **Gamma spectrometry**
- **Isotopic analysis : Isotope dilution thermal ionisation mass spectrometry : IDMS**
- **Chemical impurities: Inductively Coupled Plasma Mass Spectrometry (ICPMS)**
- **Particle analysis: Secondary ion Mass Spectrometry (SIMS)**
- **Other material properties (morphology...): Scanning and transmission Electron Microscopy**
- **Nuclear Forensic Methodologies: Age determination, statistical modelling, geo-location,...**
- **Nuclear materials database**

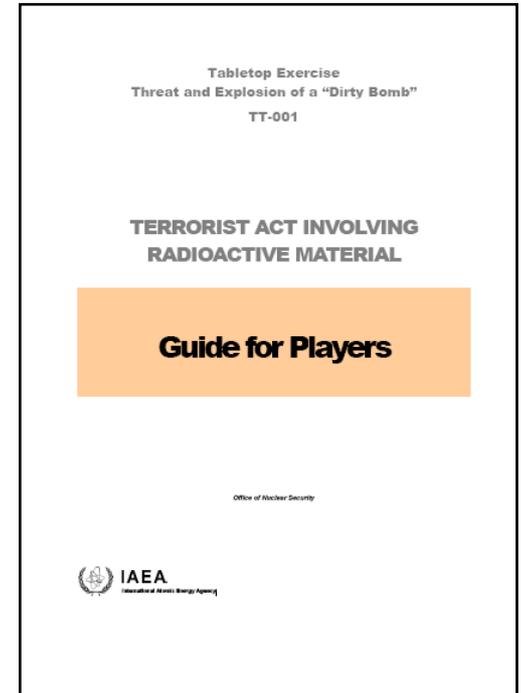
- Target audience:
 - ✓ Regulatory Authority
 - ✓ Decision Makers for First Responders
 - ✓ Expert Institution

Main Topics

- Model Action Plan
- RITNUM (Response to Illicit Trafficking of Nuclear Materials)
- National Response Plan
- Roles and Responsibilities
- Communication
- Processes



- Target audience
 - ✓ Regulatory Authority
 - ✓ Decision Makers for First Responders
 - ✓ Expert Institution
 - ✓ Customs
 - ✓ Border Guards
 - ✓ Police
 - ✓ Security Service
 - ✓ Research Institute
 - ✓ Environmental Protection
 - ✓ Health & Safety
 - ✓ Radiation Protection Research Institute
 - ✓ Measurement Laboratories



EU instruments

- **The Instrument for Pre-accession Assistance (IPA)**, for the candidate and potential candidate countries for EU accession (**25M€ for 2007-2009**).
- **The Instrument for Nuclear Safety Cooperation (INSC)** replace TACIS program (**total of 217 M€ for 2007-2009; about 20 M€ for safeguards**).
- **The Instrument for Stability (IfS)** provides the EU with funds and mechanisms to address global and trans-regional threats. (**2062 M€ for 2007-2013 in which 266M€ dedicated to non proliferation of Weapons of Mass Destruction**).
- **The Common and Foreign Security Policy**: instrument used by the Council Secretariat; covers EU expenditure on foreign policy and security such as **The Joint Actions (23 M€)**.

INSC 2008 projects to be implemented by JRC

- 1- Improvement of accountancy and control of hold-up and waste in RT-1 plant at Mayak**
- 2- Establishment of testing laboratory at VNIIA for certification of NMAC instruments (similar to the JRC TEMPEST Lab): project final phase**
- 3- Development and introduction of modern sealing devices at Rosatom's enterprises at TID (project is in its final phase)**
- 5- Analytical and metrological support on NMAC at Bochvar (Final phase)**
- 6- Improvement of the NMAC system at the Russian NPPs: Pilot project for improvement of Computerized Nuclear Material Accountancy and Control system at Kursk and Kalinin NPPs**
- 8- Enhancement of Nuclear Materials Accountancy and Control at NPP Medzamor**

Commonwealth of Independent States



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The instrument for Stability 2008: projects to be implemented by JRC

CIS countries

- Implementation of measures to combat illicit trafficking of radioactive and nuclear material – Multi-country project dedicated to Russian Federation, Ukraine, Republic of Moldova, Georgia and Azerbaijan (project is in the final phase)
- Belarus Border Crossing Station

New regions covered by the IfS

- Border Management in Mediterranean Basin countries (Mauritania, Morocco, Algeria, Tunisia, Libya and Egypt)
- Border Management activities preparation in the ASEAN Region (Malaysia, Laos, Vietnam, Indonesia, Philippines, Myanmar, and Thailand)

The Instrument for Stability (IfS)

Indicative Programme 2009-2011

- Regional centres of excellence on CBRN
- Fighting illicit CBRN trafficking and deceptive financial practices
- Assistance and cooperation on export controls on dual-use goods
- Support for the retraining and alternative employment of former weapons scientists and engineers
- Support for Multilateral Nuclear Assurance (MNA) initiatives (20 to 25 M€)

Nuclear Safeguards

First responders

Measurement Experts

Nuclear Forensics

National Response Plan

Exercises

Table-top

