

Control of radioactive sources and exposures to ionizing radiation

Eliana AMARAL

**Director, Radiation Transport and Waste Safety
Department of Nuclear Safety and Security**



IAEA

International Atomic Energy Agency

Scope of the presentation

- Accidents:
 - with sources during use
 - with sources not in use (loss of control of sources)
- Unnecessary exposures:
 - not justified
 - not optimized
 - Legacy activities



Accidents involving radiation generators and radioactive sources

Industrial gauges

Industrial radiography

Well logging

Cancer treatment

RTG's

Irradiators

Accidents with industrial irradiators El Salvador (1989)

Workers over-ride safety systems and enter irradiation room when source rack is unshielded and manipulate it

Orphan source from industrial radiography Yanango, Peru (2000)



A welder finds unshielded source, picks up source and puts it in the back right pocket of his trousers.



Ir-192 source used for industrial radiography became detached from the camera.

Severe radiation burns and amputation of a leg



Orphan source from teletherapy Goiania, Brazil (1987)

Private radiotherapy clinic closed down in 1985

1987: teletherapy head stolen and dismantled for scrap



A 50 TBq (1375 Ci) caesium-137 teletherapy machine left abandoned

Cs-137 source capsule ruptured causing major contamination, 4 deaths, buildings demolished and costs US\$20 million



Orphan source from RTG Lja, Georgia (2001)



The back of patient 2-MG on 6 Jan.2002



December 2001: woodcutters find 2 hot 'objects' in the forest. (unshielded Sr-90 sources about 1,000 TBq each)



Unnecessary exposure to radiation (2)



Mismanagement of radioactive effluents and waste, mine residues, consequences of nuclear and radiological accidents



What can be the reasons?

- Human error (complacency)
- Lack of defense-in-depth
- Ineffective safety systems (not provided or not maintained)
- Lack of monitoring
- Lack of procedures (or not followed)
- Poor maintenance of devices
- Lack of supervision
- Lack of education and training
- Lack of safety culture
- Ineffective regulatory control.....



What can be done?

Many accidents and/or unnecessary exposures could be prevented through:

- improved education and training
- fostering a safety culture and raising awareness
 - at the political level
 - among public and workers not normally involved with radiation sources
- strengthening legal and regulatory infrastructures



How can IAEA help?

- Facilitate international undertakings such as the Code of Conduct, Joint Convention
- Develop Safety Standards: Global Safety Regime
- Collect and disseminate information on accidents and unnecessary exposures
 - International Conferences
 - Reports



Code of Conduct on the Safety and Security of Radioactive Sources



Non-binding international instrument based on International Standards

Provides recommendations to States on:

- ✓ Legislation
- ✓ Regulations
- ✓ Regulatory body
- ✓ Import/export controls




Political support - November 2008



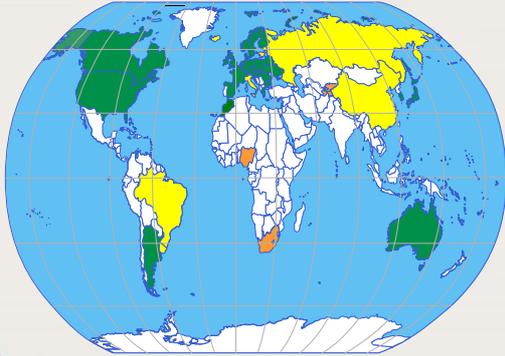
Code of Conduct:
93 States have provided written political support



Import/export Guidance: 51 States have made the additional political commitment for its harmonised implementation



Joint Convention 46 Contracting Parties in 2008



The IAEA Safety Standards

• The safety standards series comprises three levels of documents:

- Safety Fundamentals
- Safety Requirements
- Safety Guides

- Cf. Supporting documents
 - Safety Reports
 - Technical Reports
 - TECDOCs



Sharing information International Conferences



IAEA can also help...

- Assist Member States to:
 - Apply the Safety Standards and Implement the Code of Conduct and imp/exp controls
 - Establish and maintain an effective national regulatory infrastructure
 - Develop sustainable education and training
 - Appraise through review services such as RaSSIA/IRRS
 - Regain control on orphan and vulnerable sources



Strengthening National Regulatory Infrastructures

- Assessment of the status of Member State's regulatory infrastructure through appraisal missions and self-assessments
- Strengthening the establishment and maintenance of national registers of radiation sources through the Regulatory Authority Information System (RAIS).
- Development of model procedures to be used by regulatory bodies.
- Development of Training material for regulators and organising courses for staff, lawyers, custom officers, etc.



The Nuclear Safety Regime applied to Radioactive Waste Management



The Joint Convention

International Safety Standards



National Policy and Strategy



National Regulatory Control



Peer Review and Appraisal Services

Provide Member States with assurance that their strategies, policies and operations comply with International Standards and Best Practices

Give independent assessments of radiological conditions



NSRW-Seminar for Diplomats

February 2009 23

International Peer Review Service on Decommissioning: Bradwell NPP

- Initiated at the request of Magnox, UK
- Powerful method of self-improvement and sharing experience
- Complementary to OSART, IRRS, WANO services
- IAEA Methodology and supporting documents tested



First "pilot" review mission to Bradwell NPP (UK) June 2008
Joint EC-IAEA-Ukraine project (15 WWERs Units) 2009



NSRW-Seminar for Diplomats

February 2009 24

Regain control on orphan and vulnerable sources

- Facilitating multilateral initiatives, such as USA/Russia/IAEA 'Tripartite' agreement
- Radiation monitoring at national 'nodal' points, such as scrap metal facilities and ports
- 1000's of vulnerable, orphan and disused sources have been recovered, but...
 - There is a lack of national storage facilities for sources
 - A safe and secure long-term disposal solution is needed



NSRW-Seminar for Diplomats

February 2009 25

Priority Areas

- Assisting MS for prevention of accidents and unnecessary exposures in medicine
- Assisting MS in the application of safety standards in the U mining industry: from exploration to closure
- Assisting MS to identify and implement solutions to minimize denial and delay of shipment of radioactive material



Summary

- Inadequate control of radioactive material has caused many serious accidents and unnecessary public exposure
 - Orphan sources are a major concern
 - Radioactive waste are not always managed up to disposal
 - Contaminated sites are not always remediated
- IAEA helps Member States to:
 - Establish and maintain effective National Regulatory Infrastructures
 - Adopt and apply the International Safety Standards
 - Implement Conventions and Code of Conduct
 - Develop sustainable education and training
 - Increase safety culture and public/political awareness

Government commitment is Key



