

# IAEA Orientation for Diplomats 2014

## *Nuclear Safety and Security in Brief*

**Paul Woodhouse**

*Safety and Security Coordination Section  
Department of Nuclear Safety and Security*



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# Inside Nuclear Safety and Security



- Role of the IAEA
- History of Major accidents
- Global Nuclear Safety and Security Framework
- Safety Standards and Security Guidelines
- Peer Reviews and Services
- Capacity Building ( RB and TC funds)



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# Role of the IAEA



- IAEA statute Article III, A.1 *“To encourage and assist research on, and development and practical application of, atomic energy for peaceful uses throughout the world; ...”*
- IAEA provides the core engineering, technological and management support to interested Member States in the field of nuclear power
- IAEA statute Article III, A.6, *“To establish or adopt, in consultation ..., standards of safety for protection of health and minimization of danger to life and property ...and to provide for the application of these standards ”*



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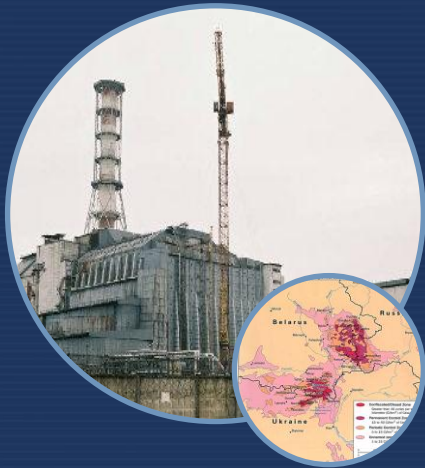


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# Safety History: Chernobyl



*"...Radioactivity does not respect national boundaries, or national sovereignties. Rules ensuring the safe use of large-scale nuclear activities should therefore be worked out internationally and accepted to apply everywhere...."*

Hans Blix,  
former IAEA Director General

- Nuclear Safety lessons learned from the accident focused on identifying the weaknesses in and improving the design safety of VVER and RBMK reactors
- Acceleration in development of safety standards, guidelines and services to assist countries affected
- Department of Nuclear Safety was created a decade later



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# Security History: 9/11



*"In the wake of those attacks, the Agency significantly expanded its nuclear security programme to help Member States protect nuclear and other radioactive material and associated facilities against malicious acts.*

*Nuclear security remains an extremely important issue for all States."*

**Yukiya Amano, Director General**

## September 11, 2001 aftermath of terrorist attack:

- Security risks from outside groups or insider threats became of paramount concern surrounding nuclear power plant critical infrastructure
- Questionable whether reactors would withstand such attacks
- Apart from radioactive sources, reactors and other parts of the nuclear fuel cycle vulnerable to attack, e.g., reprocessing facilities and transport between sites
- 2003 Office of Security



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# Fukushima Daiichi NPP accident



“The Fukushima Daiichi accident was a wake-up call for everyone involved in nuclear power. It reminded us that safety can never be taken for granted, even in advanced industrial countries with considerable experience of using nuclear energy.”

**Yukiya Amano, Director General**

- March 2011, accident at TEPCO Fukushima Daiichi nuclear plant.
- June 2011, Ministerial Conference on Nuclear Safety – Ministerial Declaration.
- DG’s statement - The primary goal is to make nuclear power plants as safe as humanly possible, as quickly as possible.
- September 2011, the IAEA Action Plan on Nuclear Safety was adopted by the IAEA's Board of Governors and subsequently unanimously endorsed by the IAEA General Conference.
- *IAEA Report on the Fukushima Daiichi Accident.*



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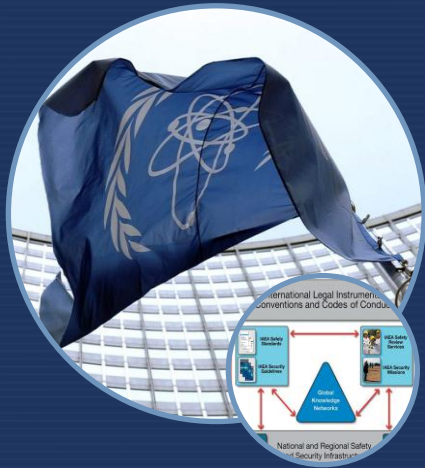


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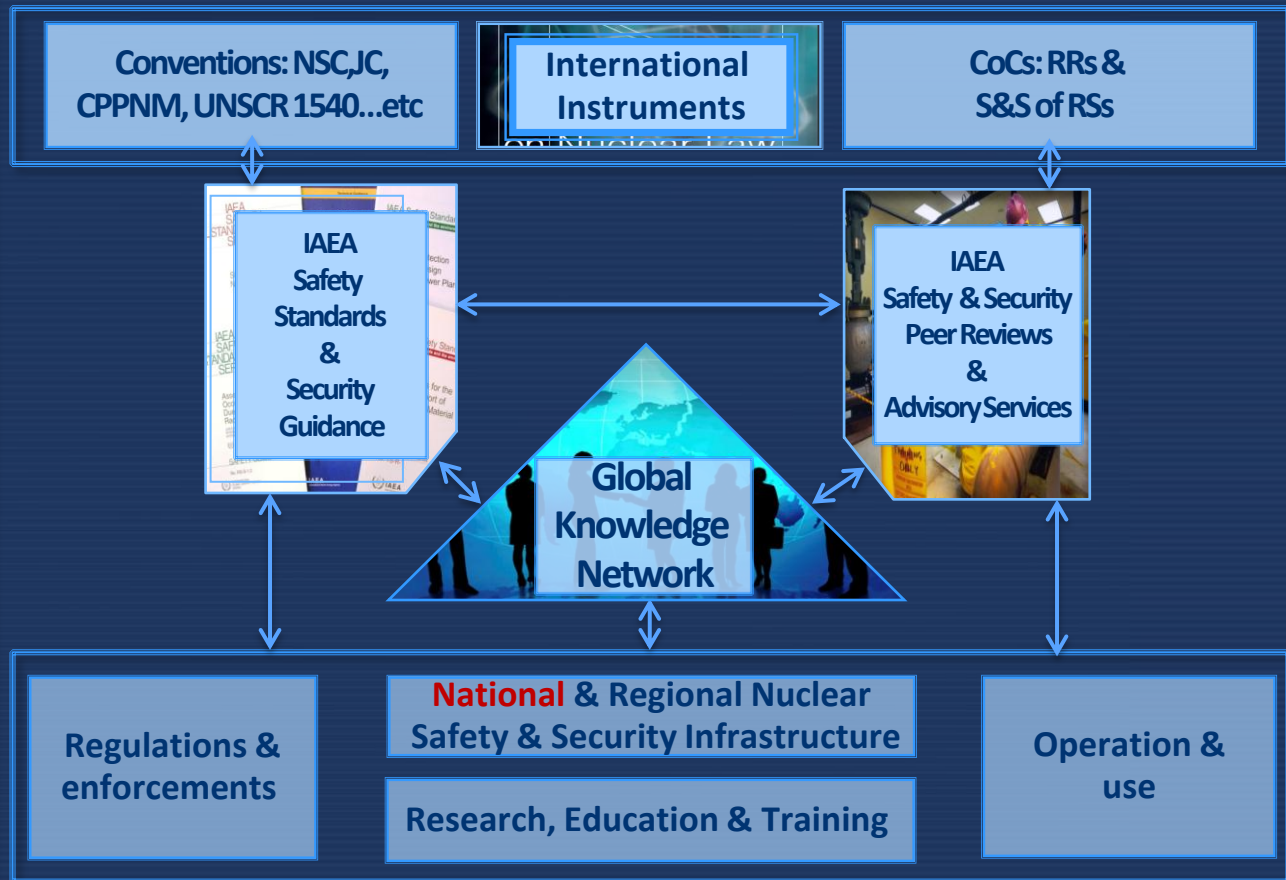
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# Global Nuclear Safety and Security Framework



*"The Network is a platform for the sharing of information among experts in order to achieve a higher level of safety and security at nuclear facilities around the world. It is instrumental in spreading best practices and ensuring continuous improvement in nuclear safety,"*  
**Yukiya Amano, Director General**



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# Nuclear Safety and Security Programme Directions



Incident and Emergency Preparedness and Response



Safety of Nuclear Installations



Radiation and Transport Safety



Management of Radioactive Waste



Nuclear Security



Nuclear Safety Action Plan



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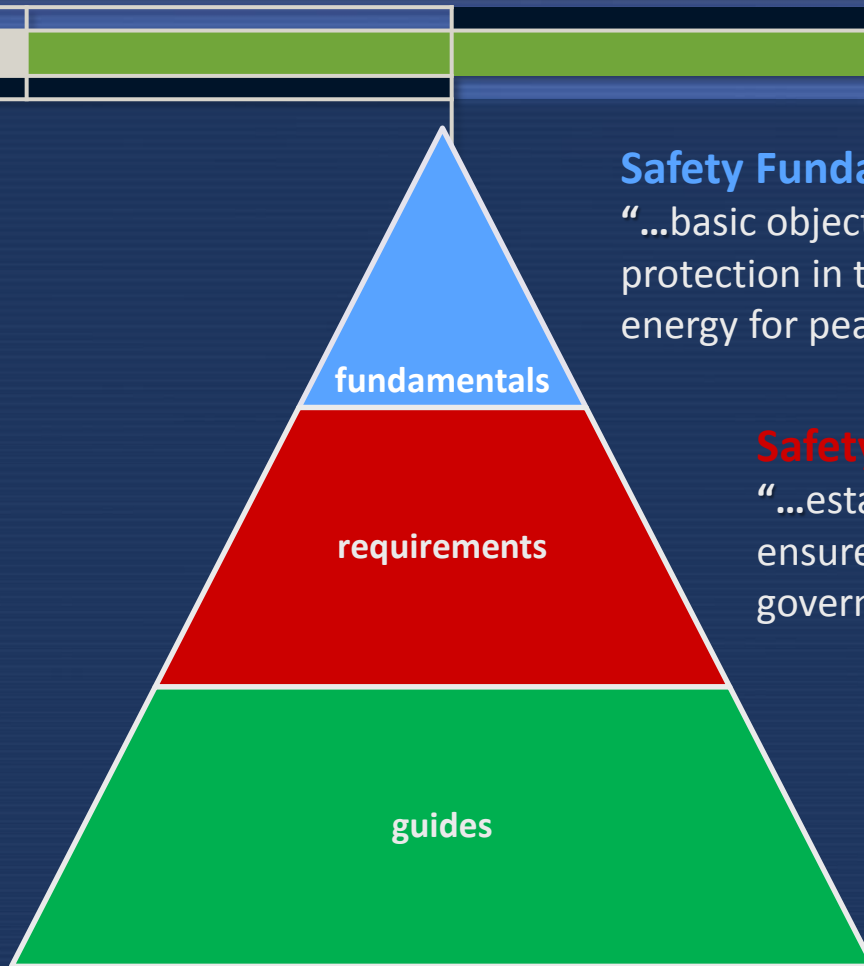


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# Safety Standards Hierarchy



## Safety Fundamentals

“...basic objectives, concepts, and principles of safety and protection in the development and application of nuclear energy for peaceful purposes...”

## Safety Requirements

“...establish the requirements that must be met to ensure safety. Expressed as 'shall' statements” and governed by Safety Fundamentals...”

## Safety Guides

“...recommend procedures for meeting safety requirements. expressed as 'should' statements, to comply with the **Safety Requirements**...”



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# Safety Standards in Numbers

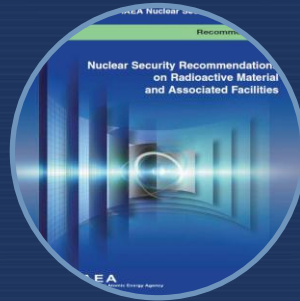
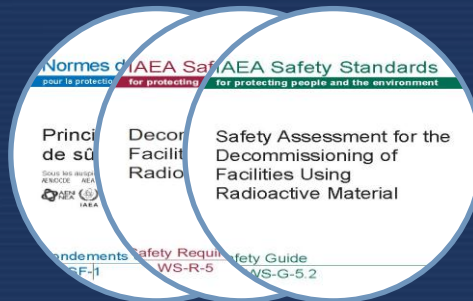


## Safety Standards:

- 126

## Nuclear Security Series:

- 21



## Safety Standards:

- 126
  - Fundamentals: 1
  - General Requirements: 7
  - Specific Requirements: 7
  - General Safety Guides: 22
  - Specific Safety Guides: 89

## Nuclear Security Series:

- 21
  - Fundamentals: 1
  - Recommendations: 3
  - Implementing Guides: 8
  - Technical Guidance: 9



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# IAEA Peer Review Missions for Nuclear Installation Safety



- Integrated Regulatory Review Service (IRRS)
- Operational Safety Review Team (OSART)
- Design and Safety Assessment Review Service (DSARS)
- Site and External Events Design (SEED)
- Integrated Safety Assessment of Research Reactors (INSARR)
- International Physical Protection Advisory Service (IPPAS)
- International Nuclear Security Advisory Service (INSServ)



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# IAEA Peer Review Services

Integrated Regulatory Review Service (IRRS)

<http://www-ns.iaea.org/reviews/rs-reviews.asp?s=7&l=47>

Emergency Preparedness Review Service (EPREV)

<http://www-ns.iaea.org/appraisals/emergency-reviews.asp?s=7&l=45>

Operational Safety Review Team (OSART)

<http://www-ns.iaea.org/reviews/op-safety-reviews.asp?s=7&l=49#osart>

Integrated Safety Assessment of Research Reactors (INSARR)

<http://www-ns.iaea.org/reviews/rr-safety-reviews.asp?s=7&l=51#insarr>

International Physical Protection Advisory Service (IPPAS)

<http://www-ns.iaea.org/security/ippas.asp?s=4&l=26>



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# Integrated Regulatory Review Service (IRRS)



**2006 - 2014**

- 43 missions
- 9 Follow-ups

- Compares national regulatory practices with IAEA safety standards and equivalent good practices elsewhere in the world for a requesting Member State.
- Provides opportunities for both the Regulator and the IAEA to learn about different approaches to the organization and practices of national nuclear regulatory bodies.
- Provides feedback to the IAEA on the application of IAEA safety standards and contributes to the harmonization of regulatory approaches among Member States.
- Follow-up missions encouraged and conducted two years from the first IRRS mission.



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# Operational Safety Review Team (OSART)



**1983 - 2014**

- 175 missions
- 119 Follow-ups

- Provides advice and assistance to Member States in enhancing operational safety of operating NPPs, and also approaching operation, commissioning or in earlier stages of construction (Pre-OSART).
- Can be focused to review only a few specific areas or a specific issue (i.e., Expert missions).
- Follow-up visits are standard and are conducted between 12 to 18 months following the OSART mission.



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# Design and Safety Assessment Review Service (DSARS)

## DSARS Modules:

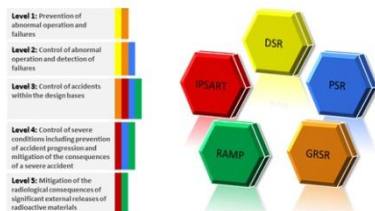
- DSR
- GPRS
- IPSART
- RAMP
- PSR



## Total so far

- 52 missions

Defence in Depth Assessment through IAEA Safety Assessment Section Services  
Ref. NSAS-10



- DSARS assess plant design safety in comparison to IAEA safety standards for a requesting Member State; it is tailored to meet specific needs
- DSARS is organized in modules and can assist countries in the following areas:
  - Review of design safety supporting design evaluation of plant licensing
  - Review of safety analysis, both deterministic and probabilistic through out the plant life time
  - Review of safety analysis applications
  - Review of the severe accident management programme
  - Various safety aspects addressed in periodic safety review



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# Site and External Events Design (SEED)



## Total so far :

- 19 missions leading to 337 recommendations

- Bundled service designed to assist the Member States through the different stages of the site selection, site assessment and design of structures, systems and components against the site specific external and internal hazards;
- Provides independent review of adherence to IAEA guidance on appropriateness of screening criteria uses in ranking sites;
- Provides multidisciplinary review of site requirements for construction of a nuclear installation;
- Provides the Member States with an independent review of safety margin assessment against external hazards for both single and multi-unit sites.
- Follow up missions as requested.



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# Integrated Safety Assessment of Research Reactors (INSARR)



## Total so far

- 65 missions

- Review of the safety of research reactors against IAEA Safety Standards and provides recommendations for safety improvements
- INSARR missions cover all safety areas of research reactors. Key review areas include design, safety analysis, operational limits and conditions, regulatory supervision, reactor operation and maintenance, ageing management, radiation protection and waste management, and experiments and modifications.
- The host organization may request a full-scope INSARR or a review of a specific area(s).
- Follow-up missions are encouraged and conducted with 12 to 18 months from the first INSARR mission.



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# International Physical Protection Advisory Service (IPPAS)



## By June 2014

- 62 missions in 39 MSs and one non-MS

- Created to assist States in strengthening their national nuclear security regime
- Is to review the State's physical protection and compare it with international guidelines and internationally recognized best practices.
- Forms the basis for recommendations for improvements including follow-up activities and assistance
- Objective is two folded:
  - Help States translate international instruments on nuclear security and IAEA guidance into regulatory requirements for the design and operation of physical protection systems.
  - Provide State bodies and facilities with new concepts and discuss best practices on physical protection with experts from other countries.



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# International Nuclear Security Advisory Service (INSServ)



**By June 2014**

- 74 missions in 63 MSs

- Serves as a flexible instrument to help a State to review the general status of measures that protect against nuclear terrorism and identify ways to improve a broad spectrum of nuclear security activities.
- Aims at identifying the broadest nuclear security needs including measures against illicit trafficking and to control and secure radioactive Sources.
- utilizes a number of IAEA guidance documents that are useful for States to develop plans and programmes that are effective, efficient and consistent with internationally recognized guidance and practices.
- is not restricted to any particular group of Member States
- are available to any country having nuclear and/or radioactive materials and associated facilities.



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# What is Capacity Building?



A systematic and integrated approach to develop and continuously improve governmental, organizational and individual competences and capabilities necessary for achieving safe, secure and sustainable nuclear power programme.



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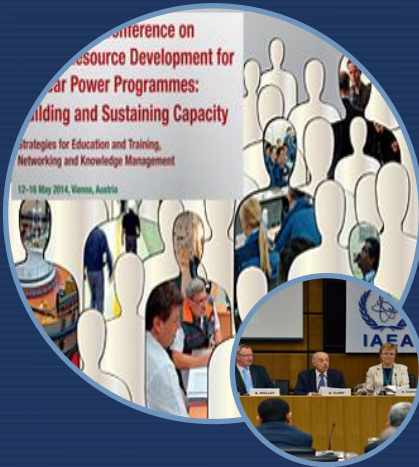
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# NS Role in TC Programme

- *NS Supports the development of the TC programme right from the start and through this support helps in building capacity in Member States.*

- Input of NS on safety related aspects of Country Programme Framework (CPF) is the key for success.
- By building safety and security elements in the CPF a firm basis is established.
- NS regularly provides input in the development of projects. (concepts, projects, activities.)
- Bulk of support comes from the Technical Officers (TOs) for each project.
- Safety reviewer role in determining the adequacy of radiation safety infrastructure.

# Integrated Vision, Common Strategy



## Our Approach

### Global Approach

**IAEA:**  
Defining policies,  
frameworks and  
providing materials  
and support for E&T  
activities

### Regional Approach

Supporting IAEA  
Regional Networks,  
and Centres,  
providing E&T  
resources and  
expertise

### National Approach

**Member States:**  
Establishment and  
maintenance of HR  
and national E&T  
infrastructure

## Global Networking



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# Education and Training

## IAEA mechanisms for Building Capacity

### Review Services & Tools

Review  
Services

Competence  
Needs  
Assessment  
Tools

### Courses & Practical Learning

Specialized  
Training  
Curriculum  
and Courses

Post-  
graduate &  
Basic  
Professional  
Courses

On the Job  
Training  
Fellowship  
Technical  
Visits

### Sustainability

Train the  
Trainers

Distance  
Learning

E-Learning

### Steering Committees & Networks

Steering  
Committees  
of Member  
States

Knowledge  
and  
Technical  
Networks

Regular Budget, Extra Budgetary, TC, Project, Regional Networks



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# Nuclear Installations (NSNI)



## Nuclear Installations (NSNI)

- Fundamentals and Basic Professional Training Courses
- Knowledge and Experience Sharing Workshops
- Train the Trainers Workshop (Nuclear Safety)
- E- Learning



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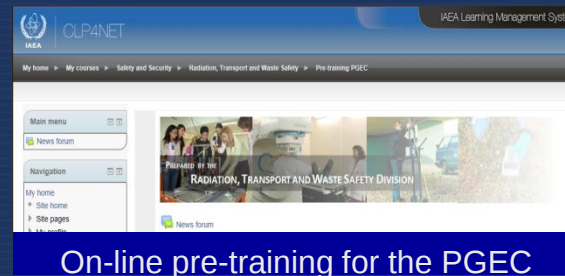
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# Radiation, Transport & Waste (NSRW)

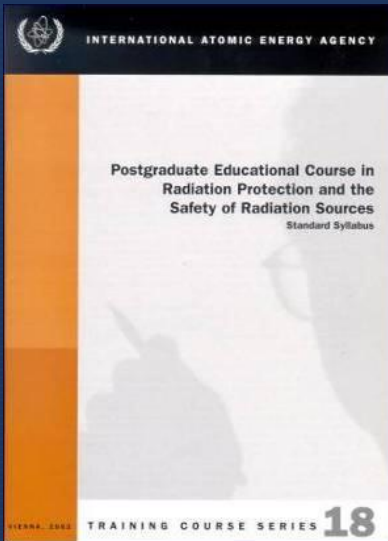


## Radiation, Transport & Waste (NSRW)

- Post-Graduate Educational Course in Radiation Protection
- Specialized Training Courses
- Train the Trainers of Radiation Protection Officers
- E- Learning



# Radiation, Transport & Waste (NSRW)



Standard Syllabus

*under revision to reflect the  
latest IAEA Safety Standards  
(GSR Part 3)*

## Post-Graduate Educational Course in Radiation Protection Specialized Training Courses (1/2)

- **Aim**

To meet the initial E&T needs of young professionals in radiation protection and the safety of radiation sources  
Specialized Training Courses

- **Participants**

Science/engineering graduates selected to work in the field of radiation protection and safety of radiation sources

- **Duration**

24 Weeks



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# Radiation, Transport & Waste (NSRW)

## Content

*Review of Fundamentals*

*Quantities and Measurements*

*Biological Effects of Ionizing Radiation*

*The International System of RP*

*Assessment of Doses due to External and Internal Exposures*

*General Requirements for RP*

*Planned Exposure Situations (requirements for occupational, public, and medical exposure)*

*Emergency and Existing Exposure Situations.*

*Train the Trainers (TTT)*

*Work Project*

## Post-Graduate Educational Course in Radiation Protection Specialized Training Courses (2/2)

- Hosting organizations**

IAEA Regional Training Centres for E&T in radiation protection



| AFRICA  | ASIA AND THE PACIFIC           | EUROPE  | LATIN AMERICA |
|---------|--------------------------------|---------|---------------|
| Algeria | Malaysia                       | Belarus | Argentina     |
| Ghana   | Syria ( <i>not operative</i> ) | Greece  | Brazil        |
| Morocco |                                |         |               |



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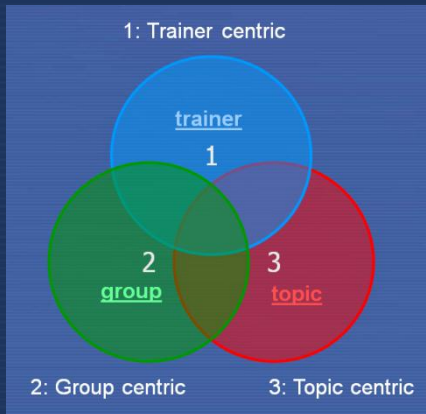
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# Radiation, Transport & Waste (NSRW)

## Teaching Styles



## Radiation Protection Officer (GSR Part 3)

*“a person technically competent in radiation protection matters relevant for a given type of practice who is designated by the registrant, licensee or employer to oversee the application of relevant requirements”*

## Train the Trainers of Radiation Protection Officers

- **Aim**

To provide participants with competencies (knowledge, skills and attitudes) to act as trainers of Radiation Protection Officers (RPOs) in their countries

- **Participants**

Participants have a good background in radiation protection and safety, and are very familiar with the role and duties of the RPO as provided in the International Basic Safety Standards

- **Duration**

2 Weeks



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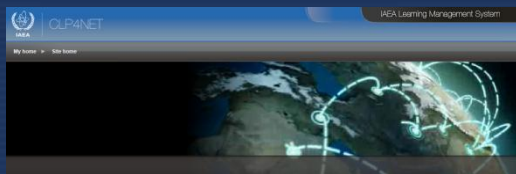


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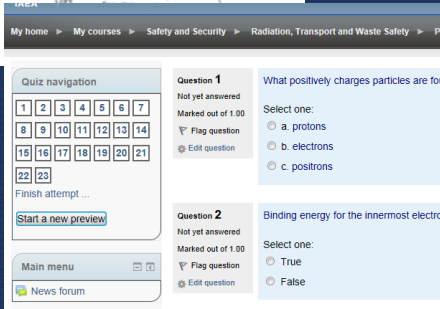
# Radiation, Transport & Waste (NSRW)



**Cyber Learning Platform for  
Nuclear Education and Training  
CLP4NET**



Lectures



Tests

## On-line pre-training for the PGEC

- **Aims**

- ✓ To refresh the knowledge to facilitate the attendance at the PGEC
- ✓ To know areas where the participants might need further support to successfully attend the PGEC

- **Participants**

Participants selected for the PGEC

- **Modules**

Biology and Radiation Effects  
Health Physics Fundamentals

Chemistry  
Mathematics



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# Radiation, Transport & Waste (NSRW)

## TC projects to support E&T in Radiation, Transport and Waste Safety



**Africa**  
**RAF9048 (2012-2015)**



**Asia and the Pacific**  
**RAS9066 (2012-2015)**



**Europe**  
**RER9109 (2012-2015)**



**Latin America**  
**RLA9075 (2014-2017)**



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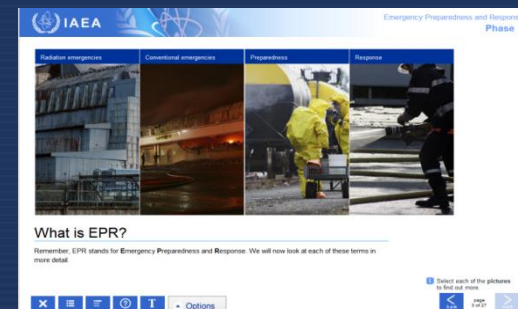
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# Emergency Preparedness and Response (IEC)



## Emergency Preparedness and Response (IEC)

- More than 200 training courses implemented between 2010 and August 2014
- Train the Trainers events are organized in a variety of areas and accompanying the development of standardised training material which complement EPR-series documents.
- E- Learning



# Nuclear Security (NSNS)

## Nuclear Security (NSNS)

- 36 courses available covering all aspects of nuclear security (Modularized and standardized) with almost 3000 people trained in the past 12 months through 111 training courses and workshops in 50 Member-States
- Member-States
  - Modularized and standardized
- Online e-learning modules on basic topics in nuclear security
  - The Use of Radiation Detection Instruments (available)
  - Physical Protection, Transport Security, Nuclear Material Accounting and Control for Nuclear Security, Radiological Crime Scene Management, and Computer Security (available in late 2014)
  - Triple Bar in Nuclear Security (available in late 2014)



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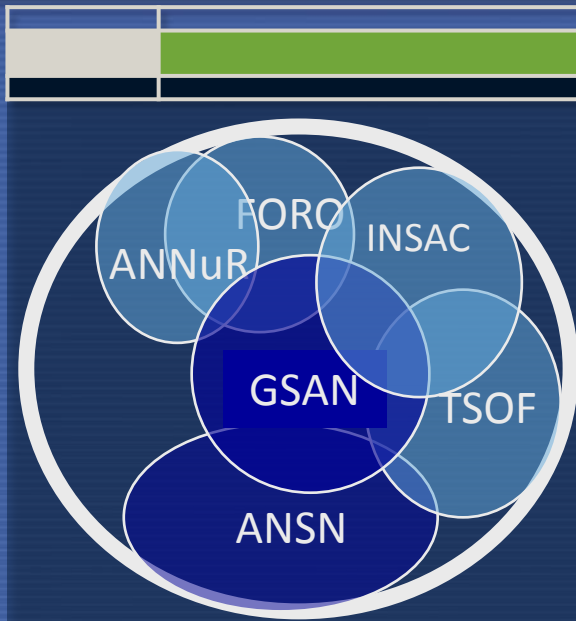


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# Networks



## GNSSN

### Global Nuclear Safety & Security Network

- GNSSN is the set of existing networks and information resources i.e. internationally accessible information and data sources, whether open or password protected.
- The aim of the GNSSN is to ensure that critical knowledge, experience, and lessons learned about safety are exchanged as broadly as they need to be.

## GSAN

**The Global Safety Assessment Network** provides focused collaboration on safety assessment capacity building in support of global nuclear safety harmonization, especially in the expanding and developing nuclear programmes worldwide.

## NSSC

**International Network of Nuclear Security Training and Support Centres** assists member states to build capacity in nuclear security through human resource development, technical and scientific support.



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# Networks

## ANSN

### ASIAN NUCLEAR SAFETY NETWORK

The objective of the ANSN is to pool and share existing and new technical knowledge and practical experience to further improve the safety of nuclear installations in Asia. The model could be further used for other regional nuclear safety networks and, eventually, for a global network

## RANET

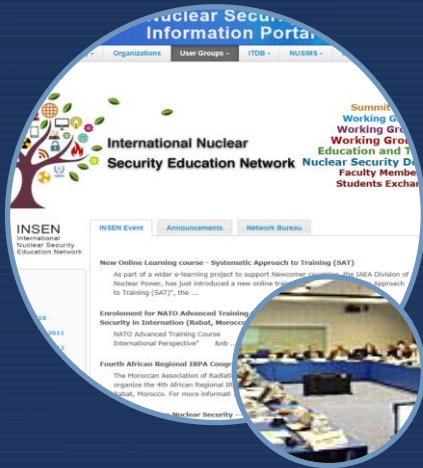
### Response and Assistance Network

The IAEA Response and Assistance Network Capacity Building Centre, coordinates several training activities related to nuclear and radiological emergency preparedness and response

## INSEN

### International Nuclear Security Education Network

The network's mission is to enhance global nuclear security by developing, sharing and promoting excellence in nuclear security education.



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Thank you