ESTABLISHING SUSTAINABLE INFRASTRUCTURES FOR EDUCATION AND TRAINING IN RADIATION, TRANSPORT AND WASTE SAFETY: IAEA’S APPROACH TO SUPPORT MEMBER STATES

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Outline

IAEA’s mission and safety functions
  • *Role of Education and Training (E&T)*

IAEA Strategic Approach to E&T in rad., transp. and waste safety
  • *Principles of IAEA’s support to Member States in the field of E&T*

National Strategy for E&T in rad., transp. and waste safety
  • *The guidance on a methodology to establish the national strategy*

IAEA support to build education and training infrastructures
  • *Cooperation projects to promote the establishment of the national strategy*
IAEA Safety functions

IAEA Functions in Radiation & Waste Safety (Article III.A.6)

To establish standards of safety

To provide for the application of standards

Safety Fundamentals
- Safety Fundamentals
- Fundamental Safety Principles
- IAEA Safety Standards

Safety Requirements
- Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards
- General Safety Requirements Part 3, No. 123 (Interim)

Safety Guides
- IAEA Safety Guides

Education and Training is one of the mechanisms and primary strategies for assisting Member States in the application of the standards.
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IAEA STRATEGIC APPROACH 2011-2020

"IAEA Strategic Approach to Education and Training in Radiation, Transport and Waste Safety 2011–2020"

Submitted to the IAEA Policy Making Organs in 2010, where it was endorsed by the General Conference

Steering Committee
MAIN ELEMENTS OF THE IAEA STRATEGY

- Vision

*Education and Training infrastructures for building and maintaining national competence in radiation, transport and waste safety, are in place in Member States, consistent with IAEA safety standards*
MAIN ELEMENTS OF THE IAEA STRATEGY

- **Objectives**

  - To *strengthen* radiation, transport and waste safety infrastructures through building competence in MSs
  
  - To *ensure* that E&T programmes in MSs address the requirements of the IAEA safety standards
  
  - To *facilitate* the establishment of a *national strategy* for E&T in rad., transp. and waste safety in MSs

- **Output**

  - *Guidance on the establishment and implementation of a national strategy for E&T*
IMPLEMENTATION OF THE IAEA STRATEGY

- **Key players**
  - IAEA
  - Member States
  - Regional Training Centres (RTCs)
IMPLEMENTATION OF THE IAEA STRATEGY
Regional Training Centres

AFRICA:
- CRNA (Algeria - French)
- CNESTEN (Morocco, French)
- GAEC (Ghana - English)

LATIN AMERICA:
- ARN (Argentina - Spanish)
- IRD/CNEN (Brazil - Portuguese)

EUROPE:
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Education and Training Appraisal (EduTA)

Background: The International Atomic Energy Agency has a statutory function to establish standards of safety for the protection of health, life and property against ionizing radiation and to provide for the application of these standards. Education and training in radiation protection is one of the mechanisms and primary strategies through which the Agency assists Member States in the application of these standards, and numerous General Conference resolutions have emphasized this role.

The Division of Radiation, Transport and Waste Safety has developed many education and training programs over several years and has published a number of technical documents to support training in the area. Furthermore, it also assists Member States to build competence in radiation protection and the safety of sources.

In order to effectively provide assistance to Member States and to design training activities, it is essential to evaluate and identify the Member States’ training needs in a systematic manner to assess their education and training infrastructure. The EduTA service was developed to fulfill this purpose.

Scope

The EduTA service includes:
- Carrying out a detailed appraisal of the status of the provisions for education and training in radiation protection and the safety of radiation sources, including the identification of the national education and training needs
- Identifying areas in education and training, where the provisions should be improved (i) to cope with national education and training needs, (ii) to comply with IAEA safety standards, (iii) to adopt best practices
- Making recommendations on actions to be taken to cope with the education and training recommendations as stated in the IAEA Safety Guide RS-G-1.4, Building Competence in Radiation Protection and the Safe Use of Radiation Sources and the IAEA Safety Report Series No. 20 Training in Radiation Protection and the Safe Use of Radiation Sources.
## IMPLEMENTATION OF THE IAEA STRATEGY

<table>
<thead>
<tr>
<th>Activities</th>
<th>Stage I: Preparation</th>
<th>Stage II: Promotion</th>
<th>Stage III: Implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Key-players</td>
<td>IAEA</td>
<td>RTCs</td>
<td>Member States</td>
</tr>
</tbody>
</table>
| Preparation of the competence building tools and guidance to establish a national strategy for education and training | Dissemination and promotion of tools and guidance at regional level among the Member States | Development and implementation of national strategies in Member States
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GENERAL FRAMEWORK ON NAT. STRAT. FOR E&T

 Requirement 1

National policy and strategy for safety

- The government shall establish a national policy and strategy for safety.

- In the national policy and strategy, account shall be taken of the following:
  ... The need and provision for human resources

- The governmental, legal and regulatory framework for safety includes:
  ... Provision for acquiring and maintaining the necessary competence nationally for ensuring safety
GENERAL FRAMEWORK ON NAT. STRAT. FOR E&T

1. Collection of data and analysis of E&T needs
2. Design of a national E&T programme to meet national E&T needs
3. Implementation of the national E&T programme
4. Evaluation and feedback

National Strategy for E&T in radiation safety

IAEA SAFETY STANDARDS SERIES
Building Competence in Radiation Protection and the Safe Use of Radiation Sources
JOINTLY SPONSORED BY IAEA, ILO, PAHO, WHO

SAFETY GUIDE
No. RS-G-1.4

INTERNATIONAL ATOMIC ENERGY AGENCY VIENNA
A practical tool for assisting Member States to establish a national strategy for education and training in radiation, transport and waste safety
Annex I:

- illustrates the practical application of the guidance for a hypothetical country
  - helps to visualize the implementation of the various steps of the process in a practical way.
1. Analysis of training needs

1. Collection of data and analysis of E&T needs

2. Design of a national E&T programme to meet national E&T needs

3. Implementation of the national E&T programme

4. Evaluation and feedback

National Strategy for E&T in radiation safety

2. Design of the National E&T Programme

3. Development and Implementation of the National E&T Programme
1. Analysis of training needs

<table>
<thead>
<tr>
<th>Practices using radiation sources</th>
<th>Number of facilities</th>
<th>Qualified Expert (QE)</th>
<th>Radiation Protection Officer (RPO)</th>
<th>Operator</th>
<th>Health Professionals (HP)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Existing</td>
<td>Foreshort (&lt;5 yrs)</td>
<td>Total</td>
<td>Existing</td>
<td>Estimated QE's required</td>
</tr>
<tr>
<td>---</td>
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<td>---</td>
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<td>---</td>
</tr>
<tr>
<td><strong>INDUSTRIAL and RESEARCH</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Industrial radiography</td>
<td>11</td>
<td>2</td>
<td>13</td>
<td>3</td>
<td>13</td>
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<tr>
<td>Industrial reactor facilities</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
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<tr>
<td>Industrial gauges and well logging</td>
<td>38</td>
<td>7</td>
<td>45</td>
<td>38</td>
<td>45</td>
</tr>
<tr>
<td>Research activities: use of sealed and unsealed sources</td>
<td>12</td>
<td>3</td>
<td>15</td>
<td>0</td>
<td>7**</td>
</tr>
<tr>
<td>Research accelerators or reactors</td>
<td>2</td>
<td></td>
<td>2</td>
<td>2</td>
<td></td>
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<tr>
<td>Mineral extraction and processing complexes (NORM)</td>
<td>10</td>
<td>2</td>
<td>12</td>
<td>0</td>
<td>6**</td>
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<tr>
<td><strong>MEDICAL</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dental radiology (closed)</td>
<td>500</td>
<td>200</td>
<td>700***</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Diagnostic and interventional radiology</td>
<td>620</td>
<td>120</td>
<td>740***</td>
<td>0</td>
<td>37**</td>
</tr>
<tr>
<td>Radiotherapy and brachytherapy</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Nuclear medicine</td>
<td>13</td>
<td>3</td>
<td>16</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td><strong>OTHER PRACTICES</strong></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
## 2. Design of the National E&T Programme

<table>
<thead>
<tr>
<th>Practice</th>
<th>Category of personnel</th>
<th>Training provider</th>
<th>Training course</th>
<th>Total number to be trained</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dental radiology</td>
<td>Operators</td>
<td>Professional Association</td>
<td>Radiation protection in the use of X-ray generators in dental radiology</td>
<td>100</td>
<td>NIL</td>
</tr>
<tr>
<td>Diagnostic and interventional radiology</td>
<td>QE</td>
<td>NTC with School of Medicine / National University</td>
<td>Advanced course in radiation protection in diagnostic and interventional radiology</td>
<td>37</td>
<td>NIL</td>
</tr>
<tr>
<td>RPO</td>
<td>NTC</td>
<td></td>
<td>Training course in radiation protection in diagnostic and interventional radiology</td>
<td>43</td>
<td>NIL</td>
</tr>
<tr>
<td>Operators</td>
<td>NTC</td>
<td></td>
<td>Radiation protection in the use of emitting radiations in diagnostic and interventional radiology</td>
<td>140</td>
<td>NIL</td>
</tr>
<tr>
<td>Radiotherapy and brachytherapy</td>
<td>QE</td>
<td>RTC</td>
<td>Postgraduate Educational Course in Radiation Protection and the Safety of Radiation Sources * - Specialized training course in radiation protection in radiotherapy</td>
<td>3</td>
<td>NIL</td>
</tr>
</tbody>
</table>

* The number of personnel to be trained does not justify the development of a national course yet.
* RB endorses the course provided at the RTC in the volume for the recognition of QE, but further practice specific courses including the course in radiography.
# 3. Development and Implementation of the National E&T Programme

<table>
<thead>
<tr>
<th>Module</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. The Radiation Protection Officer (RPO)</strong></td>
<td>Introduction to the International Basic Safety Standards&lt;br&gt;Brief overview of objectives, scope &amp; structure of BSS&lt;br&gt;Terminology: facilities, activities, practices; exposure situations (planned, existing, emergency); exposure groups (occupational, medical, public)&lt;br&gt;The RPO: definition, role, duties</td>
</tr>
<tr>
<td><strong>2. Basic nuclear physics</strong></td>
<td>Atomic structure&lt;br&gt;Protons, neutrons, and electrons; periodic table; atomic mass; isotopes of an element; excitation, ionisation; characteristic x-rays, bremsstrahlung; radiation, energy&lt;br&gt;Radioactivity&lt;br&gt;Nuclear stability; unstable nuclei; radionuclides; radioactive decay; alpha, beta, gamma, neutrons; table of radionuclides; activity; law of radioactive decay; half-life, decay chains and equilibrium&lt;br&gt;Interaction of radiation with matter&lt;br&gt;Properties of alpha, beta, gamma, X-ray, bremsstrahlung radiation, ionisation&lt;br&gt;Practical Demonstration: Alpha, beta and gamma radiation – range in air and suitable shielding material</td>
</tr>
<tr>
<td><strong>3. Quantities and units</strong></td>
<td>Radiation quantities&lt;br&gt;Activity, absorbed dose, equivalent dose, effective dose, dose equivalent, committed effective dose&lt;br&gt;Radiation units&lt;br&gt;Becquerel, Gray, Sievert</td>
</tr>
<tr>
<td><strong>4. Sources of radiation exposure</strong></td>
<td>Natural radiation&lt;br&gt;Terrestrial radionuclides, uranium and thorium decay chains, radon&lt;br&gt;Man-made radiation&lt;br&gt;Production of radiotopes, sealed sources, unsualled sources, radiation generators (x-ray sets, accelerators), common uses of radiation (e.g. industrial radiography, industrial irradiators, process control, gammas, radiotracers, wall logging, diagnostic and interventional radiology, nuclear medicine, radiotherapy)</td>
</tr>
<tr>
<td><strong>5. Biological effects of ionising radiation</strong></td>
<td>Effects of radiation on cells&lt;br&gt;Biological effects of ionising radiation, Interaction with DNA</td>
</tr>
</tbody>
</table>
## Guidance - Annex II

<table>
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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Professional bodies and associations</td>
<td>Action 2</td>
<td>Action 6</td>
<td>Action 9</td>
<td></td>
<td></td>
<td>Action 15 Action 17</td>
<td>Action 18 Action 19</td>
</tr>
<tr>
<td>Education and training providers</td>
<td>Action 2</td>
<td>Action 5</td>
<td>Action 9</td>
<td></td>
<td></td>
<td>Action 15 Action 17</td>
<td>Action 18 Action 19</td>
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Technical Cooperation Regional Projects on E&T
“Strengthening the Education and Training Infrastructure and Building Competence in Radiation Safety”

Africa : RAF9048

Europe : RER9109

Asia and the Pacific : RAS9066

Latin America : RLA9070-9075
Regional Workshops on National Strategies 2012

7 Regional workshops; 118 participants from 83 Member States

- The guidance to establish a National Strategy for E&T has been disseminated among MSs
- Preliminary information collected by MSs
Regional Workshops on National Strategies 2013

6 Regional workshops; 108 participants from 88 Member States

- MSs that attended the previous workshop reported back on progress made
- Action Plans were drafted to establish a National Strategy for E&T
The establishment by Member States of a national strategy for E&T in radiation safety is one of the main challenges that MSs will face to build sustainable capacity, in compliance with relevant IAEA Safety Standards.

For that purpose IAEA has developed a guidance and supports MSs through technical cooperation projects.

Future work of IAEA will include monitoring the progress made and analysing challenges faced and difficulties encountered, in order to identify possible solutions to be rendered to MSs (e.g. new workshops planned for 2014).
Education and Training in Radiation, Transport and Waste Safety

Building competence through education and training in radiation safety is fundamental to the establishment of a comprehensive and sustainable nuclear infrastructure for radiation safety, which in turn is essential for protecting people from the harmful effects of radiation. In order to establish a sustainable education and training infrastructure in radiation, transport and waste safety, Member States should develop a national strategy for building competence through education and training. Based on the approach provided in the Safety Guide "Building Competence in Radiation Protection and the Safe Use of Radioactive Sources".

The national strategy is based on 4 established phases, where the outcome of one phase is the starting point for the next phase. The design and development of an education and training programme for a national strategy requires the organization of training courses in radiation protection. IAEA Safety Reports Series No. 26 "Training in Radiation protection and the safe use of radioactive material" provides trainers and training organization with information on and examples of training methods and materials that have proven to be effective in use with appropriate target audiences.

http://goto.iaea.org/rtws-E&T
Thank you for your attention