Education and Training in Nuclear Decommissioning

- Needs, Opportunities and Challenges -

Presentation by:
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Since the 1980’s, the JRC’s evolving mission has progressively reduced the need for nuclear R&D installations.

In 1999, JRC started formally its Decommissioning and Waste Management (D&WM) programme, covering all its historical and future nuclear liabilities.
Accumulated Experience on D&WM at JRC

- Since the start of the Decommissioning and Waste Management programme, JRC staff acquired a large experience in operational D&WM issues.

- JRC's Decommissioning and Waste Management programme is:
  - relatively small (e.g. in comparison with NPP decommissioning)
  - but covers a variety of issues to be tackled ("exotic" installations & waste types)

The European Parliament, during its debates on the future Euratom research programme, requested that:

“JRC builds upon its experience with the decommissioning of JRC nuclear facilities and further reinforces its research to support safe decommissioning in Europe.”
Situation nuclear power reactors in the EU

- Power reactors in EU: 220
- Operating reactors: 135

Legend:
- Blue: Operational
- Brown: Shutdown - Dismantling
- Yellow: Fully Dismantled
- Light Blue: Long Term Safe Enclosure
Situation nuclear decommissioning in the EU

- Demonstration of decommissioning at an industrial scale, as a 'last but feasible step' of the nuclear life-cycle, is essential for the credibility of the nuclear energy option
- Decommissioning market is in expansion, particularly in Europe
- Currently, an industrial experience exist, however... ... further attention is necessary for:
  - Development of the most suitable techniques, with respect to safety, efficiency and waste limitation
  - Standardisation and harmonisation (incl. cost estimation)
  - Offering and promoting dedicated education and training opportunities
  - Sharing knowledge and experiences
Offering and promoting dedicated Education and Training (E&T) opportunities

JRC organised jointly with the University of Birmingham in April 2015 a seminar on Education and Training in Nuclear Decommissioning, in an attempt to answer to the questions:

- What are the E&T needs?
- What are the opportunities, what does already exist?
- How can we attract young talent?

Outcome of the seminar is published in a joint report with orientations on the way forward to support Education and Training in Nuclear Decommissioning in the EU.

How can we stimulate interest and future talent?

The JOB...

👎 'Breaking down' is not a very attractive occupation for me, I would prefer building something new!

👎 Why do I need to take care of the negative 'nuclear heritage' left by the others?

👎 At the end.. there is 'nothing'. What will then happen with my job?
Decommissioning is in reality much more than clearing, cleaning and demolishing; decommissioning projects usually present an appealing technological challenge, requiring creative solutions.

Decommissioning is an emerging activity involving on the average young people; related jobs offer many possibilities for career development.

Decommissioning offers also tremendous opportunities for people who have developed expertise in reliable technologies or experience in managing projects and who are interested in mobility.

A job in decommissioning is, in general, secure; young engineers and scientists graduating after studies dedicated to decommissioning are almost certain to find a job.

Actually, decommissioning provides a service to society and can be considered as a ‘noble cause’: decommissioning is aiming to restore a safe environment and demonstrates that closing the nuclear energy cycle is feasible.
How can we stimulate interest and future talent?

Promotion could start by **clarifying** the existing education, training and career opportunities in Europe.

**Advertising the challenge** linked to decommissioning could be stimulated and integrated within existing campaigns for the promotion of education and training.

And more generally, promotion of decommissioning could be helped by improving the **public understanding on its finality** and as such presenting the activity in a more objective way.
'Pooling' of Decommissioning Training Initiatives

ELINDER Project
European Learning Initiatives for Nuclear Decommissioning and Environmental Remediation

Rationale:

For vocational training in nuclear decommissioning, the ‘summer school’ concept of training over one to two weeks offers an attractive opportunity for employers who want to enhance the professionalism of their staff, with a focus on practical experience.
'Pooling' of Decommissioning Training Initiatives

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**Approach:**

- Training split in complementing modules, at different locations
- Qualified 'Generic modules' and 'Specific modules'

### Generic modules

<table>
<thead>
<tr>
<th>Generic course on decommissioning</th>
<th>Opportunities at:</th>
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<tbody>
<tr>
<td>- decommissioning: regulation and standards</td>
<td>CEA (F)</td>
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<tr>
<td>- status of the play, experience feedback</td>
<td>STUBA (SK)</td>
</tr>
<tr>
<td>- waste management approaches</td>
<td>KIT (D)</td>
</tr>
<tr>
<td>- related technical and organisational topics</td>
<td>SCK•CEN (B)</td>
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<tr>
<td>- related radiation safety issues</td>
<td>JRC</td>
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<td>- stakeholder involvement experiences</td>
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1 week, Presentations Visits
<table>
<thead>
<tr>
<th></th>
<th>Specific modules</th>
<th>Duration</th>
<th>Mode(s)</th>
<th>Institution(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Metrology</strong>&lt;br&gt;material and site characterisation methods, NDA and DA measurement techniques, measurement validation, metrology networks</td>
<td>1 week</td>
<td>Presentations, Hands-on measurements</td>
<td>JRC</td>
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<tr>
<td>2</td>
<td><strong>Decontamination and Dismantling techniques</strong>&lt;br&gt;decommissioning strategies, decontamination techniques, dismantling and demolition techniques and machinery, new techniques in development</td>
<td>1 week</td>
<td>Presentations, Practical demonstrations</td>
<td>KIT (D)</td>
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<tr>
<td>3</td>
<td><strong>Waste and material management</strong>&lt;br&gt;regulation and international practices for waste management, waste categories, waste and material clearance, waste handling</td>
<td>1 week</td>
<td>Presentations, Visits</td>
<td>CEA (F)</td>
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<tr>
<td>4</td>
<td><strong>Decommissioning planning</strong>&lt;br&gt;elaboration of decommissioning plan; Decommissioning cost assessments, management of the transition phase; retaining of knowledge</td>
<td>1 week</td>
<td>Presentations, Visits</td>
<td>STUBA (SK)</td>
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<tr>
<td>5</td>
<td><strong>Safety and environmental impact assessment</strong>&lt;br&gt;licensing and regulatory follow-up; Safety cases; Environmental impact assessments; management industrial risks, Integrated management</td>
<td>1 week</td>
<td>Presentations, Visit and case(s)</td>
<td>SCK•CEN (B) ENSTTI</td>
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<tr>
<td>6</td>
<td><strong>Programme and project management</strong>&lt;br&gt;EU decommissioning market; project planning/project management; procurement/contracting; working with external companies; risk management</td>
<td>2 weeks</td>
<td>Presentations, Visit/b business case</td>
<td>NUVIA (F) SOGIN (I)</td>
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<tr>
<td>7</td>
<td><strong>Environmental Remediation and site release</strong>&lt;br&gt;regulatory framework, radiological characterisation of contaminated sites, remediation strategies, remediation technologies, final survey and monitoring, organisation, planning, resources and public communication</td>
<td>1 week</td>
<td>Presentations, Visit and case(s)</td>
<td>UoB (UK)</td>
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'Pooling' of Decommissioning Training Initiatives

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**Approach:**

- Induction of professionals supported by complementary 'e-Learning' and 'Internship' programmes

### e-Learning

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<thead>
<tr>
<th>Details</th>
<th>TU Delft (NL)</th>
<th>UoB (UK)</th>
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<tbody>
<tr>
<td>- induction to nuclear industrial applications, radiation safety</td>
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<td></td>
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<tr>
<td>- PofEds for extra in-depth support in specific topics</td>
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<tr>
<td>compilation of ad hoc e-learning tools; new ProfEds; test and certificate</td>
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### Internships

<table>
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<tr>
<th>Details</th>
<th>1 month up to 2 years depending on the project</th>
<th>Managed by:</th>
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<tr>
<td>support to industrial and research projects linked to nuclear decommissioning activities</td>
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<td>JRC ENSTTI</td>
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**Audience:**

<table>
<thead>
<tr>
<th>Level of KNOWLEDGE, SKILLS and COMPETENCE (KSC)</th>
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<tr>
<td>no basic KSC in nuclear</td>
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<tr>
<td>KSC in nuclear</td>
</tr>
<tr>
<td>no KSC in decommissioning</td>
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<tr>
<td>KSC in decommissioning</td>
</tr>
</tbody>
</table>

- **Students**
  - Internship in decommissioning
  - Generic course in decommissioning
  - e-Learning: induction

- **Young professionals**
  - Internship in decommissioning
  - Generic course in decommissioning
  - e-Learning: induction

- **Experienced professionals, Managers**
  - Generic course in decommissioning
  - Specific, topical courses modules in decommissioning
  - e-Learning: induction, ProfEds
Benefits from a joint European approach:

- **Visibility and clarity:**
  - possibility to **promote** the training by joint advertising to interested employers/trainees,
  - enhanced clarity for the employers and interested trainees on the **outcomes** and **quality** of the anticipated training;

- **Synergies:**
  - possibility **sharing** of courses, teachers or facilities to visit
  - reducing organisational burden and maximising output using **common** tools and databases, including also IAEA tools, making the training more relevant and up-to-date
  - maximising the use of the **expertise** available in each of the training organisations (particularly for the specific modules)

- **Increased opportunities:**
  - possibility for trainees to **gradually** develop expertise by combining (over the years) different modules;
  - possibility to integrate also **(funded) trainees** from third countries
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Partners:

- SCK•CEN, Belgium
- CEA, France
- KIT, Germany
- University of Birmingham, UK
- STUBA, Slovakia
- T.U. Delft, The Netherlands
- U.Tartu, Estonia
- NUVIA Group
- SOGIN, Italy
- ENEN
- ENSTTI
- ENS
- FORATOM
- JRC, EC

IAEA: not a partner but will provide general assistance to the project
THANK YOU FOR YOUR ATTENTION