Education and Training in Nuclear Decommissioning

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European Commission

The European Commission Joint Research Centre (JRC)

IRMM
Institute
for Reference Materials
and Measurements

JRC Sites

IET
Institute
for Energy
and Transport

ITU
Institute
for Transuranium
Elements

Headquarters

PETTEN
GEEL
BRUSSELS
KARLSRUHE
ISPRA
SEVILLE

IPTS
Institute
for Prospective
Technological
Studies

IHCP
Institute
for Health
and Consumer
Protection

IPSC
Institute
for the Protection
and Security
of the Citizen

ISM
Ispra
Site
Management

IES
Institute
for Environment
and Sustainability

Staff: # 3000

Annual budget:
395 M€
+ 55 M€ competitive
+ 30 M€ decommissioning

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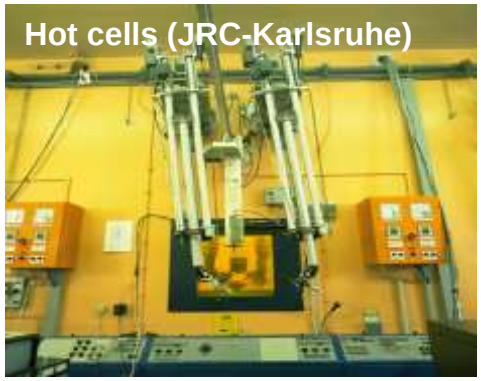
JRC's Decommissioning and Waste Management Programme

Since the 1980's, the JRC's evolving mission has progressively reduced the need for nuclear R&D installations, particularly at the Ispra Site, so that many are now shutdown and in a state of safe conservation.

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



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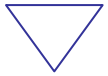
Role of the Joint Research Centre (JRC)

Accumulated Experience on D&WM at JRC

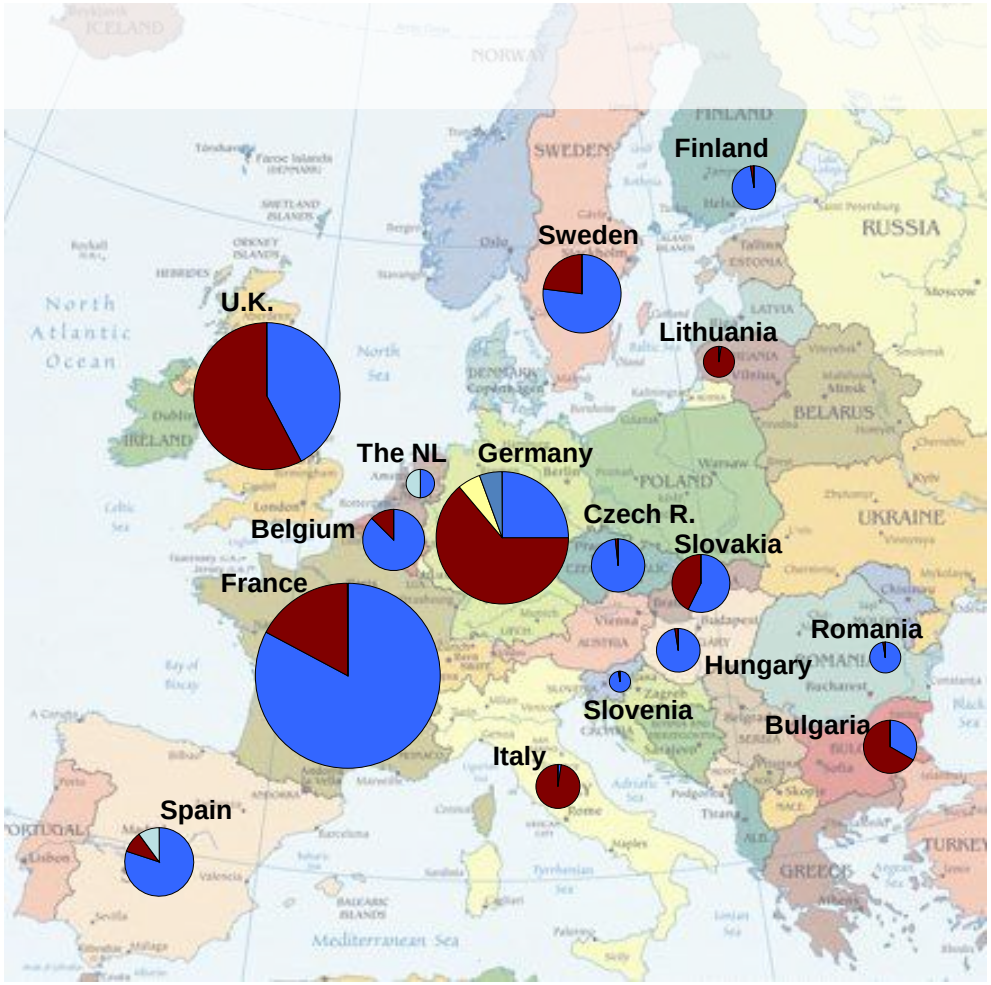
- Since the start of the Decommissioning and Waste Management programme, JRC staff acquired a large experience in operational D&WM issues.
- JRC's Decommissioning and Waste Management programme is:
  - relatively *small* (e.g. in comparison with NPP decommissioning)
  - but covers a *variety of issues* to be tackled ("exotic" installations & waste types)



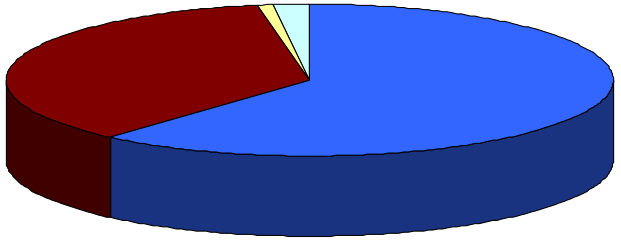
The European Parliament, during its debates on the future Euratom research programme, requested that:

"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



- Operational
- Shutdown - Dismantling
- Fully Dismantled
- Long Term Safe Enclosure



TOTAL
Power reactors in EU: 220
Operating reactors: 135

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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, in particular in Europe
- Currently, an industrial experience exist, however…

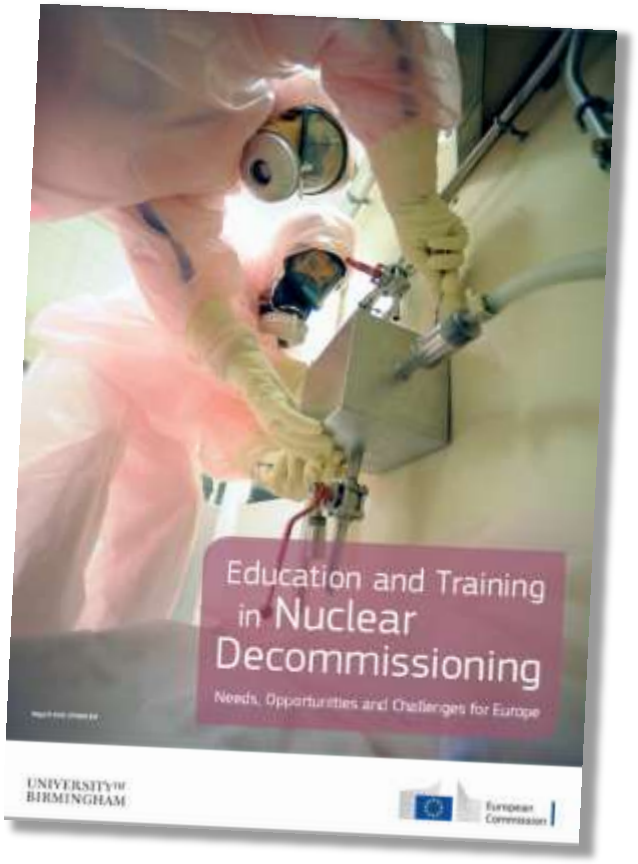
  … further attention is necessary for:

  - ✓ Development of the most suitable techniques, with respect to safety, efficiency and waste limitation
  - ✓ Standardisation and harmonisation
  - ✓ 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.

https://ec.europa.eu/jrc/en/publication/education-and-training-nuclear-decommissioning-needs-opportunities-and-challenges-europe

Competence development in nuclear decommissioning
What are the needs ?

- Large need of competences, not only technical but also financial, juridical, social , …

- Main identified 'Pinch Point' areas for nuclear decommissioning
  - Programme and Project Managers
  - Engineers specialised in Decontamination & Dismantling Techniques and in Waste Management
  - Safety Case/ Licensing Specialists
  - Radiological Protection Advisors
  - Radiation Metrologists and Radiochemists
  - Skilled technicians and operators for dedicated equipment

Competence development in nuclear decommissioning
What are the needs ?

Essential to be taken into consideration are:

- the adequate management of the cultural change, which is created by the transition from operation to decommissioning
- the long term planning of the essential competences;
- the retaining of knowledge, independently of the possible turn-over of staff;
- the importance of collaboration between the players involved;
- the need to facilitate mobility (both cross-border and cross-sector).

The EU industry and organizations would be also helped by a more in-depth assessment of the future of the nuclear decommissioning activities and of their impact on the job market.

What are the education and training opportunities?

Examples of EDUCATION in decommissioning:

- **PhD/Professorships** in decommissioning (e.g. 'Professorship on Decommissioning of Conventional and Nuclear Facilities' at KIT, D)
- **2/3 y postgraduate Masters courses** on decommissioning (e.g. 'MSc in nuclear decommissioning and waste management' UoB, UK, or 'ITDD Master – ingénierie, traçabilité et développement durable', France)
- **Dedicated modules** in decommissioning integrated in a more general master course
- **Bachelor degrees** with specialisation of about 1 y in decommissioning (e.g. Universities of Caen and Nîmes, France)

What are the education and training opportunities?

Examples of vocational TRAINING in decommissioning:

- JRC ' Summer School on Nuclear Decommissioning and Waste Management' (1week, on the JRC-Ispra site, I)
- 'Technology and Management of the Decommissioning of Nuclear Facilities' course at the AREVA Nuclear Professional School (1 week by the Karlsruhe Institute of Technology (KIT), D)
- Belgian Nuclear Research Centre courses on 'Decommissioning of Nuclear Installations' (1week open courses and customized courses at the SCK•CEN site, Mol, B)
- 'European Decommissioning Academy' organised by the Slovak University of Technology (3weeks of courses, on-site training and technical tours in Austria, Switzerland and Italy);
- CEA/INSTN international course on 'Dismantling Experience of Nuclear Facilities' (1week, including a tour of dismantling sites)
- IAEA ad hoc training programmes and possibilities for e-learning

What are the education and training opportunities?

With expansion of E&T opportunities attention should be paid for:

- harmonisation of the education and training outcomes,
- cooperation between universities and training institutes
- further enhancing the collaboration with all participants involved in decommissioning (industry, safety authorities and associated technical support organisations, waste management and decommissioning agencies, research centres).

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?

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How can we stimulate interest and future talent?

The JOB…

- Decommissioning is in reality much more than clearing, cleaning and demolishing; decommissioning projects are usually complex and 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 and excitement 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

Rationale:

For vocational training in nuclear decommissioning the ‘summer school’ concept of training over one to three 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

ELINDER Project

Approach:

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

Induction and Generic modules		
01	**Induction to nuclear** nuclear industrial applications, nuclear safety and radiation protection	e-learning (IAEA), test (tbd)
02	**Generic course on decommissioning** - decommissioning: experiences, status of the play - waste management approaches - related technical and organisational topics - related radiation safety issues - stakeholder involvement experiences	1 week, Presentations Visits

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Specific modules

11	**Metrology** Radiation measurement techniques (NDA, DA); Waste characterisation; Clearance methods and measurements	1 week, Presentations Practical hands-on measurements
12	**Decontamination and Dismantling techniques** Decontamination systems; Dismantling systems; Robots, remote handling	1 week Presentations Practical demonstrations
13	**Waste management** Waste categories; Waste handling, packing and conditioning; Waste disposal; On-site remediation	1 week, Presentations Visits
14	**Decommissioning planning** Elaboration of decommissioning plan; Decommissioning cost assessments, Management of the transition phase; Retaining of knowledge	1 week, Presentations Visits
15	**Safety and environmental impact assessment** Licensing and regulatory follow-up; Safety cases; Environmental impact assessments; Management industrial risks, Integrated management	1 week Presentations Visit and case(s)
16	**Programme and project management** EU decommissioning market; Programming/program follow-up; Project planning/ project management; Procurement/contracting; Working with external companies	2 weeks, Presentations Visit and business case
17	**Environmental Remediation** Programme tbd	1 week Presentations Visit and case(s)

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Interest in participation:

- INSTN, France
- KIT, Germany
- EWN, Germany
- STUBA, Slovakia
- University of Birmingham, UK
- SCK•CEN, Belgium
- IAEA
- JRC, EC

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Thank you for your attention