UNIVERSITY OF BIRMINGHAM | SCHOOL OF PHYSICS AND ASTRONOMY

Interaction with the industry on nuclear education and training in the UK

Dr. Tzany Kokalova Wheldon

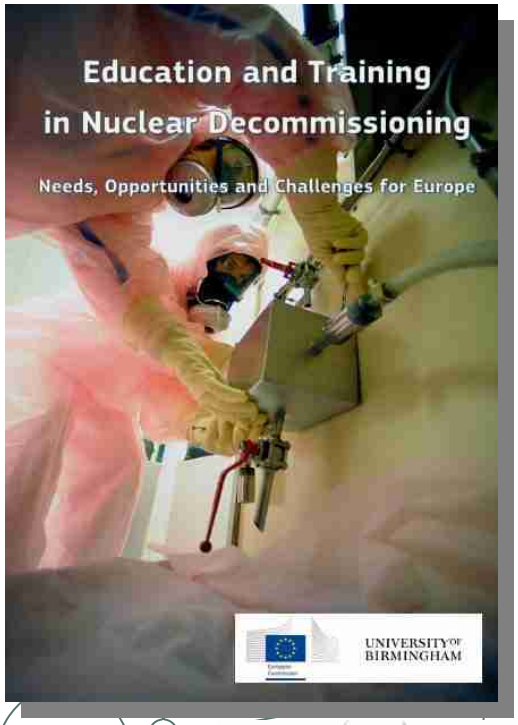
ELINDER Launch event, Bratislava, 2nd December 2016

European Commission

Offering and promoting dedicated Education and Training (E&T) opportunities

University of Birmingham organised, jointly with the JRC 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 and gives orientations on the way forward to support Education and Training in nuclear Decommissioning in the EU.**

The skills gap (UK) !

- New nuclear power stations need to be built.
- Need to reduce uncertainty over decommissioning and waste management costs.
- Legacy of Magnox power stations being decommissioned.
- UK is rebuilding its capacity in decommissioning and radioactive waste management.

Cost of building a reactor (e.g. twin at Hinkley Point C 3.2 GW, ~5% UK demand) ~ £18b [operate for ~60 years]
Takes ~ 5 years construction

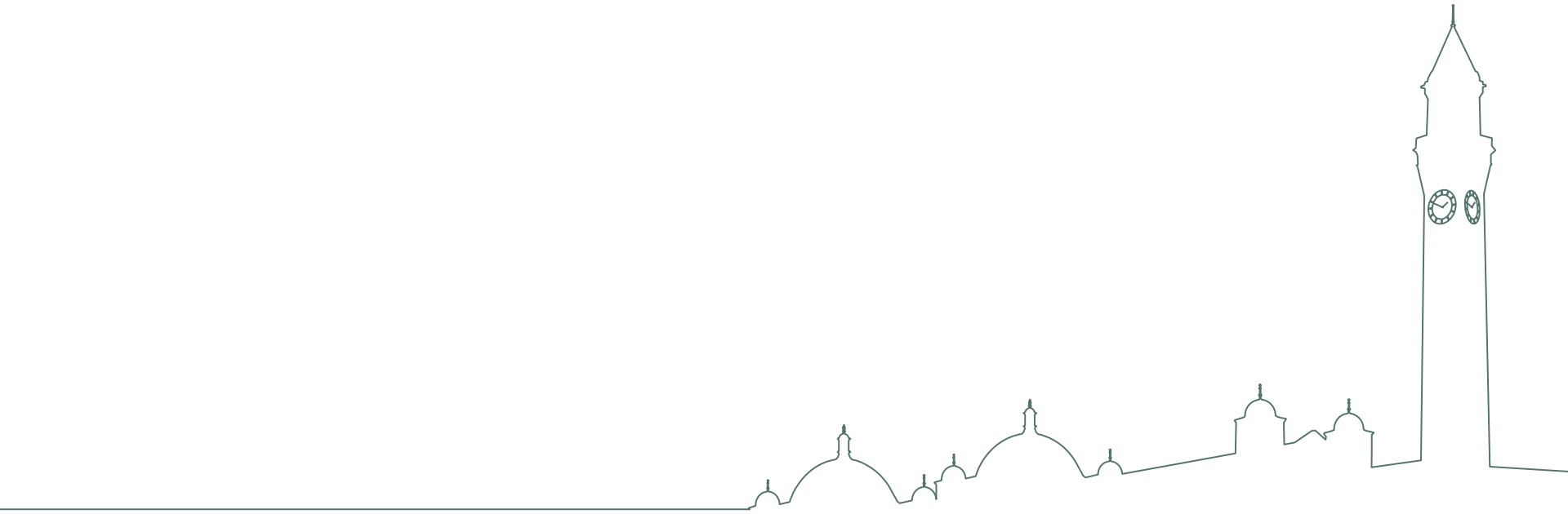
UK nuclear project NuGen to be up and running in 2024

Toshiba will pay £102m for a 60pc stake in NuGen and build a nuclear power station that provides 7pc of the UK's electricity needs

The deal is another step to helping the UK replace its ageing nuclear power stations Photo: Alamy

The JOB…

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



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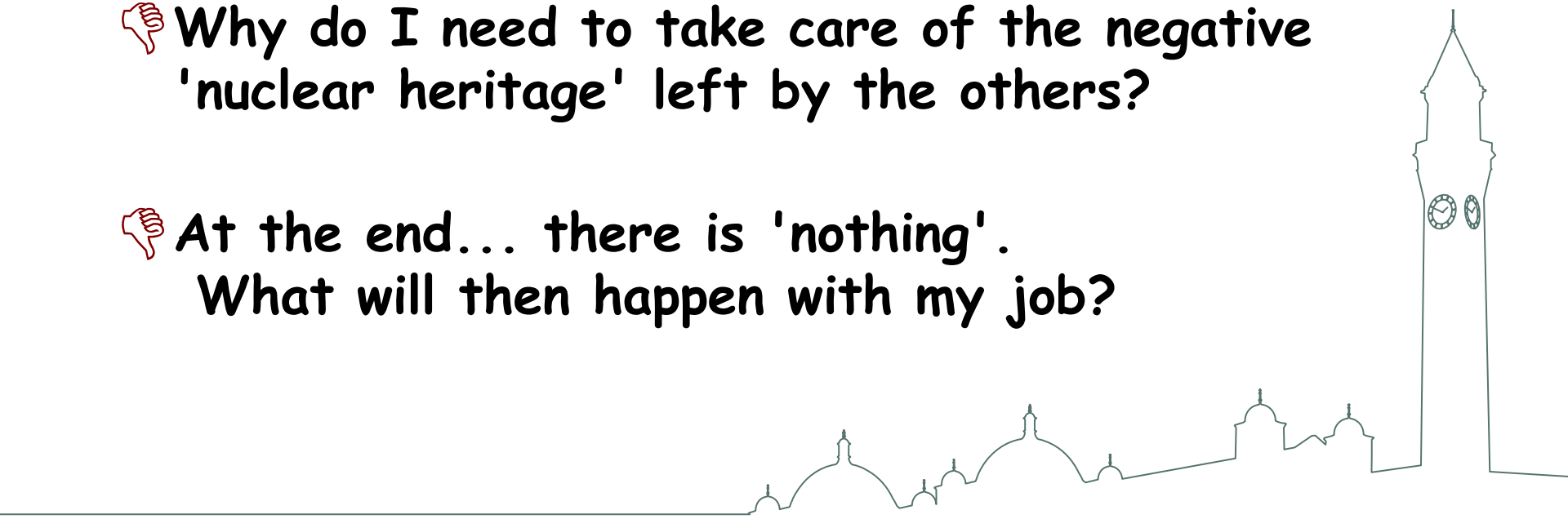
The JOB…

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

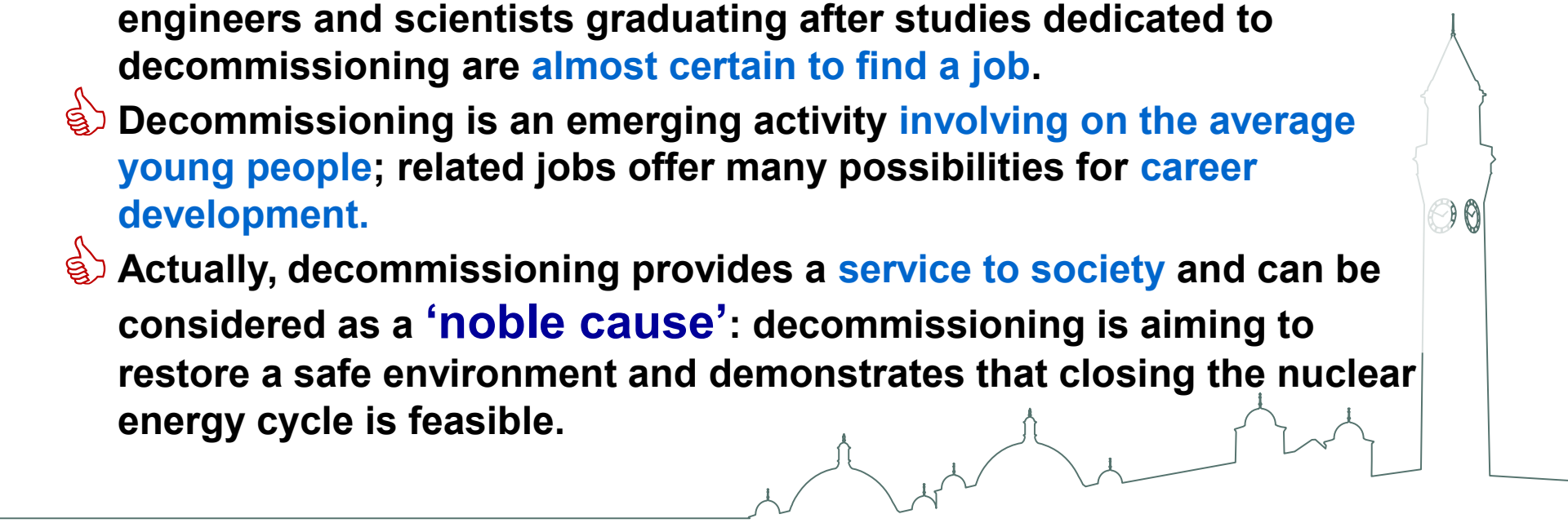
- Why do I need to take care of the negative 'nuclear heritage' left by the others?

- At the end… there is 'nothing'.
  What will then happen with my job?



The JOB…

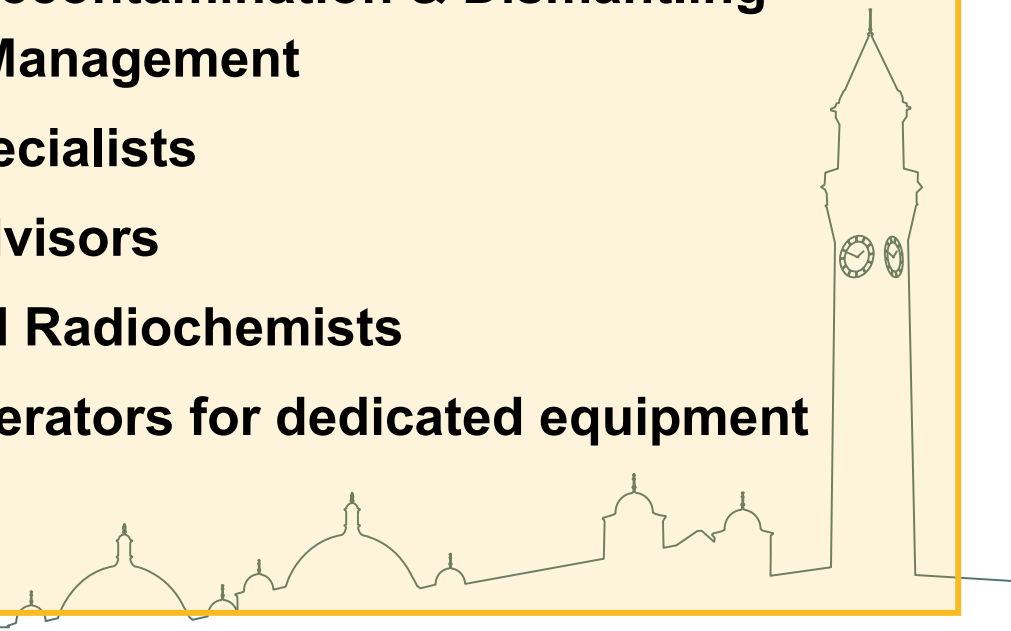
- Decommissioning is in reality *much more than clearing, cleaning and demolishing*; decommissioning projects are usually complex and present an appealing technological challenge. Requiring creative solutions.
- Decommissioning offers tremendous opportunities for mobile people who have developed expertise in new technologies or experience in managing projects.
- A job in decommissioning is, in general, secure and well paid; young engineers and scientists graduating after studies dedicated to decommissioning are almost certain to find a job.
- Decommissioning is an emerging activity involving on the average young people; related jobs offer many possibilities for career development.
- 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.



Competence development in nuclear decommissioning
What are the needs ?

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

- **Main 'Pinch Point' areas identified 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**



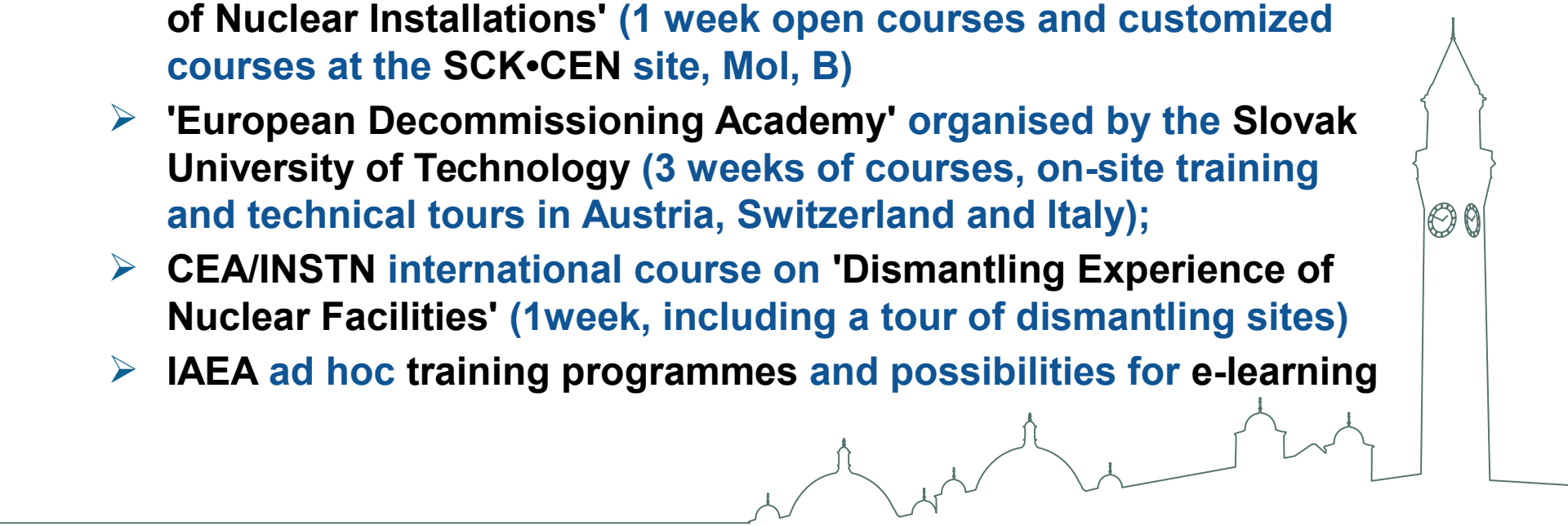
What are the education and training opportunities?

Examples of EDUCATION in decommissioning:

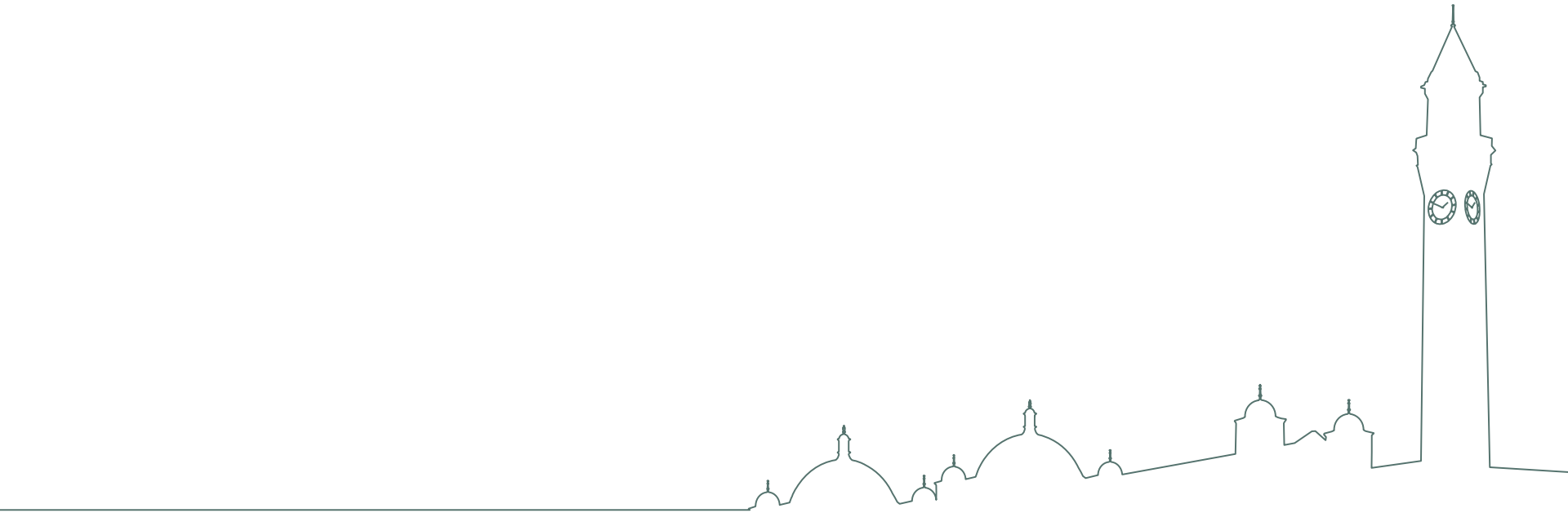
- **PhD/Professorships in decommissioning (e.g. 'Professorship on Decommissioning of Conventional and Nuclear Facilities' at KIT, D)**
- **2/3 y postgraduate Masters courses on decommissioning (e.g. 'MSc in nuclear decommissioning and waste management' UoB, UK, or 'ITDD Masters – ingénierie, traçabilité 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)**

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 (1week at the Karlsruhe Institute of Technology (KIT), D)
- Belgian Nuclear Research Centre courses on 'Decommissioning of Nuclear Installations' (1 week open courses and customized courses at the SCK•CEN site, Mol, B)
- 'European Decommissioning Academy' organised by the Slovak University of Technology (3 weeks 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 is NEEDED ?



What is NEEDED ?

ELINDER!

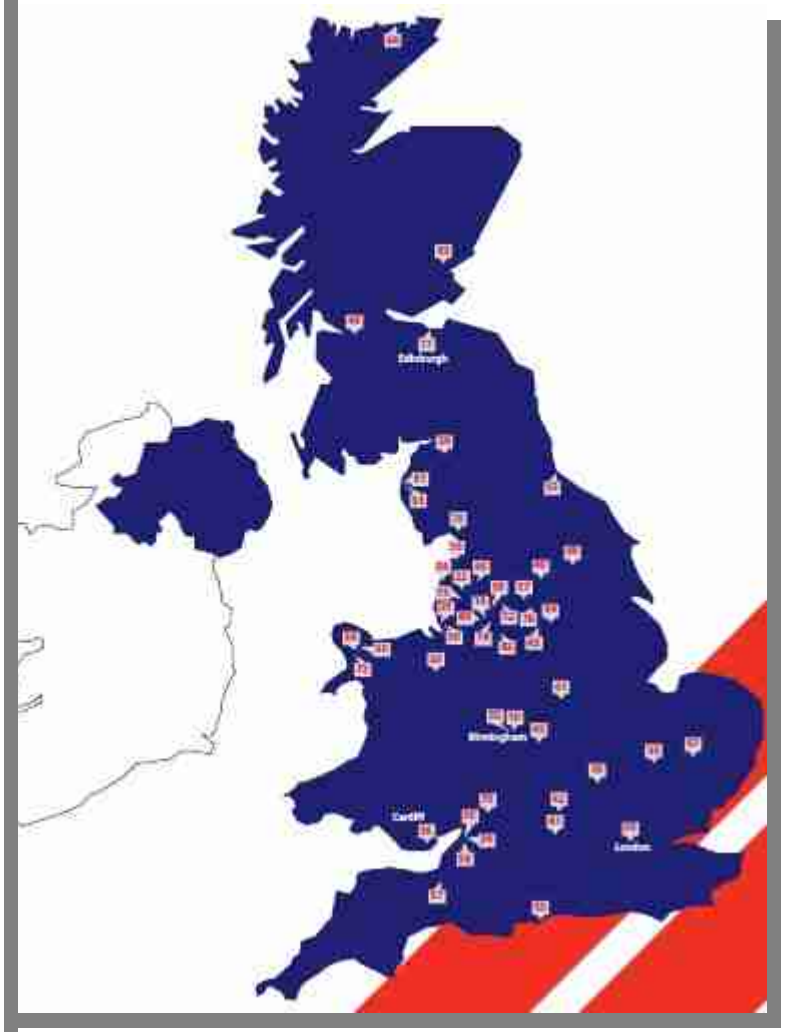
...and more initiatives like this!!!

- Interaction/engaging with the industry
- Flexibility and adaptation to the market needs
- Exchange – ELINDER...

Foreign & Commonwealth Office

The National Skills Academy
NUCLEAR

UK Nuclear Education, Skills & Training Directory



https://www.nsan.co.uk/providers/uk-nuclear-education-skills-and-training-directory

UNIVERSITY OF BIRMINGHAM

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About the university

The University of Birmingham was established by Queen Victoria by Royal Charter in 1900 and was the UK's first civic or "redbrick" university. Today Birmingham University is ranked in the top 100 out of over 8,000 universities in the world, in both the QS academic ranking of world universities and Times Higher Education world university rankings.

As a research-intensive institution, the University is committed to carrying out research that is world leading in terms of its originality, significance and rigour. Its research power derives from the breadth and depth of expertise across disciplines and the opportunities this creates for multi- and inter-disciplinary links and broad, thematic topics. Overall RAE results show that 90% of the University's research has international impact. Eight alumni and staff have been recognised with Nobel Prizes.

There are currently 4,500 international students from 150 countries amongst the student community – the fourth-largest population of international students at any UK Higher Education Institution, and the largest international postgraduate community in the UK.

UNIVERSITY OF BIRMINGHAM

Research and development

The University of Birmingham has a long and established track record in working in areas including nuclear engineering and nuclear waste management and decommissioning dating back to the first phase of nuclear construction in the 1950s.

The equivalent of 27 full-time academics and PhDs are working on the nuclear areas summarised below:

Fuel fabrication	0
Reactors	11
Spent fuel handling	3
Waste	5
Decommissioning	2
Fusion	2
Other	0
Total	27

Of particular note are:

- Extensive expertise in nuclear materials, with experience in life extension, materials irradiation, CRUD deposition and reactor corrosion and reactor graphite. The University possesses an MC40 cyclotron which is used for materials irradiation programmes.
- Programmes in nuclear waste management and decommissioning including corrosion of stainless steel waste canisters, robotics for decommissioning, mitigation programmes for radionuclides in the environment including novel bio-molecular sensors, strong programmes in hydrology and waste repository characterisation, characterisation of graphite inventory in AGRs for decommissioning.
- Nuclear chemistry, including the development and characterisation of radionuclide filters, and theory of uranium and plutonium oxide associated with fuels.
- Links to the Culham fusion programme including neutronics programme.
- A cyclotron facility for the production of medical and PET isotopes, with a world-leading Positron Emission Particle Tracking Facility.
- The development of virtual training environments for medical and military applications, including training of submariners on nuclear submarines.
- The development of non-destructive assay techniques.
- A leading role in the development of nuclear policy.

Nuclear education programme

Undergraduate courses

Nuclear Engineering MEng; Nuclear Science and Materials BSc.

Postgraduate courses

Birmingham University runs the UK's longest-established masters course in reactor technology (over 50 years) – Physics and Technology of Nuclear Reactors MSc. This course delivers 30-40 graduates per year, of whom 80% progress to careers in the nuclear and radiological sectors. The course is sponsored by the nuclear industry. In 2013 Birmingham started a new masters degree – the Nuclear Waste Management and Decommissioning MSc – which draws on expertise across the University in earth sciences, chemistry, materials, physics and nuclear science.

UNIVERSITY FACTS

26,000 students; ranked overall **10th** university in the UK in the Sunday Times League Tables; **77th** in the QS world rankings; impressive graduate employment, with **84.5%** of its students in graduate level work within 6 months of graduating, higher than both Oxford and Durham.

Birmingham

Nuclear Education Programme

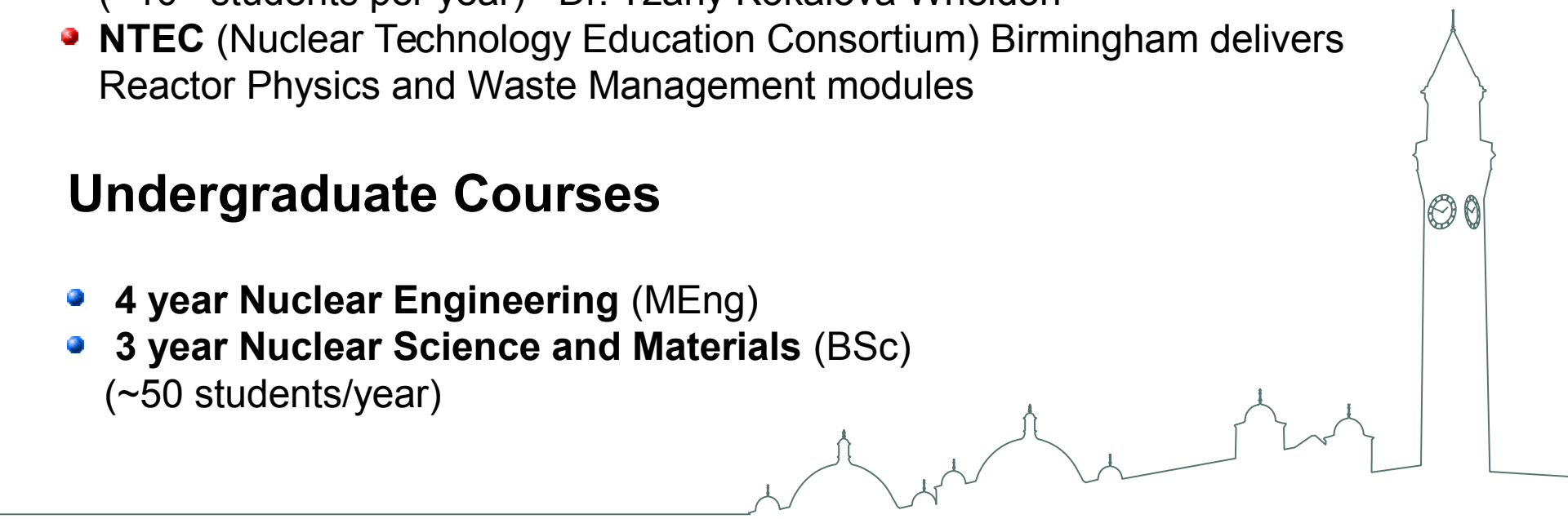
Masters Level Courses (Postgraduate):

- **Physics and Technology of Nuclear Reactors** [PTNR] (~50 students/year) – Dr. Paul Norman
- **Radioactive Waste Management and Decommissioning** [NDWM] (~10 students per year)– Dr. Tzany Kokalova Wheldon
- **NTEC** (Nuclear Technology Education Consortium) Birmingham delivers Reactor Physics and Waste Management modules

Undergraduate Courses

- **4 year Nuclear Engineering** (MEng)
- **3 year Nuclear Science and Materials** (BSc)

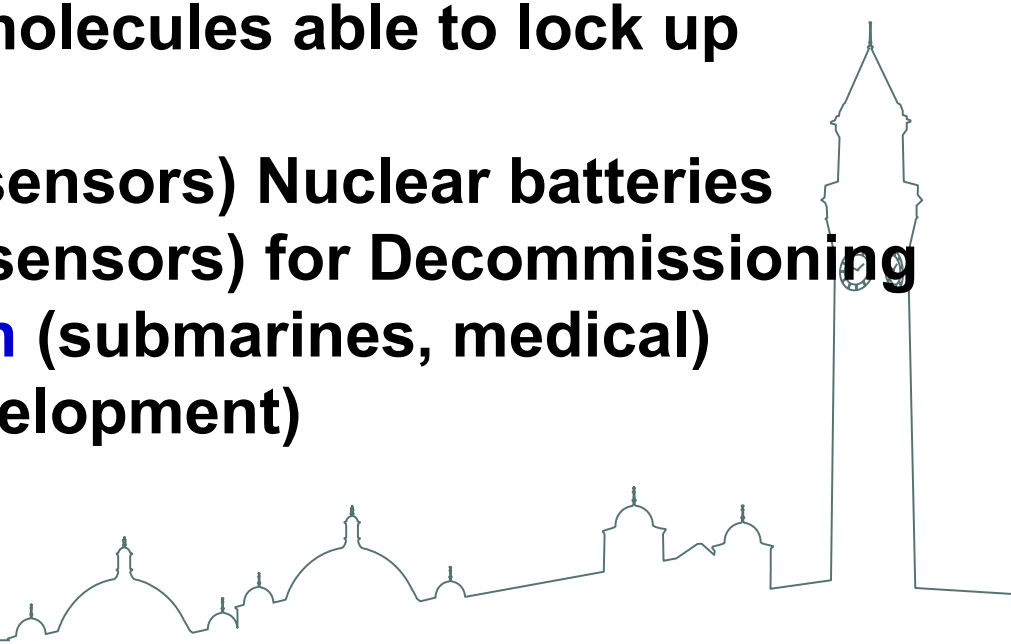
(~50 students/year)



Birmingham

Current Research Portfolio

- **Nuclear Materials** (reactor life extension work, materials analysis of radiation damage,….)
- **Nuclear Chemistry** (development of filters of radioactive waste products, e.g. zeolites)
- **Waste Storage** (materials analysis, geological analysis)
- **Biological solutions** (bio-molecules able to lock up heavy metals)
- **Radiation Sensors** (nano-sensors) Nuclear batteries
- **Robotics** (manipulation + sensors) for Decommissioning
- **3D environment simulation** (submarines, medical)
- **Waste assay** (detector development)
- **Policy**
- **Facilities** MC40 Cyclotron



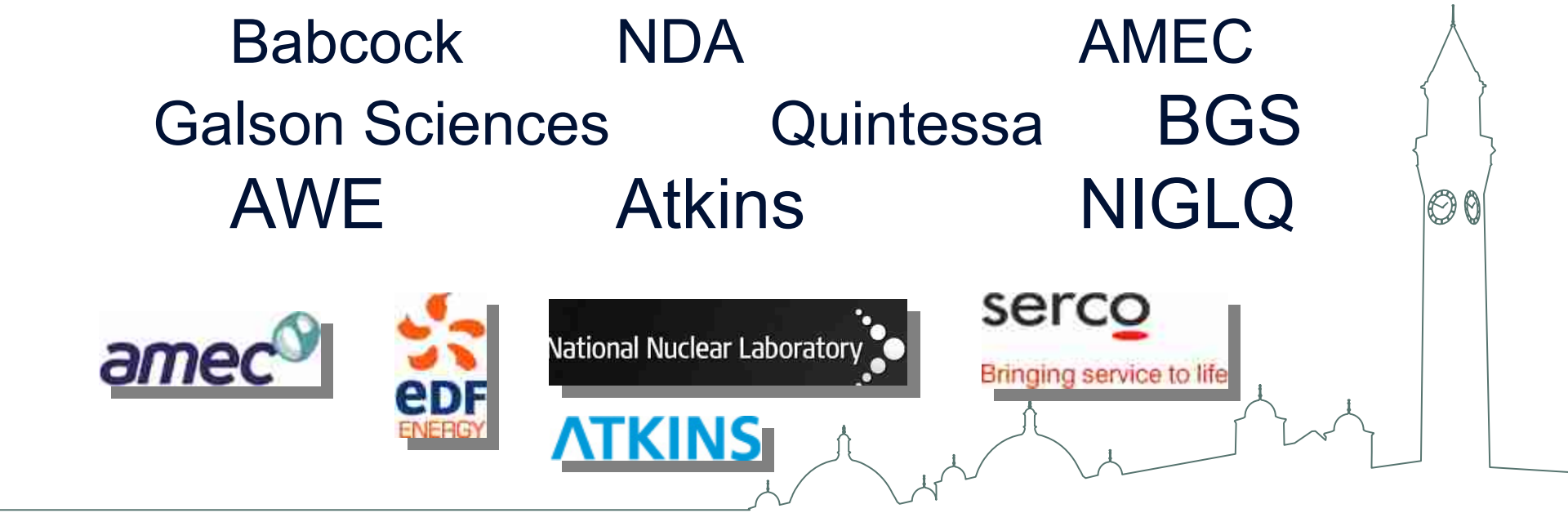
Steering Committee

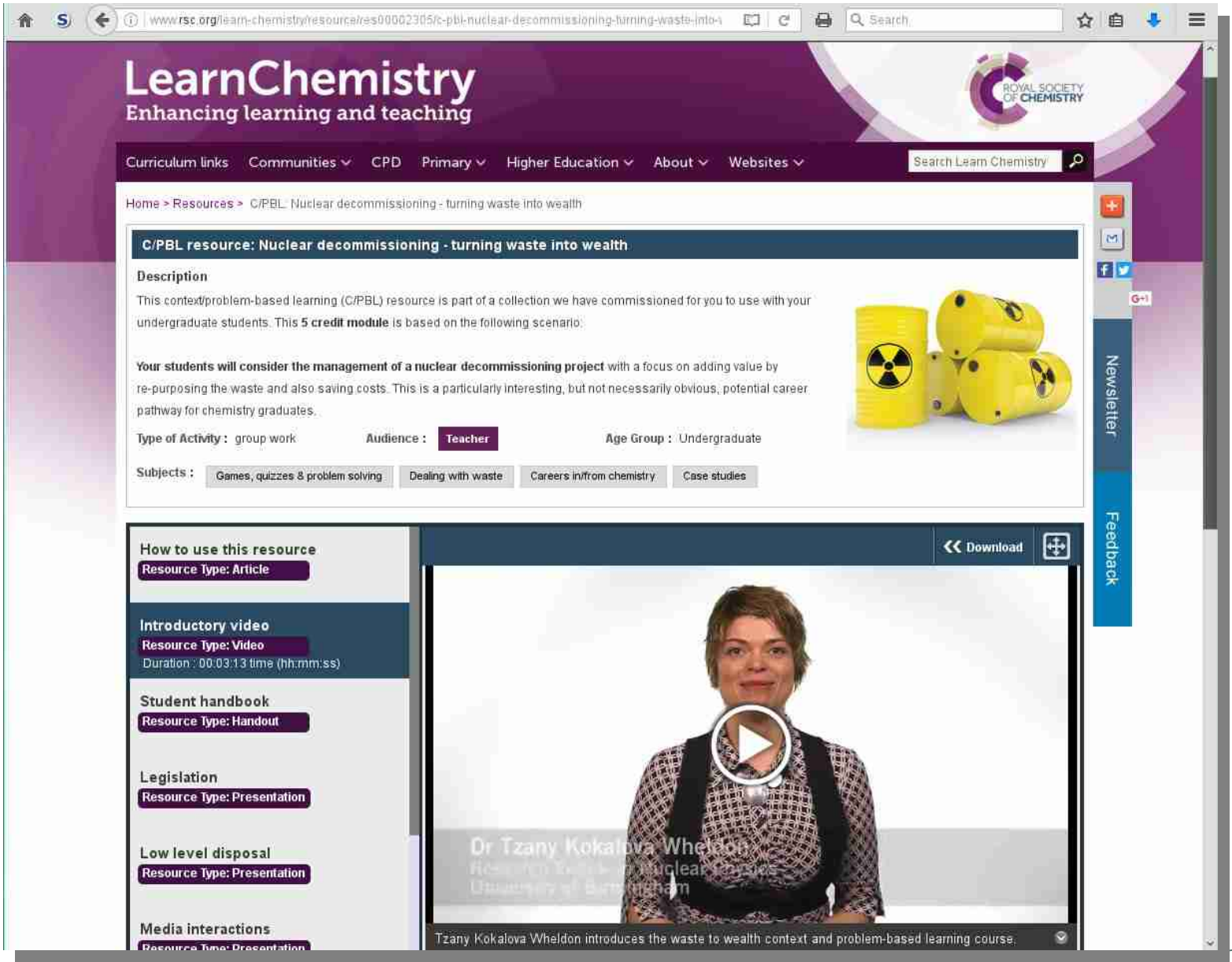
- To ensure that the course is providing students with the appropriate knowledge, skills and training to meet industry needs.
- To provide guidance and feedback on the course content and training.
- **Members:**

Babcock NDA AMEC

Galson Sciences Quintessa BGS

AWE Atkins NIGLQ




www.rsc.org/learn-chemistry/resource/res00002305/c-pbl-nuclear-decommissioning-turning-waste-into-
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Search Learn Chemistry
Home > Resources > C/PBL: Nuclear decommissioning - turning waste into wealth
C/PBL resource: Nuclear decommissioning - turning waste into wealth
Description
This context/problem-based learning (C/PBL) resource is part of a collection we have commissioned for you to use with your undergraduate students. This 5 credit module is based on the following scenario:
Your students will consider the management of a nuclear decommissioning project with a focus on adding value by re-purposing the waste and also saving costs. This is a particularly interesting, but not necessarily obvious, potential career pathway for chemistry graduates.
Type of Activity : group work
Audience : Teacher
Age Group : Undergraduate
Subjects :
Games, quizzes & problem solving
Dealing with waste
Careers in/from chemistry
Case studies
Newsletter
Feedback
How to use this resource
Resource Type: Article
Introductory video
Resource Type: Video
Duration : 00:03:13 time (hh:mm:ss)
Student handbook
Resource Type: Handout
Legislation
Resource Type: Presentation
Low level disposal
Resource Type: Presentation
Media interactions
Download
Dr Tzany Kokalova Wheldon
Tzany Kokalova Wheldon introduces the waste to wealth context and problem-based learning course.

THANK YOU FOR YOUR ATTENTION
and
Best wishes to ELINDER!

The JOB…

Development of an airborne system for Nuclear Decommissioning and radiation surveys

MSc Thesis: Antonio di Buono