

The UK Nuclear Power Industry

An overview - A bright future for nuclear power



The UK has a rich legacy of skills related to the nuclear power industry which have been built up over half a century, stemming from the world's first commercial nuclear power station constructed at Calder Hall, Cumbria, in 1956. The UK's nuclear power industry is large and employs approximately 56,000 people, *providing the country with about 20% of its electricity* via the National Grid and the electricity distribution companies.

The Government is currently investing in all sources of "low carbon energy" and this includes nuclear power, as well as renewables such as wind/solar power and carbon capture and storage. Nuclear power is seen as a long term energy solution for the UK and *11 sites have now been nominated to host new nuclear power stations*. Nuclear energy, which is based on the use of uranium as a raw material, provides an important long term energy supply.

The main activities of the industry:-

A major technical and engineering challenge for the industry is the **decommissioning** and **clean-up** of the industry's older power stations and fuel processing facilities. These were built in the 1940s, 1950s and 1960s, and the decommissioning programme is already well underway. The Nuclear Decommissioning Authority (NDA) has the responsibility for managing this and is *decommissioning 20 nuclear sites safely, securely, and cost effectively, while at the same time protecting the environment*.

The nuclear fuel cycle is where uranium is made into fuel, used in the power station to produce electricity, and then recycled or disposed. These operations are of major international importance, and the skills of people employed by UK nuclear power companies are in demand to support other countries in developing their own nuclear power infrastructure. The sector also provides power to the **defence industry**, including supplying 15 nuclear submarines.

The combination of the decommissioning programme of old power stations, and the nuclear new-build programme of new sites, will create a demand for people with STEM skills to help to meet the challenge of providing an important contribution to the UK's energy needs in the twenty-first century. This future labour market demand will increase due to the *large number of employees retiring from the industry in the next 15 years*.

Dr. Brian Murphy, Cogent Director of Research, in reaction to the news of 11 new nuclear sites to be developed, said (16 April, 2009) "If we replace current nuclear generating capacity we will require skills to be transitioned from power generation to decommissioning and back to new generating capacity again....We are at a critical point when the future is becoming clearer. At a time when the economy threatens the jobs of many, *nuclear offers a secure future and one which strategically underpins the infrastructure of our society and economy – power*."

It's not all White Coats and Homer Simpson...

The National Skills Academy for Nuclear has been developed by nuclear employers to aid in the training of people in the nuclear sector. One of the main concerns of nuclear employers is a shortfall of people choosing to study science.

Cogent Sector Skills Council (the SSC for the nuclear industry) did some research into young peoples' views of the nuclear industry as they were concerned about their image. Here are some words used by young people to describe it:

- *Controversial*
- *Uncertain*
- *Explosive*
- *Scientists in white coats*
- *Men with radioactive power suits*
- *Nuclear waste*
- *...Homer Simpson!*

Mythbuster – there is much more to this misunderstood industry than meets the eye! It is a large and economically important sector which has an exciting future and there are a range of roles within it. In fact *many of the young people who were interviewed said they would like to know more about this important industry* – admitting they did not really understand what it was all about. Here are some facts:-

- The nuclear power industry has one of the best safety records going
- It produces fewer greenhouse gases, unlike all the fossil fuels and is considered to be a “greener” form of energy
- All UK nuclear wastes are safely managed – in fact the UK has managed its radioactive waste safely for over half a century
- The electricity provided in the UK through nuclear power saves the equivalent of the carbon emissions from all the UK's cars on the road

What has the Nuclear Power Industry got to offer?

The nuclear power industry needs more young people to take up STEM subjects. *Research shows that the industry needs about 1500 recruits per annum.* There are many different routes into the nuclear sector from apprenticeships, to joining as a graduate. Opportunities include the design and construction of the new power stations, the processing and manufacturing of nuclear fuel, maintaining the UK's nuclear powered submarines, operating the UK nuclear sites or dismantling the redundant facilities.

Apprenticeships

The Cogent Apprenticeship Frameworks for the nuclear industry provide work-based training that have been designed by employers. Level 2 Apprenticeships and Level 3 Advanced Apprenticeships are available, and nuclear employers can decide which occupational role they would like the apprentice to specialise in, for example:

- Process Operator
- Decommissioning Operative

Varied apprenticeship schemes are available



Lesley Bowen, Head of Education, Training & Development at Sellafield Ltd. which has sites in Cumbria and Cheshire, says:

“Sellafield are carrying out some of the most innovative and complex nuclear decommissioning in the world. We are committed to supporting the development of young people in our operational and decommissioning phases through the Cogent Apprenticeship Framework. The apprentices have the advantages of getting paid while they learn and once trained, can work anywhere in the world.”

An apprenticeship can lead to a top ranking career in the Sector.

National Nuclear Laboratory Technical Assistant, Katie Maxwell, recently scooped the prestigious National Skills Academy for Nuclear Apprentice of the Year Award, 2008. Her work supports NNL services for customers in converting waste liquids into a glass form. She also works on laboratory management by making operator rounds to make sure facilities are kept operationally safe. Katie is also responsible for maintaining a local chemical database. Katie’s response to the award was:



Katie Maxwell receiving her Nuclear Apprentice of the Year Award in 2009

“I couldn’t believe it. I knew there was strong competition so this is particularly pleasing. I thoroughly enjoy the work I’m conducting and it’s a great time to be involved in research work at the National Nuclear Laboratory”.

Degree Level Entry

Many undergraduate engineering and physics degrees (BEng, MEng, BSc, MPhys, MSci) have nuclear options, experiments and projects which could contribute up to 30% of the final degree mark. Indeed, for an undergraduate programme to be accredited by the Institute of Physics it must meet requirements for nuclear physics coverage. The word “nuclear” is not in these degree titles.

The following are the only degrees offered below Masters level with “nuclear” in the title (apart from – “with nuclear astrophysics” degrees at the University of Surrey):-

Lancaster University

- “Nuclear Engineering”

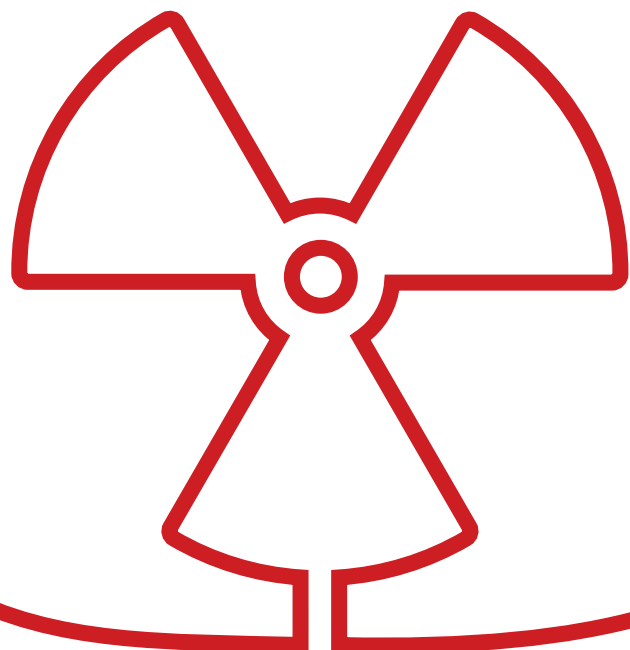
University of Central Lancashire

- “Nuclear Decommissioning”
- “Nuclear Related Technology”
- “Nuclear Project Leadership”

Imperial College, London

- “Mechanical and Nuclear Engineering”
- “Chemical and Nuclear Engineering”
- “Materials and Nuclear Engineering”

There are also Graduate Schemes designed specifically for the nuclear industry. The Nuclear Decommissioning Authority (NDA) have developed a world class graduate programme. This is the most comprehensive graduate programme the energy industry has ever seen, with 20 of the country’s leading companies involved including Rolls Royce, BAE Systems, Sellafield Ltd., Toshiba, Atkins, Amec, Jacobs, Ministry of Defence and the NDA. Further details on how to apply can be found at: www.nda.gov.uk/recruitment/nucleargraduates



Case studies

The sector needs young people for its world class graduate programme



1. Linda

Commercial Manager,
British Nuclear Fuels plc,
(BNFL) Sellafield

How did you get started in the nuclear industry?

I graduated with an MSci Degree in Mathematics from the University of Glasgow and followed it with a Postgraduate Diploma in IT. I had never considered a career in the nuclear industry, but while I was at an assessment centre for IBM another candidate mentioned BNFL. When I investigated this further, I thought it looked interesting, applied and was ultimately offered a job at Sellafield on the graduate development programme. *In my experience, being female in the nuclear industry has not posed any difficulties*

What is your role at BNFL?

I started in the High Level Waste Plants department on the programme concerned with the return of High Level Waste to overseas reprocessing customers in Japan and Europe. As a mathematician, I am accountable for maintaining and developing mathematical models for a variety of purposes from risk modelling of plant processes to the radiological modelling of High Level Waste transport flasks.

What did you do on your graduate scheme?

As part of the graduate scheme, graduates have to do a three to six month secondment. My secondment was into the commercial department to work as part of a small team leading Sellafield's contribution to the implementation of the Energy Act, 2004, and the creation of the Nuclear Decommissioning Authority (NDA). This secondment has helped me to stay in the commercial department where I carry out a number of roles including Cost/Price Analyst and Commercial Manager for all of Sellafield's functional areas (Environment, Health & Safety, Information Systems and Technology).

What are your future plans and aspirations?

I plan to stay in the nuclear industry for the foreseeable future, probably remaining in the decommissioning and clean-up area. However, *I am aware of the range of opportunities that will arise as a result of nuclear new build and I am delighted that even more opportunities will be available.*

I am chair of The British Nuclear Energy Society Young Generation Network. This is a national group of over 600 young professionals working, studying or simply interested in the nuclear industry. The group responds to consultations on issues that affect the nuclear industry, particularly the younger members. I enjoy my involvement in this group and the chance to highlight important issues such as the skills shortage in the industry.

Help and advice is available to new graduates



2. Ezzat

Chemical Engineer,
Magnox North

What are your specific roles at Magnox North?

I've been heavily involved in radioactive water treatment since starting last year. Water is used quite a lot to 'wash' radioactive contamination off certain components resulting in demand for new treatment plants to be designed and commissioned on most power stations. I'm currently involved in the commissioning of a radioactive water treatment plant in Hunterston in Scotland. I carry out tests on the plant, writing work instructions for operators and playing an active role in coming up with solutions when things go wrong!

Do you have any advice for a new graduate?

Being an engineer in the nuclear industry requires working to the highest standards of safety and reliability. Complying with all the regulations in place to ensure this happens gives you the chance to work as part of a meticulous design process. *This offers a great foundation to build a career.* My advice would be to pursue what you want – it's your career and you have the right to choose what you want to get involved in. Be bold!

What are your comments about the graduate scheme?

The graduate scheme here at Magnox North is a real plus. The courses you get sent on are really useful and making new friends with all the other graduates who are in the same boat as you is reassuring. *You get the feeling that the company cares about the early development of your career* – I have a mentor and a detailed 'development plan', which both serve to lead me in the right direction.

What do you see as the highlights of the job so far?

The highlight so far has to be playing a big part in the commissioning of the new active effluent treatment plant. It's given me real insight into the complexity of a technical project – all the different parties involved and all the opportunities that arise from dealing with so many people. It's been great getting my hands dirty while at the same time realising the fruits of my efforts sat at a desk!

What are your hopes for the future?

I intend to build on the experience I've gained so far and become a chartered chemical engineer in the not too distant future. This will enable me to get involved in more interesting projects, take on more responsibility and offer more valuable technical input. *Chemical engineering is so varied* – you can design plant to process anything from chocolate biscuits and loo roll to pharmaceuticals and radioactive sludges, and I'm really looking forward to broadening my horizons.

Websites and links to Classroom Resources

- www.cogent-careers.com – shows all the roles in the nuclear industry, including where the job fits into the organisation, the work area, the key responsibilities, and the typical day-to-day duties which the post-holder will be expected to carry out. *Education and qualification requirements are set out – and of course the salaries*
- www.nuclear.nsacademy.co.uk/teacher-zone – resources for the topic of Nuclear in the classroom
- www.nuclear.nsacademy.co.uk/teacher-zone/energy-foresight-programme :- module in KS4 for science which deals with radioactivity and related issues; the programme encourages students, teachers and parents to develop their own thoughts around moral and ethical issues related to the nuclear industry
- www.succeedingwithscience.com/about/ – part of the education programme supported by Sellafield Ltd. (on behalf of the NDA) with resources produced for teachers by teachers: as teaching aids they are designed to fit precisely into the curriculum, and are recommended by examining bodies, curriculum advisers and subject co-ordinators
- www.upd8.org.uk/activity/180/Nuclear-power-the-great-debate.html – classroom activity looking at issues related to our future electricity supply
- www.ntec.ac.uk/intro.htm – the Nuclear Technology Education Consortium (NTEC) consists of 11 universities which provide postgraduate-level training for the nuclear sector designed to meet the UK's projected nuclear skills requirements in decommissioning reactor technology, fusion and nuclear medicine
- www.niauk.org – the Nuclear Industry Association (NIA) represents over 100 companies and contains links to current publications about nuclear energy
- www.nda.gov.uk – the Nuclear Decommissioning (NDA) site which provides updates on the progress of the decommissioning programme
- www.nuclearinst.com – the Nuclear Institute promotes public understanding of developments in nuclear technology

Acknowledgements – Mary Kinsella, Communications Manager, National Skills Academy Nuclear and Judith Holcroft, Communications Manager, Cogent Sector Skills Council who sourced most of the material for this industry focus, and provided the case studies.