Insight into Nuclear Sector skills requirements

South West Region
Skills and Employer Responsiveness (SER) programme

Summary

This report has been prepared by Bridgwater College in partnership with the National Skills Academy for Nuclear as part of the Learning and Skills Improvement Service's Skills and Employer Responsiveness (SER) programme run in the South West and to support an 'Insight to Nuclear' Workshop organised by Bridgwater College. This workshop aimed to give teaching professionals in the post-16 adult education and training sector an insight into the nuclear industry, helping them to gain a better understanding of the working environment within the Nuclear Power Industry and highlighting the career opportunities that the Industry and its supply chains can offer.

Bridgwater College has been working in partnership with nuclear industry employers since 2006 developing radiation control and nuclear decommissioning qualifications. The college hosts the hub for the south west network of the National Skills Academy for Nuclear and is a quality assured training provider.

Sector relevance

This case study is aimed at a range of individuals and teams within training provider organisations and should be particularly interesting to staff in FE colleges, sixth form colleges and private work-based learning providers who are engaging, or are seeking to engage with employers in the civil nuclear power sector and its supply chains.

Background to nuclear power generation in the UK

Nuclear power has been used as an energy source in the UK since 1956 when the UK's first commercial nuclear power station came into operation. By 1997, over 40 years later, the industry supplied over a quarter of the UK's electricity. Due to the age of many stations and the need for decommissioning, by 2010 power generation from the nuclear industry had decreased to approximately 17% of the UK's overall electricity supply.

Recently there has been a nuclear renaissance in the UK, partly because of its low carbon credentials and the Government's pledge to significantly reduce carbon emissions in the Low Carbon Act in response to climate change; and partly because of an ever-increasing demand for energy, the need for security of supply and the instability of energy prices. These factors combined have contributed to placing 'low-carbon new-nuclear' back in the future energy generation mix, alongside emerging low carbon renewable technology, to power the future needs of the UK.

There are currently two active nuclear sites in the South West of England – one in Somerset (Hinkley Point) and the other in Gloucestershire (Oldbury). Both locations have been identified as suitable sites for the building of the next generation of low carbon nuclear stations – which will include a twin EPR reactor station adjacent to Hinkley Point B (AGR) and Hinkley Point A (Magnox). NNB Genco plans to build two Hinkley C reactors; the first is due to be commissioned for the generation of power in 2018 and the second in 2019.

Following the developments in Somerset, Horizon Nuclear Power plans to build either a twin EPR reactor station or a triple AP1000 reactor station adjacent to the existing Magnox Station at Oldbury. Horizon Nuclear Power is expected to make their reactor technology choice in 2011. This new station at Oldbury will be commissioned for generation in 2022/23 (four years after Somerset).

There will be implications for the workforce in terms of the transferability of skills between sites in view of the development plans for the South West and the UK as a whole, and the new nuclear site building process, which is typically six years in the construction phase before generation.

Skills requirements in the South West

In 2010, *Next generation: skills for new build nuclear*, research by Cogent, the sector skills council for chemicals, nuclear, oil and gas, petroleum and polymers, identified over 3,600 people currently employed in the civil nuclear sector in the South West, 78% at a technical or professional level with a minimum of NVQ Level 3 qualification. The ageing profile of the nuclear workforce in the South West means that by 2025 a large proportion of them will be retired: 59% of the current technician workforce, over 63% of the professional workforce and 65% of managers and senior managers. Education and training providers need to be aware of the future skills needs of the industry in the generation phase from 2018 and the construction phase starting next year in 2012.

New build – construction skills

Construction skills to support the building of new nuclear power stations will be the largest and most immediate area of demand for jobs. The main phase of construction for Hinkley Point C will begin in the summer/autumn of 2012. The following paragraphs detail the current and future skills needs identified for the site construction phase based on recent research from Cogent which matches the latest figures from EDF Energy.

During the six-year period in which the twin reactor station at Hinkley will be built, the Cogent estimates that over 13,000 person years of employment will be provided, which averages out at 2167 full-time equivalents over a six-year build phase. Workforce numbers on site will vary depending on the phase of construction but peak numbers have been estimated to be 5,500 in years 4 and 5 with a total of 20,000 to 25,000 individuals accessing the site over the six-year period. Budget estimates vary, but construction cost is expected to fall between £8 and £10 billion, equivalent to the 2012 Olympics.

Within construction it has been estimated that 25% of the workforce will be trained up to NVQ Level 2, e.g. Construction Plant Competence Scheme (CPCS) Operator Card or Engineering Services Green and Blue Cards; 60% to NVQ Level 3, e.g. Assuring Competence in Engineering Construction Card (ACE) or Construction Skills Certification Scheme (CSCS) Gold Card; and 25% at NVQ Level 4 and above, e.g. CPCS Manager Card. For more details see Appendix 1.

The main skill categories for construction operatives at the civil works and mechanical and electrical (M&E) works stages are included in Appendix 2.

New build – manufacturing skills

Cogent estimates that the number of manufacturing jobs created by new nuclear build will be 3,200 person years of employment, which is equivalent to 533 full-time roles. The breakdown at skill level is 15–30% at NVQ Level 2, 30–40% at NVQ Level 3 and 20–40% at NVQ Level 4 and above.

Commissioning and into operational phase

Commissioning and up to the first year of operations will require 5,000 person years or full-time equivalents of 833. The skill levels breakdown within this group are 10% at NVQ Level 2; 40% at NVQ Level 3 and 45% at NVQ Level 4 and above.

Many of the commissioning personnel will move into operational roles to support the plant in its initial operational life span of 40 years (which may well be extended to 60 years). The full-time workforce during operations will be approximately be 800 full-time employees with 200 embedded contractors.

With two new-build sites identified in the south west there will be an overlap in their construction phases from 2017 to 2019 which will effectively extend the construction phase in the south west to 10 years from 2013 to 2023 and is the equivalent of two Olympics being built in the south west.

Decommissioning workforce

Over the next five years the decommissioning sector in the South West will grow. Oldbury will be decommissioned in 2012 and Hinkley Point B is planned to be decommissioned then, too, although there is a realistic possibility that it will have a lifetime extension to 2021. There is an opportunity to re-skill workers who have operational skills with decommissioning skills, the ageing profile in the south west would still leave a 15% gap to bridge by 2025.

Behavioural competency

Safety is paramount in the nuclear industry and personnel are trained to work to high standards and to reduce risks and errors to ‘as low as reasonably practicable’ (known as ALARP). This requires among other things, effective communication between individuals and teams, taking a flexible approach, solving problems and dealing effectively with change to overcome business environment challenges and seek opportunity.

Most companies in the nuclear industry operate behavioural competency models that are key to achieving the required quality and safety standards.

For more information on behavioural competency models please refer to Appendix 3 detailing the model used by Magnox South, which will be similar to models used by the rest of the industry.

The role of the National Skills Academy for Nuclear in supporting skills development

The National Skills Academy for Nuclear is working with nuclear industry employers to develop industry-wide training standards and qualifications. To support this work they are also developing a network of quality assured training providers that will be able to provide industry-standard training and qualifications to the site licence companies and supply chain.

Bridgwater College is a quality assured training provider and also the regional hub for the South West network of the National Skills Academy for Nuclear (NSA-N).

The Nuclear Skills Passport

The new Nuclear Skills Passport (NSP) was developed by the National Skills Academy for Nuclear and the nuclear industry to support the drive to increased staff transferability and to constantly improve the level of nuclear professionalism across its workforce. It is now being rolled out across the nuclear industry.

Historically individual nuclear sites have trained employees and contractors to their own high standards, but when staff transfer to different facilities, their previous training is not recognised. This leads to duplicate training and acts as a barrier to the mobility of this highly trained workforce.

The NSP is bringing about a step-change for the nuclear sector; it will be a national repository for the training records of all industry personnel. It will also contain information on new industry training standards, detailed industry job roles (also known as Job Contexts) and the availability of training through the quality assured training providers network. This information, supported by a suite of analysis tools, will allow individuals and organisations to manage their career and skills development by identifying skills gaps.

Bridgwater College, as a quality assured training provider, will offer the NSP to help employees address these gaps.

The five key elements of the Skills Passport concept

1	A web-based accessible learner database that provides a registry of training records for individual passport holders and the facility to generate a skills passport card. Roles, qualifications and Industry Training Standards held on the Nuclear Industry Training Framework (NITF), which was developed by Cogent and endorsed by employers through the Skills Passport User Group and the Nuclear Employers Steering Group
2	Dataset repository for Job Contexts. Job Contexts are agreed common job roles across industry aligned with associated competencies are aligned.
3	Benchmarking tool that supports and enables upskilling and workforce mobility across the sector – enables existing employees' skills to be recognised and mapped against defined standard industry Job Context roles, highlighting gaps in skills and/or training.
4	Training signposting tool that supports upskilling by signposting learners to Skills Academy quality assured training provision (courses/programmes/qualifications) to meet any identified skills gaps. Offers a simple modular approach to closing skills gaps through continuous learning and development with accreditation against national industry standards.
5	A reporting suite that generates statistics at industry, regional and corporate levels. The Nuclear Skills Passport working with quality assured training providers will help companies plan, develop, maintain and demonstrate their nuclear expertise; this in turn will help them win future contracts in growth markets such as new build and decommissioning.

Appendix 1 Background to the evolution of the Nuclear Industry in the UK

Nuclear power has been used as an energy source in the UK since 1956 when the UK's first commercial nuclear power station came into operation at Calder Hall in Sellafield. By 1997, the industry supplied over a quarter of the UK's electricity but since the decommissioning of older stations, power generation from the nuclear industry has reduced in the UK to approximately 17% of the overall electricity supply.

The reactor type at Calder Hall is known as Magnox, a term derived from the alloy used in fuel rod construction, and was the design used in the first generation of nuclear power stations.

Eleven Magnox stations were built; the last one on Anglesey began commercial operations in 1972. Only two now remain in operation, Oldbury, north of Bristol, and Wylfa at Anglesey. Both are due for decommissioning in 2012.

The second generation of nuclear power stations are known as Advanced Gas Cooled Reactors (AGRs) and, like the Magnox reactors, use carbon dioxide as a coolant with graphite as a neutron moderator. These second generation stations were designed to be more thermally efficient running at higher temperatures and pressures. In total seven AGR stations were built – the last one beginning commercial operations in 1989. Decommissioning of the AGR fleet will begin in 2014 with the last station due for closure in 2023.

In the 1990s a third generation of nuclear power stations was planned, with reactor technology switching from gas-cooled to water-cooled reactors. However, only one of these new stations were built at Sizewell; it is known as 'Sizewell B' and entered service in 1995. The rest of the new build programme was cancelled and Sizewell B is due for decommissioning in 2035.

In 2008 the UK Government gave the go-ahead for a new generation of nuclear power stations. Currently three consortia are planning to build new stations – NNB Genco (EDF Energy and Centrica), Horizon Nuclear Power (RWE npower and E.ON UK) and NuGeneration (GdF Suez, Iberdrola and Scottish and Southern Energy). Two reactor designs are currently being assessed for licensed operation in the UK through a process known as Generic Design Assessment or GDA. These are the Areva European Pressurised Reactor (EPR) design and the Westinghouse AP1000 design. So far only one consortia has chosen – NNB Genco has chosen the Areva EPR design.

South West perspective

Two sites have been identified in the South West for new nuclear build: Hinkley Point in Somerset and Oldbury in South Gloucestershire.

NNB Genco is planning to build a twin EPR reactor station adjacent to Hinkley Point B (AGR) and Hinkley Point A (Magnox). This twin reactor station will generate almost three times the output of the existing AGR station. The first reactor is due to be commissioned in 2018 with the second reactor commissioned in 2019.

Horizon Nuclear Power is planning to build either a twin EPR reactor station or a triple AP1000 reactor station adjacent to the existing Magnox Station at Oldbury. They are expected to choose their reactor technology by Autumn 2011 and the new station at Oldbury will be commissioned in 2022/23.

In addition to the new build programme the South West will have a growing decommissioning programme. It already has two stations that are being decommissioned, Berkeley (inactive since 1989) and Hinkley Point A and in the next five years Hinkley Point B and Oldbury will also be decommissioned.

Appendix 2 Construction phase skills breakdown

Figures from Cogent's Next Generation report, based on the construction phase of a twin reactor station, estimate it will provide over 13,000 person years of employment, which averages out at 2167 full-time equivalents over a six-year build phase. Workforce numbers on site will vary depending on the phase of construction but peak numbers have been estimated to be 5,500 in years 4/5, with 20–25,000 individuals accessing the site over the six years. Budget estimates vary, but construction cost is expected to be £8–£10 billion, equivalent to the 2012 Olympics.

Within construction it has been estimated that 25% of the workforce will be trained up to NVQ Level 2, e.g. Construction Plant Competence Scheme (CPCS) Operator Card or Engineering Services Green and Blue Cards, 60% to NVQ Level 3, e.g. Assuring Competence in Engineering Construction (ACE) card or Construction Skills Certification Scheme (CSCS) Gold Card and 25% at NVQ Level 4 and above e.g. CPCS Manager card.

The latest figures from EDF Energy give the following main skill categories for construction operatives in the civil works stage and mechanical and electrical (M&E) works stage:

Civil works stage (operatives)

- Timber/formwork
- Concrete/cement/masons
- Drivers/crane operatives/labourers
- Reinforced steelwork/erectors
- Scaffolders
- Welders
- Civil works labourers/semi-skilled.

Mechanical and electrical works stage (operatives)

- Mechanical and electrical labourers/semi-skilled
- Welders – special metals
- Welders – steel
- Boiler makers; pipe-fitters
- Fitters
- Electricians; electro-mechanical fitters
- Instrumentation

- Cable pullers.

Table 1 shows the breakdown of estimated labour demand during the construction phase covering the civil works peak in April 2014 and the overall labour peak in June 2016. This latter peak incorporates the peak for M&E operatives.

Table 1 Breakdown of estimated labour demand

Main skill category	Civil works peak, April 2014		Overall peak, June 2016	
	% of work force at civil peak	Number	% of work force at overall peak	Number
Civil operatives	68%	3060	13%	740
M&E operatives	7%	300	59%	3290
Operational staff	1%	50	4%	250
Staff and management	19%	870	19%	1050
Site services, security and clerical	5%	240	5%	290
All	100%	4520	100%	5600

Table 2 shows 2008 data from the Office of National Statistics: it gives a breakdown of the available workforce identified by Standard Industrial Classification (SIC) codes in the construction sector overall, the civil engineering sector and related technical services and looks at the workforce availability by geographic area. The upper section of the table looks at the local authority areas at or near the new-build site at Hinkley Point. The lower part of the table looks at the available workforce from the perspectives of the county, a 90-minute commute zone and finally a south west perspective as defined by the boundaries of the South West Regional Development Agency.

Workforce figures for the proposed new build site at Oldbury have not yet been compiled.

Table 2 Breakdown of available workforce

Area	Construction sector (SIC 45)	Civil engineering (SIC 45.2)	Related technical services (SIC 74.2)
Sedgemoor	1870	947	479
Taunton Deane	2279	1366	1546
West Somerset	405	207	54
Sub total	**4554**	**2520**	**2079**
Somerset	9366	4967	3435
90-minute commute zone	47996	24406	20510
South West	98835	49627	36473

Appendix 3 Behavioral competency model

The following behavioural competency model is reproduced with the kind permission of Magnox Ltd.

The Magnox South behavioural competency model reflects 12 key behavioural competencies within four competency quadrants as follows:

Behavioural quadrant	**Leadership quadrant**
Team working Communication Flexibility and adaptability Problem solving	Safety and standards Accountability Developing self and others Managing change Impact and influence
Technical quadrant	**Business quadrant**
Defined in post and training profiles	Delivery Business environment Customer focus

This behavioural competency framework helps line managers to set behavioural targets and evaluate the level of sustained contribution demonstrated through action by team members. It describes the 'how' rather than the 'what'. For example, a delivery target might require a piece of work to be completed by a certain date and the competency target to achieve this (and other delivery targets) might be to demonstrate particular levels of motivation to get the job done, as described in the delivery competency.

Using competencies to support progression recommendations

The following table displays the different levels for team working within the Behavioural quadrant.

Purpose		**Level – typical indicators**	**Core questions**
We need to work cooperatively to encourage team spirit and effective team working. This will enable us to optimise the contribution of everyone and deliver for the business	1. 2.	Understands the benefits of team working. Recognises and places importance on the value of respecting others. Plays a positive role in the team, regularly offering help to others. Treats people fairly and honestly	Is the individual clear about the role that s/he plays within a team? Are they aware of the impact they have on other members and their work? At higher levels does

	3.	Works positively with own team and others. Builds good team relationships by sharing information and knowledge to benefit individual and team contribution.	s/he create opportunities to improve team working within and across teams and create an environment that enables it to succeed?
	4.	Creates a positive team spirit and acknowledges and praises achievements. Provides support even when things are not going well. Works across teams to help achieve improvements.	
	5.	Plays an active role in improving the effectiveness and delivery of teams across the business. Is perceived as a role model and acts as mentor and coach to others.	

Competency purpose

The 'purpose' section in each of the 12 competencies summarises what the competency is all about. When thinking about performance and *how* an individual performs their job, it is helpful to reflect on specific examples: how did that person work with others, what standards did they work to and what results did they achieve/what was the outcome

Typical indicators

Each competency level describes *typical* behaviours. The levels do not provide an exhaustive list, but a few examples that line managers and individuals can use in performance discussions and when agreeing and setting targets. If the examples of behaviour do not readily reflect the nature of the examples supplied, the 'purpose' and the 'core questions' in each competency should help.

Core questions

These help to clarify what behaviours the competency levels are seeking to describe. This section also summarises the differences between the lower and higher levels to enable line managers to judge the level of contribution an individual makes at every opportunity.

Levels

There are five levels in each competency. Competency level 1 reflects a *basic* level of understanding, *building* at each level to *increase* to competency level 5.

The competencies are cumulative, so to be working at Level 2, an individual will need to demonstrate they are also working at Level 1; at Level 3 they will need to demonstrate they are also working at both Levels 2 and 1, and so on. See also 'typical indicators' section above.

Each benchmark role has a competency profile that determines the competency level required to be working at 'spot', and is therefore role specific.

The information in the following table is based on the job specification and training profile of a maintenance technician in Magnox Ltd. The training profile builds on the job specification ensuring personnel are 'Suitably Qualified and Experienced Personnel' (SQEP).

Job specification	Criteria: Essential (E) Desirable (D)
1. Education/qualification/training	
• Appropriate technical qualification, e.g. City and Guilds, BTEC ONC (NQF Level 3)	E
2. Experience/knowledge	
• Relevant experience in technical area	E
• Appreciation of RSA and IRR requirements	D
• Plant operations in areas assigned	D
• Experience of working in the nuclear industry	D

Training profile

Mandatory: The minimum training that must be completed before post holder can commence any task, activity or duty required by the post.

Essential: Training, in addition to mandatory training, which the post holder must complete in order to be declared fully SQEP.

The need for additional refresher training, where not specified below, will be determined by the line manager's judgement/assessment. Where the refresher periods are specified, line managers may identify the need for refresher training at shorter intervals.

Generic technical training

Training requirements	Mandatory/Essential
Basic common induction – nuclear sites	Mandatory
Basic common induction – Magnox South	Mandatory
Human performance error avoidance tools	Essential
Security awareness	Essential
IOSH working safely	Essential
Basic understanding of decommissioning	Essential
Conduct of maintenance	Essential

Business, behavioural and leadership training

Training requirements	Mandatory/Essential
STEP (site-specific technical training) – employee	Mandatory
Stress Awareness	Essential

The training requirement, where not specific to the job but to the ability to apply the skills in question, should be reviewed to meet the needs of the individual during the STEP process.

Site-specific technical training

Training requirements	Mandatory/Essential
Dept and section induction	Mandatory
Dept organisation and interfaces	Mandatory
Major plant systems	Mandatory
Functional activities	Mandatory
Health physics induction	Mandatory
Environmental awareness	Essential
Manual handling awareness	Essential
Asbestos awareness	Essential
Risk assessment	Essential
Point of work safety assessments	Essential
Health Physics Monitoring	Essential

This level of training is repeated across the nuclear industry and highlights the level of investment in personnel to make sure the site license companies comply with the 36 site license conditions laid down by the nuclear regulator.

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