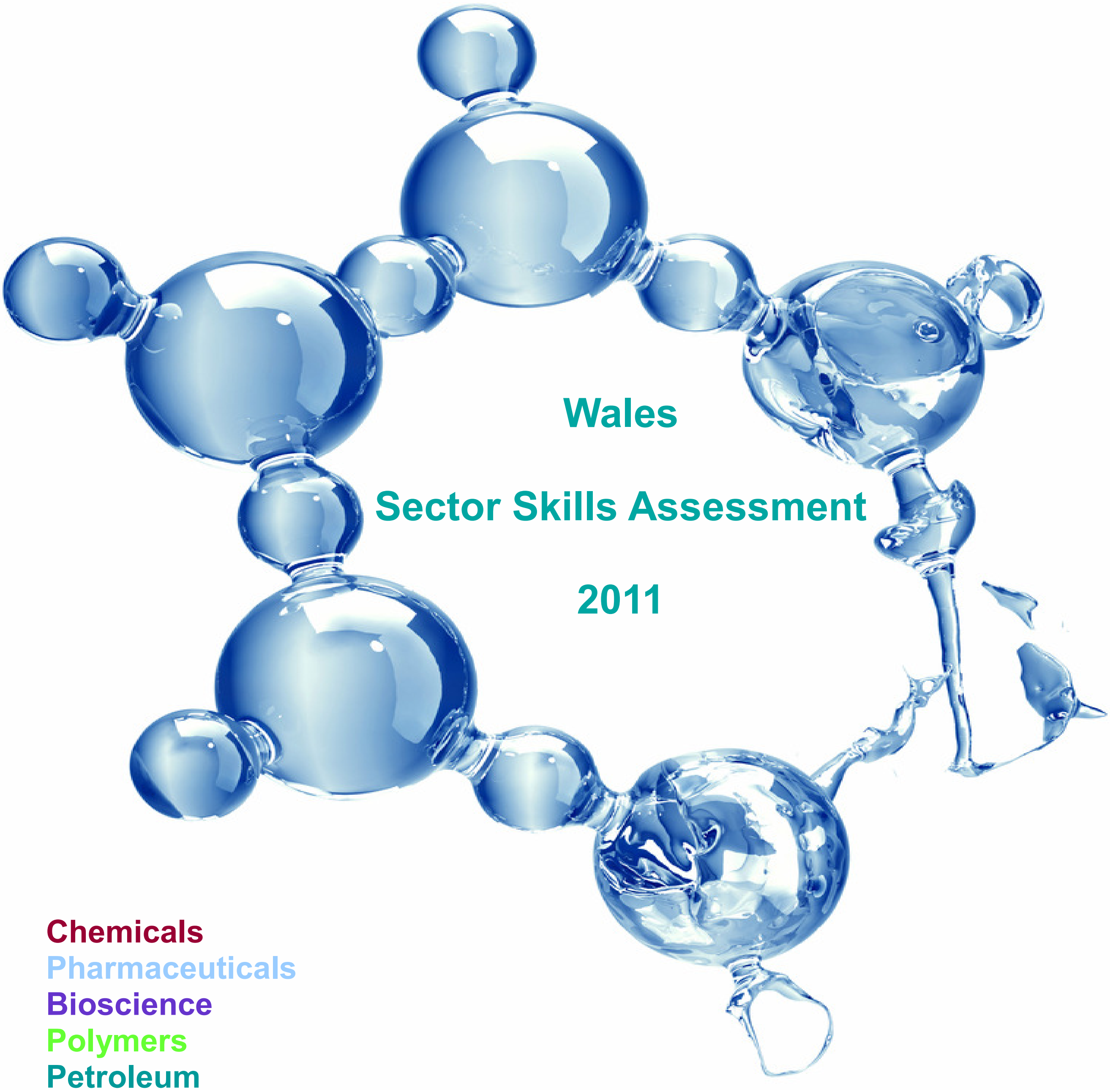
Current and Future Demand for Skills in the Science Based Industries



Wales

Sector Skills Assessment

2011

Chemicals
Pharmaceuticals
Bioscience
Polymers
Petroleum
Oil & Gas
Nuclear

Delivering Skills for Science Based Industries

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1.0 Prologue

*This Sector Skills Assessment for **Wales** is part of a suite of five covering the four nations, together with a main UK wide report reviewing the sector by industry. While each report has been designed to be self-contained and comprehensive in its own right, the complete assessment is formed from the five documents and should be viewed together.*

The year 2010 marked a change in government and the political drivers of the skills system. With a lower emphasis on skills intervention and a shift in philosophy to the choices of individuals and employers on skills, comes a conversely strong emphasis on high quality research that translates to the skills solutions, information, advice and guidance required to inform decisions; decisions that will be made by employers, employees and 'stakeholders' such as qualification awarding bodies, funding bodies, providers of education and training, and (not least) policy developers in government itself.

Nationally and globally the recession continues to dominate. Working through, as it has since 2008, from Banking to Manufacturing, the latest test to the economy will be in the contraction of the public sector over the next four years and the extent to which the private sector can grow to absorb capacity shed by the public sector. Skills for growth are therefore a strategic imperative.

The UK position of skills development in an evermore connected global economy remain as before. In this context, skills contributions to energy, clean water, food, health, a low carbon economy, sustainable development and advanced manufacturing bring both a social and a technological dimension to skills development. This places high importance on the supply and demand for skills in science (physical science and bioscience) and engineering, and the translation of research and innovation into solutions.

There is not a subsector of the Cogent footprint that is either untouched by or driven by this complex set of environmental drivers in play during 2010. This is illustrated in Table 1.0.1 for each of the sectors active in Wales.

Table 1.0.1 Strategic Contribution of Skills in Cogent Sectors in Wales

Sector	Strategic Position
Bioscience	R&D, health, low carbon, sustainable development
Pharmaceuticals	R&D, health, advanced manufacturing
Chemicals	advanced manufacturing, strategic supply chain manufacturing
Polymers	strategic supply chain manufacturing, advanced manufacturing (composites)
Petroleum	energy (fuels), transport infrastructure
Nuclear	energy (electricity), low carbon, energy security

These sectors are diverse in both their markets and their skills drivers but they are united by the underpinning science: all deploy molecular transformations to achieve their products. The most critical occupations that define these industries are those that require knowledge and application in science, engineering, and regulatory affairs. These are manifest in the managerial, professional, technical and associated professional and craft occupations mainly. Cogent research consequently focuses on these occupations.

The following sections explore in increasing depth the sector, its industries, the evidence base and the Cogent research strategy. Where it has not been possible or appropriate to include a full account of research findings, the Appendices contain further information and a full bibliography of recent skills publications by Cogent.

The UK has the 6th largest economy in the world, and 4th in the OECD, but its recovery from the recession that began in 2008, will depend *inter alia* on strong growth in the manufacturing sector, not least the Cogent industries. This is central not only to the immediate contribution to industrial activity, employment and wealth creation, but also to the longer term goal of rebalancing the economy with respect to the financial sector. The Cogent sector in Wales is an attractive target for investment and development, and one which can maintain a competitive edge through its use of intellectual capital.

Finally, this Sector Skills Assessment is published in December 2010. The previous Sector Skills Assessment was published in February 2010. There is consequently some degree of overlap in the coverage of these two publications. While Cogent has sought to keep this to minimum and report new primary research and customized national data, the latest Skills Oracle (see later) does not become available until January 2011.

1.1 Chemicals – a strategic asset
UK Chemical firms are required to offset the lower labour and raw material costs of the emerging markets in Asia and Eastern Europe by adding value to commodities, using lean manufacturing techniques and developing supply chain efficiencies. Mergers and acquisitions are being used to reposition companies to remain competitive, although bulk transport costs limit the distance over which chemicals can be reasonably transported, and in turn the degree of consolidation possible.

Increasingly, rapidly developing economies are exploiting their growing strength to attack traditional high value markets in the UK, Europe and the USA. Nevertheless, PricewaterhouseCooper predicts firms, such as pharmaceuticals, close to world class academic institutions, will remain strong; an analysis that suggests that UK based firms should remain resilient even while they cope with the expiry of patents and the fragmentation of the industry caused by the rise of niche, targeted, therapies.

1.2 Nuclear – secure, low carbon electricity
Nuclear Electricity Generation in 2010 stands on the verge of the largest change of all of the Cogent industries. Against an on-going decommissioning programme which will see the UK capacity fall from 10 GWe to 1 GWe, three private consortia have proposed investment which would result in the construction of 16 GWe of new capacity. This amounts to a major collaborative, privately financed, infrastructure project with a huge demand for high level science and technology skills. Planning to underpin it took a specific step forward in October 2010 with the coalition government's identification of 8 potential sites in its revised draft National Policy Statement. In response to this national proposal, Cogent produced in 2009 an in-depth report, *Power People* (2009), which remains the starting point for an assessment of the industry today. Shortly afterwards it published *Next Generation* (2010), an assessment of the skills impact of a thirteen year building programme based on 6 reactor pairs. Next Generation included an initial risk register that identified where, at this point, skills shortages would pose a particular threat. These included, amongst others, project management, high integrity welding and safety case authoring.

1.3 Bioscience – a new industrial revolution
Alongside the established industries, the Cogent footprint also contains the burgeoning Biotechnology sub-sector. In August 2010 Cogent took on responsibility for the Life Sciences sector from Semta. Both SSCs will continue to work closely together to meet the need the needs of employers in their footprints, and are currently arranging a series of meetings with stakeholder groups across the UK to

agree new operational arrangements in each nation, and make arrangements for the handover of existing projects, where appropriate. The new arrangements will build on Cogent's existing remit for the Pharmaceutical Industry and provides the Life Sciences sector with 'one voice' to speak clearly to Government and Academia on skills issues.

International statistics for biotechnology confirm the dominance of health. In contrast, there is a paucity of data for industry and primary production to demonstrate significant commercial penetration. Small businesses dominate the landscape of biotechnology and outsourcing of specialist services is prevalent. There is evidence of continued growth in medical biotechnology and rapid development of parts of industrial biotechnology, e.g. speciality chemicals (supply chain to the pharmaceuticals industry) and steady development on others (e.g. energy, environment, materials); and slow development in agricultural biotechnology.
The latest biotechnology data for the United Kingdom confirm that the United Kingdom has a major global profile in medical biotechnology. The data demonstrate that the bioeconomy is dominated by health. The proportion of companies in medical biotechnology that are SMEs is extremely high at 99%, while the proportion of companies in medical biotechnology with fewer than 50 employees is also high at 90%. Total employment in medical biotechnology is estimated to be of the order of 24,000. Industrial biotechnology was recorded in the National Strategic Skills Audit (UKCES 2010b) as one of six strategic advanced manufacturing sub-sectors for their importance in the supply chain of numerous established sectors, and for their potential contribution to a low-carbon economy.

1.4 The workforce today

As would be expected in a sector reliant on science and technology, the Cogent Workforce is generally highly qualified workforce. Table 1.0.1 shows the distribution of qualifications across the Cogent industries, and in comparison with the UK as a whole.

Table 1.0.1 Workforce Qualifications

	Level of highest qualification held						
	S/NVQ 4 +	S/NVQ 3	Trade Apprenticeships	S/NVQ 2	Below S/NVQ 2	No qualifications	**Total**
Oil and Gas	46%	19%	12%	12%	8%	4%	100%
Petroleum	26%	19%	5%	22%	16%	13%	100%
Nuclear*	38%	33%	5%	20%	3%	1%	100%
Chemicals	47%	14%	6%	14%	12%	7%	100%
Pharmaceuticals	58%	15%	3%	11%	8%	5%	100%
Polymers	20%	17%	8%	19%	23%	13%	100%
Cogent	**38%**	**18%**	**6%**	**16%**	**13%**	**8%**	**100%**
UK	**32%**	**17%**	**5%**	**17%**	**14%**	**15%**	**100%**

(Source: LFS 2009; *Power People: Civil Nuclear Workforce 2009-2025)

The Pharmaceutical sector shows the highest fraction at NVQ level 4 and above, although this may underestimate the actual level because of the inadequacy of Standard Industry Codes in Pharmaceutical research and development. In contrast, Polymers and Petroleum employ a large number of staff with qualifications below NVQ level 2, and have the largest fraction with no qualifications at all.

The 2006 Leitch Review set a goal for the UK to reach the OECD upper quartile for skills attainment by 2020. Targets derived from this recommendation provide the benchmark for the UK Commission for Employment and Skills annual assessment of

UK skills, jobs and productivity, Ambition 2020. [1,2] Table 1.0.2 shows the 2020 target together with the current UK and current Cogent levels.

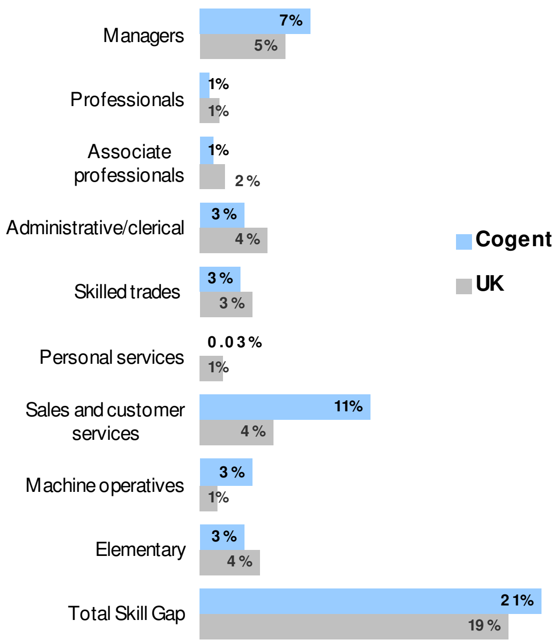
Table 1.0.2 Ambition 2020

Highest Qualification	Target 2020	UK (current)	Cogent (current)
Level 4	40%	28%	38%
Level 3	28%	17%	24%
Level 2	20%	17%	17%

(Source: UKCES 2010; LFS 2009)

The occupational distribution of the Cogent Sector workforce is given in figure 1.0.1 which reflects the expected demand for Managers, Professionals and Process Operators . In broad terms, this is repeated across the industries with some variation in for Professional and Sales depending on the nature of the industry.
Across the sector the existing integrated skills gap is slightly higher than the UK average, with particularly high levels amongst Managers and Sales and Customer services. The latter reflects the requirement for a combination of marketing skills and customer focus together with a high degree of technical knowledge.

Figure 1.0.1 Occupational Distributions



(Source: NESS 2009)

Ambition 2020 cites a link between the proportion of workers trained and the Gross Value Added such that a 5% increase in the number former results in a 4% increase in the latter. The gearing between training and productivity must be, in part, a function of the character of the industry. If taken at face value, at least, this would imply that raising the proportion of Cogent employees trained from 52% to 60% would generate an additional Gross Value Added of £4bn.
Cogent industries are well placed to support the UK economy in its recovery, and in any event form a critical part of the industrial supply chain. Driven by technology and science, high level skills have always been the life blood of the sector. This is only further emphasised by the economic necessities and technological opportunities that present themselves in 2010.

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[1] Ambition 2020: World Class Skills and Jobs for the UK, July 2010
[2] Prosperity for all in the global economy - World Class Skills: The Leitch Review of Skills, December 2006

2.0 National Policy Overview

As a result of the economic downturn, the Welsh Assembly Government published a paper, *Economic Renewal: a new direction*[3] in July 2010. The government has a vision for economic renewal which is built upon the strengths and skills of its people and natural environment; recognised at home and abroad as confident, creative and ambitious; a great place to live and work. They have decided on five priorities for delivering the vision:

- Investing in high quality sustainable infrastructure
- Making Wales a more attractive place to do business
- Broadening and deepening the skills base
- Encouraging innovation
- Targeting the business support offer

2.1 Broadening and deepening the skills base

The foundation of any economy is its working population, and education and skills at all levels are vital for economic growth and prosperity in Wales. Training contributes powerfully to national competitiveness, business productivity and individual social mobility. Developing skills is central to making Wales a highly attractive place to live, invest, employ and grow. Broadening and deepening the skills base is a shared responsibility between Government, learning providers, employers and individuals. For economic renewal it will be necessary to:

- develop a responsive partnership with business on skills provision that targets investment explicitly on the post recession economic requirements
- support young people to succeed and prepare them for employment
- increase efforts to help those who are disengaged, reducing economic inactivity and worklessness.

The document also highlights the need to interest more young people in developing the skills that will develop Wales' potential for economic growth. Subjects such as science, technology, engineering and mathematics (STEM) are especially important. The Welsh Assembly Government promotes these skills and subjects through the new National Science Academy.

The paper also highlights the needs for foundation degrees that are clearly linked to employer needs, and that reflect the future skill requirements of those employers. Moreover, there is a very clear expectation that further education and higher education establishments will work collaboratively and look for opportunities to work with employers and networks to ensure foundation degree availability is targeted on up-skilling the Welsh workforce.

There is a clearly defined need to develop sector based approaches to skills needs and the Welsh Assembly Government needs to work with Sector Skills Councils and stakeholders to strengthen the Apprenticeship programme.

2.2 Targeting the business support on offer

Resources need to be concentrated where they can add the most value, acting as an enabler of growth for the economy as a whole rather than a significant direct deliverer of services to individual businesses. A sector-based, strategic approach to business support will be developed through Cogent's role as an expert facilitator and enabler.

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[3] *Economic Renewal: a new direction*, Welsh Assembly Government, July 2010

For economic renewal it is necessary to:

- reduce the level of direct business support and deploy more resources to wider infrastructure development
- move to more of an investment culture
- adopt a sectoral approach, focusing support on work with six sectors where, with better targeted intervention, Wales can gain competitive advantage
- build strategic relationships with ‘anchor’ companies
- offer limited, specialised support to all businesses
- improve interactions with businesses.

With finite resources the Welsh government has decided to focus its support in six sectors – three of which are relevant to Cogent’s footprint (marked *)

- ICT
- Energy and environment*
- Advanced materials and manufacturing*
- Creative industries
- Life Sciences*
- Financial and professional services

The Welsh Assembly Government is in the process of aligning both the Department for the Economy and Transport and the Department for Children, Education, Lifelong Learning and Skills to support the six focus areas. Cogent has been associated with Advanced Materials and Manufacturing sector and Life Sciences. The sectors included in the priority areas amount to about one third of private sector employers in Wales in terms of business turnover.

2.3 Advanced materials and manufacturing

The Advanced materials and manufacturing sector covers the composition, structure and properties of materials and their specific applications, at the forefront of technological innovation, as well as high value manufacturing based on high-level knowledge, skills and design, leading to technologically complex products and processes. The sector’s importance is based upon its activities underpinning future product development and innovations for most other sectors. In relatively high-cost developed economies, manufacturing has had to change radically. This sector offers the opportunity for the strategic and employment benefits of manufacturing to be realised whilst remaining globally competitive. The sector is engaged in cutting-edge research with the engineering departments of Welsh universities. Particular strengths in Wales include automotive, aerospace and electronics.

2.4 Welsh language

The final draft of Cogent’s Welsh Language policy is now with the Welsh language board for approval. Nevertheless, discussions with employers have to date revealed none who conduct their business meetings in Welsh.

2.5 Foundation degrees

Foundation degrees are recognised as vocational qualifications that can meet skills shortages at the higher technician and associate professional levels. They are an excellent platform to progress to professional qualifications or a full honours degree, and improve progression routes.

Through its Working Higher initiative, Cogent is already exploring the feasibility of developing a Nuclear based foundation degree working in collaboration with Coleg

Menai.[4] To underpin this a partnership between Coleg Menai and UCLAN is now in preparation to deliver the Nuclear foundation degrees.

There are also two European funded projects in Wales for the development of foundation degrees, one managed by the Higher Education and Funding Council for Wales (HEFCW), and the other by University of Glamorgan. Both highlight the importance of engagement of SSCs in the development of foundation degrees from the earliest point. The Cogent Wales manager sits on the Programme Board for foundation degrees for the University of Glamorgan on behalf of the Alliance.

2.6 Development of Foundation Degrees in Wales

Skills That Work for Wales - A Skills and Employment Strategy and Action Plan clearly articulates the role of Sector Skills Councils (SSCs) in Wales in relation to Vocational Qualifications: the policy requires SSCs in Wales to work closely with employer bodies to strengthen the employer voice in decisions on skills provision.

Specifically, SSCs have been remitted to focus on:

- demonstrably increasing employer engagement, demand for, and investment in skills;
- undertaking national analyses of sectoral labour market and skills needs and demands; and
- informing the development of new vocational qualifications, to ensure that they meet the needs of business.

SSCs are required to work with employers to draw up annual Sector Skills Assessments (SSAs) and Sector Qualification Strategies (SQSs)[5]. These documents map out exactly what skills employers expect their sector workforce to have, and the key qualifications they will need in future. The Sector Qualification Strategies and action plans produced by SSCs provide advice on the vocational qualifications that employers see as priorities for public funding, ensuring that the supply of skills is clearly informed by sector needs. In Wales, SSC Sector Qualification Strategies will be increasingly used to inform which qualifications attract public funding.

HEFCW has since worked closely with the Alliance and with individual SSCs to establish high level skills, in particular working with the Department for Children, Education, Lifelong Learning and Skills.

The Quality Assurance Agency's Foundation Degree Qualification Benchmark states that the design and delivery of foundation degree specifications are likely to be informed by the Foundation Degree Frameworks of appropriate SSCs (and it is recognised that there will be specific needs and priorities in Wales), as well as by other reference points. The design of the foundation degree specifications should be driven by employers to enable foundation degree developments to be mapped against Labour Market Intelligence (including Skills Foresight Activity), agreed Occupational Standards and Learning Outcomes. Indicative content specifications will need to take account of the different contexts in which a provider would work with employers on a national or regional basis. This would enable a much more in depth understanding of the business case and geographical demand for a foundation degree.

[4] Working Higher, Cogent

[5] See links to individual SSC websites via www.sscalliance.org into higher education from work-based learning frameworks such as Apprenticeships Frameworks (which are specified by SSCs). In addition to being a recognised progression route they are qualifications valued by employers, preparing learners for the world of work, and equipping them with skills that can be applied immediately in the workplace

The role of SSCs is to advise on whether any proposed foundation degree fits with Sector Qualification Strategies to meet the needs of business, and articulates with lower/higher level qualifications to support seamless progression routes. To this end, SSCs are a critical component of the current HEW ESF Foundation Degree and Work- Based Learning Programmes.

2.8 Apprenticeships

2.8.1 Draft Specification of Apprenticeship Standards for Wales (SASW)

As Education and skills are devolved powers Wales has its own Apprenticeship standards which differ from those in England. In the main, this reflects the different qualifications available in Wales and the methodology of Essential Skills as opposed to key skills. However, there has been some concern that apprentices in Wales will hold different qualifications to those in England. This is especially difficult for those companies on the border.

2.8.2 Pathways to Apprenticeship

Following the economic downturn The Deputy Minister for Skills announced that, subject to European approval for half of the funds, an additional £20 million would be made available to create opportunities for young people leaving school to access apprenticeship training opportunities. This funding would support the introduction of a college based Pathways to Apprenticeship programme, support for employers to take on additional apprentices through a Young Recruits programme

Pathways to Apprenticeships (PTA) will provide a flexible route for young people to acquire the underpinning knowledge and skills that would be required for successful completion of the full apprenticeship framework. Under PTA, individuals will spend up to 1 year on a full-time intensive training programme, specified by the relevant Sector Skills Council (SSC), to ensure that they have the requisite sector specific skills to progress to a full apprenticeship once the training has been completed. Five Sector Skills Councils have developed programmes of qualifications to meet their industry requirements; SEMTA (Engineering), Habia (Hairdressing & Beauty), Construction Skills (Construction), People 1st (Hospitality) and Summit Skills (Plumbing, Electrical Installation, Domestic Heating and Ventilation)

Following the success of the Pathways programmes during 2009/10 the Department for Children, Education, Lifelong Learning and Skills has decided to extend the programme and has offered the opportunity for other SSCs to develop their own pathway. Cogent has submitted an Expression of Interest to develop a pathway based on the Pre Energy Apprenticeship piloted in Lowestoft College. It is expected that there would be two potential variations of the scheme based on either the Petroleum industry in Pembrokeshire or the Nuclear Industry on Anglesey.

2.9 The Sector Priorities Fund Pilot (SPFP) Programme

The Sector Priorities Fund Pilot (SPFP) Programme is supported by the Convergence area European Social Fund (ESF) as part of the new European Structural Funds programmes in Wales for 2007 – 2013. It is designed to take forward strategic project activity with Sector Skills Councils in order to realise key policy recommendations outlined in "Skills that Work for Wales". The SPFP Programmes builds on, and replaces, previous support provided to SSCs through the Skills Development Fund(SDF) and Sector Skills Fund (SSF). The overarching aim of the Programme is to provide the evidence base with which to inform and influence policy and delivery systems in Wales to enable mainstream programmes supported by the Welsh Assembly Government to become more demand-responsive. SSC strategic projects will be underpinned by evidence of employer-demand gained primarily through the Sector Skills Agreements and Sector Qualifications Strategies and will pilot activity aimed at feeding intelligence to inform the 2011 Sector Priorities Fund identified in "Skills that Work for Wales".

SPFP is targeted solely at SSCs as the strategic project delivery agents of the SPFP Programme. It is an all encompassing document for SSCs to refer to during the entirety of the SPFP Programme; from project development through to evaluation, exit strategies and sustainability.

Cogent has been involved with two project submissions both of which have been successful. One project is in collaboration with the Manufacturing Skills Alliance and is being led by SEMTA. The project involves the development of a collaborative provider network working as a distributed, virtual Manufacturing Skills Academy delivering new and innovative skills development programmes.

The Cogent programme builds on the research carried out in Wales investigating skills needs of the sector. The outline for the project is below.

<u>Cogent Gold Standard Implementation Pilot</u>
The project aims to implement the Cogent Gold Standard with pilot groups of employers in two areas of Wales with two specific Cogent sectors, including assessment of employers' needs to bring their workforce's skills up to the Standards, liaison with relevant providers and development of materials for delivery. Training delivery will be subsidised to encourage the take up of training.
The project will improve productivity for target companies, as well as building the capacity of the provider base for further world-class skills training and laying the foundation for the activity of the National Skills Academy for the Process Industries in Wales

2.10 Wales Employment and Skills Board

Wales Employment and Skills Board (WESB) is an independent advisory board, established in May 2008, to advise Welsh Assembly Government Ministers on how skills, employment and business support systems might be improved to meet the needs of employers and individuals across Wales. Their remit also includes reviewing the work of the SSCs.

Moving Forward: Foundations for Growth is the 2010 Annual Report of the board presented to Welsh Ministers on the 17th May.[6]

The report is made up of five volumes:

- Economic Renewal and the Skills Agenda
- Basic Skills
- Employability Skills
- Youth Employment
- Higher Education

In the report WESB make a number of recommendations to the Welsh Assembly Government, including the following that relate to Sector Skills Councils:

- Ensure that UKCES national skills audits adequately cover Wales and its regions and that results are made available as early as possible to Wales' employers, providers, guidance services, and other stakeholders

- Ensure that there is the accurate and up-to-date intelligence and information gathered on employment and skills demands for all sectors and sub-regions in Wales

[6] Moving Forward: Foundations for Growth, May 2010

- Secures positive outcomes for Wales from the performance management, and any future reform, of SSCs

- The maintenance of the existing Pathways to Apprenticeship programme, with further work being undertaken with Sector Skills Councils (SSCs) not currently engaged with the programmes so as to extend its range; and monitoring of the progression rate of young people on the scheme into full Apprenticeships

2.11 Wales Action Plans

As part of the UKCES contract, the Welsh Assembly Government requires Cogent to have an action plan for Wales, agreed by all stakeholders. The Department for Children, Education, Lifelong Learning and Skills is then responsible for its management.

Stakeholders include:

- Careers Wales
- Job Centre Plus
- HEFCW
- Wales TUC
- the Department for Children, Education, Lifelong Learning and Skills

3.0 Research Strategy and Products

The advanced manufacturing industries in the Cogent footprint cover a diverse set of sectors which, although bound by a common reliance on science and molecular transformation, differ significantly in their economic and skills drivers and the extent to which national data provides sufficient evidence to sustain skills gap analysis and future skills projections.

The research approach employs best use of national data where it exists combined with primary research to fill gaps and to penetrate more deeply than national data. Apart from the annual Sector Skills Assessment (this report), there are four main categories of output:

- **Factsheets**
  (by Industry and Region)
- **Skills Oracle**
  (annual report of primary research)
- **FutureSkills**
  (annual report of primary in-depth research and future scenarios on skills)
- **Hard-to-Reach Sectors**
  (sectors of complexity by size, location etc)

Table 3.1.1 illustrates the sectors in the first column and the Cogent perspective of segmentation of subsectors in the second column. For the most part the sectors are mutually exclusive although their supply chains may intermingle. In this way Pharmaceuticals is largely distinct from Chemicals but Chemicals is a significant supply chain to Pharmaceuticals. Bioscience is an exception. From 2010 Bioscience is a new sector to the Cogent footprint. Bioscience is cross-cutting with Medical Biotechnology siting closely with Pharmaceuticals while Industrial Biotechnology sits closely with Chemicals.

The third column illustrates the extent of national data coverage (by Standard Industry Classification). This shows clearly the lack of national data coverage for three highly strategic sectors (politically, economically, strategically and technologically) and a number of additional specialist segments. The three strategic sector gaps left by national data are: 1 – the absence of Nuclear (Power Plant Operation; Power Plant Decommissioning; Power Plant Construction; Defence – Propulsion and Deterrence); 2 – the limited coverage of Pharmaceuticals (given the large proportion of R&D functions outside manufacturing in this sector); and 3 – the limited coverage of bioscience industries as distinct from the specific coverage of research in biotechnology.

Table 3.1.1 shows how the four research outputs have been deployed to ensure full coverage. In particular, the in-depth research of those sectors that are politically, economically, strategically and technologically of high priority is mapped out in the short term. In this way, for example, Nuclear has been covered by both Skills Oracle and FutureSkills leading to internationally recognised reports throughout 2009 and 2010; and this will continue through 2011, as the priority shifts to include skills for growth in the cross-cutting area of Bioscience.

Table 3.1.1 Sector Segmentation and Research Coverage

Sector	Segmentation	SIC fit		Fact Sheet	Skills Oracle	Future Skills	Hard-to Reach Research
Nuclear*	NPP Operation			2011			2010 intern'l project
	NPP Decommissioning						
	NPP New Build						
	Defence						
	Fuel Processing						
Bioscience	Pharmaceuticals						
	Medical Biotechnology			2010	2011		2011
	Industrial Biotechnology				2010	2010	2011
Chemicals	Industrial Chemicals						
	Consumer Chemicals						
Polymers	Processing						
	Packaging						2012
	Sign Making						2012
Petroleum	Forecourts Retail						2011
	Storage and Distribution						
	Refining (Downstream O&G)						Commercial
Oil& Gas	Extraction (Upstream O&G)						2011

*NPP = Nuclear Power Plant

Legend

Good coverage

Coverage as indicated

SIC only - not covered

3.2 Research Products

3.2.1 Factsheets[7]

These are data sheets distilling national data (e.g. ABI, LFS, NESS, ASHE), primary research by Cogent, and secondary data sources (e.g. government, trade, and international data). There are factsheets by industry (six), by region (thirteen) and by nation (four).

3.2.2 Skills Oracle[8]

Skills Oracle is a means by which employers can avoid survey fatigue yet get a useful and quick turn around in return for investing information with Cogent. At the same time the aggregated and anonymised analysis allows Cogent to generate the body of evidence and substantiate the voice of employers to policy makers and funders of qualifications. Building year on year, Skills Oracle, in conjunction with other sources of intelligence, establishes how well the sector is positioned to secure the skills it requires. But most importantly, it helps inform and shape action for the future; the evidence of demand and the evidence of progress.

Skills Oracle is a major contribution by knowledgeable employer experts – usually HR managers or equivalent with an authoritative voice on skills and training for all employees on their site. It is hosted annually by electronic means.

The survey combines regular quantitative measures with qualitative capture of opinion and future perspectives. Skills Oracle concentrates on the heart of the science-based industries – the employment and training of people with skills in science and engineering. Skills Oracle is therefore a focused survey of those sector and segments that employ such skills.

Cogent likens Skills Oracle to a skills ‘ftse’ of the top employers of skills, and thereby a barometer of the picture generally. The outputs from Skills Oracle are an overarching annual report. Although less robust, but still useful qualitatively, are the individual sector reports that are also published. A confidential company benchmarked version of the sector reports are provided to all respondents.

3.2.3 FutureSkills

FutureSkills is the collective output for the in-depth research projects that are prioritized for a given sector in any given year. The output is typically a detailed report arising out of major primary research in a sector, including employer and stakeholder consultation. The reports are often peer reviewed, formally launched, and followed by dissemination, evaluation and feedback. Examples of such reports included in this SSA are the Nuclear Series and the Bioscience series.

Nuclear series:
- Power People (2009)[9]
- Next Generation (2010)[10]
- SouthWest Nuclear Workforce[11]

Bioscience series:
- BioVision (2010)[12]
- Biotechnology (2010)[13]

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7 http://www.cogent-ssc.com/research/regionsindustry.php
8 http://www.cogent-ssc.com/research/Oracle.php
9 http://www.cogent-ssc.com/research/renaissance_i.php
10 http://www.cogent-ssc.com/research/renaissanceII.php
11 http://www.cogent-ssc.com/research/Publications/SouthWestNuclearWorkforce.pdf
12 http://www.cogent-ssc.com/research/Publications/BioVision.pdf
13 http://www.cogent-ssc.com/research/Publications/SEMTA_COGENT_report.pdf

3.2.4 Hard-to-Reach Sectors

This product is new for 2010-11 and addresses special research to cover gaps in intelligence due (usually) to hard-to-reach sectors. Hard-to-reach status may be due to the nature of the employer base (e.g.SMEs), or the complexity of the research (e.g. international collaborations). Current activities in this area include international research collaborations in Nuclear across the OECD and planned research of petroleum retail and bioscience SMEs.

3.3 Research Drivers

The research strategy considers PESTEL factors (see elsewhere in this SSA) in order to prioritise resources and workstreams in a given year. The Cogent footprint covers some of the most strategic science-based sectors in the UK economy. The industries range from the strategic (Nuclear) to the world-leading (Pharmaceuticals); many are incubators of new technologies (Chemicals – Industrial Biotechnology, Plastics - Composites) that will refresh and renew the sector in the future; others generate wealth and support our self-sufficiency in energy fuels (Oil & Gas and Petroleum). All have the deployment of higher level and technical skills at the heart of their business.

The research and intelligence reported in this SSA illustrates how the they have been driven in large part by both gaps in information and the strategic and political UK priorities, especially those sectors for which major in-depth research has been conducted and collaborations established.

3.4 Quality Assurance, Control

For major reports, a system of peer review is deployed[14] (or expert panel review drawing from Cogent Advisory Councils), and general evaluation and feedback captured.[15] These together with the Cogent Research Charter,[16] internal proofing and auditing protocols apply.

All major publications are accompanied by a web-published technical annex, giving details of the methodology and rationale.

3.5 Dissemination and Evaluation

All major publications are accompanied by an appropriate dissemination strategy. This usually entails national dissemination, often entails a launch event and can include international dissemination. The dissemination is usually accompanied by a feedback questioannaire on impact. The feedback analysis is web-published.[17]

3.6 Operationalising LMI

The various outputs inform the development of the business strategy, the action plans for the four nations and form the evidence base for development of standards (including NOS) and qualifications. Often this will require further tailored research. These and the resrecah putputs in themselves are received by the various industry Advisory Council administered by Cogent (Chemicals, Life Sciences, Pharmaceuticals, Nuclear, Polymers, Downstream Oil& Gas). The evidence is also used to support project development and the business plans of the two National Skills Academies (process Industries and Nuclear).

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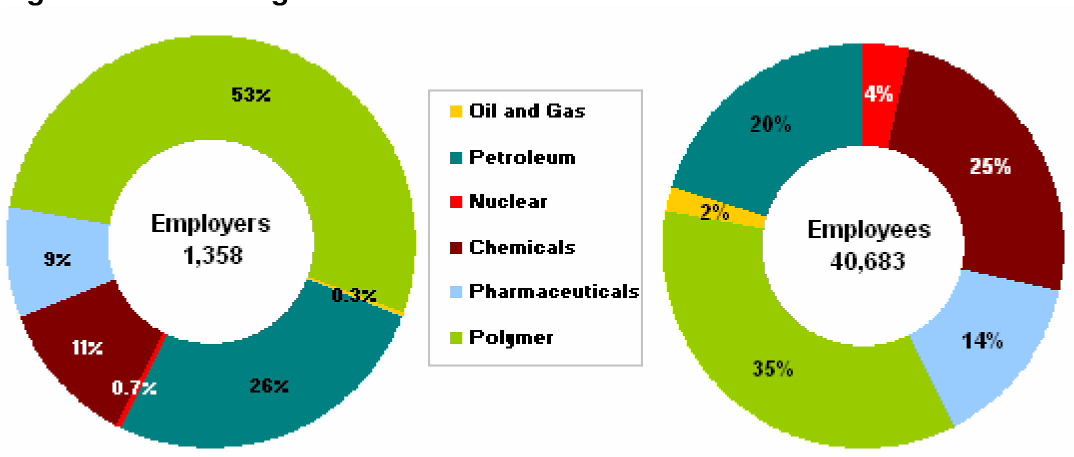
[14] For example http://www.cogent-ssc.com/research/Publications/Technical_Annex.pdf
[15] http://www.cogent-ssc.com/research/surveys.php
[16] http://www.cogent-ssc.com/research/Publications/Research_Charter.pdf
[17] http://www.cogent-ssc.com/research/surveys.php

4.0 National Sector Overview

Figure 4.0.1 shows the distribution of companies and staff across the Cogent industries. Over half (54%) of Cogent workers in Wales are employed in the Polymers and Chemicals industries, which in turn account for three quarters of Cogent employers in the country. Although Nuclear accounts for a relatively small proportion (4% of employees) in the decommissioning at Trawsfynydd and electricity generation at Wylfa, this is of importance as one repository of strategic nuclear skills for the UK. In 2010 Wylfa was listed as a potential site for nuclear new build in the government's revised draft National Policy Statement for Nuclear. Horizon Nuclear Power have identified the site as the location for the first of its new build projects.

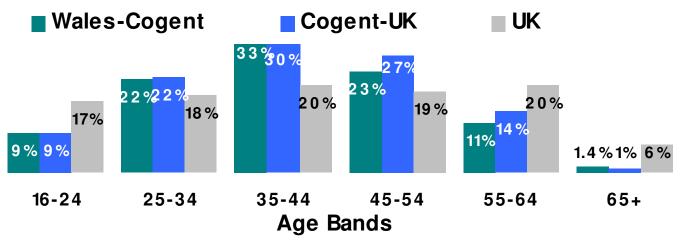
Figure 4.0.1 The Cogent Sector Workforce in Wales



(Source: Wales Factsheet, Cogent 2010)

The age profile of the Cogent workforce in Wales is shown in figure 4.0.2. In common with the sector in the UK, the distribution is less evenly spread than the workforce generally, with a broad but clear maximum between 35 and 54 years. This is consistent with sectors that rely largely on higher (and older) levels of skill from the education supply.

Figure 4.0.2 Age Profile[18]

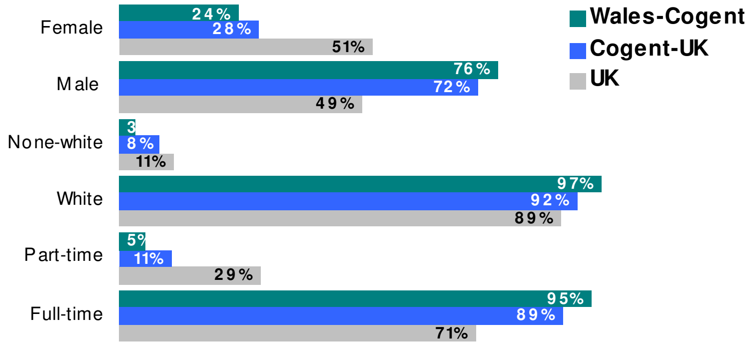


(Source: Wales Factsheet, Cogent 2010)

Figure 4.0.3 illustrates the workforce distribution in terms of gender, ethnicity and employment type (full time or part time). Overall the profile follows the broad characteristics of the Cogent sector; the workforce is overwhelmingly white, male and in full time employment. In fact, these characteristics are slightly stronger in the case of Wales than the sector generally. Notably the ratio of males to females is significantly different from the UK generally, showing a continuation (albeit with some weakening) of an historical trend in these indistries.

[18] Labour Force Survey (LFS) 2009, ESDS 2010

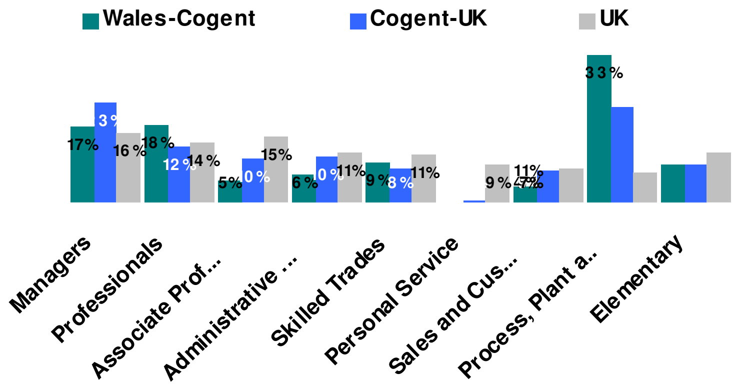
Figure 4.0.3 Workforce Distribution by Gender[19], Ethnicity[18] and Employment[18]



(Source: Wales Factsheet, Cogent 2010)

Figure 4.0.4 shows the sector in Wales with higher proportions of professionals and process operatives than Cogent-UK and the UK generally. This is in line with expectation for a manufacturing profile although there is significant variation by sector.

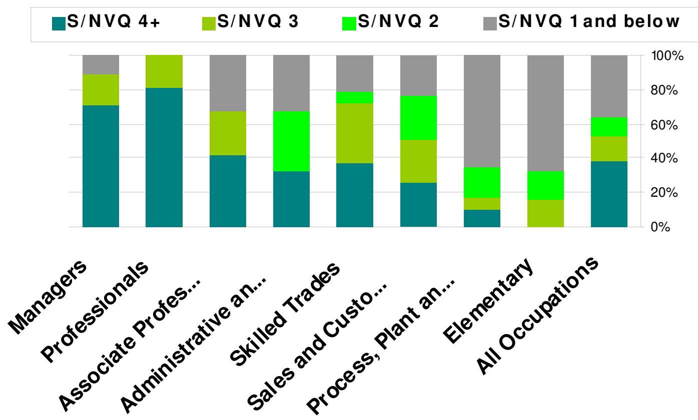
Figure 4.0.4 Occupational Distribution



(Source: Wales Factsheet, Cogent 2010)

Figure 4.0.5 shows the proportion of highest level qualification by occupation. Analysis in conjunction with Skills Oracle data (Main UK report, section 5.2), suggests that the three most highly skilled occupations are also those, in a UK context, with the greatest turnover and net increase in recruitment: management, professional and technical; these also correspond – again according to Skills Oracle – to the occupations that are hardest to fill.

Figure 4.0.5 Skill Level by Occupation



(Source: Wales Factsheet, Cogent 2010)

[19] Annual Business Enquiry (ABI) 2008-data released June 2010, ONS

Figure 4.0.6 shows the most recent data available reflecting employer view of skill gaps and shortages. Fewer vacancies are reported for the Cogent sector compared to all industries.

Figure 4.0.6 Skills Issues

	Wales-Cogent	Wales – All industries
	2005	**2005**
Proportion of firms reporting vacancies	15%	21%
Proportion of firms reporting 'hard-to-fill' vacancies	6%	10%
Proportion of firms reporting a skills shortage vacancy	3%	4%
Proportion of firms reporting internal skills gaps	20%	18%
Proportion of firms providing training (last 12 months)	54%	58%

(Source: Wales Factsheet, Cogent 2010)

4.2 Skills Oracle

Skills Oracle is essentially an online project surveying, over time, a significant and consistent sample of science and engineering employers. It is therefore not intended to cover all sectors or segments (retail forecourts being an example that is not in scope).

When used in conjunction with other sources of intelligence, and with national data, Skills Oracle is a powerful addition to the quantitative and qualitative evidence base on skills, training, qualifications, and the employer perspective.

The survey is not yet sufficiently large to resolve differences nations, so the following UK integrated data is cited as a guide to the key issues for employers in Wales as elsewhere.

- Annual average company turnover in employment is approximately 15%.
- Professional scientists and engineers vacancies that are 'hard to fill' are reported by 57% of employers.
- Annual training budgets average was £930 per employee. In addition to this companies may incur additional cost such as travel, subsistence, internal training and mentoring, the maintenance cost of training facilities as well as maintaining productivity during training.
- Employers were satisfied with the coverage of qualifications across the sector. Satisfaction ratings were highest for 'Academic' qualifications, 'Competence Based' qualifications and 'Flexibility' of provision.
- Health, Safety and Environment (HSE) training was the most frequently reported training undertaken, when viewed across both internal and external training requirements. Companies tend to resource externally for specialist training, such as, 'Professional', 'Technical' and 'Health, Safety and Environment'.
- 'Private Training' providers are used by 94% of employers; 80% use 'FE' providers; and 51% use 'HE' providers.

- For private training providers, satisfaction levels tended to be extremely high (ranging between 76% and 97%) in all areas of; ‘Cost’, ‘Relevance’, ‘Flexibility’, ‘Location’ and ‘Quality’ of provision. This reflects the highly tailored provision offer by private training providers.

- The satisfaction ratings for FE and HE were also very high (ranging between 60% and 85%), with the lower of these ratings referring to relevance, flexibility and location of provision. This suggests that while employers value such provision, there is scope for FE and HE to innovate in flexible and accessible provision, and that there is a role for the Sector Skills Council in facilitating this.

- The majority of employers (83% and 78% respectively) place a high level of importance on the supply of Apprentices and Graduates to their workforce (8% of the skills supply recruited were Apprentices; 11% of the skills supply recruited were Graduates).

- Most employers (81% and 74% respectively) invest in ‘Competence Based’ and ‘Technical’ training of the existing workforce, with 64% of employers investing in ‘Professional/Higher Level’ training.

- Skills gaps and shortages were reported by 83% of employers to had some, or significant impact.

- Competence-based skills needs are reported by 65% of employers report have increased in the 12 months preceding the survey; 72% of employers expected the demand for both competence-based and management level skills to increase in the 12 months following the survey.

- Looking ahead, Cogent employers were split in concluding that the economic situation for their businesses would ‘improve’ (39%), ‘remain static’ (26%), or ‘worsen’ (26%) within the year (8% of employers were undecided).

- Most Cogent employers predicted ‘no significant change’ in employment in the short term (2 years ahead).

- Securing funding, improving access to training courses and encouraging young people into the sector, are viewed by Cogent employers as the highest priorities for a Sector Skills Council.

5.0 In depth - Selected Sectors

5.1 Nuclear

The beginning of the second decade of the century is a pivotal time for nuclear skills in the UK as a whole. Within the civil sector, there is very high aspiration from the utilities and vendors to construct new capacity, set against a rapidly increasing demand for low carbon electricity. Defence nuclear capability, although not located in Wales, similarly has a large programme of planned construction and on-going operations which may have an influence on the availability of nuclear aware personnel generally.

In Wales, the nuclear industry is centred on Trawsfynydd, in Gwynedd, and the Wylfa site on Anglesey. Trawsfynydd ceased operations in 1991 and is now being decommissioned under the auspices of the Nuclear Decommissioning Authority. Wylfa operates under licence to Magnox North. In October 2010, the NDA announced that the operational lifetime of the plant would be extended from December 2010 by up to 2 years. [20]

The nuclear industry in Wales supplies the equivalent of 40% of the nation's electricity needs.

Also in October 2010, the government published a revised draft National Policy Statement (NPS) for nuclear, listing eight sites as potential locations for civil new build, including at Wylfa on Anglesey.[21]

Horizon Nuclear Power was formed in 2009 as joint venture between E.ON UK and RWE npower with the intention of building new nuclear plants at Oldbury in Gloucestershire and adjacent to the existing Wylfa site.[22] In August 2010 Horizon announced the beginning of initial works at Wylfa and analysis of both Areva's EPR pressurised water reactor and the Westinghouse's equivalent AP1000 design.[23]

While nuclear operations in Wales form a crucial strategic industry and important high skill employment, it is also inseparable from the industry in the UK generally, both in terms of Westminster facilitative actions, and the ambitions of private consortia proposing large scale new build in England and Wales. The remainder of this section outlines the UK context within which the Welsh contribution will develop.

Cogent has assessed UK skills needs for the nuclear industry within in a series of reports under the title of 'Renaissance'. The first of these, *Power People*[24], was published in September 2009 and described the existing civil nuclear estate, with an overview of the findings included in the 2009 Sector Skills Assessment (SSA). Since then, Cogent has published *Next Generation: Skills for Nuclear New Build*[25] and prepared a report on the defence sector to be published as 'Assurance'[26]. Some of the information presented in the 2009 SSA covering current work in generation, fuel processing and decommissioning, is repeated here since it describes the single largest nuclear activity in the UK at the time of reporting.

5.1.1 Civil Nuclear Sector

The existing estate

Today, the UK industry is on the cusp of a renaissance in new build that will see a transition between the old and the new generation of power stations. It is therefore paramount that the UK retains the skills it already has and develops the skills it

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[20] NDA News Release, 13 October 2010
[21] Revised Draft National Policy Statement for Nuclear Power Generation (EN-6) Vol1 and 2
[22] RWE npower, E.ON UK nuclear joint venture fully established, News Release, 5 November 2009
[23] Horizon Nuclear Power studies options for new Wylfa station, News Release, 2 August 2010
[24] Power People: The Civil Nuclear Workforce 2009 – 2025, Cogent 2009
[25] Next Generation: Skills for New Build Nuclear, Cogent 2010
[26] Assurance: Skills for Nuclear Defence, to be published December 2010

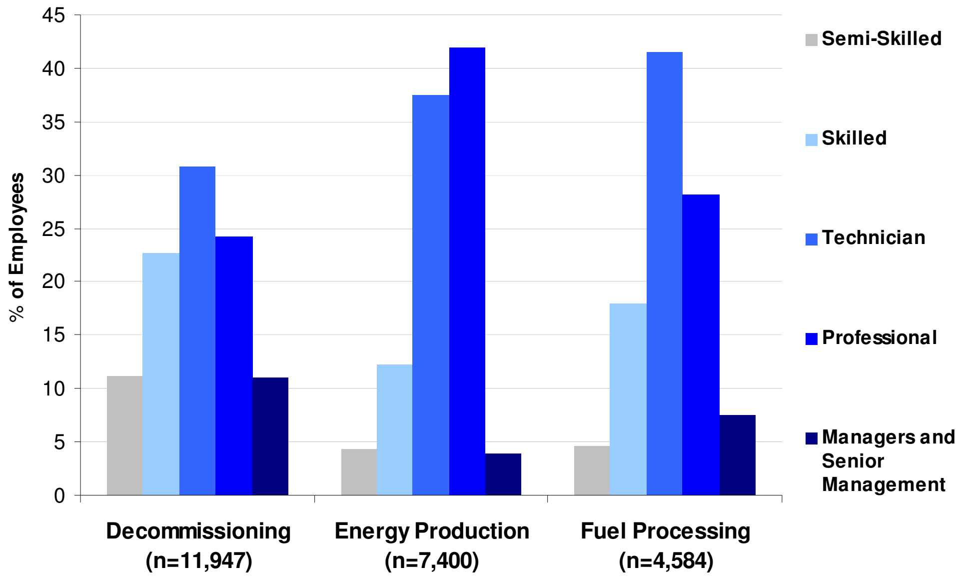
needs to meet the requirements of a sector that is likely to grow over the next few years.

The civil nuclear industry today provides employment for 44,000 people[24]. Of these, 24,000 are employed directly by the nuclear operators across three sectors – Electricity Generation, Decommissioning, and Fuel Processing. The remainder is employed in the direct supply chain to the nuclear industry. The sectors are split across both public and private ownership, with the latter being prevalent in Electricity Generation. Of the 24,000 employed directly by the nuclear operating companies, Decommissioning (12,000) is by far the largest sector, followed by Electricity Generation (7,500) and Fuel Processing (4,500).

The North West of England has the largest employment, with 53% of the workforce overall, comprising 14% of Electricity Generation, 62% of Decommissioning and 73% of Fuel Processing. The South West of England (12%), Scotland (11%) and the South East of England (9%) are the next largest in employment. The North East of England, the East of England and North Wales have a 3% share, each, of the national employment of the sector. However, much of this picture will change within the decade.

The skill levels of the workforce are high, as would be expected for a safety critical industry, with the combined Technical, Professional and Senior Management skill levels typically close to, or in excess of, 70% in any of the sectors. Figure 5.1.1 shows the distribution of skill levels across the sectors.

Figure 5.1.1 Occupational Skill level of UK Civil Nuclear Workforce (excl. Supply Chain)



(Source: Power People: Civil Nuclear Workforce 2009-2025, Cogent 2009)

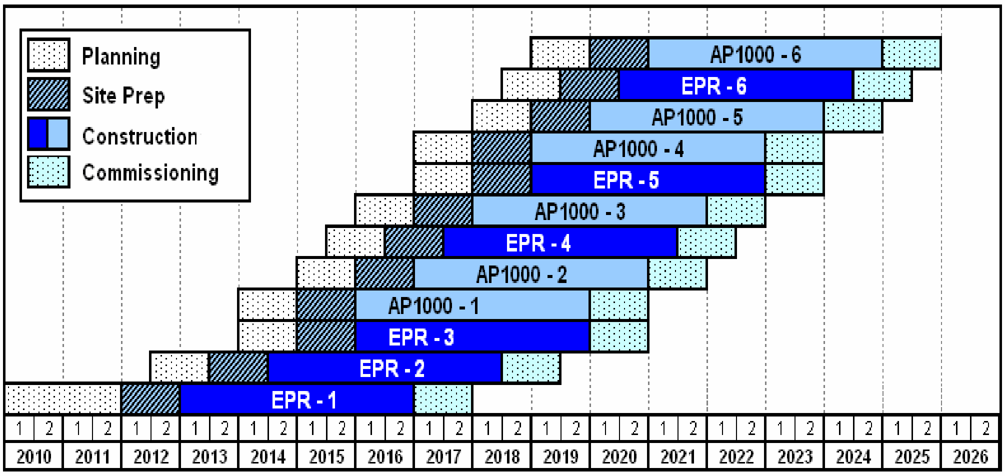
Future prospects

The decommissioning timescale for the existing AGR fleet will result in a loss of 10 GWe capacity in the period to 2025. In response, and in line with government policy of a mixed low carbon electricity economy, three private sector consortia[27] have stated their intent to deliver up to 16 GWe by 2025. New build on this scale would create thousands of new jobs and training opportunities in construction, advanced manufacture, engineering construction, regulation, nuclear operations, power

27 GDF Suez, Iberdrola, Scottish and Southern; EDF; Horizon Nuclear Power (RWE and E-ON)

generation, and plant maintenance.[28] It is in this context that a 'next generation' scenario has been framed. The scenario assumes no significant alteration to the timeline projected by the Office for Nuclear Development[29] for first new nuclear generation, and that the UK is expected to supply most of the skills required.

Figure 5.1.2 Indicative 16 GWe New Build Scenario (Timeline for 12 Units)

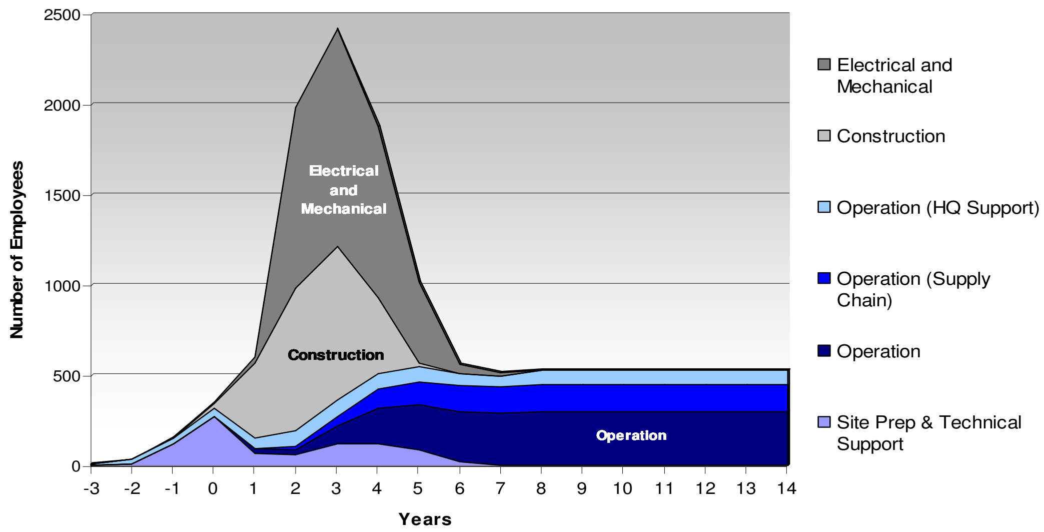


(Source: Next Generation: Skills for New Build Nuclear, Cogent 2010)

The assessment made in '*Next Generation'* examined the workforce required to build 6 stations by deploying 12 Pressurised Water Reactor units to generate up to 16 GWe, finishing *circa* 2025.[30] The station build profile modelled in Figure 5.1.2 comprises six 'EPR'[31] and six 'AP1000'[32] reactors. The timeline accommodates an 'early-starter' profile for the EPR design followed by the AP1000, with an average five years to achieve a fully commissioned single unit. The basis of the model was an industry informed profile for a single unit (figure 5.1.3) that could be scaled accordingly. With the long projection to 2025, it is estimated that the figures are accurate to a precision of 20% (alternative scenarios have also been analysed http://www.cogent-ssc.com/research/renaissanceII.php but show only small differences in the overall effect on the workforce).

28 Employment figures used are generally quoted in full-time equivalents (fte). This will give the lowest possible estimate of the number of jobs. Mobility in the workforce and fractionation of fte will return a multiple of the fte calculation.
29 Department of Energy and Climate Change.
30 No inference is intended that new build will cease after this timeframe, or that new build should be aimed at a predetermined capacity ceiling. The market will decide what it can bear.
31 The Pressurised Water Reactor design of the vendor company Areva
32 The Pressurised Water Reactor design of the vendor company Westinghouse

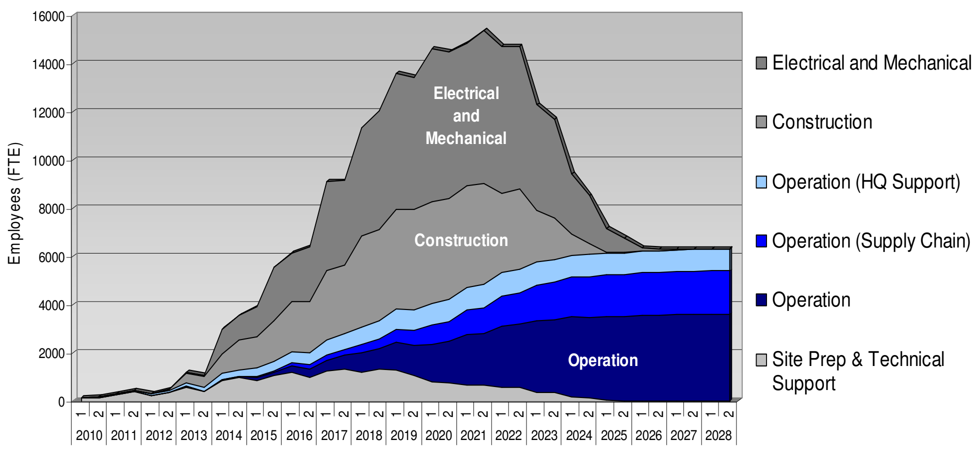
Figure 5.1.3 Single Pressurised Water Reactor (PWR) Workforce Level



(Source: Next Generation: Skills for New Build Nuclear, Cogent 2010)

Employment of the order of 110,000-140,000 *person years* is predicted, based on full-time equivalents totalled each year for every year. This gives an average 10,000 jobs *per year.* Headcounts will be considerably higher, especially for construction.

Figure 5.1.4 Integrated Workforce (6 twin unit stations - 16 GWe)



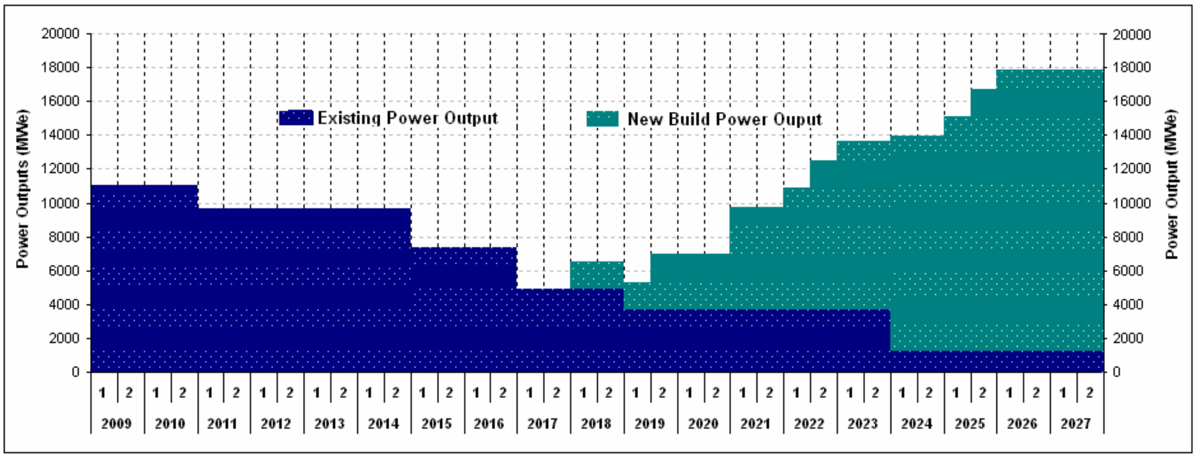
(Source: Next Generation: Skills for New Build Nuclear, Cogent 2010)

Figure 5.1.4 shows the effect of scaling up the single unit of figure 5.1.3 along the profile of figure 5.1.2 to represent the integrated workforce over the entire build programme.

Stretching or compressing the new nuclear timeline affects the predicted peak employment and the degree to which the construction and manufacturing workforces can cycle through various build projects. For the scenario, a main total employment peak of 14,000 full-time equivalents *circa* 2021 is predicted. This figure provides an indication of the racking up of skilled demand over the next decade and has implications for the supply of skills from education and training, and for transition planning of existing skills in the industry. The peak is driven by the significant overlap in the separate new build projects with seven units under various stages of construction between 2019 and 2021.

The sum of the separate sector maxima, albeit at different points in time, amount to 18,000, comprising 12,000 for Construction, 5,000 for Operations and 1,000 in Manufacture.

Figure 5.1.5 Power Output forecast for 12 units



(Source: Next Generation: Skills for New Build Nuclear, Cogent 2010)

Before new generating capacity is fully commissioned, existing generating capacity, according to current lifetime plans, continues to decline (figure 5.1.5). A low of 5 GWe generation provided by nuclear in 2017 is predicted before a gradual increase to a combined peak of approximately 17 GWe is established by the end of the scenario timeframe *circa* 2025. This illustrates the potential for workforce transition planning across the old and the new power stations. However, the age profile of the established workforces will reduce this facility over this period. Further, the operation of the existing estate will require on-going support, including a degree of new construction itself, as successful and safe operation in this area is a prerequisite for future development.

While no reference has been made in this work to the locations of new build[33], at site level the model for the component reactor unit can be applied to single, twin, and triple-unit stations as required. By way of example, employment in the manufacture, construction and operation of a twin-unit station will be 21,200 person years over six years.

During a new build project, Construction will comprise 60% of the workforce, Operations 25% and Manufacture 15%. Construction and Manufacturing are secured early and persist for as long as the supply chain is engaged in the project, while the Operations workforce is a more permanent entity for the estimated 40-year operating lifetime[34] of a station, and beyond to decommissioning. It is in Manufacturing where employment in the global supply chain will have greatest share. It is anticipated that for employment in Construction and Operations the UK can realize the employment requirements from a combination of retaining existing skills and growing the skills that are required. A summary of workforce metrics is given in table 5.1.1.

The demand for skills in each sector requires careful planning due to the significant number of people required across a range of skills and occupations. This will be compounded by nuclear awareness and safety training requirements associated with working under a regulated nuclear site license from the outset of construction.

[33] The draft National Policy Statement for Nuclear listed the following as potential sites for new build: Bradwell, Hartlepool, Heysham, Hinkley Point, Oldbury, Sellafield, Sizewell and Wylfa.
[34] Recognising that operating lifetimes of new nuclear power stations could be around 60 years

Further, long induction periods are required for some critical skills due to the high levels of education, training and experience to produce the highest levels of workmanship, quality assurance, and competence. The projected levels of demand will not only risk the supply of critical skills for capability, but will also emphasize the demand for skills capacity through ‘new blood’, drawn from all levels of the education and training supply, as well as transitioning expertise from sectors with oversupply (*e.g.* existing nuclear operations as they progress to decommissioning).

Capacity issues identified are:

- shortage of demand information
- workforce mobility
- supply of apprentices, scientists and engineers
- age profile of existing workforce
- long induction periods for experience competing demand for experienced
- people from national and international projects.

Capability issues identified are:

- nuclear awareness, behaviour and culture
- suitable qualification and experience.

Table 5.1.1 New Nuclear Workforce Metrics

16 GWe (new)	6 Twin-Unit Stations	Station (twin unit)	Construction[a] (twin unit)	Manufacture (twin unit)	Operation (twin unit)
Person years %	110,000 - 140,000	21,200	13,000 60%	3,200 15%	5,000 [b] 25%
Timeframe of build	13 years	6 years	6 years	6 years	6 years
Employment – pn yrs per GWe	6,000	7,571 [c]	4,643[c]	1,143[c]	1,786[c]
Employment - fte p.a. (aver.)	10,000[d]	3,533[d]	2,167[d]	533[d]	833[d]
Skill Levels			25% L2 60% L3 15% L4+	15-30% L2 30-40% L3 20-40% L4+	10% L2 [e] 40% L3 [e] 45% L4+ [e]
Workforce Split			40% Civil 45% Mechanical & Electrical 15% Management & Supervision	10% Civil 30% Major Nuclear 40% Balance of Nuclear island 20% Balance of Plant	60% Nuclear Operator 30% Supply Chain 10% Utility HQ etc
Other	18,000 combined peak employment of sectors (peaks at different times)		12,000 peak employment 2021 UK supply (most)	1,000[f] Peak employment UK supply (mostly)	5,000 peak employment 2026 UK supply

a Here 'Construction' includes site preparation and electrical and mechanical jobs; **b** thereafter 1,000 fte pa for 60 years or 60,000 person years; **c** uses a hypothetical EPR+AP1000 station; **d** 'Person Years' divided by 'Timeframe'; **e** based on nuclear operator data; **f** estimated contribution to peak from sector that is highly globalised.

(Source: Next Generation: Skills for New Build Nuclear, Cogent 2010)

In addition to the capacity and capability assessment, a risk register has been created to identify the most critical skills required for the first new build across the progressive stages of Design and Planning, Manufacture, Engineering Construction, Operation. At the time of writing, the most at-risk skills are identified as:

- Project Management
- Safety Case Authoring
- High Integrity Welding
- Control and Instrumentation
- Planners and Estimators
- Geotechnical Engineering
- Non-destructive Engineering
- Manufacturing Engineering (Mechanical Electrical, Production, Chemicals)
- Design Engineering (Mechanical Electrical, Production, Chemicals)
- Regulators

5.1.3 Skills Summary

- Priority sector for Wales.
- Highly regulated, safety critical sector.
- Stable skills demand for Decommissioning.
- Stable skills demand for Defence.
- Significant increased demand for skills for nuclear Power Generation dependent on extent of private sector utility adoption of new build.
- Most at risk skills in the short term are skills in the supply chain for new construction.
- Most UK construction supply chain has lost nuclear capability and experience in skills for nuclear pointing to benefit of Nuclear Skills Passport.
- Training in nuclear safety culture and behaviour required as top up to existing training.
- Scenarios for new build developed and applied at national and regional level.
- Transition planning of skills from old to new estate is a priority for operating workforce.
- Long periods required to achieve suitable experience and qualification.
- Dependency on secure supply of science and engineering skills.

5.2 Life Science Industries – A Labour Market Survey

During 2009 Cogent and Semta collaborated on research covering the life science industries. The research report, based on 380 interviews from a sample base of 3,028 companies was published in February 2010. The respondent sample represented 24,000 staff across England (80% of companies), Scotland (13%), Wales (4%) and Northern Ireland (2%).

Full details of the research findings and the methodology were published during 2010.[35] The research focused primarily on:

[35] http://www.cogent-ssc.com/research/Publications/SEMTA_COGENT_report.pdf

- Establishment and workforce details
- Recruitment issues
- Workforce skills
- Training and development

The research is one of the most comprehensive yet undertaken in skills in these sectors. The sample of 380 respondent organisations has given a reasonable level of confidence in the findings reported, with the usual caveats when examining sub-group samples smaller than 100. Employer skill priorities and plans for action for the sector.

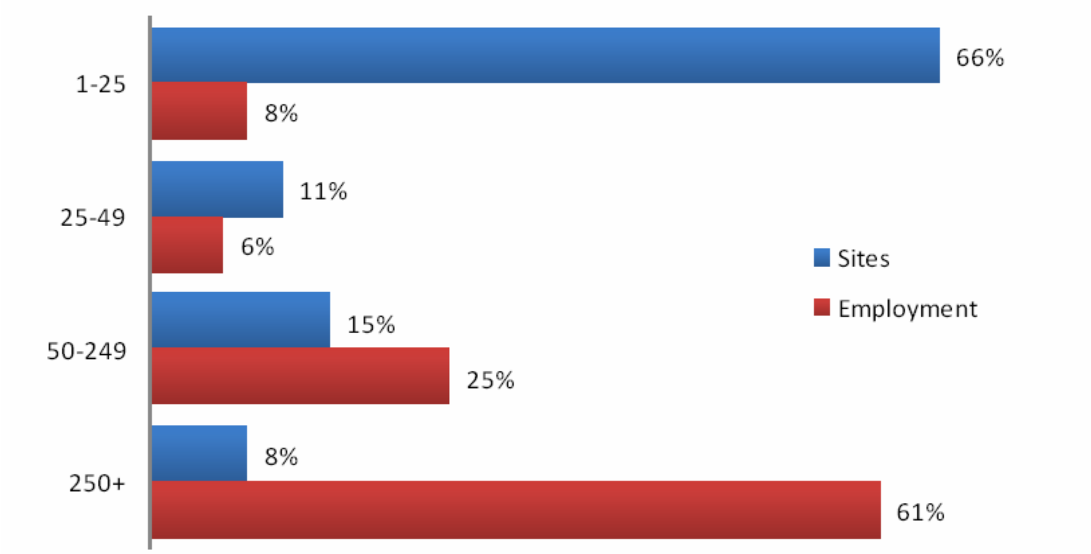
This section reviews some of the findings.

5.2.1 Employers

The sample covered three types of company: pharmaceuticals (excluding R&D), medical devices and research (including biotechnology and pharmaceuticals). Cogent's interest rests across the first and the third; Semta's interest rests across the second and the third.

By employment 76% (18,384 employees) of the sample rests in the Cogent footprint; and by company/site 53% (203). The distribution by site and employment shows the normal inverse correlation between employment field and employer size (figure 5.2.1).

Figure 5.2.1 Sample by Sites and Employment



<u>Biotechnology</u>
Of these life science companies, 15% deployed biotechnology. This represents 18% of employment overall. In the pharmaceuticals and R&D sectors a higher incidence of biotechnology was recorded at 19% and 22% respectively.

<u>University Spin-Outs</u>
Overall 11% of companies had their origin as a university spin out. This proportion rose to 22% in the R&D sector.

5.2.2 Occupations

A slightly reduced sample (94% of respondents; 356 companies; 19,326 employees) were able to respond to this query.

A high proportion of senior management was recorded (22%); this is in character with national data for these sectors. When combined with professional scientists, technologists and engineers, 55% of employment was found to reside in these occupational groups (10,000 employed from the sample). A correspondingly low level of employment of elementary skills was also recorded (1%).

Just under two-fifths of those employed were female, with the five largest proportions, in decreasing order, being: administrative (66%), sales (53%) technical (44%), professional (35%), and management (33%) occupations.

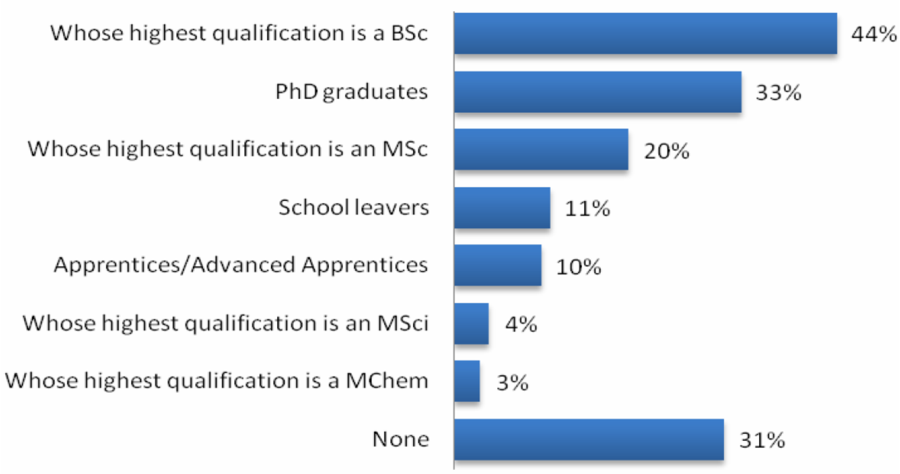
Research and Development
Across all occupations 29% of employment is in an R&D function, with the expected highest proportion of professional occupations (59%) being deployed in this category; 38% of managerial staff were deployed in this category.

5.2.3 Recruitment

Employment appeared to be stable, with 48% of all companies having similar levels of employment to the previous year; almost a third had increased recruitment; less than a fifth had reduced employment. The smaller companies are those most likely to have the same levels of employment.

Many companies (48%) had recruited within the year. The larger companies were the most likely to have been active in this area.

Figure 5.2.2 Recruitment – Skill Levels (base: 181)



Qualifications
Recruitment tended to be at the higher end of the skills spectrum. This is in keeping with the high levels of R&D recorded by the sample.(figure 5.2.2) When analysed by R&D company, recruitment of staff with qualifications at degree, masters and doctorate levels was, naturally, much higher at 65%, 38% and 62% respectively.

Relevant Work Experience
At least two-thirds of recruits were deemed to have relevant work experience. This figure rises in proportion to the qualification level, so that 94% of those of masters level.

Overseas Recruitment
Almost one-third of recruitment is of overseas personnel or students from overseas.

Hard-to-Fill Vacancies
Although sample size did not prove robust for this query, the data qualitatively suggests that professional and technical occupations of R&D in large companies experience this problem to the greatest degree.

5.2.4 Workforce Skills

Skills Gaps

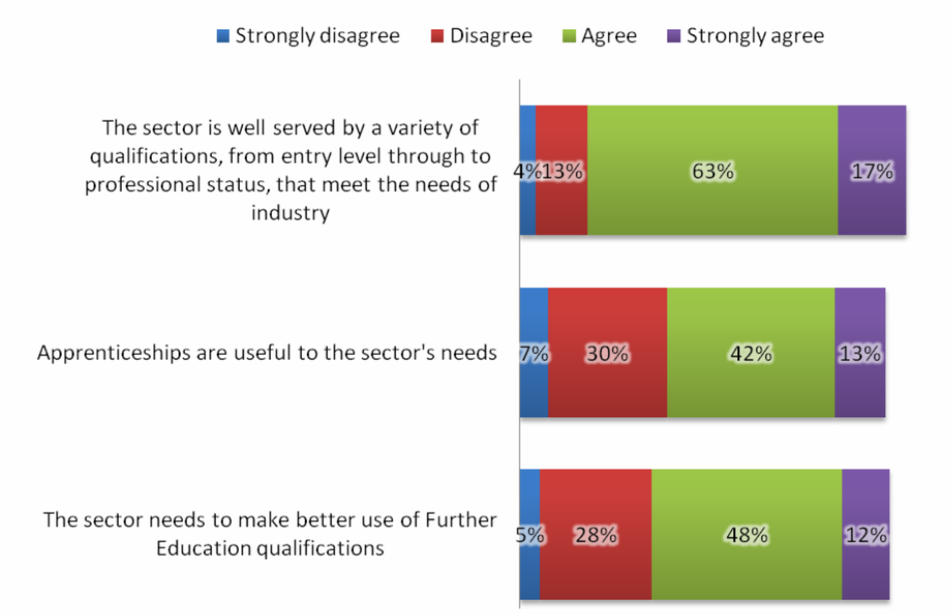
Skills gaps required to meet business objectives were reported by one in seven of employers; down from almost a third of employers since 2006. In line with the hard-to-fill enquiries, the gaps are most evident at the higher level occupations.

On a qualitative basis the most pronounced skills gap in science is chemistry, with pharmacology/toxicology also being cited.

Qualifications Supply

The majority of employers (79%; base: 380) declared their sector well-served by qualifications from entry to professional levels, but more than half suggested that they needed to make better use of vocational pathways. Figure 5.2.3 illustrates.

Figure 5.2.3 Qualifications (base: 380)



Drivers of Change of Skills

New products, new technologies, new equipment or compliance issues are the most quoted reasons for changes in skills needs. Almost three-quarters (72%; base: 351) of employers anticipated that their existing workforces would need to acquire both new skills and new knowledge to continue to meet business objectives; less so for small employers (58%).

Training

On average 61% of employers (base: 390) have arranged or funded off-the-job training within the year; this being consistent across all three sectors. This rises to 84% for the larger companies. The pattern is similar for on-the-job training, with the corresponding statistic being 68% overall. This leaves one quarter of all companies that have undertaken no training within the year.

The average external spend on training is close to £21k (base: 94). When factored by employee, this averages to less than £645k per employee but there is a wide variation by sector and an abruptly ‘stepped’ variation of average spend per company by size category: from £122k for the large employers (250+ employees), to £44k for the medium-to-large employers (50-249 employees), to £9k and £8k for the small employers (5-49 and 1-4 employees, respectively).

The Pharmaceutical and R&D sectors on average spend almost four times as much than Medical Devices.

Most companies (58%; base: 294) expect levels of spend on training to remain fairly static in the coming year.

Training tends to focus more on the higher occupational levels as shown by table 5.2.1)

Table 5.2.1 Training by Occupation (%) (base: 294)

	On-the-job only	Off-the-job only	Both	Don't Know	Neither
Managers and Senior Staff	23	16	40	1	20
Professional Engineers, Scientists and Technologists Occupations	23	12	52	1	12
Associate professional and technical occupations	21	14	49	2	13
Skilled trades occupations	21	6	45	5	23
Process, plant and machine operatives	28	4	34	7	27
Sales and customer services occupations	33	12	33	2	20
Administrative and secretarial Occupations	27	8	34	5	26
Elementary occupations	27	9	23	2	39
Personal service occupations	19	4	19	19	41

In-house training is common (81% of those training), followed by commercial training providers (47%; base: 294). This tends to be due to expertise and experience. The Skills Oracle survey (section 5.2) found similar but probed more deeply to show that the job-specific training was the main focus, and that where technical and professional training with qualifications was required, that providers (FE or HE) were used.

Ratings for providers of training or qualification followed the Skills Oracle pattern also. Cost and time to train are the most quoted barriers to training. This is a pattern that is consistent across the economy generally. Just over a quarter of the sample accessed funding for training activities, mainly for vocationally orientated courses. The incidence tended to be highest for R&D (35%; base: 83) and increases in line with company size (45% for companies of 250+ employees). Many companies had difficulty identifying access to qualification funding.

5.2.5 Skills Priorities

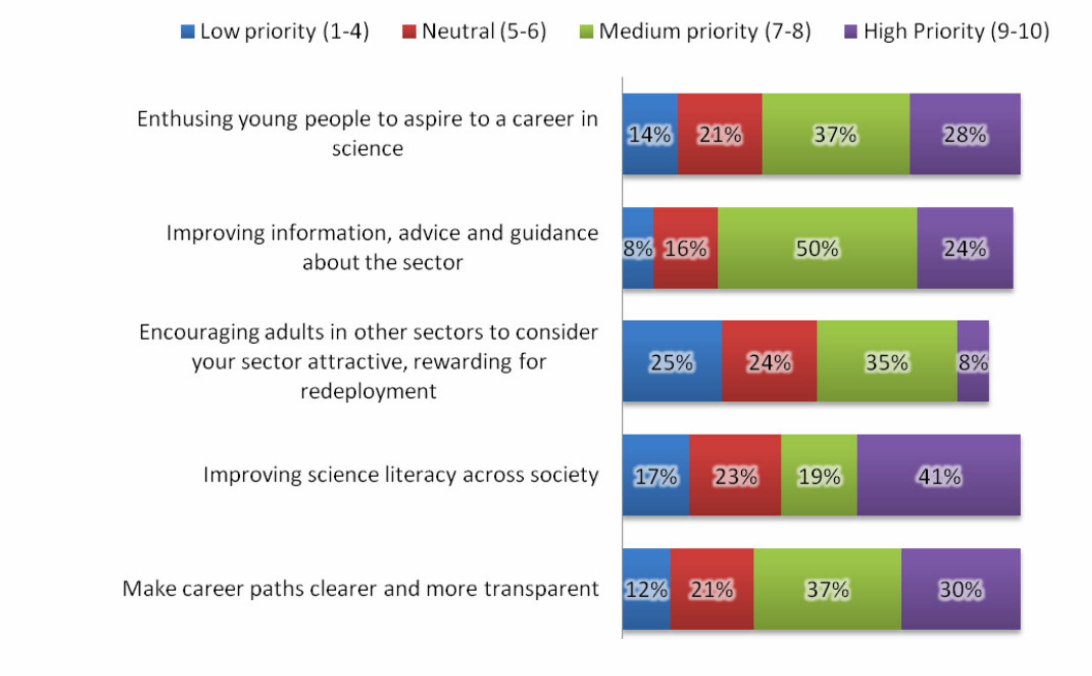
When asked to rate the objective of skills in their company from the restricted list of objectives below, employers prioritised the objectives as follows (base: 380):

- Achieve a top quality workforce (73%)
- Improve employer engagement and investment in skills (55%)
- Enhance leadership and entrepreneurship (53%)
- Improve sector image (44%)

When restricted to a single choice, ‘achieving a top quality workforce’ was more than twice as popular as any other at 38%. The aims feeding this priority are the development of training and qualifications that are more relevant to the employer need, and working with the education system to equip a higher number of people with the right vocational and practical skills as well as academic science.

Closing the skills gap in this context by increasing the supply of quality people and for practical skills to be championed from the education system featured prominently. Figure 5.2.4 discloses all priorities.

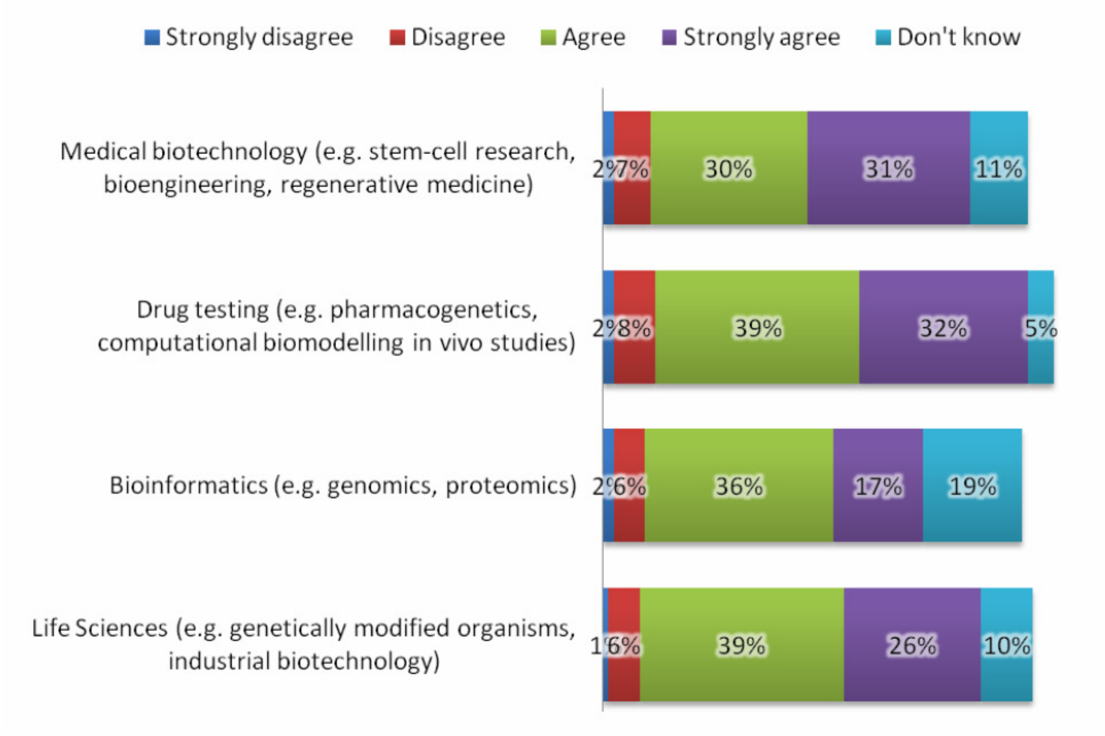
Figure 5.2.4 Priorities in Achieving a Top Quality Workforce (base: 146)

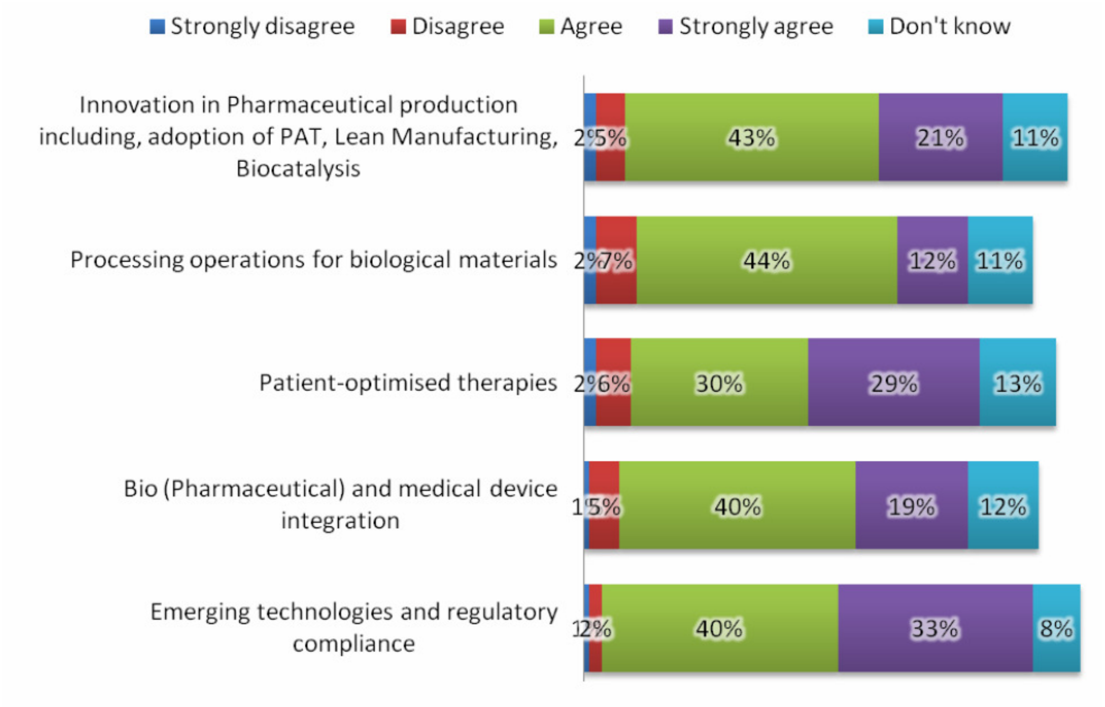


5.2.6 Science and the Future of the Pharmaceuticals Sector

Pharmaceutical companies were asked to indicate the extent to which they agreed with a number of propositions about the future of the sector. The sample base in this sub-group was 84. In all cases there was overwhelming agreement of the importance of the future developments in science and engineering. The responses are catalogued in figure 5.2.5.

Figure 5.2.5 Future Advances in Science and the Pharmaceuticals Sector





5.2.7 Skills Summary

- A priority sector for Wales
- A high proportion of senior management and professional occupations.
- A significant element of R&D qualifications associated with professional occupations.
- Employment has been stable and largely independent of economic downturn.
- Significant overseas recruitment in R&D skills.
- Skills gaps are most evident in the higher skilled levels.
- Hard-to-fill vacancies are also mostly experienced at professional and technical level.
- Skills gaps in the supply from education include chemistry, pharmacology and toxicology.
- Education provision, in the main, serves the sector well but better use could be made of vocational pathways.
- Spend on training appears low by UK benchmarks but the measure is company dependent and fails to capture investment in training facilities.
- R&D intensive companies spend four times as much on workforce development.
- Achieving a top quality workforce is the most sought after outcome of training.

6.0 Sectors Industry by Industry

Wales has a dominant cluster of Nuclear, Polymers, Petroleum and Chemicals industries. The nuclear industry is localised in the north west with two nuclear facilities – in Gwynedd, Trawsfynydd Power Station is a decommissioned reactor; and, in Anglesey, Wylfa Power Station continues to generate, currently licenced until 2012. There are a number of polymer and chemicals companies clustered around Cardiff, Swansea and Newport in the South of Wales, and Wrexham in the North. Petroleum refineries are located at Milford Haven and Pembroke. a further decommissioned refinery is located in Waterson, which currently has an oil storage and jetty facility in operation. Two new Liquefied Natural Gas (LNG) facilities are under construction at Waterson.

6.1 Chemicals

- A strategic infrastructure in manufacturing and raw materials supply supporting most other UK manufacturing.
- Strategic to UK supply of chemicals that are not readily imported due to hazards associated with storage and transport.
- Safety critical sector; highly regulated.
- A major UK industrial sector.
- An energy intensive sector.
- High levels of skills from operator through technical, professional and management.
- Technical and professional occupations are most hard-to-fill.
- Economic downturn has reduced output in short-term.
- Requires supply of science and engineering skills.
- Impact of emerging technologies could drive shift in skills needs higher more interdisciplinary, more bioscience.

6.2 Pharmaceuticals & Medical Biotechnology

- A priority sector for Wales.
- A large demand for Professionals, Managers and Operators in the sector.
- There is a concentration of Research Institutions in the south east which may change with fragmentation following the development of biologics, for example.
- There is demand for technical up-skilling.
- There is competition from low-wage economies.
- Rapid change transfer of new technologies will be a key driver of skills.
- There is demand for science, technology, engineering and mathematics (STEM) graduates, and especially for the highest skills in chemical and biological sciences.

6.3 Polymers

- Polymers is a critical UK supply chain to manufacturing.
- The industry is dominated by SMEs.
- A high demand for process operators is evident from the workforce make up.
- Job specific training of highest priority for employers, making training for process operatives a high compounded priority.
- Levels of external spend on training are lower than UK norms and lower than other manufacturing sectors and may be a reflection of the SME dominance of the sector and the lower level of regulation compared to other manufacturing sectors.
- The supply of Apprentices and Graduates is articulated by some employers as an important to the sector.
- Employment turnover can be high.
- There is demand for technical, leadership and management skills.
- Training provision tends to be catered for by private providers, with much specialist provision from the HE and FE having shrunk in recent decades.
- High technology role in the area of composites.
- There is a need to attract more young people to the sector.

6.4 Nuclear

- A priority sector for Wales
- A politically orientated sector with a future linked to private and public investment.
- A highly regulated, safety critical sector.
- Private sector investment in new build will be a major determinant of future skills demand.
- Long term stable and predictable demand for skills in Decommissioning which will be largest subsector workforce for the foreseeable future.
- The future of Fuel Processing capacity and capability depends on: a) the global demand for fuel manufacture; and b) future policy decisions on the reprocessing of waste.
- The UK is at the forefront of Western European new build ambitions in Civil Nuclear.
- Models of future workforce demand have been developed – potentially equivalent to three London Olympics projects.
- If new build programmes proceed, there will be an immediate need for skills in the manufacturing, engineering construction and construction supply chains.

- New build activity, if significant could induce skills shortages in and the sustainability of the Decommissioning sector.

- Major skills shortages are projected from both primary research and lessons learnt from new build projects in western Europe; these are commonly in the areas of nuclear safety and quality assurance in the supply chain, and points to a requirement for standards and training to be developed.

- Critical at-risk skills identified across construction, engineering construction and operation of new nuclear power plants.

- General demand for the supply of engineering, science and specialist professionals.

6.5 Petrochemicals

- A strategic infrastructure in manufacturing, satisfying domestic demand and obviating major imports of refined fuels.

- A sector in two parts – Refining and Retail, with very different skills needs.

- A safety critical sector requiring skills in safety awareness in particular in both Retail and Refining contexts.

- Manufacturing sector with high demand for hard-to-fill process operator skills and professional, technical and managerial skills in particular.

- Supply of science and engineering skills is important.

6.6 All Sectors

- Almost one million employed (UK) in strategic science and engineering industries across energy and manufacturing.

- Strong levels of productivity and contribution to balance of trade.

- Research and development skills a strong feature of the Life science industries.

- Some of the largest private sector employers (by number of employees) in UK.

- Propensity to higher end of skills levels of attainment.

- Mostly full-time employment.

- Widely distributed industries across all UK regions and nations.

- Levels of occupations for categories of Management, Senior Official and Plant Operatives are distinguished from the UK as a whole.

- Greatest skills requirements are in technical competence or job-related roles.

- Safety critical sectors.

- Dependence on skilled science and engineering supply.

7.0 Projected Demand (Working Futures)

Working Futures projections have been taken at the highest level SIC as an approximation for each sector. While the Working Futures[36] data preceded the onset of the recession, its projections a decade ahead normally sit outside the variations of general economic fluctuations. In the case of the current global recession the data is yet to be reassessed and is used here as the best data available to inform a conservative analysis. It is also noted that the Working Futures analysis uses LFS and ABI base data which under-represents the footprint overall (see earlier section) by as much as 50% when supply chain and sectors outside national data are accounted for.

Figure 7.1.1 shows a decline for the manufacturing sectors overall – historically this is a well established trend with a shift in employment across the UK from manufacturing to services. However, segmentation shows that the trend is not uniform.

In total, an employment requirement of an additional 5,700 personnel is projected. Allowing for uncertainty and a conservative estimate of an additional 50% for the direct supply chain and uncoded sectors, suggests of the order of 5,700 – 8,600 new personnel are required in total by 2017.

7.1 Projected Demand by Occupation and Sector

When analysed by occupation, the greatest net requirement is for occupations related to science or engineering. Figure 7.2.1 shows the details overall. Selecting the occupations that centre on skills in science and engineering, there is a net requirement for:

- managers of 1,500
- professionals of 870
- associated professionals of 670
- machine operatives of 600
- skilled trades of 900

These are the occupations which focus on the application of knowledge and skills in science or engineering and make up 4,500, or the majority of the total new employment requirement. Allowing for uncertainty and incomplete coverage of national data, a conservative estimate of approximately 6,800 new personnel is projected for science or engineering-related occupations by 2017.

7.2 Projected Population of Science-related Occupations

Figure 7.3.1 shows the projected population trend of occupations within the standard occupational classifications, noting that the volumes would require scaling by a conservative factor of 1.5 to represent the sector overall. Of particular note are:

- the increase in the population of corporate managers
  - scaled estimate of population 3,250 - 4,900 by 2017

- the stable population of science and technology professionals
  - scaled estimate of population 1,260 – 1,900 by 2017

- the fairly stable population of science and technology associate professionals
  - scaled estimate of population 620 - 930 by 2017

- the decline in the population of process operatives
  - scaled estimate of population 3,480 – 5,200 by 2017

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[36] *Working Futures 2007-2017,* UK Commission for employment and Skills, 2008.

- the decline in the population of skilled trades (Mechanical/Electrical)
    - scaled estimate of population 1,830 – 2,750 by 2017.

Although the decline is most steep for process operatives, the occupation will nonetheless remain the most populous. In contrast, for managerial occupations there is a projected rise in demand. The large proportion of process operatives will be related to the predominant make up of the Cogent sector Wales by the Nuclear, Manufactured Fuels, Polymers, Chemicals and Pharmaceuticals industries. The profile for process operative is not mirrored by that for skilled trades, reflecting the large plant presence of these sectors.

7.3 Skills Shortages and Skills Gaps

It should be noted that due to the small projected numbers, relative to the UK base data, the error in projection may be significant and the projections are most useful qualitatively for trends.

Gaps will continue to emerge across all occupations driven in the main by technology, regulation and compliance.

Of the 6,800 new personnel required in science and engineering-related occupations, apportionment, across the priority occupation gives requirements of:

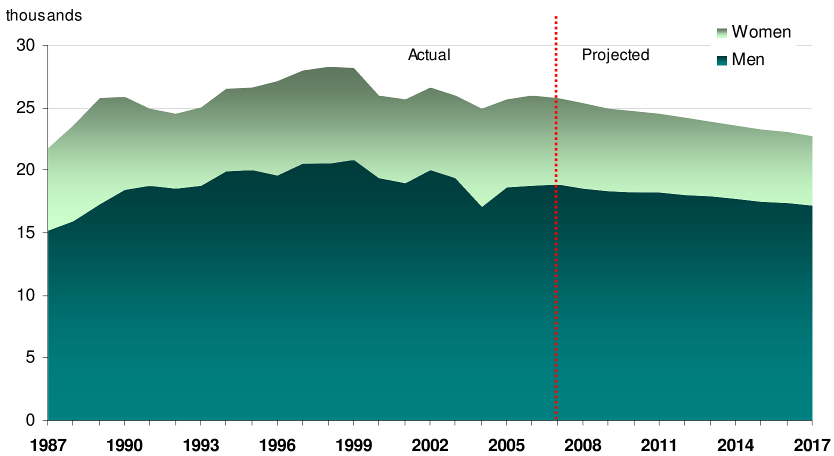
- managers – 2,200
- professionals – 1,350
- associated professionals – 1,000
- machine operatives – 900
- skilled trades – 1,350

For managers the main entry routes are either by internal progression or transfer from the economy generally. These occupations are therefore not limited by the supply from the education system.

For professionals the main entry route is either graduate recruitment or transfer from the economy generally.

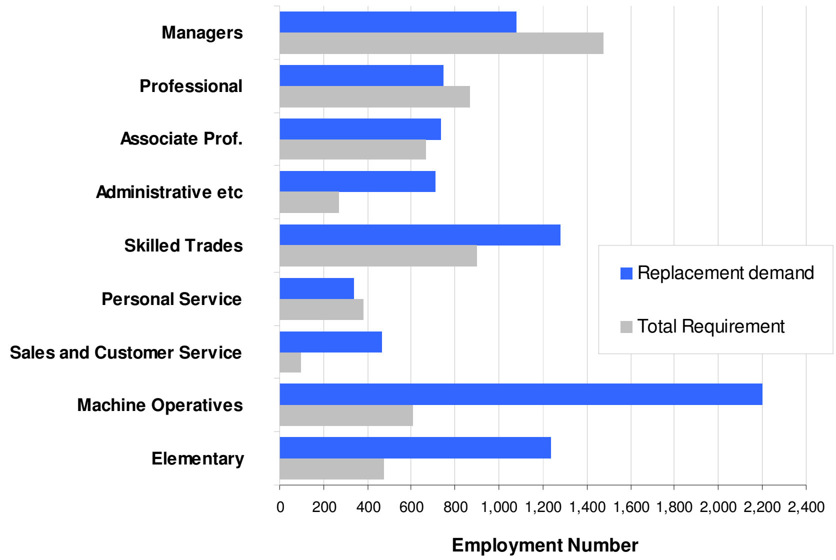
For the occupations of associated professional, process operatives and skilled trades, there is a combined requirement for 3,250 by 2017 (projected from 2007). It is in these occupations that apprenticeship and technician training are most relevant.

Figure 7.1.1 Projected Demand and Net Employment Requirement 1987-2017



(Source: Working Futures2008; excludes Nuclear, Bioscience)

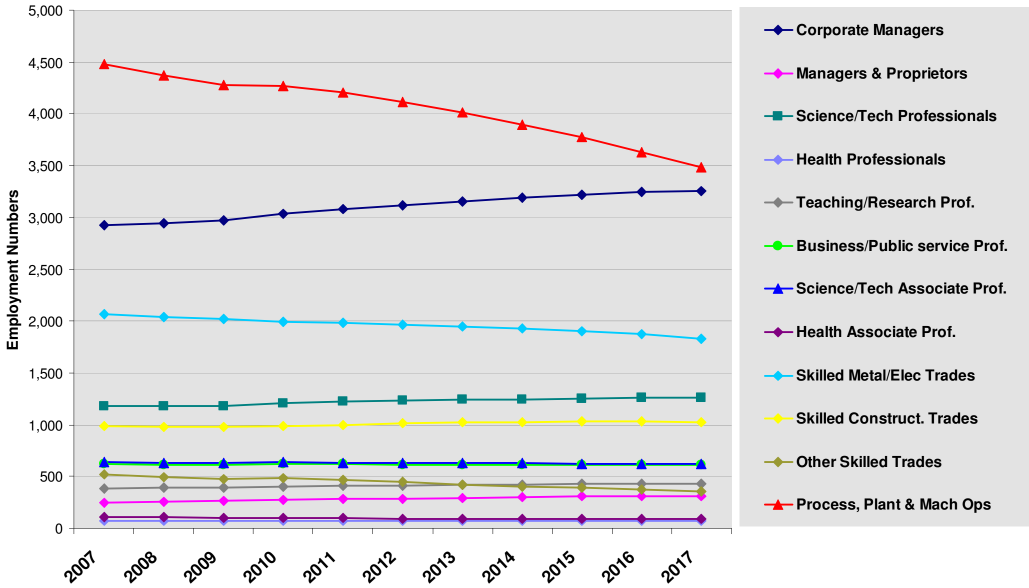
Figure 7.2.1 Projected Demand by Occupation and Sector 2007-2017



(Source: Working Futures2008; excludes Nuclear, Bioscience)

Notes
Replacement Demand = Retirements + Occupational Mobility + Migration
Net requirement = Expansion Demand + Replacement Demand

Figure 7.3.1 Projected Occupational Populations 2007-2017



(Source: Working Futures 2008; excludes, Bioscience)

7.4 Summary

The following apply to the year 2017.

- Positive recruitments are projected for most occupations.

- Science-related occupations comprise the majority of the workforce demand by 2017.

- Occupations at technical and professional levels comprise the majority of demand for science-related occupations.

- A net positive recruitment requirement of 5,700 – 8,600 is projected by 2017.

- A net positive recruitment demand of approximately 6,800 in science-related occupations is projected by 2017:
  - managers – 2,200
  - professionals – 1,350
  - associated professionals – 1,000
  - machine operatives – 900
  - skilled trades – 1,350

- For most of the science-related occupations the population projection is fairly stable, with the exception of process operatives for which a population decline is projected. For the priority occupations the following trends are projected:
  - corporate managers – slow increase
  - science professional/associated professional - stable
  - process plant and machine operatives - decline
  - skilled trades - decline

- For the priority occupations the following populations are projected**:**
  - 3,250 -4,900 corporate managers
  - 1,880- 2,830 science professionals/associated professionals
  - 3,480 – 5,200 process plant and machine operatives
  - 1,830 -2,750 skilled trades.

- Skills gaps are most likely to be driven by technology, regulation and compliance and will require new standards as well as facilitative actions on development of suitable provision for education and training.

- For those occupations dependent on apprentice programmes for new intake, the technical, process operative and skilled trade occupations share a combined requirement of 3,250 by 2017 (projected from 2007).

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Skills for Science Based Industries

The National Skills Academy NUCLEAR

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The strategic skills alliance for the Science-based Industries