



The Sector Skills Council for
Chemicals, Nuclear, Oil and Gas,
Petroleum and Polymers

Nuclear Employers Survey

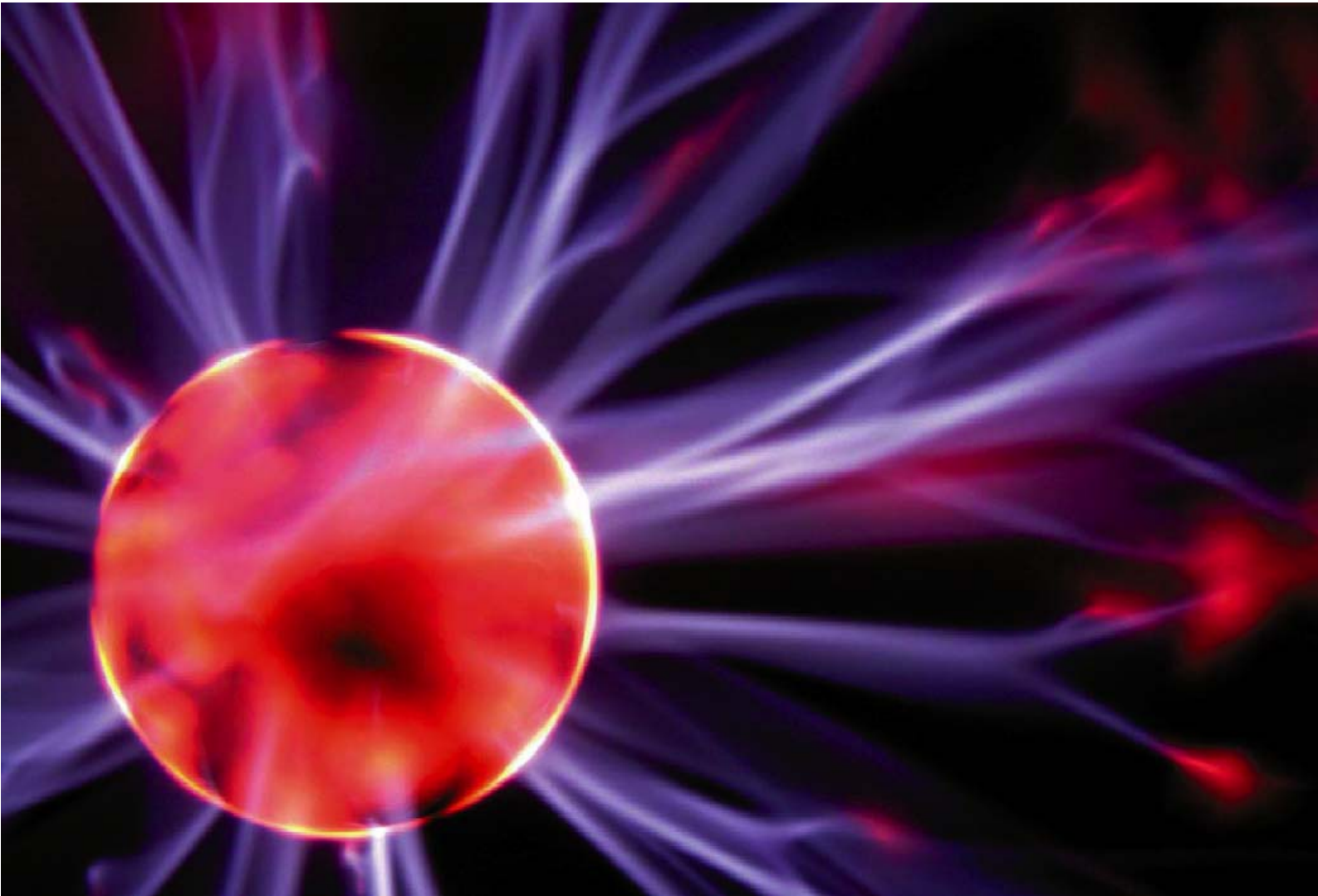
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Executive Summary

The Nuclear Employers Survey was undertaken in 2005 to build upon the 2002 Nuclear and Radiological Skills Study and to inform industry planning and decisions. It also forms a cornerstone input to the Sector Skills Agreement process leading towards an agreed industry skills action plan.

A three part survey was undertaken with employers looking at: overall employment and skills issues; employment volumes and age profiles of core science, engineering and technical workforce and; recruitment and entry routes for this group of workforce. Responses covered the sub-industry functional segments of:

- Nuclear Heat Generation and Fuel Handling
- Nuclear Material Processes
- Nuclear Decommissioning
- Nuclear Waste Management.

The survey responses covered 19 employers, over 20 nuclear industry work sites and covered nearly 28,000 employees - 50% of industry employment.

Nuclear industry employment continues to be dominated by white males working full-time. Only 3% of the workforce is reported to work part-time. The industry was found to be less gender and ethnically diverse than comparator industry sectors such as the Cogent sector, the chemical and utilities industries with males making up 82% of the workforce and whites 96%. The ethnicity of the workforce however does tie in with the regional cluster areas of employment. In a general sense, the age profile of the overall workforce did not give cause for great concern however this hid underlying trends.

Among the small group of employers responding to the survey, nearly three quarters reported having skills gaps in their overall workforce – i.e. job holders do not have all the skills required to be fully proficient in their job role. This was most frequently found to impact upon meeting customer service objectives and responses were to increase training and recruitment activity.

In the short term the most important generic skills were reported to be project management, communication and problem solving skills. Project management will be a critical in the coming years as already a skill gap has been identified. Management & leadership skills are also of high importance

The industry has a strong training culture. All employers provided off the job training and nearly all provided on the job training in the previous 12 months. Managers & senior officials, professionals and associate professionals were the most likely to receive training. Health & safety management was the most frequently delivered training. For companies with a dedicated training budget the average investment per employee was £623 per annum. The most common barrier to training was shift pattern disruption – likely to be a factor in why process & machine operatives received a lower proportion of training.

Science, engineering and technical (SET) workforce made up 63% of the overall workforce reported in the survey. The SET workforce is dominated by professionals i.e. engineers and scientists, this is particularly the case in heat generation and fuel handling where they comprise 56% of the workforce.

The SET workforce has a more aging profile than the overall industry. 11% are due to retire over the next 10 years, but this could rise as high as 20% if early retirements at age 60 occur. Certain areas were found to have an older workforce e.g. 44% of process & machine operatives (including environment, health & safety monitor operatives) are aged over 45. While overall demand for this group may be declining this is outstripped by the rate of retirements. Nuclear heat generation has an ageing profile with 18% due to retire over the next 10 years; however this could rise up to 33% if early retirements occur.

SET employment is even less gender diverse than the overall industry - particularly in the professional and skilled trades areas where only one in ten employees is female. Heat generation and decommissioning also employ less than one in ten females. While an element can be accounted for by the gender profile of science and engineering students/apprentices, the industry is also not attracting suitably skilled and qualified female applicants.

Nearly all companies had recruited engineers over the previous 12 months, just over half had recruited scientists and one third recruited EHS monitor operatives. Graduates made up half of the engineering recruitment and two fifths of the scientist recruits. The survey respondents represent half of the industry employment and recruited between them 233 graduates.

Just below three quarters of employers found engineering and scientist vacancies hard to fill as candidates lacked the required skills, qualifications or experience. Nuclear safety management, safety reliability and nuclear plant & instrumentation systems job roles were the most common skills shortages.

The status of the industry is reasonably sound. The overall age profile for the industry is lower than for the whole national workforce although the power station (operation & decommissioning) sites are higher than the norm. The industry makes a high commitment to training. However there are shortages emerging in a few specialisations and there are definite gaps in skill sets which will need to be filled in the near term in order to have the workforce which the industry needs for the future, against a backdrop of competition for scarce resources from major construction and development projects in other sectors. Graduate recruitment is running at more than retirement levels and appears to be healthy. Looking ahead, although in general retirement rates are anticipated to be lower than the average UK workforce, there are concerns about finding qualified and experienced people to replace them.

The findings, conclusions and recommendations of this report are carried into the sector skills agreement process.

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1. Introduction

Cogent is the Sector Skills Council (SSC) for the Chemical, Nuclear, Oil and Gas, Petroleum and Polymer industries. These industries are of economic and strategic importance to the UK, contributing £46.69bn to its Gross Added Value. However, they face significant changes in the demands placed on their workforce from global competition, increasing public expectations for cleaner safer products, new technology, workforce demographics and sustainable development requirements and the move into decommissioning of assets.

As an employer-led organisation, Cogent provides the opportunity for coherent leadership and strategic action to meet our sector's skills and business needs. Cogent has four key objectives:

- Understanding and Interpreting Industry's skill needs
- Influencing government and industry to ensure there is appropriate investment in the skills required
- Ensuring skills delivery meets industry's needs
- Improving the Cogent sector industry image to make it a positive career choice

Cogent aims to improve performance and drive up productivity through better, more focussed training and the bridging of skills gaps. Industries within our sector depend on a range of skills relating to science, engineering and technology. Having the right people with the right skills in place is critical to productivity, competency, innovation and sustainability right across the sector.

2. Research Background and Method

In order to update and build upon the 2002 Nuclear and Radiological Skills Study (commonly referred to as the Coverdale report) and to form the basis for industry planning and decisions it was agreed by the industry that a Labour Market Information study be undertaken. The structure of the survey for this study has benefited from an Occupational and Functional Mapping study for the Nuclear industry completed in 2004.

Three elements of concern by the industry were highlighted by predecessor reports, industry representatives and Cogent as requiring further investigation:

- a. As national statistics and other employment research sources such as the Employers Skills Surveys depend upon Standard Industrial Classification codes and as the coding is insufficient to isolate specific employment in nuclear, very little information is available for nuclear industry from these sources.
- b. The issue was raised in the Coverdale report that the supply of suitably skilled people to work in engineering, science and technical skills and occupations is declining. It was recognised there was a need to identify the number of people currently employed in specific occupations and to undertake forecasting for numbers required in the future out to 10 years and identify hot spots where collaborative action may prove beneficial

- c. There is and has been limited collaboration between employers in tackling skills issues or working collectively to raise the profile of the industry as a potential career to young people. It was agreed that there was a need to examine recruitment patterns, entry routes into the industry and training pathways for three specific occupations (Engineers, Scientists, EHS Monitors) and to identify where skills shortages exist

There have been several significant developments in the industry and in the energy sector as a whole since the Coverdale report. The period of planning of the NDA up to its establishment in April 2005 saw significant programmes of reductions in employment in several companies as Magnox power stations shut down and the NDA programme emerged. Meanwhile the electricity generation price has recovered to historic levels and above. These and other factors have changed the operation of the industry.

A three part survey was developed to address each of the areas highlighted.

- a. In order to make comparisons of the nuclear industry across the Cogent sector and against other industries, it was agreed to undertake a summarised version of the National Employer Skills Survey 2003/04. This was the General Survey of Nuclear Employers. (see appendix 1)
- b. To gain the further detailed information required about Science, Engineering and Technical (SET) workforce numbers and demand a detailed matrix was developed. This was a spreadsheet Matrix based survey to identify numbers currently employed in job roles and future demand as well as looking at the gender and age profiles of this group of workers. (see appendix 2)
- c. To provide the information required about recruitment patterns and entry routes for the industry in specific SET job roles a further detailed survey was developed. The Drill-down survey looking at Engineering, Science and Environment, Health & Safety Monitors. (see appendix 3)

This format was piloted with a group of ten employers to approve the process. Refinements to the final format were made before the survey was distributed to a further 57 employers across the UK. It was estimated that these 67 employers would cover approximately 80% of employment within the sector.

Employers were encouraged to participate in the survey through a series of one to one meetings with employers – before and during the survey process - and through industry forums such as the Nuclear Employers Steering Group and the Nuclear Advisory Council.

3. Industry summary

At close out of data collection, 19 out of 67 companies responded to the survey (28% response rate) covering (a minimum of) 20 sites across the UK, while this does not appear to be a high response rate in terms of proportion of employers, the representation of employees is more significant. The 2002 Nuclear and Radiological Skills Report identified that 56,000 people were employed in areas of the nuclear industry represented by the Cogent. Using this baseline for total employment, those companies responding to the survey represent 50% of employment in the nuclear industry (27,959).

3.1 Employment Structure

Split of employment between operators and contractors

Responses received to the survey were split evenly between licensed Operators and Contractors. However given the larger base of employment within the responding Operator companies, 94% of the reported employment was in Operating companies.

Concentrations of employment by region

The table 3.1a below shows the distribution of employment across the regions for survey respondents

Table 3.1a: Distribution of responses by region / home nation

	% Employed in Region
East Midlands	11%
East of England	6%
North West	28%
North East	0%
South East	11%
South West	39%
Scotland	6%
Wales	0%

Employment activity of respondents by functional segment

Survey respondents activities were spread across the nuclear industry in the concentrations reported in table 3.1b below.

Table 3.1b: Distribution of responses by functional segment

	Nuclear Heat Generation & Fuel Handling	Nuclear Materials Processes	Nuclear Decommissioning	Waste Management
Split of Employment	15%	43%	28%	13%

4. Findings from Generic Survey

The nuclear industry workforce continues to be dominated by white, male employees working full-time. Full-time workers still make up 97% of employment within the nuclear industry. Of the 3% part-time workers the vast majority are females.

4.1 Gender profile

Table 4.1a shows the split of employment by gender for the overall nuclear industry (based on those responding to this survey), those in Science, Engineering and Technology (SET) based occupations in the nuclear industry.

Comparisons are made with the Cogent sector and other similar SET dominated industries.

Table 4.1a: Gender breakdown comparisons

	Male	Female
Total Nuclear Industry	82%	18%
Nuclear Industry: Science, Engineering & Technical	88%	12%
*Cogent Sector	74%	26%
*Chemical industry	64%	36%
*Energy & Water Workforce	74%	26%
*UK Workforce	54%	46%

* Labour Force Survey (av. q4 2003 – q3 2004)

The Nuclear industry has a greater gender bias among its workforce than is illustrated for the Cogent sector as a whole. This is particularly prevalent among the SET specialist workforce. While this is a trend that stands across all SET based industries such as Engineering Manufacture and the Energy Industries it does appear to be a more acute issue within the nuclear industry. The gender breakdown of the SET workforce will be examined in greater detail in section 5.5 (page 15).

4.2 Ethnic profile

The ethnic profile displayed for the nuclear industry shows it is roughly in line with the Cogent sector however there is an absence of Asian/British Asian people in the survey group. Comparisons are drawn in table 4.2a with the Cogent sector and the whole economy.

Table 4.2a: Ethnic breakdown comparisons

	White	Asian/British Asian	Black/British Black	Chinese	Mixed	Other
Nuclear workforce	96%	<1%	<1%	<1%	<1%	1%
*Cogent Sector	94%	3%	.	n/a	2%	
*UK Workforce	93%	3%	2%	n/a	2%	

* Labour Force Survey (av. q1 2004 – q4 2004)

“.” Indicates data cannot be reported due to sample restrictions
n/a – data not available for this sub-set

However, given the locations of operations for most nuclear sites the profiles are considered to be in keeping with the local community profiles. In addition there are also some barriers for first and second generation immigrants in the security system in some parts of the industry.

4.3 Age Profile of workforce

Figure 4.3a and table 4.3a illustrate the age profile of the Science Engineering and Technology occupations compared to the findings of the Coverdale report for power defence and clean up employees, overall for the Cogent sector and the UK workforce.

Figure 4.3a: Age profile comparisons

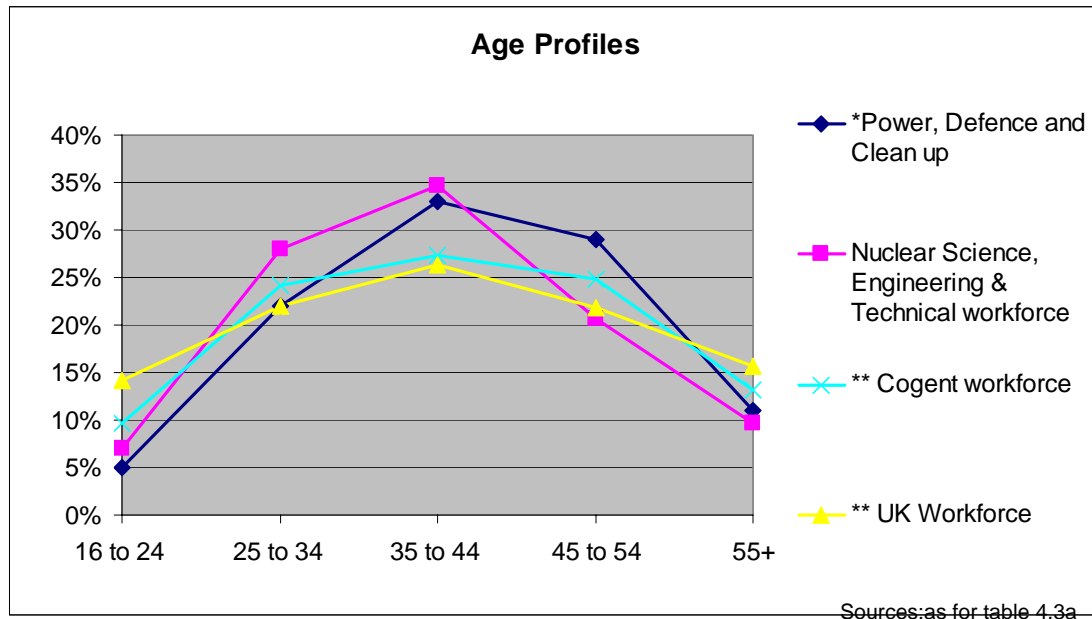


Table 4.3a: Age breakdown comparisons

	16 to 24	25 to 34	35 to 44	45 to 54	55+
*Power, Defence and Clean up	5%	22%	33%	29%	11%
Nuclear, Engineering, Science & Technical Workforce	7%	28%	35%	21%	10%
**Cogent Technical Workforce	10%	19%	27%	29%	15%
**Cogent Sector	10%	24%	27%	25%	13%
**UK of Working Age	14%	22%	26%	22%	18%

* Nuclear and Radiological Skills Study (2002)

** Labour Force Survey (av. Q1 2004 – q4 2004).

For Cogent technical workforce, skilled trades and process & machine operatives' data has been used.

The age profile for those in technical occupations in the nuclear sector – illustrated in chart 4.3a - shows a rather young distribution for this population with a high workforce peak among 35 - 44 year olds in comparison with the UK workforce age profile. The age profile from this survey is unlike the overall Cogent workforce and for all occupations in Power Defence and Clean up in the Coverdale report, which shows an aging workforce where the population is skewed to older age groups. The clear difference between the Coverdale age profile and the new data probably reflects departures and early retirements over the last three years. The age profile of the technical workforce will be investigated further in section 5.4 of this report (page 13).

4.4 Skill gaps & impact

Skills gaps are experienced where it is considered that job post holders do not have the skills required to be fully proficient in their job role. 72% of the companies surveyed reported experiencing skills gaps among their workforce. Skills gaps reported by employers were focussed in the areas of Project Management (39%) and Technical and Practical skills (22%). A significant proportion of the reported skills gaps were seen as being the result of a lack of experience in the job role (22%). Of interest is that no companies reported gaps in the generic skills areas of general IT, literacy, numeracy or in areas of sales/marketing/PR.

Further investigation of the Project Management issue shows several roles/levels: Programme Management is a high level activity in any industry and Project Managers may work their way into that level. Programmes and projects also need Planners and Programme Controllers – these are technical skills which are often IT based. For example the NDA programme, which is composed of work on many sites, requires the use of standardised methodologies including specific software by all the Site Licensed Companies. This has created a demand for Planners and Programme Controllers with these particular system skills.

For 63% of employers skill gaps are experienced within critical areas of their business. With 40% reporting that “meeting customer service objectives” suffered from the impact of skill gaps. These findings highlight that skill gaps are a significant issue for employers in the nuclear industry that are impacting upon their business effectiveness.

When questioned about action taken to address skill gaps within the workforce the most frequent actions taken were to: Provide further training (61%) and increase recruitment activities (50%). This illustrates that employers are already proactively addressing the issue of skill gaps. While additional training activities will benefit the employer, the job holder and the wider industry, the impact on the industry and on employers of increasing recruitment activity could be negative. If increasing recruitment activity means taking an experienced worker from another employer within the industry while solving the company’s immediate problem the issue is then transferred to another employer instigating a spiral of recruitment.

Employers were asked to consider a series of generic skills to assess how important they would be in 2-3 years time, rating them either as: Important; Fairly important; Not very important; Not at all important.

- Project management, communication skills and problem solving skills – were rated by all employers to be either fairly or very important over the coming three years. In fact, 89% of employers rated project management skills as important – this is taken to mean the range of project management skills referred to above. Given that project management has already been highlighted as an area where the industry has a skill gap action should be taken to prevent this gap becoming more severe.

- Leadership & motivational skills were also heavily supported with the majority of employers finding they would be important. Management skills were also found to be important for 94% of employers. Cogent is involved in the Skills for Business Network's **employer-led** approach to:-
 - ⇒ articulate employers' needs
 - ⇒ develop management and leadership skills for all sectors across the UK economy; and
 - ⇒ cascade best practice.
 Currently Cogent is working with nuclear decommissioning industries to import key units from the new set of National Occupational Standards (NOS) for management and leadership.
- Foreign language skills were found to be the least important skill closely followed by general and professional IT skills along with literacy and numeracy which were seen as the least important skills required over the period.
- Interestingly opinion was split over the importance (or not) of entrepreneurial skills. Perhaps this reflects the split between Operator and Contractor respondents where entrepreneurial skills are of greater importance in the contracting environment. This may be particularly the case as the industry moves into the decommissioning phase and competition becomes more open.

4.5 Patterns of Training

Employers were asked whether any off the job or on the job training been delivered over the last 12 months. All employers reported that off the job training had taken place (training away from the immediate work station). 94% of employers also reported having given on the job training to employees in the last year.

On the job training was delivered to all occupational levels however the proportions of training given varied depending upon occupational level. Administrative staff; Associate Professional & Technical staff; Professionals and Managers were up to 3 times more likely to receive training than Process & Machine Operatives and Elementary staff. Managers and senior officials, professionals and associate professionals (including Engineers & Scientists) were the most likely to receive training with 19% of on the job training provided to these job holders.

A similar pattern emerges for off the job training with the higher level occupations most likely to receive training. Incidence of training for Machine & Process operators was increased to nearly 6% of off the job training however this is still only a third of that experienced by Professional occupations.

Both on and off the job training requirements are most likely to be set on a site by site basis with over 50% of employers in stating this was the case.

An even spread of the types of training delivered by employers to their staff was reported. Most frequently provided training over the last 12 months was in Health & Safety and Management. Given the highly regulated nature of the industry and the changes that are occurring due to the shift of activities towards decommissioning this would be anticipated.

Methods of training delivery are varied. Most training is delivered by on-site staff (28%), closely followed by external consultants & private training providers who deliver 26% of training. Just under one-fifth of training is provided by company owned training centres. The remainder is delivered through a mixture of Further Education colleges and Higher Education institutions.

89% of companies surveyed have a dedicated training budget – this is far higher than the level reported for the Cogent sector as a whole in the Employer Skills Survey which stood at just under half that. Regulatory requirements drive the requirement for training in nuclear. However this may also be due to the sample of companies participating in this survey. The high proportion of companies with a dedicated training budget does reflect the fact that the majority of training plans are set at a site basis.

For those companies reporting having a dedicated training budget the average training spend per employee is reported as £623 per annum. All companies report spending the same or more on training staff now than they were three years ago (with one third of companies spending more).

Employers were also asked about factors which inhibited their investment in training. The most commonly cited barrier to provision of training to staff was the disruption it causes to work patterns. This indicates a need for more flexible training delivery that can take account of shift working. The cost of training was also an issue reported by employers. While investigation of levels of collaboration or sharing of training resources was not part of the scope of this study this may be an option which would assist in alleviating the issue of training cost. Other barriers mentioned but experienced to a lesser degree were lack of appropriate training provision and the lack of awareness of training provision. Issues such as these will be tackled in the current Sector Skills Agreement work that Cogent are undertaking on behalf of the industry.

5. Science, Engineering & Technology Occupations

5.1 Introduction

Concern has been raised through the Coverdale report and by other engineering and science based industries that the supply of potential workforce into the sector will not meet the demand of employers. While overall employment numbers may be declining (expansion/contraction demand) the need to replace that workforce nearing retirement (replacement demand) means that the industries still need to attract a large volume of new employees. Engineering, science and technology based industries are competing in a shrinking pool for a skilled workforce.

The new build prospect may help the Nuclear Decommissioning Authority (NDA) with its responsibility to maintain levels of skills and knowledge available for decommissioning. The NDA recognise in their Annual Plan for 2005/06 the remit and role of Cogent in this respect and potential for working in partnership.

The Matrix was designed to pull together workforce information focussing upon specific Engineering, Science and Technical based roles across five Standard Occupational classification levels ranging from process & machine operatives to senior officials. See Appendix 1 for copy of Matrix forms. Employers were asked to provide details of employment in these occupations across four major industry functional segments:

- Nuclear heat generation & fuel handling
- Nuclear material processes
- Decommissioning of nuclear facilities
- Nuclear waste management

Each functional segment is split into the four operational areas:

- Operations
- Maintenance
- Engineering & Technical Services
- Environment, Health & Safety

5.2 The Prospect of New Build

Recent months have raised the issue of potential new build nuclear facilities as the debate continues regarding how the UK can best meet carbon emission targets for the Kyoto agreement (and the tougher targets the UK has set for itself). The prospect of new build programmes calls into play the potential for additional recruitment requirements for the longer term.

The challenge lies in that those who were involved in the most recent new build nuclear power station, are nearing retirement - if not already retired. Should a process of new build go ahead the build up of technical work for the industry would be expected to be very limited for the first 4-5 years until contracts for design and construction are placed, rising rapidly thereafter. However, even in the first 5 years, the work programme would require specialists in several nuclear fields such as:

- Nuclear physics
- Reactor systems design
- Safety analysis
- Metallurgy

and these are not in abundant supply.

Setting aside this potential issue as a matter of Energy Policy the research has focussed upon requirements for current and planned activities. Projections for future workforce demand (including the prospect of new build facilities) is the subject of further investigation in the Sector Skills Agreement process.

5.3 SET Employment Patterns

The total employment of Science, Engineering and Technical (SET) specialists reported in the matrix is 17,716 representing 32% of the total industry workforce (estimated as 56,000 in the Coverdale report). In terms of SET workforce as a proportion of total workforce reported in the survey, the specialists make up 63% of employment.

5.3.1 SET Employees by Functional Segment

Of those companies responding to the survey the split of employment across the four functional segments is as detailed in the table 5.3a.

Table 5.3a: Employees by functional segment for respondent companies

	Total SET Employees Reported	% of total SET Employees
Nuclear heat generation & fuel handling	2739	15%
Nuclear material processes	7609	43%
Decommissioning of nuclear facilities	5035	28%
Nuclear waste management	2333	13%
Total	17716	-

SET employees functional segment split by occupation

Table 5.3b gives the breakdown of employment within each function by occupational role.

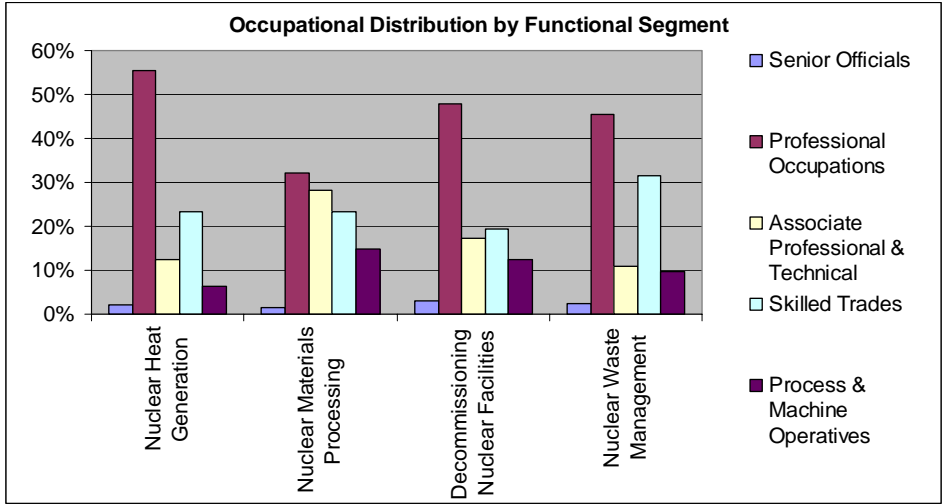
Table 5.3b: Employees by occupation and functional segment for respondents

	Nuclear Heat Generation & Fuel Handling	Nuclear Materials Processing	Decommission Nuclear Facilities	Nuclear Waste Management	All Nuclear SET Roles	
	No. Reported	No. Reported	No. Reported	No. Reported	Total	%
Senior Officials	60	120	155	55	390	2
Professional Occupations	1523	2442	2416	1063	7444	42
Associate Professional & Technical	341	2134	863	258	3596	20
Skilled Trades	640	1786	975	733	4134	23
Process & Machine Operatives	175	1127	626	224	2152	12
Total	2739	7609	5035	2333	17713	100

Figure 5.3a shows the percentage split of employment in these occupations for each segment to allow comparison of the structure of employment within each area.



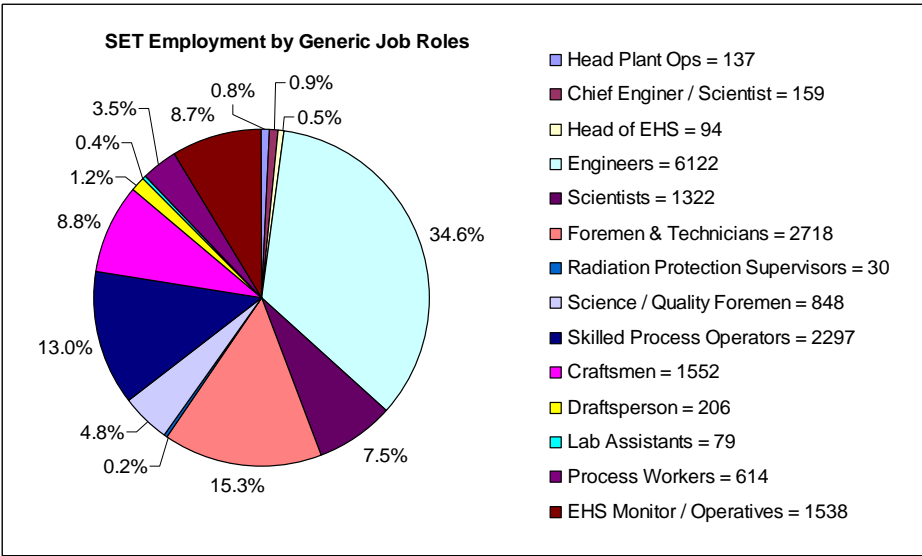
Figure 5.3a: Occupational distribution comparisons by functional segment



The occupational spread across the different functional segments varies as can be clearly seen in figure 5.3a. In each case Professional Engineers & Scientists make up the highest proportion of technical workforce to differing degrees. For example Nuclear Heat Generation has reported a far higher proportion of staff in the Professional Engineering and Science Occupations 56% compared to other functions, particularly Nuclear Materials Processing. This indicates a greater level of demand for higher level skills in this segment.

As may be expected the Nuclear Materials Processing segment employs the highest proportion of process and machine operatives. Nuclear Waste Management has the highest demand for Skilled Trades. A balance is seen across the functions in terms of the proportion of employment as Senior Officials and Management occupations.

Figure 5.3b: Employment breakdown by job role



Employment in each occupational category can further be broken down by generic job roles which were agreed by industry representatives in the development of the survey. The more detailed occupational breakdown is as presented in figure 5.3b.



Figure 5.3b illustrates the industry's dependence upon Engineers who make up by far the highest element of employment in SET job roles. Engineering roles were said to include: Operations, Maintenance, Mechanical, Electrical, Chemical, Instrument / Control & Project Engineers. The Engineers reported are split across the four Functional Operations as follows:

- Nuclear Heat Generation 19%;
- Nuclear Material Processes 40%;
- Decommissioning 31%;
- Waste Management 10%.

A similar examination of the split of employment of Professional Scientists across the Functional areas shows that their employment is predominantly in Decommissioning:

- Nuclear Heat Generation 27%;
- Nuclear Material Processes 1%;
- Decommissioning 41%;
- Waste Management 31%.

SET employees functional segment by operational activity

Within each functional segment the balance of operational activity varies in relation to the focus of that function. Table 5.3c illustrates that while Nuclear Heat Generation & Fuel Handling has a strong emphasis upon employment in Engineering & Technical services; employment in Decommissioning is focussed in Operational activities. Operational activities across Nuclear Material Processing and Waste Management are more evenly spread.

Table 5.3c: Employment breakdown by functional segment and operational activity

	Nuclear Heat Generation & Fuel Handling	Nuclear Materials Processing	Decommission Nuclear Facilities	Nuclear Waste Management
Operation	25%	24%	55%	22%
Maintenance	15%	23%	12%	28%
Engineering & Technical Services	53%	30%	23%	25%
Environment Health and Safety & Regulatory Compliance	8%	24%	10%	26%

5.3.2 SET Employees by Operational Activity

Table 5.3d is the breakdown of the technical workforce by operational activity.

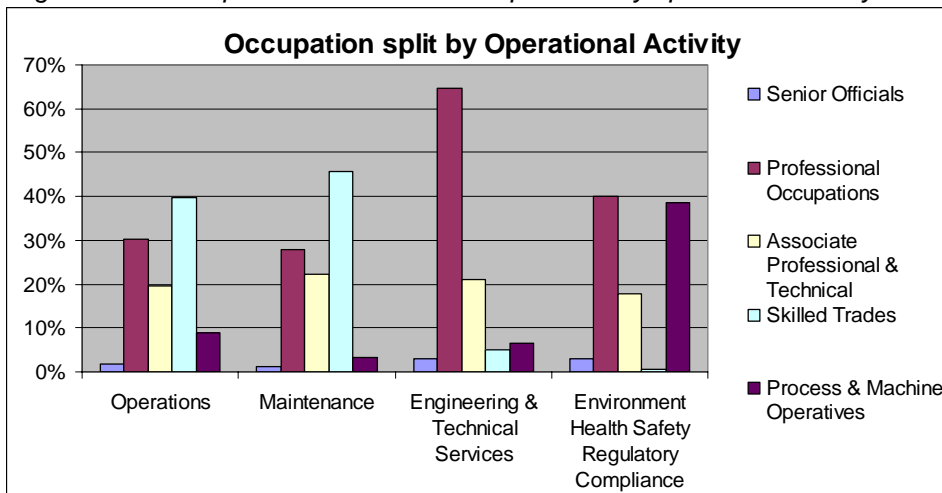
Table 5.3d: Employment breakdown by operational activity

	Total SET Employees Reported	% of SET Employees Reported
Operations	5784	33%
Maintenance	3403	19%
Engineering & Technical Services	5433	31%
Environment, Health & Safety	3096	17%

Note: Environment, Health and Safety makes up 17% of total SET workforce.

Figure 5.3c provides a comparison between the proportions of workforce by occupation within each occupational area.

Figure 5.3c: Occupational distribution comparisons by operational activity



The proportion of line managers required across Operations varies little, illustrated by Senior Officials and Associate Professional & Technical (Foremen & Supervisors).

Of interest is the difference in proportions of Professional Occupations (Engineers and Scientists), Skilled Trades (Skilled Process

Operators, Craft workers, Draftsmen, Laboratory Assistant) and Process & Machine Operators (Process Workers and EHS Monitor / Operatives). Within the areas of Operations and Maintenance there is a dominance of Skilled Trades – comprising level 3 skilled Operators and Craftsmen. Given the activities in these areas this is to be expected. The peak of Process and Machine Operators in EHS is dominated by the EHS Monitors and Operatives.

5.4 SET Age Profiles

5.4.1 Age profile by occupation

The industry summary showed the age profile for SET employees compared against those of the Cogent sector and other industries. Table 5.4a shows the age profile breakdown of SET employees at an occupational level.

Table 5.4a: Age breakdown of workforce by occupation

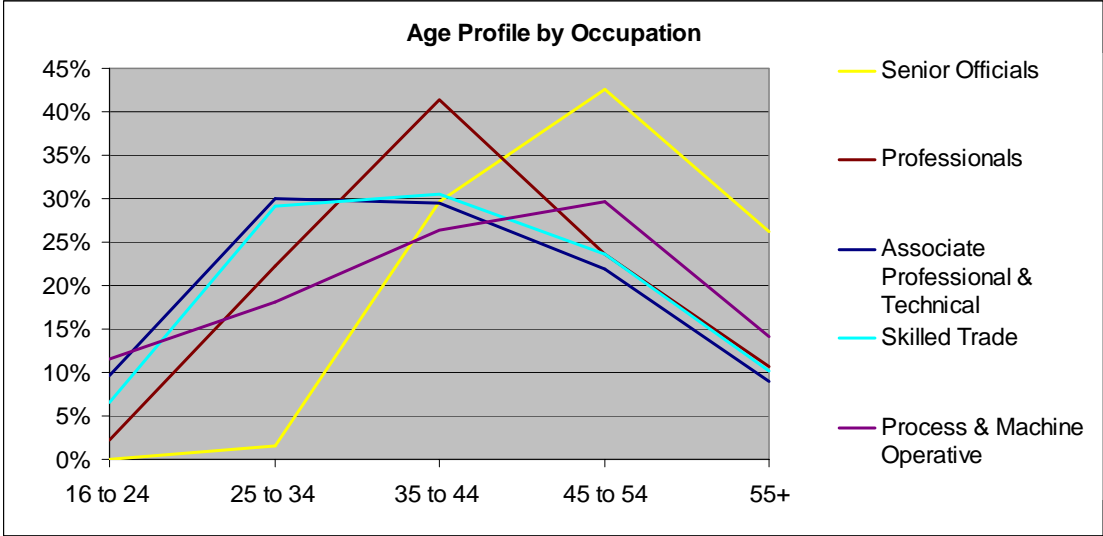
	16 to 24	25 to 34	35 to 44	45 to 54	55 to 64	65+
Nuclear Engineering, Science & Technical Workforce	6%	25%	34%	24%	11%	0%
Senior Officials	0%	2%	30%	43%	25%	1%
Professionals	2%	22%	41%	24%	11%	0%
Associate Professional & Technical	10%	30%	29%	22%	9%	0%
Skilled Trades	7%	29%	30%	24%	10%	0%
Process & Machine Operatives	12%	18%	26%	30%	14%	0%
*Cogent Technical Workforce	10%	24%	27%	25%	13%	0%
*Total UK of Working Population	14%	22%	26%	22%	16%	2%

* Labour Force Survey (av. q1 2004 – q4 2004)



Table 5.4a shows that 35% of the workforce is over 45 for the nuclear specialist job roles in total compared to 38% for the technical roles in the overall Cogent sector. However closer examination on the age profiles illustrated in figure 5.4a shows that Senior Officials and Process & Machine Operatives have age profiles more skewed to older workers. In the case of senior officials this is to be expected. The profiles for skilled trades and associate professional & technical are remarkably similar.

Figure 5.4a: Age profile of workforce by occupation



From the survey 11% of SET employees are due to retire over the next 10 years (potentially 20%+ including early retirements at age 60). Even at straight line attrition this shows a replacement demand of 2.3% per annum assuming a stable workforce demand.

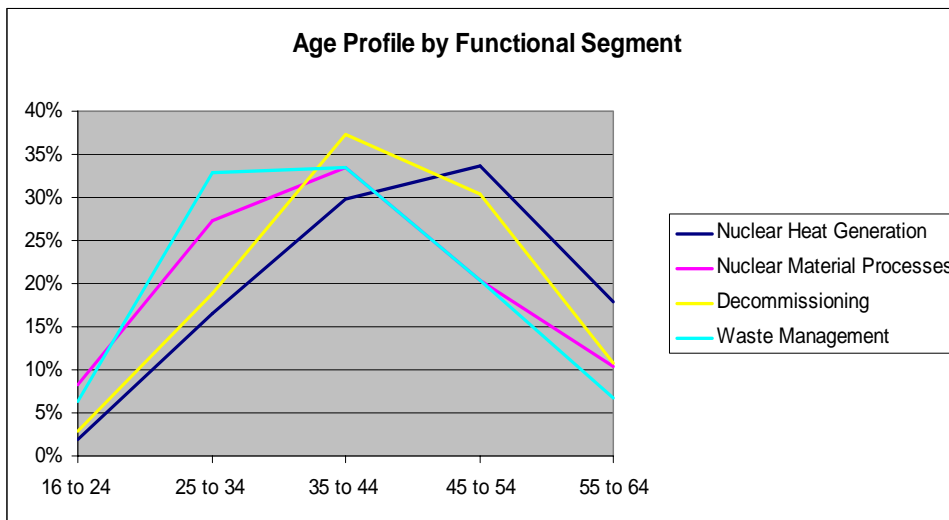
Recruitment figures reported, by survey respondents, for Engineering, Scientists and EHS Monitor/Operatives for the last 12 months was 245 new entrants to the industry. This figure of recruitment was in line with the 2.3% replacement demand. However the proportion of EHS Monitor/Operative recruitment in relation to the overall population shows that in this area while it may be argued that employment demand is decreasing the indications are that retirements may be outstripping the pace of replacement. In addition to this it should also be noted that Process and Machine Operatives (the occupational category that EHS Monitor Operatives are recorded) stand out as making up a proportionately larger part of the workforce due to retire than they do the overall workforce. The same can be said for Senior Managers and Officials.

Although Senior Management is only a small population, attrition of people in these specialist roles (through retirement) means that succession planning must be in place. Assuming the continuity of existing organisation/business models and structures, future Chief Engineers, and Heads of Plant Operations and Environment, Health and Safety may be required to replace the likely 56 retirements over the next 10 years among those 11 out of 13 companies who have provided age profiles. This equates to one third of this group retiring over the next 10 years. However, some rationalisation is likely over this period.

5.4.2 Age profile by Functional Segment

Examination of workforce age profile by Functional Segment also provides an insight. Figure 5.4b provides an illustration of this where it can be seen that there is a high proportion of workforce aged 55+ in Nuclear Heat Generation which may have an effect on future operations.

Figure 5.4b: Age profile of workforce by functional segment



While a decline in demand for workforce in Nuclear Heat Generation is expected there will also be a need to replace retiring workforce to ensure ongoing operations. 18% of the workforce in this area are due to retire over the next 10 years (including 22% of Associate Professional & Technical workforce in the function) should early retirements be a factor

the retirement level could rise as high as 33% over the next 10 years. This area may require further investigation given the level of response to the survey within this Functional Segment of the industry. In other functional segments, the age profile is healthier.

5.5 SET Gender Profile

5.5.1 Gender breakdown by Occupation

Table 5.5a shows the gender split of the SET workforce overall and by occupational breakdown. Figures for Cogent and the UK workforce are included for comparison.

Table 5.5a: Gender breakdown of workforce by occupation

	Males %	Females %
Nuclear Science, Engineering & Technical Workforce	88	12
Senior Officials	90	10
Professionals	91	9
Associate Professional & Technical	85	15
Skilled Trades	92	8
Process & Machine Operatives	73	27
*Cogent Technical Workforce	82	18
*Cogent Sector	74	26
*UK Workforce	54	46

* Labour Force Survey (av. q1 2004 – q4 2004)



It can be clearly seen in table 5.5a that while the Cogent workforce in general has a male dominated workforce this effect is even more exaggerated in technical occupations.

The gender profile of associate professionals and technical workforce (foremen, radiation protection and science / quality foremen & technicians) mirrors the average for all technical staff in the overall Cogent sector. Professional engineers & scientists and the skilled trade occupations such as skilled process operators, draftsmen, craftsmen and laboratory assistants display the greatest gender imbalance each with only one in ten workers being female. In contrast the gender profile of process workers and environment, health and safety monitors mirrors that of the sector with 27% of this workforce being female – however a note of caution that this finding is skewed by some survey responses.

5.5.2 Gender breakdown by functional segment

A review of the gender breakdown by functional segment in table 5.5b makes for equally grim reading in terms of gender diversity of the workforce.

Table 5.5b: Gender breakdown of workforce by functional segment

	Males %	Females %
Nuclear Science, Engineering & Technical Workforce	88	12
Nuclear heat generation & fuel handling	92	8
Nuclear material processes	84	16
Decommissioning of nuclear facilities	92	8
Nuclear waste management	88	12

The higher proportion of process and machine operatives (i.e. EHS monitor / operators and process workers) in nuclear material processes account for the increased proportion of females within that functional segment. The male / female split of the machine operative workforce in this functional segment is 64:36.

On the other side of the spectrum within the nuclear heat generation functional segment females are under-represented in all occupational groups. In this area females make up only 3-4% of the workforce in the skilled trades and associate professional and technical job roles.

5.6 Projected Demand for SET Workforce

With respect to employers working within the NDA programmes, there is so far little indication of change over the next two to five years, reflecting the data in Near Term Work Plans (NTWP) and life-cycle baselines (LCBL). The Tier 1 contractors managing the NDA sites (British Nuclear Group and UKAEA) have indicated that efficiency gains over this period will result in some reductions (perhaps 3 % pa). The opening of Tier 1 contracts to competition after two years will almost certainly drive reductions in the workforce on Licensed Nuclear Sites, but the amount of those reductions can only be guessed at.

The future workforce demands will be estimated by industry foresight groups taking account of such factors as:

- New build of power stations

- Construction of waste disposal facilities
- Life extension of existing power stations
- Technology developments in decommissioning
- National research demand
- Fusion technology – realisation
- Export demand

This work should result in long term projections of change to workforce demand including occupational and functional spread. It is planned to hold a workshop looking at potential future scenarios and impact on employment and skills demand in December 2005.

6. Findings from Engineers, Scientists, EHS Monitor / Operatives Survey

6.1 Recruitment patterns

In the survey companies were asked how many people were recruited in last 12 months – 89% of the companies had recruited engineers, 56% had recruited professional scientists and 36% had recruited environment health safety monitor/operatives

Just below 7% of the reported engineer workforce was recruited in the last 12 months. This saw recruitment of 419 people across the 50% of employment represented by this survey of which new graduates made up 40% (169 in total). Over half of the companies took on new engineering graduates.

In terms of scientist recruitment a total of 163 professional scientists were recruited in the last year of which 39% were new graduates (64 recruits in this area).

In the case of both of the above while a reasonable proportion of recruits are new to the industry from University there will also be a high element of movement within the overall nuclear population of workforce moving between employers but remaining within the industry. In any case, a total of 233 new graduates were recruited in those companies responding to the survey who represent 50% of the workforce.

On EHS Monitor / Operatives, the return of data was limited. 36% of the companies responding to the survey reported having recruited in the previous 12 months, and only two companies recruited school leavers (12 in the year). Training was provided through a combination of in-house training and local colleges with no formal frameworks in use.

6.2 Future Demand

Demand & disciplines for vacancies reported by companies representing 50% of industry employment are as follows:

- Engineer vacancies = 302
The majority of these vacancies are for Mechanical Engineers (97), followed by Project Engineers (58) and Operations Engineers (47).

- Scientist vacancies = 57
Health Scientists represent the largest majority of vacancies (16) RPA and Environmental Scientists each have 9 current vacancies, Safety Analysts (5) other Scientist vacancies are the most prevalent (18).
- EHS Monitor / Operative vacancies = 13 vacancies reported

6.3 Hard to fill vacancies

Employers were asked whether they considered any of their Engineering, Science or EHS Monitor/Operative job roles hard to fill. 73% of employers completing the survey report that they find Engineering vacancies are hard to fill and 69% find Science vacancies hard to fill. Causes attributed to why these vacancies are hard to fill are in the case of both engineers and scientists that applicants do not have the required qualifications and skills for the job role and that they lack the relevant work experience required.

6.4 Skill shortage vacancies

Where employers have found vacancies hard to fill over the last 12 months for skills related reasons e.g. applicants lacked required qualifications / skills / experience they were asked to highlight specific occupations where this was an issue. Fifteen employers reported back in this area specifically for engineering job roles.

- Ten out of 15 employers found shortages of suitably skilled applicants for Nuclear Safety Management positions.
- Nine out of 15 employers found shortages in the recruitment related to Safety Reliability
- Eight out of 15 employers surveyed had experienced skill shortages in the area of Nuclear Plant and Instrumentation Systems

6.5 Skills gaps of graduates

Employers who have recruited Engineers in the last 12 months were asked if there was a difference between skills graduate recruits have are those that they expected them to have. Just short of 29% of employers reported that this was the case. Similarly for those who had recruited graduate Scientists one third of employers found that graduates did not have the skills expected. Further investigation and feedback from industry will be required to clarify in what areas graduate skills do not meet the expectations.

6.6 Leavers from industry

Employers were asked for information regarding those employees who had left the organisation in the last 12 month. Of those who left for reasons other than retirement the most common reasons cited for leaving were for an improved reward and benefits package or for a change of job type.

7. Conclusions

The status of the industry, as presented in responses to the survey from the early 2005, is reasonably sound. There is no problem over basic skills in the industry. The overall age profile for the industry is lower than for the whole national workforce although the power station (operation & decommissioning) sites are higher than the norm. The industry makes a high commitment to training. However there are shortages emerging in a few specialisations and there are definite gaps in skill sets which will need to be filled in the near term in order to have the workforce which the industry needs for the future, against a backdrop of competition for scarce resources from major construction and development projects in other sectors, such as Olympics driven projects.

Graduate recruitment is running at more than retirement levels and appears to be healthy. Looking ahead, although in general retirement rates are anticipated to be lower than for the average national workforce, there are concerns about finding qualified and experienced people to replace them. It seems that the industry will be increasingly forced to hire and train within the industry:

- more young people with qualifications
- more qualified and experienced people from outside the industry

General points on recent trends:

- Industry employment appears to have reduced in size slightly over the past five years
- The expected increase in graduate recruitment has not yet taken place since Coverdale reported in 2002
- Closure of nuclear power stations means this segment employs less people and, as a result, recruitment is reducing: the age profile is higher than the norm and a new programme of power stations could find a vacuum of skilled operators in 10 years if action is not taken
- In passing from operation to decommissioning, the requirement for professionals seems to fall and for less qualified to increase – this is consistent with experience elsewhere e.g. in the USA.

The main issues which arise are as follows:

- Numbers of women in the SET workforce are very low by any standard especially in power generation and decommissioning
- Process and machine workers (semi skilled), including EHS monitors, are well above the normal age profile
- Skills gaps are clearly arising in project management and Technical/practical skills – some of these are thought to be related to the specific requirements that the NDA programme management system places on their contractors
- Looking ahead, employers see a need for better management & leadership skills
- Vacancies for experienced engineers are hard to fill for most of the employers
- Specialist shortages are few, the most common being for Nuclear Safety specialists and Instrumentation/System specialists which more than half of employers reported.

8. Recommendations

The following recommendations are offered before the forward look with scenario planning is done.

- i. The data in this project has under-represented those contractors which are not operating sites i.e. potential Tier 1 contractors and Tier 2+. A separate and smaller scope survey of such contractors should be done, concentrating particularly on age and gender profile, hot spots and gaps.
- ii. The gender imbalance is apparently severe. This should be investigated further: to investigate the availability of women SET graduates and school leavers, to determine barriers to employment of women, to provide a clear picture of opportunities and expectations for women, to compare with other industries. Further assessment of the ethnic imbalance should also be done. With a clear picture, Cogent should consult employers to monitor female and ethnic recruitment and employment over the next 5 years.
- iii. The number of apprentices p.a. is known to be at a historic low. The data indicates that there will be significant demand for apprentices to replace departures from the skilled and associate professional grades. The trend to accelerate decommissioning will tend to increase the demand. The situation on apprenticeships for the nuclear industry should be reviewed with employers and suitable action taken.
- iv. There is a stated need for improvements in leadership and management. The assessment of skill levels should be encouraged. NOS for Management & Leadership have been developed and can be contextualised specifically for use in the nuclear industry, as with the recently published Nuclear Decommissioning Operations NOS for qualifications at Levels 2 and 3. This issue should be taken into account in development of all standards and qualifications.
- v. Project Management skills are also clearly in demand especially for the NDA programme. A variety of Project Manager training is available and employers should be encouraged to look for the appropriate courses: Cogent should investigate best training practice and report.
- vi. There is a specific requirement for Planners and Programme Controllers who are knowledgeable in the NDA's system software which may need collective action. Cogent will monitor the situation and propose action if necessary.
- vii. There is a clear need for more Safety engineering specialists. Employers should be encouraged to develop more staff in Safety engineering competence. Assessment processes should be reviewed. It is recommended that employers share common methodology (e.g. Safety Case NOS) for assessment and development of specialists and seek training which is based on this methodology as appropriate. Cogent should review the training provision available, provide a guide to employers and encourage the providers to provide consistent and appropriate training in the field. Cogent should also take the NOS to other safety case industries such as: oil & gas, railways, aviation to share common parts and identify nuclear specifics.



Appendix 1

Generic Employer Survey (attached separately)

Appendix 2

Science Engineering & Technology Matrix Survey (attached separately)

Appendix 3

Drill Down Survey into Engineering, Science and EHS Monitor / Operative Occupations (attached separately)