

Chartered Quality Institute

Nuclear Industry UK Research into current and future quality professional skill needs



Contents

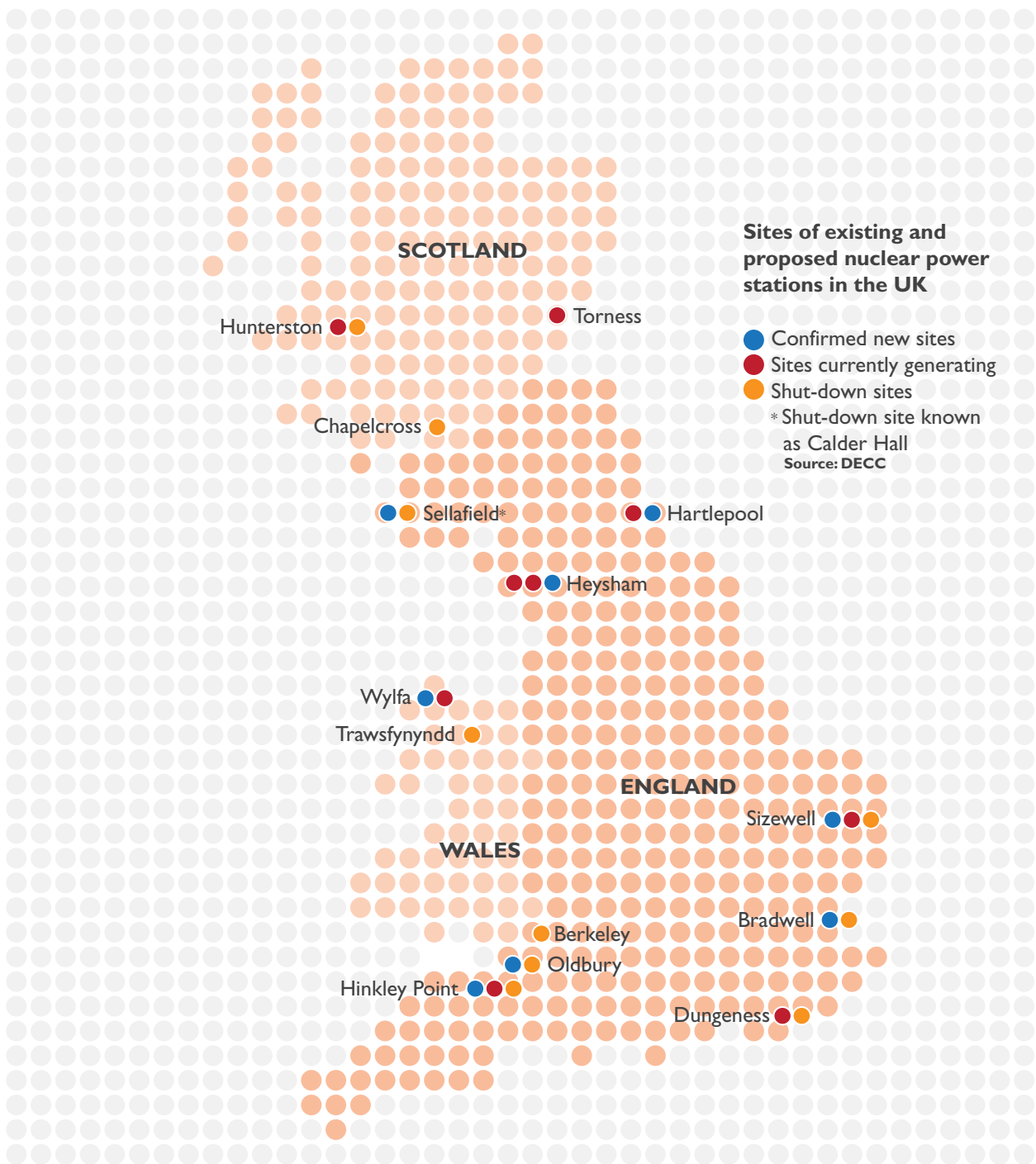
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I. Executive summary

- 1.1. Nuclear energy remains a core plank of the UK government's energy policy. Its current workforce of 44,000 in civil nuclear and a further 14,000 employed in defence is highly skilled, but it is also ageing at a faster rate than the rest of the UK's nuclear workforce.¹ The ageing profile of the nuclear workforce as a whole is one of the factors driving the strategy of Cogent, the nuclear sector skills council.
- 1.2. The time span for the new build and decommissioning process stretches over the next 13 years, but the trigger points for skills shortages are likely to arise much sooner. While skills shortages apply across a range of key groupings in the nuclear industry, this research has targeted the skill sets for quality professionals, a cohort critical to the sector's future given its emphasis on regulation and safety and having quality management and assurance as vital components.
- 1.3. The UK government has so far identified five new nuclear plants for construction. Contracts for the first of these are due to be awarded shortly, with Rolls-Royce expected to win a £400m (\$632m) share in the building of the first of the planned power plants and France's Areva expected to secure the contract for supplying the majority of the nuclear reactors.
- 1.4. Recent decisions by RWE npower and E.ON to pull out of the Horizon joint venture, which had been formed to undertake construction of the Wylfa B nuclear plant in Anglesey, has created some uncertainty around the progress of the UK's nuclear new build programme, however the intention is to seek new owners of the Horizon company.
- 1.5. Running alongside the new build programme is the programme for the decommissioning of existing plants. As a result, over the next 10 years, employment in the sector is expected to rise by 14,000 (see para 3.4) and within this figure there will be a demand for over 1,000 new quality professional jobs in new build alone. These figures are based on the estimated figure of 2,600 quality professionals currently employed in the nuclear sector. (see para 3.8).
- 1.6. The age profile of quality professionals currently operating in the sector, identified by this research, reflects the picture established by Cogent through its own research.² In addition, both Cogent's findings, and this new research, have identified an anticipated high rate of attrition of quality professionals from the sector through retirement, which will add to the pressures of future skill needs. Based on both this new research and Cogent's figures on age profile in the nuclear sector, the attrition rate for quality professionals will mean an estimated 1,200 – 1,700 additional quality professionals will be required by 2021.
- 1.7. This new research has also identified serious gaps in the sector's skills strategy regarding the monitoring of quality professionals. Cogent, and the other employer led bodies for the sector, have identified future skills shortages which mirror the skill set of quality professionals but have failed to separately categorise these shortages, and consequently run the risk of failing to include the measuring, training and qualification needs for the quality profession in its plans.
- 1.8. Furthermore, this report identified that while there is high recognition of the importance of quality across the sector, the professionals delivering it need to be formally recognised.

To ensure that sufficient quality management skills exist in sufficient numbers, at the optimum time, the profession as a whole needs to be measured and formalised and Cogent should make the separate categorisation of quality a priority in order to ensure that quality professional numbers are sufficiently measured and planned for.

The training period for a quality professional averages two years. This is because the qualifications are often add-ons to existing professional qualifications. For example, engineers recruited in to the nuclear sector over the years have added professional quality qualifications to engineering degrees or other professional engineering qualifications, as their careers have developed. The two year time span, set against the timescale for the development of new



build, means that immediate attention is required from the industry and its regulatory bodies to ensure that appropriate training programmes are in place to address future skills base and shortages of quality professionals.

This research has not found evidence to suggest that the industry has so far recognised these needs, by incorporating professional quality qualifications into its detailed skills strategy. Action to address this failing is one of the key recommendations arising from the findings contained in this research.

1.9. This research, in its examination of the nuclear defence sector, found less evidence to suggest that an increased demand for jobs would arise over the next 10 years. Demand, which is dependent upon government defence strategy, is expected to remain essentially constant, although there may be a small decrease in overall employment during the next 13 years. The availability of skilled individuals in the nuclear defence sector is likely to be affected by the demands in new build in the civil sector.

2. Introduction

- 2.1. The Chartered Quality Institute (CQI) is the chartered body for quality management professionals. Established in 1919 and formerly the Institute of Quality Assurance (IQA), it gained a Royal Charter in 2006 and became the CQI shortly afterwards, in January 2007. The CQI promotes a quality management approach, based on planning, measurement and improvement, which delivers the following benefits for organisations:
- improved customer satisfaction;
 - reduced costs and improved profitability;
 - improvement and innovation;
 - identification and management risk; and
 - corporate care and responsibility.
- 2.2. It recognises that these business outcomes can only be delivered by competent quality professionals, CQI members, and in support of this the CQI provides the following services:
- promoting the benefits of the quality management approach to industry;
 - maintaining the Body of Quality Knowledge;
 - disseminating quality knowledge and resources;
 - providing qualifications and training; and
 - assessing and recognising quality competence.
- 2.3. The institute has members across all sectors and this paper addresses the issue of quality professional skills in the nuclear industry where the institute has a significant membership. This report will specifically address the energy/power nuclear sector; examining the current labour market profile and future needs to meet the requirements of the government's proposed new build and decommissioning plans over the next 10 years.
- 2.4. The CQI commissioned this study in response to concerns expressed by its' members of skills shortages, an ageing profile and lack of recognition of the separate role/skills set required for quality professionals in the nuclear sector. The report seeks to identify the current skill base across the nuclear industry, both private and public.
- 2.5. As well as addressing the need for quality management in the prime delivery companies, through new build and decommissioning programmes, it also observes the need for appropriately skilled professionals to be represented in its supply chain and the major decommissioning programme; similar skills demands and 'peaks' exist across all three areas.

3. Background of the nuclear sector

- 3.1.** The UK is on the cusp of a sea change in energy and the nuclear industry has been earmarked as one of two key future providers. In 2010, against the background of the on-going decommissioning programme, three private consortia proposed investment which would result in the construction of 16 GWe of new capacity. Planning to underpin this took a step forward in October 2010 with the coalition government's identification of eight potential new build sites in its revised draft National Policy Statement. To date, the five sites identified for construction are Hinkley Point and Sizewell (EDF), Wylfa and Oldbury (Horizon), and Sellafield (NuGeneration).
- 3.2.** The government's current energy strategy remains for five new nuclear plants to be built, despite the announcement³ of RWE and E.ON at the end of March 2012 of their intention to pull out of the new build project Wylfa B site in Anglesey and Oldbury-on-Severn, near Bristol. The construction of the five sites will be reliant upon new investors taking over Horizon Nuclear Power, the joint venture set up to develop them. This strategy will create a huge demand for high level science and technology skills. Amongst these will be the need to ensure high levels of quality management, essential to the industry.
- 3.3.** The UK civil and defence nuclear sector employs around 58,000 personnel (14,000 in defence and 44,000 in civil nuclear⁴). Over 24,000 people are currently employed in the operation and decommissioning of the UK's nuclear power stations with a further 20,000 employed in the direct supply chain to the nuclear industry. Cogent, the UK sector skills council responsible for the nuclear industry, has indicated that the proposed programme for the nuclear power industry will require annual recruitment of around 1,000 people, many at apprentice and graduate level⁵.
- 3.4.** Overall employment in the industry, based on the scenario of seven reactors either in construction or under commissioning, is set to rise by 14,000 by 2020-21. While much of this will be in construction, over 4,000 technical and graduate level jobs will be required in operations and 800 jobs in manufacture⁶. Although construction and operations is expected to be mainly UK sourced employment, the manufacturing supply chain capacity and capability is estimated to be only 75% sourced from the UK⁷. This is due to nuclear vendors such as Areva, Westinghouse and others, who having established global supply chains, utilising as much of the UK supply chain to supplement their integrated global suppliers.
- 3.5.** The reports from Cogent, which form the Renaissance Nuclear Skills Series⁸ – constantly remind us of the nuclear sector status as a safety critical industry. The series was designed to classify, quantify and qualify the skills present in the civil nuclear industry. In the second of this series⁹, reference to quality assurance, project management, safety case authors/engineers and the need for a shared understanding of quality assurance in a nuclear context, indirectly highlighted the important contribution of quality professionals to the sector.
- 3.6.** Cogent, through its Labour market intelligence research¹⁰, has quantified three skills drivers for the nuclear industry:
- an ageing workforce driving replacement demand;
 - a shift in skills to decommissioning; and
 - a new demand for skills to operate a new fleet of nuclear power stations.
- 3.7.** Cogent's report identifies supporting functions such as Business, Safety and Security and Project Management as forming up to 40% of the skilled activities. Quality professionals are most likely to be found within this cohort as it comprises those skill sets most associated with the work of quality professionals – professional engineering, project and risk management and inspection.

3.8. The Cogent Skills Risk Register¹¹ proposes that the number of Quality Control/Assurance posts required for a single reactor is 200. Given the current nuclear civil estate, (see 'fig 1'), this would suggest that approximately 2,600 posts requiring quality professional skills currently exist, covering electricity generation and decommissioning sites. Based on the original government proposals for increasing nuclear fuelled electricity generation the requirements over the next 13 years would see this figure substantially increase as new build and decommissioning programmes converge and the retirement profile, set out in paragraph 3.9 below, takes effect. If, as predicted by Cogent¹², and supported by the research carried out for this report, (see para 6.4) the attrition rate for quality professionals is greater than for the overall picture for the industry, simply replacing the existing skills would require in the region of between 1200 and 1700 new quality professionals over the next 13 years. These figures relate to the specific functions of Quality Control and Quality Assurance and are likely to underestimate the overall quality skills requirement across operational roles throughout the sector.

3.9. The nuclear workforce is older than the general workforce, making retirement projections most severe for the more experienced personnel. The ageing profile of the nuclear workforce is quantified in the Cogent report 'Power People – the Civil Nuclear Workforce 2009 – 2025'¹³. The findings showed that the age profile of the civil nuclear sector was more sharply attenuated when compared with the tapered and flattened profile for the UK workforce generally. This report also suggested that early retirement is more frequent in the nuclear sector than in the UK workforce as a whole. In the context of this research, the nature of the role of quality professionals places them in the older and more experienced workforce group – a point confirmed by the Cogent research retirement profile, which states: "...the greatest attrition is from the higher and more mature skilled levels... so that up to two thirds of these skill pools will be eroded by 2025."

3.10. In addition to new build, the resource demands of decommissioning also have to be taken into account. Employment will gradually decline at decommissioning sites but an analysis¹⁴ carried out by Cogent defines the lifetime plans of the Advanced Gas Reactor fleet and its employment impact. The projections shows an increase in demand for the decommissioning sector in 2015, the same time that recruitment for new build is likely to commence. This suggests that the potential for employees from the old sites being available to transfer into the new build will be limited and is likely to contribute to a peak shortage in three years' time in new build and/or decommissioning. The Cogent paper illustrates the different job role categories, but the configuration applied across the roles is very similar.

3.11. Although this research has examined the nuclear defence industry, detailed information relating to workforce issues affecting this sector is less available. It is clear, however, that future demand for professional/expert employees is likely to decrease over the next 13 years to 2025. Age profile may still play a part in the replacement demand, even with an overall decline in employment, but the actual numbers of any shortfall in nuclear defence is likely to be below the numbers required for new build to be delivered.

3.12. While the nuclear defence industry has obvious differences from the civil sector, quality skills would be transferrable to the civil sector should the defence sector diminish. However, the overall skills shortage anticipated across the nuclear sector and its supply chain is significantly greater than any potential surplus arising from the defence sector.

4. Quality management skills

- 4.1. Having asserted that quality management is an essential skill base for the nuclear sector this research examines the current qualification requirements of the industry and where quality management fits into that analysis. It is recognised that the sector, through Cogent and the National Skills Academy for the nuclear industry, have undertaken significant research into the future skills needs of the sector. However, the findings of this research show that further work is needed to fill the current gap of estimating and monitoring the need for quality professionals.
- 4.2. The National Skills Academy for the nuclear industry was established to ensure that the industry and its supply chain have the skilled, competent and safe workforce it needs. The Academy's prospectus usefully identifies four skills areas and links these to associated training and qualifications, namely:
- technical;
 - business improvement;
 - compliance; and
 - functional and behavioural.
- 4.3. It is interesting to compare this list with the five modules set out in the CQI's own Body of Quality Knowledge published in July 2003¹⁵. This document identifies quality components which relate to each of the four skills areas listed above. These components were further expanded upon more recently in the CQI's Nuclear Quality Knowledge¹⁶. In this document, produced by the CQI's Nuclear Special Interest Group, the specific requirements for a quality professional operating in the nuclear sector are highlighted. They encompass management systems; hazards and safety; organisational design; records management; knowledge management; procurement; configuration management; and assessment of management systems.
- 4.4. It is this wide reaching impact of quality management which, on the one hand, makes quality management professionals an obvious component of the nuclear industry while, on the other, illustrates the difficulty of identifying where responsibility for delivering quality management lies.
- 4.5. Similarly, the sector's other skills body, Cogent, published an assessment of the skills impact of a thirteen year building programme, based on six reactor pairs. Its 2010 report, 'Next Generation' included an initial risk register that identified project management and safety case authoring as key skill shortages, both areas where quality management would form an essential part of the skill base. This finding is further substantiated by this research which includes along with employer views those of the quality profession working within the sector.
- 4.6. Cogent, in its qualifications prospectus for the nuclear sector¹⁷, lists all the standards and qualifications which are appropriate to the sector. This includes training standards such as IOSH Working and Managing Safety and qualifications such as The Diploma in Business Improvement Techniques; Award in Personal Development; and Certificate in Team Leading. Cogent manages the standards and the 'National Skills Academy (NSA) for Nuclear'¹⁸ is responsible for establishing a network of high quality providers to ensure these standards are delivered. While this recognises the importance of quality in the sector, neither Cogent nor the NSA formally recognise quality professionals as a separate professional group or in terms of professional training and membership. This is further evidenced by Cogent's own failure to identify Quality Management/Assurance as an essential skill set for the industry going forward.

4.7. During the research it was suggested that in many instances within the nuclear industry, specific nuclear skills are not identified but are secondary to more commonly identified job categories (for example there is no such category as a nuclear engineer). This profile typically applies to quality professionals who usually enter the industry with other professional qualifications and subsequently add to their quality skill set at a later stage.

4.8. In the second of Cogent's 'Renaissance Nuclear Skills series'¹⁹ quality assurance is identified as one of the critical skills areas at risk. The Skills Risk Register Table²⁰ set out in the paper identifies, at peak demand for a single reactor Unit, an estimated 200 Quality Control/Quality Assurance personnel. Based on the currently projected new build proposals (these are subject to a number of external factors such as regulatory approval and individual commercial decisions) there is potential for five new build projects to be at commissioning stage by 2021. This would indicate that in the region of 1,000 additional Quality Control Assurance personnel will be needed by that time for new build alone.

4.9. Again, while there is recognition of the importance of quality, it needs to be formally and independently recognised. To ensure that sufficient skills exist, in sufficient numbers and at the optimum time, this needs to be measured and monitored. In addition Cogent should make the separate categorisation of quality management a priority.

5. Research of primary sources

5.1. The CQI's research addressed the following questions:

- quantity of quality professionals currently in the UK nuclear sector;
- average age of nuclear quality professionals;
- scope of jobs existing within the sector and job titles;
- skills and qualifications currently sought;
- the estimated shortfall of skills; and
- the timescales over which the future skills needs would need to be replaced.

5.2. A survey of key employers within the nuclear industry was conducted between 14th February 2012 and 28th February 2012. A copy of the questions posed is attached as Appendix A to this report.

5.3. A similar survey was also conducted during January 2012 of CQI members employed in the nuclear industry. The questions for this survey are attached as Appendix B to this report.

5.4. The online surveys were analysed and the findings are set out in this report below.

5.5. Separate interviews were conducted with Cogent and key nuclear sector company professionals. These included representatives from the following companies and organisations:

BAE Systems; National Skills Academy for Nuclear; Nuvia Ltd* and NIS Ltd*

*Major design and engineering contractors to the nuclear industry

An analysis of their comments and opinions is included in the report in paras 7.1 to 7.9.

6. CQI membership survey results

6.1. The CQI nuclear membership survey produced 108 responses from approximately 350 questionnaires issued. This return provides a reasonable statistical basis upon which a number of conclusions can be drawn. The respondents divided themselves in to civil and defence nuclear establishments with 72% of responses from the civil sector and 28% from defence. This split reflects the current workforce proportions in the nuclear industry. The responses from the defence sector were divided between AWE (43%), Babcock and BAE Systems (40%), with Sellafield accounting for 25% of the civil responses.

6.2. Those responding had, in the main, job titles that reflected a quality role. Of the 94 responding to the question 'Which of the following job titles is closest to yours?', 86 had the word quality in their title and a number of those also included a role/title of auditor. The titles included the following:

Internal independent assessors
Inspector/Inspection
Internal Auditor
2nd Party Auditor
3rd Party Auditor
Procurement specialists
QC Manager
Engineer Quality Engineer
Quality/QA Engineer
Quality process Engineer
Supervisor
Team Leader

6.3. To these can be added the following personal job titles identified by individual CQI members in their survey responses:

Head of Quality
HESQ Lead
Business Integrity Manager
Operational Feedback Engineer
Quality Consultant
QA Engineer
EHS & Q Manager
Nuclear Compliance
Project Manager
Change Manager
Systems Technical Manager

6.4. One of the most significant findings arising from the survey was the age profile of the respondents. The table below sets out the responses received and from this it is noted that **61.7% of all respondents were over the age of 50.**

Q4. Which age bracket do you fall into?

Answer Options	Response Per cent	Response Count
25 or younger	0.9%	1
26-29	0.9%	1
30-39	9.3%	10
40-49	27.1%	29
50-59	48.6%	52
60 or older	13.1%	14

6.5. The survey also revealed the retirement intentions of respondents with 55.8% (58 individuals) saying they plan to retire from, or leave, their quality role in the next 10 years.

Q5. Please indicate if you intend to retire or leave your quality professional role in the following periods

Answer Options	Response Per cent	Response Count
In the next 12 months	3.8%	4
1-2 years	5.8%	6
3-4 years	6.7%	7
5-6 years	17.3%	18
7-8 years	16.3%	17
9-10 years	5.8%	6
Over 10 years	44.2%	46

6.6. This age and retirement profile creates a potentially serious quality skills shortage for the nuclear industry if the current government policy for new build and decommissioning is adopted over the next 10 years. This was clearly identified in the responses to the survey question, asking what members considered to be the most significant drivers likely to impact on quality management skills in the industry, as indicated in the table on the next page, 6.9.

6.7. According to Cogent, approximately 5% of the nuclear workforce is due to retire each year up to 2025, so that by the end of 2025 over half the workforce will have left through natural attrition. The higher and more mature skilled levels (Professional and Manager/Senior Manager) are expected to be eroded at a faster rate of up to two thirds over the same period. This is the cohort from which quality professionals are drawn.

6.8. As mentioned earlier in this report, Cogent projections suggest in the region of 1,000 new employees will need to be recruited each year over the next 10 years to meet the overall demands of the industry. The target figure of 200 quality professionals required for each new reactor, as per the National Skills Register produced by Cogent, would concur with this research's estimate of the need for an additional 1,200 quality professionals over the next 10 years. The timescales, age profile and retirement intentions indicated by this research suggest that this skill need will be stretched if over half of the existing cohort leave the industry during this period and the decommissioning process continues to take up a significant proportion of those remaining.

6.9. A similar issue is also likely to arise in the defence nuclear sector where a similar age profile exists.

Q9. Which of the following drivers do you believe will impact on quality management skills in the nuclear industry?

Answer Options	Response Per cent	Response Count
Age of current quality management employees	54.6%	59
Lack of employer recognition of CQI	17.6%	19
Staff turnover	32.4%	35
Future industry and defence policy decisions	50.0%	54
Inadequate training and development	51.9%	56
Lack of a nuclear specific qualification	42.6%	46
Lack of a defined competency set	41.7%	45

6.10. The CQI member survey also looked at the perceived attitude of employers in the industry towards quality professionals and the status applied/conferred on professional qualifications, training and membership.

6.11. CQI members themselves believe that CQI membership is not considered an essential requirement of their job by employers, with less than a third suggesting that it was an essential requirement. An even smaller percentage (16.5%) believed that CQI qualifications were essential for their job.

6.12. Notwithstanding these numeric results, some of the comments received (from 26 respondents) provided a more positive picture concerning industry recognition of professional membership, training and qualifications. These included reference to CQI qualifications in a job advert specifying that CQI membership was preferred but not essential; Sellafield Ltd seeking to make CQI membership and qualifications essential requirements for future quality professionals and, again, listed as desirable on relevant job adverts. These may paint a changing picture which could be capitalised upon by employers working more closely with the quality professional institute, the CQI, in developing sector specific training using CQI training modules.

6.13. In addition to the above, 36% of respondents thought that having CQI qualifications gave them an enhanced chance of being shortlisted for their job over someone without the qualifications, and 50% thought that membership of the CQI enhanced their chances of being shortlisted for a quality position in the sector.

6.14. The following comments were included in responses to the members' survey which provide some indication of a changing approach by employers:

"Now it {CQI membership} is a requirement which ensures that the individual has professional knowledge, and depth to the role and company which is a vast improvement."

"Requirements now would suggest membership should be preferred, but 10 years ago IQA was not seen as a significant institution whereas CQI is today."

"We value both qualification and experience and recognise the rigour of the CQI membership process so either route is fine for us."

6.15. Responses were also positive about the training support provided by employers for those who were studying for the CQI qualifications, but this was qualified by almost half of the respondents indicating that a lack of management understanding of safety and quality management would be a problem in delivering the quality skills needed for the future. In the immediate term the problem most commonly identified by quality professionals in the sector was a lack of quality skills in the local area.

6.16. A full list of the responses relating to problems of skill shortages is set out in the table below.

Q10. From your own experience can you indicate the level of the problem relating to quality skills shortages in your workplace?

Answer Options	No problem at all	No immediate problem	Problem likely in future	Some problems soon	Current problem	Response count
Current age profile of quality professionals	7	24	28	34	14	107
No existing skills base in the company	15	27	23	20	20	105
Shortage of quality skills in the local area	4	18	25	22	36	105
Company not prepared to offer training	43	37	15	5	4	104
Company fails to recognise need for quality professionals	18	42	20	5	19	104
Lack of management understanding of management for safety, including quality	26	33	11	12	23	105

7. Industry professionals (employers, regulators and suppliers) survey results and interviews

7.1. The survey attached in Appendix A was sent to 23 companies and organisations. The rate of return was very low with a number of key organisations stating it was against their policy to respond to surveys. However, conversations took place with Cogent, NIS Ltd, The National Skills Academy for Nuclear, Nuvia Ltd and BAE Systems which added essential information to the research.

7.2. These discussions, together with the survey results, suggest that the recognition for quality professionals, relative to their critical role, is low and that qualifications are not regarded as essential to the industry when it comes to the recruitment and selection of quality professionals. Of those interviewed, there was a lack of awareness of the potential skills time-bomb surrounding the recruitment of quality professionals in line with demand over the next 10 years.

7.3. According to the employers spoken to, around 10% of the workforce roles in decommissioning and supply chain companies require quality professional qualifications. The industry identified the following job titles as specifically requiring quality professional skills. These titles reflect the responses in part provided by CQI members:

Auditor or assessor
Inspectors
QC Manager
Quality Process Engineer
Quality Assurance
Quality Engineer
Safety Engineer

7.4. Considering these results, and those of the CQI members, it is apparent that a wide range of job titles have been adopted by the industry, confirming information previously recorded by the CQI. In response to the enquiry, one major supply chain contractor made clear that all employees within the nuclear industry are likely to be conversant with quality processes and the health, safety and environment issues affecting the industry, requiring a general level of awareness training.

7.5. From the discussions carried out as part of this research, employers in the industry are not yet identifying quality professionals as an existing or potential skills shortage. The skills associated with quality management are viewed as an add-on to other skill sets and qualifications and as one manager put it "...the quality professionals currently in the industry seem to have fallen into the role rather than been recruited specifically."

7.6. Another major nuclear supply chain provider also commented that they saw no need for a specific quality qualification but did recognise that there would be a growing demand for quality professionals, especially inspectors. The same company indicated that currently recruitment of such people was proving difficult and that as a result it would be developing its own internal training programme for inspectors over the next two years.

7.7. The new build nuclear industry may seek to gain some of its skilled workforce, including quality professionals, from the decommissioning process, as this winds down. However, at best this is a medium to long term proposition and is unlikely to address the more immediate needs identified from this research. Interviews with employers have identified some sharing of HR resource, planning between decommissioning and new build employers, which is sensible, but there is no evidence to suggest that this is widespread or specific to quality professionals. One view was that for the foreseeable future the number of quality professionals required in decommissioning would remain fairly static.

7.8. A further demand for quality professionals in the waste management section of the industry was identified by employers, again adding to the demand for a scarce resource and strengthening the argument for a more strategic approach to the skill shortage. The sourcing of quality professionals would be likely to go beyond the UK given the major players involved in new build. However, it was suggested by one employer that there was a general shortage of quality professionals across Europe, and in all sectors.

7.9. This research, together with the skills analysis undertaken by Cogent and its partners, helps provide a fuller picture of the range of jobs for which a quality skill set will be required. Whilst recognising the vital part that quality management and quality assurance plays across the nuclear sector, it is apparent that the posts required to possess such skills are not necessarily confined to quality management departments. Indeed, as stated previously, Cogent and its skill partners have not identified specifically the quality professional skill set. Both the National Skills Academy for Nuclear and employers have taken the view that the quality skills required specifically for the sector are likely to be developed in house from experience and training.

7.10. However, the figures presented in this report (see para 3.8) provide at best a conservative estimate of future demand.

8. Research findings

- 8.1. The age profile of the existing nuclear quality professionals, coupled with the future labour demands for skilled quality professionals across the nuclear sector, shows the need for a strategic approach to address this report's forecast of a skills shortage over the next 10 years.
- 8.2. This paper identifies the absence of such a strategy to address the skills shortage in the nuclear sector for quality professionals. Given the high profile of this sector, and the focus on safety and quality management, the absence of such a strategy is a serious omission by employers and regulatory bodies.
- 8.3. The leading employer based bodies for the nuclear sector, whilst recognising the skills shortage in the functions of quality professionals, have failed to develop a strategy that would ensure the requisite skills and numbers of quality professionals over the next 10 years. In the UK, the Nuclear Energy Skills Alliance, led by Cogent, reviews its Nuclear Skills Risk Register annually. The Register in 2010 identified Quality Control and Quality Assurance skills to have a high risk of skill deficit over the medium term (four to five years). However, no strategy has been put in place to address this.
- 8.4. There is no mechanism in place to measure the number or identification of job categories which require quality professional skills.
- 8.5. The industry bodies and Cogent have undertaken extensive labour market research to support their skills analysis and forecasts for the nuclear sector: Cogent has proposed a Certificate of Nuclear Professionalism. This is a flexible postgraduate qualification supporting continued professional development of the nuclear industry workforce. It is being developed and managed by the National Skills Academy for Nuclear, through an employer steering group and designed in partnership with the Open University, with input from Cogent's Higher Education team. The Certificate will incorporate training modules delivered through employer accredited training/learning, distance learning and taught lessons which will be incorporated onto the Nuclear Skills Passport with professional recognition through the Nuclear Institute. This currently omits quality management modules.
- 8.6. Identification of quality professional skills as a key factor is supported by the evidence set out in Cogent's UK Sector Skills Assessment 2011²⁸. Within this assessment for the nuclear industry it states that "skills shortages are projected for 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."²⁹ The absence of well-trained quality professionals in European Pressurised Water Reactor (PWR) projects have indicated that human factors in safety awareness and quality assurance at the most stringent levels demanded by the nuclear sector are the origin of significant delays, significant costs and reduced productivity.
- 8.7. The strict regulatory nature of the industry, its importance to the UK economy and the absolute importance of safety, provide real drivers which produce a high emphasis on skills, safety and quality.
- 8.8. An examination of the government's programme for decommissioning and nuclear new build, between 2010 and 2025, shows that the convergence of decommissioning and new build over the next three years will create a significant skills shortage, particularly amongst business support and technical professions. This will lead to competing demands for similar skills and as far as quality professionals are concerned an estimated additional 1,200 – 1,700 will be required by 2021.
- 8.9. The research found that because it takes an average of two years to qualify as a quality professional, the critical timescale for additional quality professionals will arise in 2015 and it is therefore important that the industry urgently addresses this skills shortfall.

9. Recommendations

- 9.1. The following recommendations are aimed at the sector and the regulatory bodies responsible for the sector. The Chartered Quality Institute will be happy to assist in the delivery of these recommendations.
 - 9.1.1. The regulatory bodies, including Cogent and the National Skills Academy for Nuclear, should urgently re-assess the demand for quality professionals across the nuclear sector and adjust the current skills strategy as appropriate following the re-assessment.
 - 9.1.2. The Nuclear Industry Association (NIA) should use its powerful voice as a representative body for the industry to promote active development of quality professional qualifications specific to the sector.
 - 9.1.3. Individual employers in the sector, both primary and supply chain, should undertake a quality assurance skills analysis across their existing workforce to identify gaps and shortages in professional quality knowledge, relevant to the nuclear sector.
 - 9.1.4. The proposed Certificate of Nuclear Professionalism should include within its modules provision for those students wishing to qualify as quality professionals.
 - 9.1.5. The nuclear industry should consider adding CQI qualifications to its list of qualifications and, working with the CQI seek to develop a “nuclear” module within these qualifications.

10. Conclusion and summary

- 10.1.** The overall picture presented by this research clearly points to a potential skills shortage of more than 1,200 quality professionals across the sector, which is likely to build up in the civil sector over the next 10 years, particularly if the government's proposed development goes ahead. Even without that, the age profile within the industry will raise skill shortage issues in the quality field over the same period. Combined with the overall shortage of quality professionals across Europe, and the competing sectors seeking these skills, a failure to act now to develop a strategic approach to future skill shortages could lead to severe delays in the new build programme and a loss of productivity.
- 10.2.** The strict regulatory nature of the industry, its importance to the UK economy and the absolute importance of safety provide real drivers, which produce a high emphasis on skills and on quality. This research has highlighted that, against this background, there is a serious potential skills deficit when it comes to assuring the quality standards expected are met by sufficient and appropriately qualified personnel.
- 10.3.** The new build development programme is at present going through a period of uncertainty but notwithstanding this situation there will be a need to address a future shortage of skilled quality professionals across the sector over the next 10 years. To delay or defer such an initiative places at risk the ability to provide the UK nuclear sector with the full range of skills it needs.
- 10.4.** The five recommendations contained in this report are designed to provide a considered approach involving all the stakeholders within the sector and the CQI is uniquely placed to support in the development and delivery of such initiatives.

Appendix A

Survey questions to industry professionals

1. Please indicate below your position within the company.

- HR Director/Manager
- Training Manager
- Personnel Adviser
- Head of Skills Development
- Other (please specify)

2. Which area(s) of the nuclear industry do you operate in?

- Construction
- Operation and Maintenance
- Electricity Generation
- Fuel Processing
- Decommissioning
- Defence
- Supply Chain
- Other (please specify)

3. Are you engaged in the government's proposed new build programme?

- Yes
- No
- Other (please specify)

4. How many employees are currently working on your site?

- less than 100
- 101 - 250
- 251 - 500
- 501 - 750
- 751 - 1000
- over 1000

5. Please indicate the number of employees you expect to recruit in the next 6 years?

6. How many of your current workforce would you describe as Quality Professionals?

- Less than 10
- 10 - 24
- 25 - 49
- Over 50

7. Which of the following job titles would require quality professional competences?

- Auditor or assessor
- Quality Assurance
- Quality Manager
- QC Manager
- Quality Engineer Quality Process Engineer
- Safety Engineer
- Supervisor
- Team Leader
- Technician
- Others (please specify)

8. How many employees with quality assurance experience and competences do you expect to employ over the next 6 years?

9. Have you previously heard of the Chartered Quality Institute?

10. Does your company require CQI qualifications for any posts? If so please list the posts in the comment box

- Yes
 - No
- If yes please specify jobs

Appendix B

Survey questions to institute members employed in nuclear industry

1. Please indicate which of the civilian sites below you currently work at?

2. Which of the following nuclear defence sites do you work at?

3. Which of the following job titles is closest to yours?
(You can tick more than one option)

- Internal independent assessors/regulators
- Inspector/Inspection Engineer
- Internal Auditor
- 2nd Party Auditor
- 3rd Part Auditor
- Procurement specialists
- QC Manager
- Quality Engineer Quality/QA Manager
- Quality Process Engineer
- Safety Engineer
- Special Process Engineer (Welding, NDT etc)
- Supervisor
- Team Leader
- Technician
- Other (please specify)

4. Which category below includes your age?

- 25 or younger
- 26-29
- 30-39
- 40-49
- 50-59
- 60 or older

5. Please indicate if you intend to retire or leave your quality professional role in the following periods

- In the next 12 months
- 1-2 years
- 3-4 years
- 5-6 years
- 7-8 years
- 9-10 years
- Over 10 years

6. Was your CQI qualification an essential requirement for the job?

7. Would a candidate for your job with a CQI qualification be shortlisted above a candidate without it?

8. Does your employer provide training support for those studying CQI qualifications?

9. Which of the following drivers do you believe will impact on quality management skills in the nuclear industry?

- Age of current quality management employees
- Low profile of CQI
- Staff turnover
- Future industry and defence policy decisions
- Inadequate training and development
- Lack of a nuclear specific qualification
- Lack of a defined 'competency set'

10. From your own experience can you indicate the level of the problem relating to quality skills shortages in your workplace?

	No problem at all	No immediate problem	Problem likely in future	Some problems soon	Current problem
Current age profile of quality professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
No existing skills base in the company	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shortage of quality skills in the local area	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Company not prepared to offer training	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Company fails to recognise need for quality professionals	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Lack of management understanding of what is meant by management for safety including quality	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix C

List of companies contacted during research

Cogent
EON UK Plc
RWE
ABB Control Systems
AMEC Plc
AREVA Plc
ATKINS Plc
BAe Systems Plc
Balfour Beatty Plc
BAM Nuttall Ltd
Bartec Ltd
Bendalls Engineering Ltd
BNS Nuclear Services Ltd
Costain Group Plc
Emerson (AscoNumatics) Ltd
Halcrow Ltd
Jacobs Engineering Ltd
Jordan Engineering Services Ltd
Mott Macdonald Group Ltd
NDA
Nuvia Ltd
Phoenix IS Ltd
Serco Assurance Ltd
Sheffield Forgemasters International Ltd
Shepherd Engineering Services (M&E)
Sulzer pumps Ltd
Urenco UK Ltd
Weir services

Appendix D

Literature review/sources

Cogent UK Sector Skills Assessment 2011

Cogent Skills Oracle 2010 The Nuclear Industry

Cogent Standards and Qualifications Prospectus

Cogent Nuclear Industry Skills Strategic Action Plan August 2011

Cogent Renaissance Nuclear Skills Series

1. Power People – The Civil Nuclear Workforce 2009 – 2025

2. Next Generation - Skills for a New Build Nuclear

3. Assurance – Skills for Nuclear Defence

Nuclear Quality Knowledge – Nuclear Special Interest Group – Chartered Quality Institute

Web pages

Chartered Quality Institute

www.thecqi.org

Chartered Quality Institute's Nuclear Special Interest Group

www.thecqi.org/Community/Special-Interest-Groups-SIGs/Nuclear/

Nuclear energy skills alliance – DECC:

www.decc.gov.uk/en/content/cms/meeting_energy/nuclear/new/supply_skills/nesa/nesa.aspx

The National Skills Academy for Nuclear

www.nuclear.nsacademy.co.uk

Cogent

www.Cogent-ssc.com

Nuclear Decommissioning Authority

www.nda.gov.uk

Office for Nuclear Development

www.decc.gov.uk/en/content/cms/meeting_energy/nuclear/new/office/office.aspx

Nuclear Advanced Manufacturing Research Centre (Nuclear AMRC)

www.namrc.co.uk/

References

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2. Cogent Power People –The Civil Nuclear Workforce 2009- 2025 – Part C age profiles
3. Horizon Nuclear Power - <http://www.horizonnuclearpower.com/files/downloads/Horizon%20Public%20Statement%2029%20March%202012.pdf>
4. Nuclear Industry Fact sheet Cogent 2010
5. Cogent - Power People - The Civil Nuclear Workforce 2009 – 2025 page 41
6. Cogent – Next Generation – Skills for new build nuclear March 2010
7. The UK Capability to Deliver a New Nuclear Build Programme, the Nuclear Industry Association, 2006 (updated 2008)
8. Cogent - Renaissance Nuclear Skills Series - Published September 2009 – August 2011
9. Cogent Next Generation – Skills for New Build Nuclear
10. Cogent Power People –The Civil Nuclear Workforce 2009 – 2025 – page 4 Dr Brian Murphy Research Director
11. Cogent Next Generation – Skills for New Build Nuclear page 19
12. Cogent Power People The Civil Nuclear Workforce 2009 – 2025 page 34 Section 7.2
13. Cogent Power People The Civil Nuclear Workforce 2009 – 2025 Part C page 34 paragraph 7.2
14. Ibid – Section 8 The shape of skills to come
15. CQI –The Body of Quality Knowledge July 2003 www.thecqi.org/Documents/knowledge/BOQK.pdf
16. Nuclear Quality Knowledge (NQK) September 2011
17. Cogent Standards and Qualifications Prospectus
18. National Skills Academy for Nuclear - is an employer led membership organisation established to ensure that the UK Nuclear Industry and its Supply Chain has the skilled, competent and safe workforce it needs to deal with the current and future UK nuclear programme
19. Next Generation – Skills for New Build Nuclear - Cogent
20. Ibid – Page 19
21. Power People –The Civil Nuclear Workforce 2009 - 2025
22. The Skills Risk Register – Next Generation - Skills for New Build Nuclear - Cogent
23. CQI Salary Survey 2011 – Quality World December 2011 page 40
www.thecqi.org/Knowledge-Hub/Research-and-reports/Salary-survey-2011/
24. Next Generation: Skills for New Build Nuclear 2010, Cogent
25. Nuclear Energy Skills Alliance - a grouping of the key strategic skills bodies and organisations with an interest in nuclear skills, and Government
26. Next Generation: Skills for New Build Nuclear 2010, Cogent
27. Cogent Standards and Qualification Prospectus – Nuclear Industry
28. Current and Future Demand for Skills for the Science Based Industries – UK Sector Skills Assessment 2011 - Cogent
29. Ibid

Notes

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