cogent | Skills for Science Based Industries

RENAISSANCE NUCLEAR SKILLS SERIES: 1

Power People

The Civil Nuclear Workforce 2009-2025

The Renaissance series:

Renaissance 1 *– Power People: The Civil Nuclear Workforce*
Renaissance 2 *– Next Generation: Skills for New Build Nuclear*
Renaissance 3 *– Assurance: Skills for Nuclear Defence*
Renaissance 4 *– Illuminations: Future Skills for Nuclear*

cogent | Skills for Science Based Industries

The National Skills Academy NUCLEAR

The strategic skills alliance for the Nuclear Industry

Joanna Woolf

Chief Executive, Cogent Sector Skills Council

Power People is a ground-breaking report, the first in a series of outputs from a major Cogent skills research programme underway this year, to work with the nuclear industry to ensure its future skills demand can be delivered in the UK.

The research programme covers both the shape of skills now and an outlook on the shape of skills to come. It spans decommissioning, civil new build, defence, and current operations up to 2025 and builds on a previous skills gap analysis for the industry.

These reports are providing unprecedented up-to-date industry-wide evidence that will inform skills solutions for the coming decades. They form a critical part of Cogent's licensed remit – to understand and quantify skills needs; alongside articulating employer requirements, designing qualifications and attracting young people into the Sector.

As the report outlines, it's clear that the UK has a rich legacy of skills to offer the nuclear industry as it moves towards a new build programme for power generation. This is a capability which has been built up over half a century, a long heritage stemming from the first power station at Calder Hall in the North West in 1956.

Nuclear Power has long been a strategic element of energy policy in the UK, but over the years it has not always had either the public or the Government support necessary to ensure its long-term future.

Now the case for new build is compelling. The Energy Review (2007) highlighted the challenges of energy security, the rising costs of fossil fuels and, of course, climate change. As a result, the Government gave the go-ahead to a new fleet of nuclear power stations following detailed consultation.

We now need, as a matter of urgency, to undertake significant workforce planning with the industry to ensure a sustainable world-class nuclear sector. And to do this we need to understand where we are and where we need to be. This understanding is needed at the very detailed level of core job contexts through to the numbers of people required to fulfil a range of highly skilled roles.

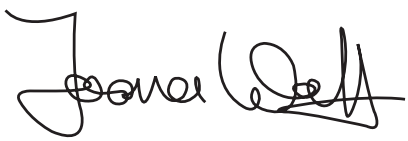
While we have the aforementioned powerful skills legacy, with current capacity and capability fit to deliver all aspects of the nuclear cycle, we also have an experienced and ageing workforce, and a demand forecast that means we need to bring new people into the Sector.

This report, and the others in the series, will help to ensure that we develop the skills resource needed in every part of the industry. They will provide much-needed quantification, will support the development of labour market models and identify specialist skills gaps at the micro-level.

The research also underpins our delivery mode, which sees all the main parties working within one national nuclear skills framework: this includes employers, trade unions, government agencies, academic institutions, training providers and schools. It is a shared strategy to deliver a shared vision.

Our key partner organisation, the National Skills Academy for Nuclear, can in turn ensure that the UK's training and education providers meet the needs of the Sector, whilst working within a common occupational skills standards framework designed by Cogent with industry input.

Together with the National Skills Academy for Nuclear, Cogent looks forward to continuing its important strategic service for nuclear employers during what is a tremendously exciting renaissance for this industry.



Dr Brian Murphy

Research Director, Cogent Sector Skills Council

At the time of writing the Government has just launched the UK Low-Carbon Transition Plan with a strategic role for nuclear (which currently accounts for around 80% of our current low-carbon electricity). In addition, the private sector has committed to build at least 12 GWe of new electricity-generating capacity. These developments set the stage for a nuclear renaissance and prompt an assessment of the skills capacity and capability of the UK nuclear workforce.

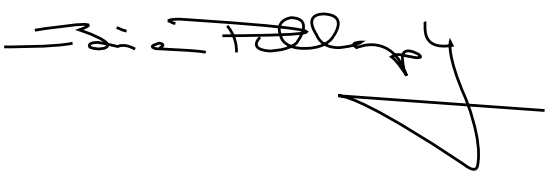
Cogent is therefore pleased to launch this nuclear labour market report entitled "Power People", and the "Renaissance" series that it heads. "Power People" is our most comprehensive skills panorama of the industry today. It encompasses the full cycle of operations from Fuel Processing to Electricity Generation to Decommissioning. It also brings into focus future skills on a 2025 horizon.

Prior to this research the sector had been estimated from limited data. This severely restricted our future skills projections. This is now corrected with an impressive and full industry return to us of manpower data, further enhanced with in-depth detail on job contexts, skill levels and age profiles. This analysis is the first stage in a comprehensive research programme in which this report quantifies the current civil nuclear sector and develops the future skills scenarios. Three follow-up reports drill into critical sectors to develop recommendations for training and skills interventions.

"Power People" portrays the macro skills picture and futures, layered by job contexts and skills. We see, today, an industry of 44,000 people. Looking ahead we have quantified three skills drivers: an ageing workforce driving replacement demand; a shift in skills to decommissioning; and, new demand for skills to operate a new fleet of nuclear power stations. Of course, many in the sector knew (anecdotally) of these drivers. But what we have now are the robust figures, in-depth data and peer-reviewed analysis. Further reports in the "Renaissance" series will address key areas such as new build generation and construction, the Defence sector, Waste Management and regional skills scenarios. There are messages for employers, government, and the education and training sector.

In conclusion, we see Cogent's labour market research as addressing a major gap in national data and as providing the evidence base for the authoritative voice on skills needs. With our findings we will be working with our strategic partners - the National Skills Academy for Nuclear, the Nuclear Industry Association and the Nuclear Decommissioning Authority.

We see skills as part of the solution to a self-sufficient, de-carbonised electricity supply; and one that secures the UK position in nuclear capacity and capability both domestically and globally.



Jean Llewellyn

Chief Executive, National Skills Academy for Nuclear

The labour market research being completed by Cogent Sector Skills Council is of vital importance to the National Skills Academy for Nuclear, and will inform our future actions and plans.

It will underpin the design and implementation of effective skills interventions to prevent skills shortages and gaps over the coming decades. In addition it will form an important part of our Five Year Business Plan.

The National Skills Academy for Nuclear has a huge part to play in ensuring that the nuclear skills needed for jobs both today and in the future are in place.

This skills delivery will enable a sustainable future for the industry and support its strategic contribution to the infrastructure of our society and economy.

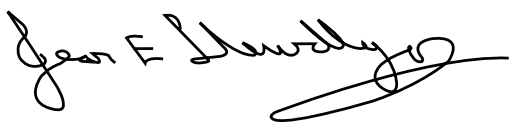
The Skills Academy facilitates a unique UK approach to nuclear skills issues, with employers in a competitive market coming together on skills deficiencies and solutions for the greater good of the future of the UK Nuclear industry.

Due to the ageing workforce, new entrants need to be attracted into the sector with urgency. With the Government's commitment to effective decommissioning, defence and now continuing the future of nuclear power generation, the industry is finally able to make an image change from a declining sector into an exciting industry with many long term career opportunities.

To help bring in new people to the sector, and possible returners the Skills Academy is rolling out the Award for Nuclear Industry Awareness qualification. This provides a broad level of understanding of the nuclear industry and its unique requirements.

Following their construction, the commissioning and running of new Nuclear Power Stations will require an operational workforce – essentially new recruits, since such posts will have declined during the decommissioning phase. The Skills Academy is gearing up to use this opportunity to skill and re-skill people through this transition.

The Nuclear Skills Passport, which will be operational from 2010, will be an essential development to record this re-skilling and training to demonstrate competence across the Nuclear workforce, and maintain the highest standards across the industry and the breadth of the supply chain.



Companion Website:
www.cogent-ssc.com/research/nuclearresearch.php

Available to download:
The Report - Power People: The Civil Nuclear Industry 2009-2025
The Technical Annex
The Charts - The UK Civil Nuclear Industry at a Glance

Executive Summary

Power People: The Civil Nuclear Workforce 2009-2025

With electricity generation associated with close to 30% of global man-made CO_2 emissions, a nuclear renaissance offers a low-carbon, high-energy density solution to sustainable economic and social development. This report shows that investment in skills today is vital to sustain the UK nuclear industry and to ensure that UK skills share in the rewards of the global nuclear markets of tomorrow.

Skills are an essential part of the solution for a Nuclear sector on the cusp of renaissance. Never before have policy, public sector and private sector intent been so aligned with the technological solutions and skills planning. The consensus arises because Nuclear is widely accepted as an important part of a future and diverse energy strategy. Yet these are transition years in which the industry's decisions on skills will define the sector for decades to come. In this transitional term, it is therefore crucial that the skills and productivity of the workforce demonstrate early potential of UK capability.

In response, Cogent Sector Skills Council has undertaken labour market research to establish the current state of skills in the industry and to model the future skills requirements. This analysis is the first stage in a process that leads to training and skills interventions to prevent predicted skills gaps arising and to ensure that the industry has a sustainable skills base, and is in a position to take advantage of the new build opportunities.

The research addresses a major gap in national data and provides the evidence base for the authoritative voice on skills needs. Three skills drivers are analysed: an ageing workforce driving replacement demand; a shift in skills to decommissioning; and, demand for skills to operate a new fleet of nuclear power stations. While, the sector may have been aware (anecdotally) of these drivers, the defining contribution of this report is in the robustness of the figures, the in-depth primary data and the peer-reviewed analysis. This will feed the subsequent reports in the "Renaissance" series which will carry recommendations.

Four publications in a "Renaissance" series are planned, of which this is the first. The full series will be:

1. Power People: The Civil Nuclear Workforce 2009-2025
2. Next Generation: Skills for New Build Nuclear
3. Assurance: Skills for Nuclear Defence
4. Illuminations: Future Skills for Nuclear

For the civil nuclear workforce, the skills legacy is a positive position to grow from. Be it Electricity Generation, Decommissioning or Fuel Processing, the workforce has current capability. This is a resource to be nurtured for a secure and sustainable energy future for the UK, for UK employment, and for UK PLC globally.

In contrast to the wide range of econometric data collected nationally for various economic sectors, there is a paucity of discrete national and international data that does justice to the labour market of the civil nuclear industry. This places great emphasis on the primary labour market research reported in this "Renaissance" series. **This, the first report in the series, provides the most comprehensive industry-wide evidence to-date of skills in the civil nuclear industry of any nuclear-generating country, together with an outlook on the shape of skills to come.**

A skills classification system, applied to labour market returns from all the operating companies, has allowed the workforce to be **mapped by region, nation, skill level, age, sector, and job context.**

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

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

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

The core job contexts of Energy Production Operations, Decommissioning Operations, Processing Operations and Maintenance Operations, make up 43% of the workforce. In balance, supporting and value-adding job contexts, such as Project Management, Engineering Design, Safety and Security, and Business make up the bulk of the remaining employment (42%).

A general Reactor model has been developed using historical data. **Each unit creates operating employment for up to 500 people. At least 350 are employed on site,** with **up to a further 150** employed elsewhere in the company. (Refinement of the Reactor model, including sensitivity to the two most likely new build designs, will form part of the second report in this "Renaissance" series).

Future demand for skills depends on the model adopted for Decommissioning and New Build Nuclear. The former is the largely predictable shift from Electricity Generation to Decommissioning associated with the ageing Advanced Gas Reactor (AGR) fleet; the latter is, to some extent, opaque and has been analysed using a Replacement Generating Capacity scenario of 12 GWe at 2025 and lifetime extensions to existing fleet. **Without new build the workforce is set to decline by 58% by 2025; with new build at Replacement Generating Capacity, the model projects new demand for 4,600 jobs in the Electricity Generating sector by 2025 with a sizeable impact on the supply chain as well.**

The workforce is older than, and retires earlier than, the UK workforce in general. This lends a considerable level of complexity, urgency and flexibility to skills planning. The profile acts most harshly on the higher skilled and more experienced parts of the workforce. Here, up to 70% of current employees will retire by 2025. The age profile is the main determinant in the Replacement Generating Capacity scenario, driving a general skills gap of up to 14,000 by 2025. This converts to an **industry requirement of the order of 1,000 new recruits per year, mainly as new apprentices and graduates.** However, the new build driver of demand will draw in suitably experienced personnel from other sectors and possibly globally. (The exact skills complexion of this will be the subject of subsequent reports in this "Renaissance" series).

The year 2015 appears to be a watershed year for skills. At this point many of the drivers of skills converge. By 2015, the retirement profile of the workforce begins to diverge significantly from that of the UK workforce; by 2015, the decommissioning of the old fleet will have taken hold; and, by 2015, recruitment and training for the new fleet must begin if the first are to commence operations from 2017.

The skills demand will follow the change in landscape by sector. This will be: stable numbers in Decommissioning; decline in old Electricity Generation followed by expansion of new Electricity Generation; and, finally, decline in Fuel Processing. The most striking demand statistic is the demand without new build. In this case, regardless of scenario, the UK faces a reduction of 90% in the workforce employed in nuclear Electricity Generation.

At the macro level, the skills challenge will be in managing skills supply and skills transitions. There will be locations where 'old' and 'new' generation nuclear may crossover. The regions concerned will hold nuclear-literate workforces and communities. But the skills involved in new-generation operations will have changed, with new technologies, new processes, new practices, new regulations and new owners.

Up to six regions may have both new and old capacity side-by-side: the South West of England (Hinkley Point, Oldbury), the East of England (Sizewell, Bradwell), the South East of England (Dungeness), North Wales (Wylfa), the North West of England (Sellafield, Copeland, Heysham, Braystones), and the North East of England (Hartlepool). As the regional futures become clearer, drill-down research will be required to inform the development of local skills strategies.

The skills compass points to the development of strategies on: general public awareness and confidence in a sector in renewal; perceptions of employment opportunity, advancement and prestige to attract new blood to the sector; reskilling and upskilling for mobility and retention of valued skills within the industry; and, on-site training opportunities and accessible specialist facilities (eg reactor simulators) linked to the industry and the colleges and universities involved in skills supply and training.

Cogent Sector Skills Council and the National Skills Academy for Nuclear, working with industry, will take a leading role in ensuring these strategies are driven forward and that the skills products (below) continue to develop and evolve to remain capable of embracing these developments.

- Future Skills
- Career Pathways
- Nuclear Skills Passport
- Nuclear Industry Training Framework (an integral part of the Skills Passport)

Cogent will enhance its work with other strategic nuclear industry bodies,* government,† and wider sectors‡ for new build construction, for the benefit of the industry and to ensure that skills are a solution to a secure and self-sufficient, low-carbon energy supply of the future. Employers must continue to invest in skills – not just for today but for the new industry of tomorrow.

* the Nuclear Decommissioning Authority, the Nuclear Industry Association
† The Office for Nuclear Development, the Department of Energy and Climate Change, the Department for Business Innovation and Skills
‡ Construction Skills, the Engineering Construction Industrial Training Board

Acknowledgements

Cogent SSC would like to thank the various contributions from within and without the organisation.

Authors
Dr Brian Murphy, Director Science & Research, Cogent SSC
Una Borte, Market Analyst, Cogent SSC
Clive Smith, OBE, Nuclear Skills Director, Cogent SSC
John Haddon, Consultant
Dr Steve Bennett, Research Manager, Cogent SSC
Judith Holcroft, Communications Manager, Cogent SSC

Production
Mervin Dadd, Marketing and Communications Director, Cogent SSC
Kate Hutchins, Information Officer, Cogent SSC
Dr Caroline Sudworth, Higher Level Skills Development Manager, Cogent SSC

Peer Review
Steve Ball, Head of HR & Organisational Development, Urenco UK Ltd
David Barber, Head of Training, British Energy
Nigel Couzens, Head of Skills and Capability, Nuclear Decommissioning Authority
Cdr Jon Heley RN, MoD Submarine Safety Assistant Team Leader
Dr Peter Storey, Head of Research, Nuclear Directorate, the Health and Safety Executive (HSE)
Joanna Woolf, Chief Executive, Cogent SSC

Employers - without whose contribution of labour market data, this report would not have been possible.

British Energy
Dounreay Site Restoration Ltd
Low Level Waste Repository Ltd
Magnox North Ltd
Magnox South Ltd
The Nuclear Decommissioning Authority
Research Sites Restoration Limited
Sellafield Ltd
Springfields Fuels Ltd
Urenco UK Ltd

Part A:
Renaissance Nuclear

The environment for nuclear re-birth has never been so good.

Electricity, which is produced by energy fuels, has become an essential form of distributed energy, but the sustainability of electricity production from fossil fuels is under question with close to 30% of man-made carbon emissions being attributed to electricity production. Nuclear energy provides a solution to this form of low-carbon electricity generation.

Policy and regulatory instruments are in place; government has expressed the desire that nuclear be part of the future energy mix; public perceptions have become more in favour; the workforce retains the skills for all aspects of the fuel cycle; financially strong consortia are emerging with new build ambitions; and, the strategic skills organizations Cogent Sector Skills Council, the National Skills Academy for Nuclear and the Nuclear Decommissioning Authority are positioned well for labour market research, education and training standards and manpower planning.

In the midst of the nuclear renaissance, and at a time when the future direction of the industry will emerge, Cogent is publishing this report on the nuclear labour market. The prime aim is to classify, quantify and qualify the skills picture of the civil nuclear industry and offer labour market models of the shape of skills to come.

Many challenges will present; skills are part of the solution.

"The challenges of new build and operation will add to demand for high quality training for much of the workforce. The industry has some unique requirements and we need to ensure that these are met as we move ahead into a challenging future. We need a clear national agenda and framework for skills to support the private sector to build and run nuclear power plants in the UK."

John Lee Male, Head of Learning,
Organisation & Capability Development Power and Process Europe, AMEC Power and Process

1. Renaissance Nuclear

1.1 Backdrop

Energy is the ultimate currency. All economic and social development requires it. Electricity, produced by energy fuels, has become an essential form of distributed energy. But with electricity production accounting for close to 30% of man-made CO_2 emissions, continuing a past century trend in electricity generation, especially if drawn mainly from fossil fuels, is widely regarded as unsustainable. Nuclear as a form of low-carbon energy – zero-carbon at point of generation – has a role in answering the global demand to raise living standards and hold down emissions.

The environment for nuclear re-birth has never been so good. On the policy and regulatory fronts, Government has ensured that the infrastructure is in place to optimise private-sector nuclear power generation as part of the UK's energy mix.[1] Public perceptions have become more in favour.[2] The main drivers have become low-carbon electricity and energy security. These, together with energy density per hectare footprint,[3] make Nuclear Power an essential part of the future UK energy supply mix. Consequently, the developments that will emerge in the next decade will define the industry and its workforce for much of the rest of the twenty-first century.

Nuclear Power has long been a strategic element of energy policy and electricity-generating capacity in the UK. Over half a century ago, in a pioneering era beginning 1956, the skills of scientists and engineers produced the world's first commercial nuclear power station at Calder Hall in the North West of England – a region which still retains the largest concentration of the nuclear workforce today. These ground-breaking UK developments marked the birth of an industry that has since expanded globally. In the intervening decades, UK nuclear generating capacity has waxed and waned. Surges of interest in nuclear have historically, and mainly, been in response to the cost and accessibility of gas and coal for the production of electricity. The punctuated development of the nuclear industry has left its mark on the shape of the current workforce and the nuclear estate.

The most recent nuclear build was in 1995 when the first commercial Pressurised Water Reactor (PWR) in the UK was commissioned at Sizewell. The new technology out-moded the ageing, British-designed, Magnox and AGR prototype fleets. As these older designs have been steadily coming off-stream, the nuclear contribution to electricity generation has been in slow and steady decline. By 2023, Sizewell B may be in sole operation unless new build nuclear is commissioned in the meantime.

The earliest that new build nuclear could now come into operation is late 2017. Without new build the current generating capacity of 11 GWe will decline by 90% to 1.1 GWe.

Were this to become a reality, the UK risks a major divestment of capacity and capability in the sector at precisely the time when many experienced and qualified personnel retire. It would also have far-reaching economic impact in those regions that currently host the nuclear workforces. In addition, the supply-chain stimulus for engineering SMEs with global growth potential would be stifled.

In the midst of all this the UK retains a powerful skills legacy, with current capacity and capability fit to deliver all aspects of the nuclear cycle from fuel processing to power generation and decommissioning.[4] Managing these skills for the future of the industry, at a time of potential expansion in generating capacity, is therefore an imperative.

Decommissioning will remain the dominant labour force for the foreseeable future. It is currently the largest manpower activity of the industry and is due to expand still further.

New build, if adopted, will steadily redress the balance to some extent. The industry's applications for 11 new strategic site assessments have just been published.[5] The approval of these sites opens up potential for the private sector to deliver a new nuclear-powered estate with capacity beyond current levels.

Fuel Processing is integral to the UK's full-cycle capacity and capability and forms a major strategic role as the nation moves to a new nuclear generation.

The next few years thus herald a defining period in which to review the UK skills base across the nuclear industry and to look ahead to 2025.

1.2 Questions

In the civil sector, labour market questions abound.

- What is the national and regional skills picture of the current civil nuclear establishments?
- What is the most effective classification system for the many skills and occupations of the workforce?
- Are supply and demand sufficiently geared to account for skills attrition due to retirement of the skilled workforces?
- How many skilled workers will be needed for the existing estate across fuel processing, electricity generation, and decommissioning?
- How many new reactors and electricity generating stations could, or should, there be?
- How many skilled workers would each new station require?
- Does the market require intervention to manage the transition of skills between decommissioning and new nuclear electricity generation?
- Will the supply of skills from schools, colleges and universities meet demand?
- What will be impact of the global demand for skills and the UK supply chain?

This Renaissance series of labour market reports will address these questions. One answer is certain though - skills are part of the solution.

---

[1] Low Carbon Transition Plan 2009, http://www.decc.gov.uk/en/content/cms/publications/lc_trans_plan/lc_trans_plan.aspx; The Energy Act 2008; The Planning Act 2008; The Climate Change Act 2008; Meeting the Energy Challenge: A White Paper on Energy, HMG, 2008; The Future of Nuclear Power, HMG, 2007

[2] 35% "favourable", 19% "unfavourable" (2,000 respondents), Robert Knight, Ipsos MORI, Public Attitudes to the Nuclear Industry , Nuclear Industry Association, November 2008.

[3] 'Flamanville 3' will produce 55 MWe per hectare (3.3 GWe in 60 hectares)

[4] Nuclear Power in the United Kingdom, World Nuclear Association, May 2009, http://www.world-nuclear.org/info/inf84.html

[5] Department for Energy and Climate Change http://www.nuclearpowersiting.decc.gov.uk/

1.3 Structure

This report is presented in five parts which largely correspond to introduction (A), review (B) and results and discussion (C and D), and conclusions (E). Further details are published on a companion website:

Part A: Renaissance Nuclear
Part B: The Power Point
Part C: The Next Generation
Part D: Skills Compass
Part E: Concluding Remarks

The companion website[6] hosts a downloadable version of the report together with details of the research methodology, quality assurance, peer review, and an extensive expanded set of labour market charts.

1.4 Scope

The primary aim of the research is to classify, quantify and qualify the skills picture of the civil nuclear industry and, further, to offer labour market models on the shape of skills to come.

To discern skills gaps at the micro-level is beyond the scope of this report; this will be evident, in any case, at the local/employer level. Subsequent reports will, however, probe more deeply into new build and the skill gaps in detail.

Power Generation, Decommissioning, Fuel Processing, New Build and the Supply Chain are the main activities recognized by this study, provided the business activity is in nuclear operations. The first three are activities of the nuclear operators; the latter two are less well defined sectors with significant wider economic impact. The Supply Chain sits within each of these sectors. Detailed research on the Supply Chain will be reported separately.

This report analyses the labour market in these areas to provide the most comprehensive picture to date of skills in the nuclear industry and a forward-looking perspective on skills demand to 2025.

For clarity, each sub-sector of the industry is defined in the following section.

1.5 Definitions

Nuclear Electricity Generation in this report is defined as those skilled activities taking place on an electricity-generating site as well as the business and regulatory support functions which may reside either on or off site but within the same company or group of companies. The site includes both the nuclear island (where nuclear heat generates steam) and the balance of the plant (where the steam drives turbines to produce electricity). Currently, Electricity Generation from nuclear is largely the preserve of British Energy,[7] with the exception of two close-to-decommission plants within the Magnox North site license company. These Magnox stations, although presently in electricity generation, are formally part of the estates administered by the Nuclear Decommissioning Authority (NDA).[8] At least two other new build consortia will bring private sector diversity to nuclear electricity generation.[9]

Projections of workforce demand to 2025 will exceed the lifetime of most of the existing operating fleet of nuclear power stations, and will see all but one transfer into decommissioning.

Fuel Processing covers the UK element of the nuclear fuel supply chain. It covers four main areas, conversion, enrichment, fabrication and reprocessing.

The first - conversion (of Uranium to Uranium Hexafluoride) - is carried out at the Springfields Fuel company, part of the NDA estate and operated under a management and operating contract by Westinghouse Electric UK Ltd.

The second - enrichment (of Uranium) – is fulfilled by Urenco, an independent international company with headquarters located in the UK.[10]

The third - fabrication (of nuclear reactor fuel) - is conducted at the Springfields plant, part of the NDA estate and operated under a management and operating contract by Westinghouse Electric UK Ltd.

The fourth - reprocessing (of used fuel) - is performed at Sellafield where special facilities support reprocessing of Magnox fuel, while the spent fuel from the AGR fleet is treated at the Thermal Oxide Reprocessing Plant (THORP). Sellafield Ltd is the site license company managing the site on behalf of the NDA.[11] Now under the ownership of Nuclear Management Partners, Sellafield Ltd has the largest concentration of nuclear expertise in Europe.

Nuclear Decommissioning under the NDA estate includes, not only sites in decommissioning, but also, as indicated above, some power generation and some fuel reprocessing. For the purposes of this report, these have been disaggregated and apportioned to Fuel Processing.

Projecting forward on workforce demand brings some of the decommissioning sites to the end of 'active' decommissioning as well as bringing new sites into decommissioning.

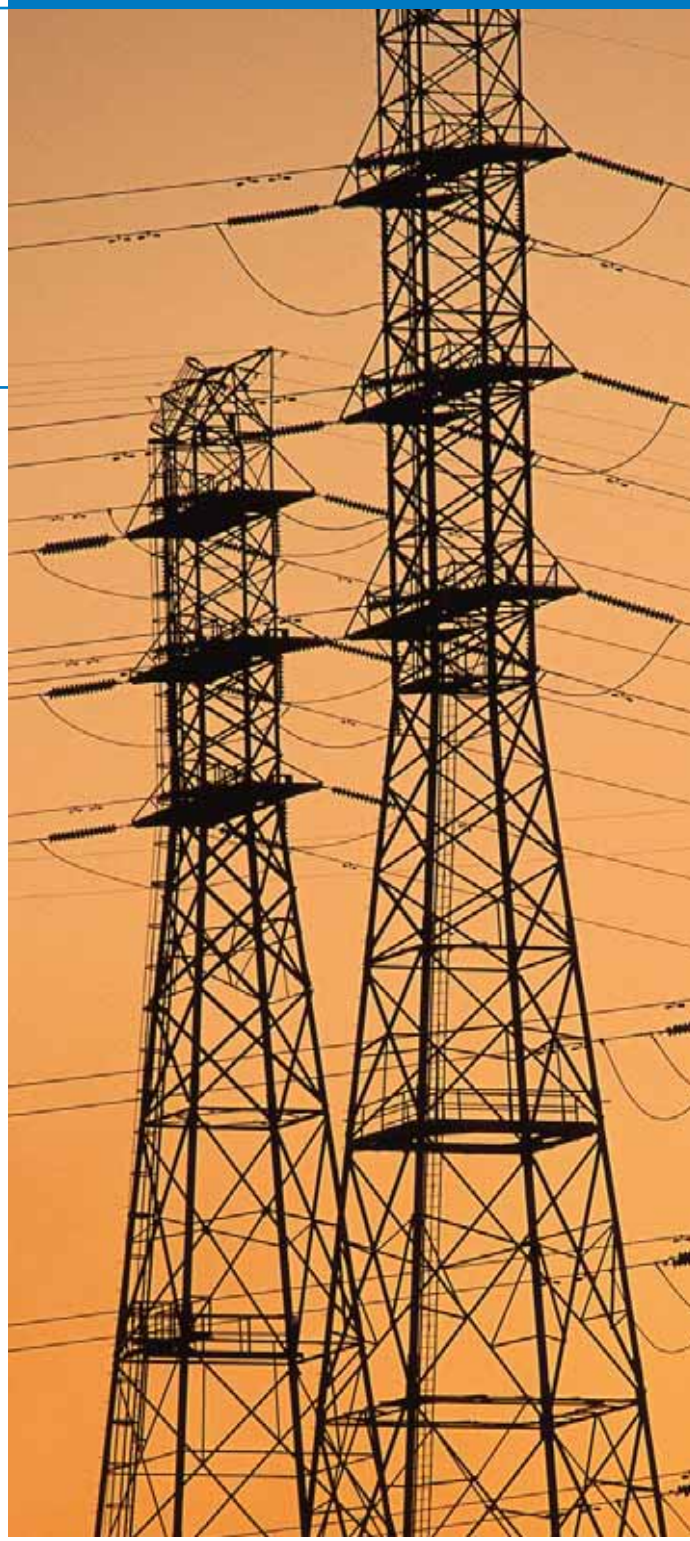
With new build nuclear, much depends on private sector investment and the pipeline of skills. This report addresses only the operating workforce required for new build. (A subsequent report addresses the construction and manufacture supply chain).

Drawing from a baseline of no new build to project the future nuclear workforce, a Replacement Generating Capacity scenario is developed in this report to project the workforce picture at 2025.

To set the scene for the labour market analysis, the following section reviews the drivers for nuclear power, the current nuclear estate and the baseline of labour market research in skills in the nuclear industry - "The Power Point".

[6] Web charts http://www.cogent-ssc.com/research/nuclearresearch.php
[7] Now part of EDF Energy - http://www.british-energy.com/
[8] Nuclear Decommissioning Authority http://www.nda.gov.uk/sites/
[9] For example E-ON/RWE;Ibderola/Scottish and Southern
[10] Urenco - http://www.urenco.com/
[11] THORP - http://www.sellafieldsites.com/page/what-we-do/sellafield-site/reprocessing

Part B:
The Power Point



From Calder Hall in 1956 to Sizewell B in 1995, and through the intervening Magnox and Advanced Gas Reactor fleets, the UK has developed full fuel-cycle, power generation and decommissioning capacity and capability.

With electricity demand set to rise for reasons of population, economic development and the general de-carbonising of transport, a major shift to a low-carbon grid is essential. In this emerging low-carbon world, nuclear presents a solution: zero-carbon energy at the point of generation; an efficient baseload source of electricity; security of supply; and, an electricity output that is of high density in terms of station footprint.

With the current ageing nuclear generation capacity set to decline substantially over the next decade, there is increasing emphasis on new build and interest in labour market research to determine skills and project demand. Yet there is a paucity of national statistics for the nuclear industry. This emphasises the importance of sector skills research.

Ensuring a competent nuclear workforce and a secure skills pipeline will be of key concern for employers, the public, and businesses demanding a secure and clean supply of electricity.

"Britain's strong heritage in nuclear power, and its clear role in our low carbon future, means that Cogent and the National Skills Academy for Nuclear have a critical role to play in the skills agenda. The nuclear sector requires increased flexibility and mobility across the workforce. As the transition from operating, to decommissioning, through to new build takes place, an expanded supply of matching skills will be needed to meet the growing global demand."

Mark Higson
Chief Executive, Office for Nuclear Development

2. Drivers

2.1 Energy Security – A Nuclear History

While nuclear power has its origins in the post-war weapons programmes, the history of its development has been one driven by periodic threat to energy supply. For example, in the same year that the UK commissioned the world's first commercial nuclear power station - 1956 - the Suez crisis brought home the prospect of a threat to oil supplies; the planned nuclear programme at the time was then trebled.

British technology led to the pioneering 'Magnox' design of the late 60s to early 70s which, in turn, gave way to 14 new reactors based on a new prototype – the Advance Gas Reactor (AGR). For the most part, the AGRs were commissioned from the mid 70s to late 80s. There then followed a lull in development with the deregulated UK energy markets being wary of building and decommissioning costs and a strong current of public opinion, at the time, against nuclear on the grounds of potential threats to health, safety and the environment. As a result, nuclear power capacity was retained in the public sector until 1996, when the AGR fleet was transferred into part private ownership with British Energy. The remaining Magnox stations became part of the estate of some of the site license companies.

With gas from the North Sea in plentiful supply at the end of the twentieth century, the so-called 'dash for gas' displaced further nuclear new build. As a result, only one new nuclear power station - Sizewell B – has been commissioned since 1995.

Nevertheless, the technology used for Sizewell B – a Pressurised Water Reactor (PWR) – was a signpost to future reactor designs that the UK and other nuclear nations were likely to commission in the future.

Security of energy supply was heightened when, in 2008, the oil market behaved in a highly volatile manner. Although the current recession has temporarily dampened energy demand, it is clear that the underlying demands of developing economies will maintain long-term upward pressure on the costs of fossil fuels at a time when the UK Continental Shelf reserves are moving into decline.

Nuclear energy would insulate the UK from the worst effects of volatility and security of supply.

2.2 Electricity Demand

An expansion in electricity demand is expected, not least from a growing UK population and economy, but also from a major switch to low-carbon transport. This places great demand overall for low-carbon electricity on the grid.

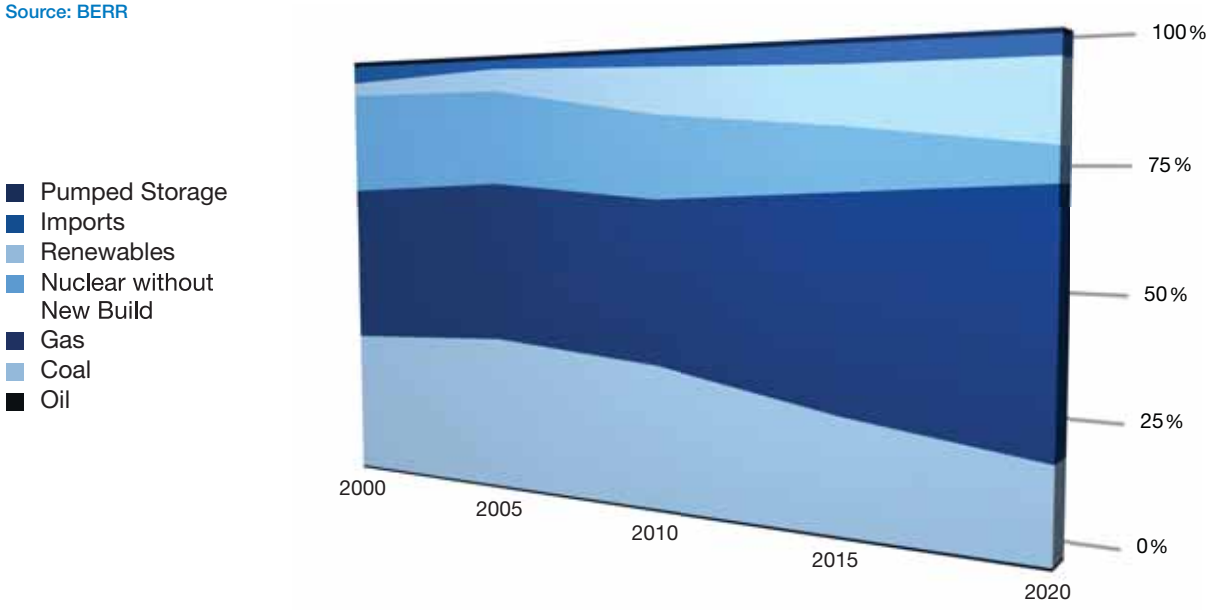
Renewables, Nuclear and Coal (with carbon capture and storage) could provide such low-carbon electricity. All have their unique challenges and risks. But only in the case of nuclear has the capability been technically demonstrated on the scales required. In the absence of new build (Figure 2.2.1), the low-carbon contribution from nuclear to grid capacity could drop by 90% by 2020. If this transpired, it would risk-load the other technologies to fill the low-carbon energy gap.

2.3 Energy Policy

Concern over climate change has been critical in turning public opinion favorably towards Nuclear Power as a low carbon source of energy, even after build and decommissioning are taken into account.

In October 2008, the UK Government set a unilateral target of reducing emissions in stages by 2020 and by 2050. A Nuclear contribution is currently viewed as part of the solution in a mixed low-carbon energy market.

Figure 2.2.1
UK Electricity Generation 2000 - 2020[12]
Source: BERR



[12] Reproduced with permission

The Energy White Paper[13] concluded:

"…the Government believes it is in the public interest that new nuclear power stations should have a role to play in the country's future energy mix alongside other low-carbon energy sources; that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the Government should take active steps to open up the way to the construction of new nuclear power stations."

The Government has subsequently formed the Department of Energy and Climate Change which houses the Office for Nuclear Development (OND) and hosts the Nuclear Development Forum. In particular, the OND has a policy-driven role to deliver and implement the policy framework for new build and to facilitate the critical delivery pathways, including those of skills supply and demand.

The Generic Design Assessment and the Strategic Site Assessment processes are now on critical paths, and the Nuclear National Policy Statement is due in 2010.

In conclusion, from the policy standpoint the UK position is very clear and the groundwork to allow industry-led developments has been set in train.

2.4 The Environment

Notwithstanding the low carbon agenda, the pressure on land use, from a rising population, and the effects on the environment of major infrastructure are also a consideration. In this connection the energy density of nuclear power is worth consideration. Nuclear can demonstrate the highest energy density of any primary energy source that science and engineering is currently able to harness and industry able to distribute on a national scale.

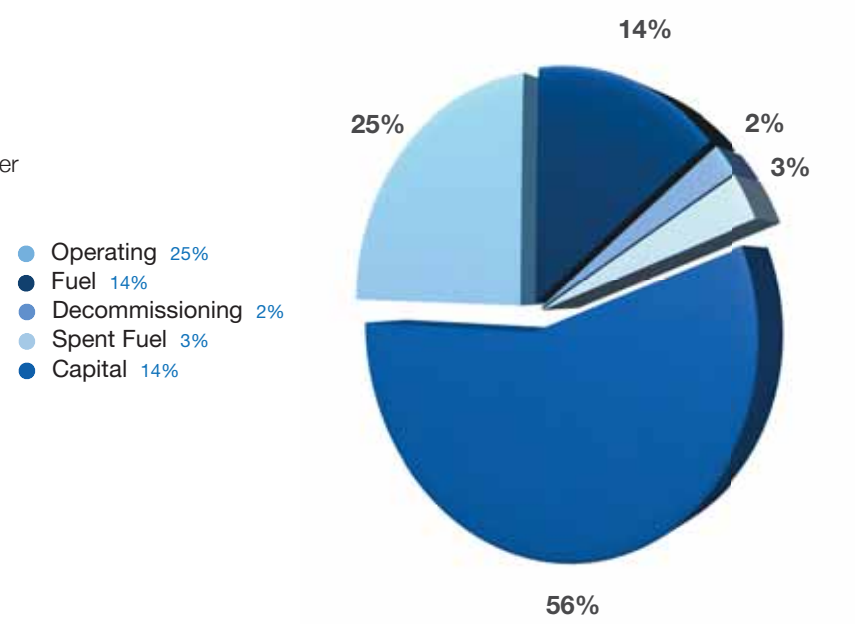
An energy capacity density of 55 MWe per hectare is demonstrated by the latest statistics of new build in France.[14] By this comparison a station on a relatively small site can generate as much electricity as 2,000 wind turbines.[15]

2.5 Cost

While the policy and regulatory infrastructure is designed to remove impediments to low-carbon energy, the decision to build new capacity will ultimately be one for the market. The private sector will incur all the capital and labour costs for new build electricity generation, and end-of-lifetime decommissioning. Research has demonstrated that, over the lifetime of a nuclear power station, costs can be on a par with that of other fuels used for electricity generation.[16]

In contrast to fossil fuels, the major costs for nuclear power are in new build and decommissioning. A major cost for fossil plants is the fuel itself. In contrast, the cost of nuclear fuel is relatively low and stable (Figure 2.5.1).[16] The raw material itself is in plentiful and secure supply or is in accessible stockpile. It is estimated that there is sufficient supply to service demand and control prices for the foreseeable future, even in the event of a major upsurge in global nuclear generating capacity. [17]

Figure 2.5.1
The Cost of Nuclear Power



[13] Meeting the Energy Challenge: A White Paper on Energy, HMG, 2008
[14] 'Flamanville 3' will produce 55 MWe per hectare (3.3 GWe in 60 hectares)
[15] Assumes 1.5 MWe per turbine (average per UK turbine from BWEA) ; 2387 turbines for 3.3 GWe; source http://www.bwea.com/ukwed/index.asp)
[16] Nuclear Energy Outlook 2008, Nuclear Energy Agency, OECD
[17] Uranium 2007: Resources, Production and Demand, Nuclear Energy Agency, OECD

2.6 Skill

It is a strength for the UK that it has both the facilities and the skills pool to draw on from all aspects of a civil nuclear programme. If current nuclear generating capacity is run down, the skills transition will simply be from power generation to decommissioning. Should new build take effect there will be a further transition for skills back to power generation once again.

The two new PWR designs undergoing Generic Design Assessment are superior in fuel management, generating capacity, safety control and speed of build. However, experts such as the Nuclear Industry Inspectorate do not expect there to be a significant change in the workforce mobilised to operate and maintain new reactors when compared to existing ones. (This is an important aspect of the scenario development of this report.)

2.7 The Global Economy

It is against the above backdrop that many economies across the globe are gearing up for an expansion in nuclear generating capacity. This has raised debate concerning the international mobility of skills and the global capacity of the supply chain.

If the UK becomes one of the global early movers in new build, UK companies will have considerable global market potential. This will secure highly skilled jobs in the UK.

3. The Nuclear Estate

Companion website - extended range of charts
www.cogent-ssc.com/research/nuclearresearch.php

Nuclear will remain an important part of the future energy mix. It is the fourth most used fuel in the total energy supply of the UK, and the third largest single-fuel source of electricity generation. Although it will constitute a declining proportion of electricity generation in the UK in the short term, it is predicted to grow in proportion as new build nuclear emerges in the medium term. Skills transitions will mirror this nuclear trajectory with the focus of skills moving towards decommissioning in the short term followed by a return to electricity generation in the medium and long term.

Analysis demonstrates that it is feasible to envisage nuclear electricity generation beyond current capacity.

There is a realistic scenario of Power Generation, Decommissioning and New Build operating concurrently in some regions for the first quarter of the current century at least. This is of major significance for workforce planning in that regional economies will become repositories of skilled and nuclear literate labour with potential for reskilling to facilitate retention and accelerated transition between the various phases.

3.1 Primary Energy Supply

The global Total Primary Energy Supply (TPES) in 2006 was 11,741 million tonnes of oil equivalent (Mtoe), of which 23% was used for electricity generation. Nuclear is consistently part of the energy mix but, in the more developed economies, a greater share of the energy economy relies on a high technology infrastructure with attendant high levels of skills to deliver a safe and strategic service. The nuclear industry is one such example in the UK, being fourth in terms of contribution to TPES (8%) and third in terms of electricity generation (15%).[18]

3.2 Electricity Generation

Since 1980, UK energy consumption has risen across all sectors, with dramatic rises of 68% for transport and 10% for domestic use.[19] However, the proportional split across domestic, industry and services has remained fairly stable (Figure 3.2.1). Within this power production envelope the nuclear contribution has been declining from a previous peak of 19% of total electricity supply (Figure 3.2.2). The current levels vary between 15% and 17% depending on maintenance outages of the ageing fleet of reactors and the fact that a small deficit in energy supply (1-2%) is drawn from an interconnector linked to France and is therefore up to 80% nuclear in origin. While nuclear may remain the third fuel source for electricity generation, it still contributes proportionately less than half that of coal, the second most used fuel source, and just over a quarter that of gas, the most important fuel for UK electricity generation currently (Figure 3.2.2).

[18] Energy Balances of OECD Countries, 2008, International Energy Agency, OECD
[19] Reproduced with permission– UK Energy in Brief , July 2008 (BERR now department of Business Innovation and Skills)

Figure 3.2.1
Electricity Consumption[19]

Electricity consumption, 1980 to 2007

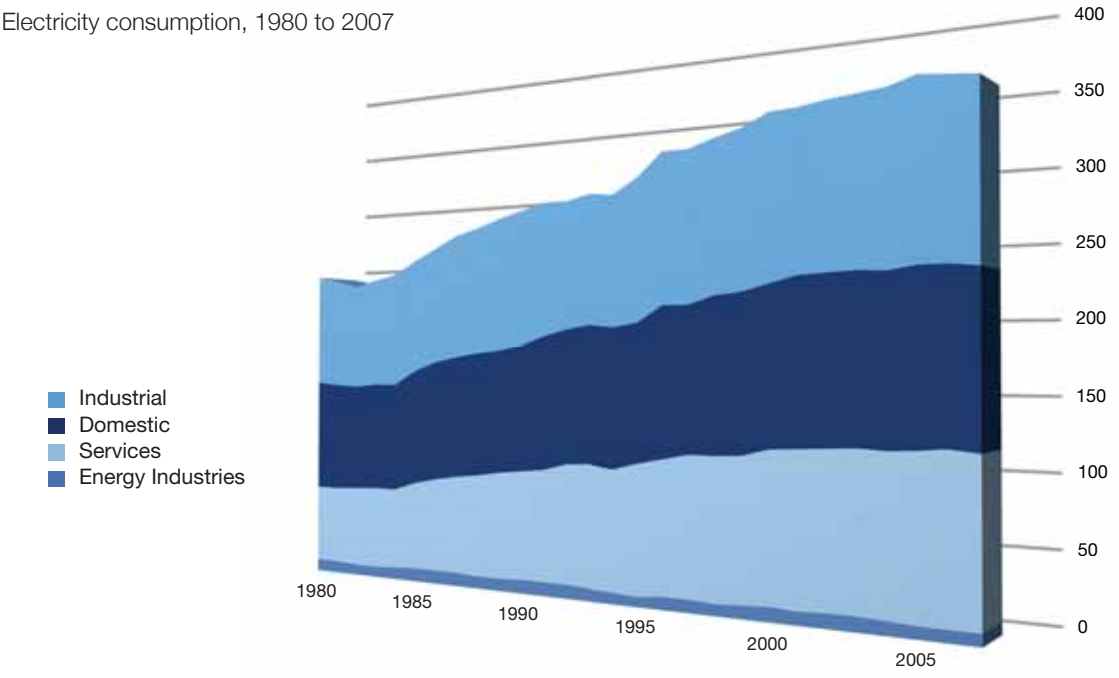
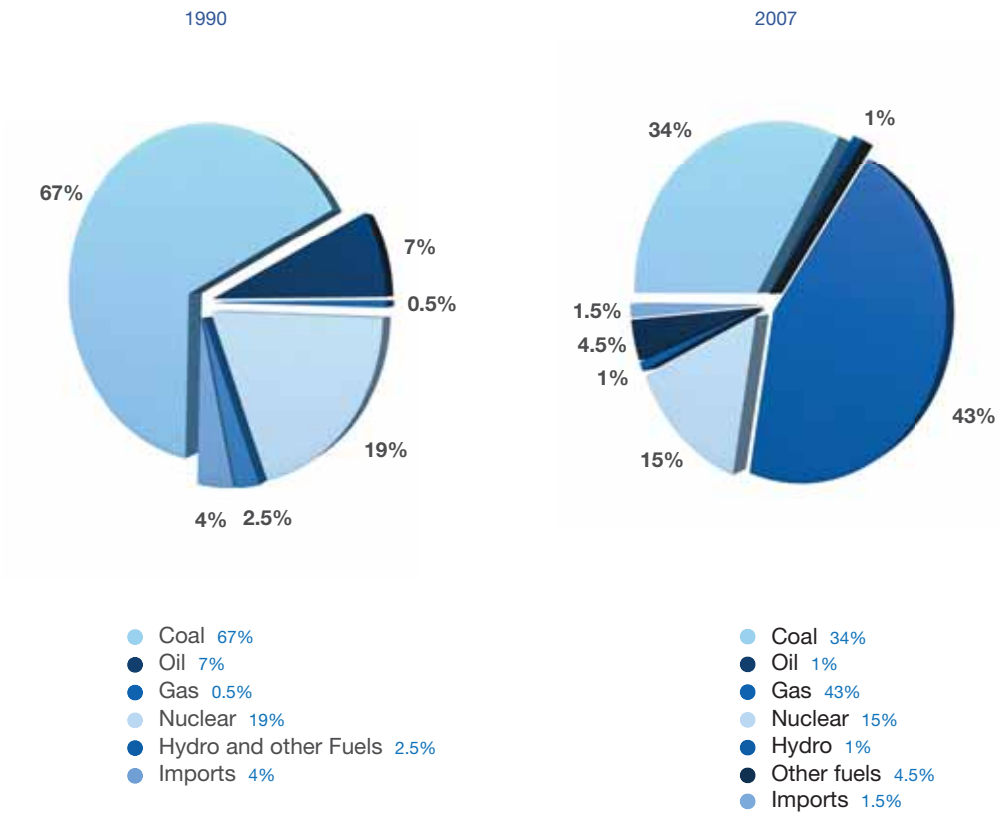


Figure 3.2.2
UK Electricity Generation - Fuel Sources[19]

Electricity supplied by fuel type, 1980 to 2007



3.3 The UK Civil Nuclear 'Estates'

In 2006 the UK had 19 reactors generating 11GWe – 15-17% of capacity. While gas and coal each generate a greater proportion of the total electricity demand, nuclear provides 'baseload' capacity – meaning that the reactors operate to maximum capacity for most of their operating lifetime, barring outages for maintenance.

Nuclear is the most suited fuel for baseload generation as the nuclear energy is constantly available. Typical figures for the operating efficiency of new reactors are high and in the range 90-95% of capacity.

Figure 3.3.1 illustrates the age profile of the current nuclear power generating estates. This is based on the published lifetime plans of the current reactors (Magnox, AGR and PWR).

Figure 3.3.2 charts the locations of the civil nuclear sites covering current decommissioning and power generation.

Figures 3.3.3 summarises the effect of lifetime plans and extensions.

Future power-generating sites will be determined in the first instance by the outcome of the strategic site assessments of the 11 nominated locations. It is therefore feasible to envisage nuclear generating capacity beyond current capacity.

3.4 Skills for Nuclear Power

The skills required to support nuclear power are not simply those demanded by the operating lifetime of a station (ca 60 years), but a significantly extended period to service decommissioning and remediation of the site. It is therefore clear, that if new build is sanctioned in the coming years, and commissioning continues through the ensuing decades, that the UK demonstrated capacity and capability in Power Generation, Fuel Processing and Decommissioning will be extended and will be operating side-by-side for the first quarter of the current century at least.

This is of major significance for workforce planning in that regional economies will be repositories of skilled and nuclear literate labour with potential for reskilling to facilitate retention and transition between the various phases.

Figure 3.3.1
Current Nuclear Fleet – Reactor Lifetimes

UK Nuclear Power Stations Lifetime

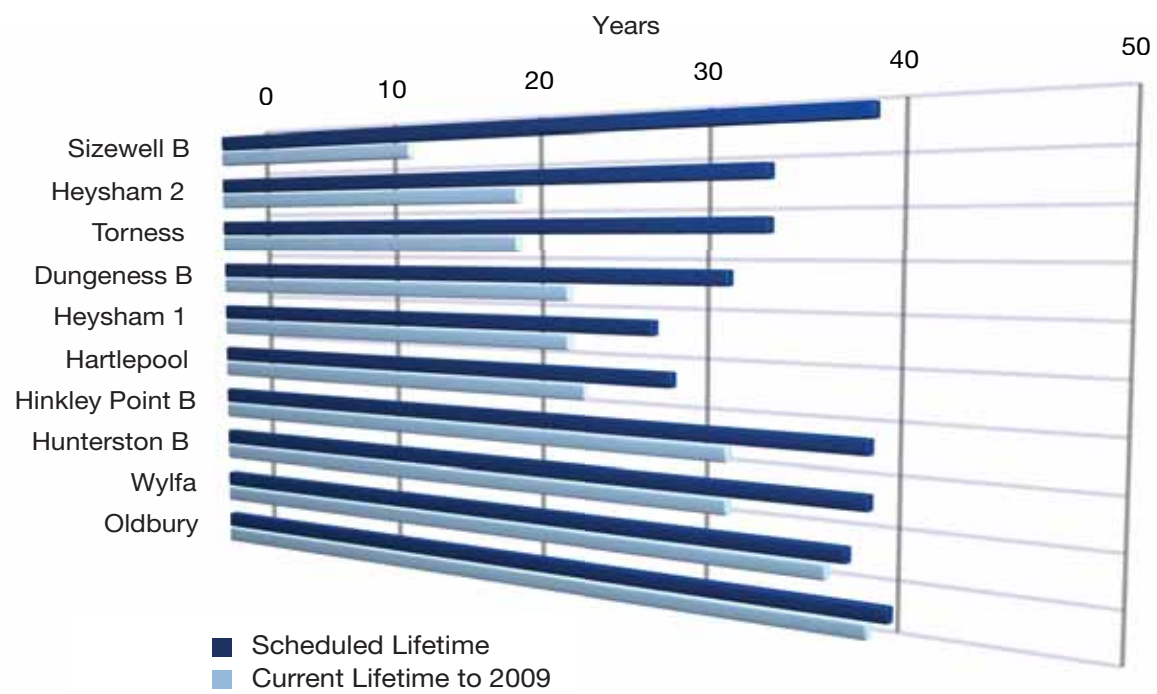


Figure 3.3.2
UK Current Nuclear
Electricity-Generating Sites

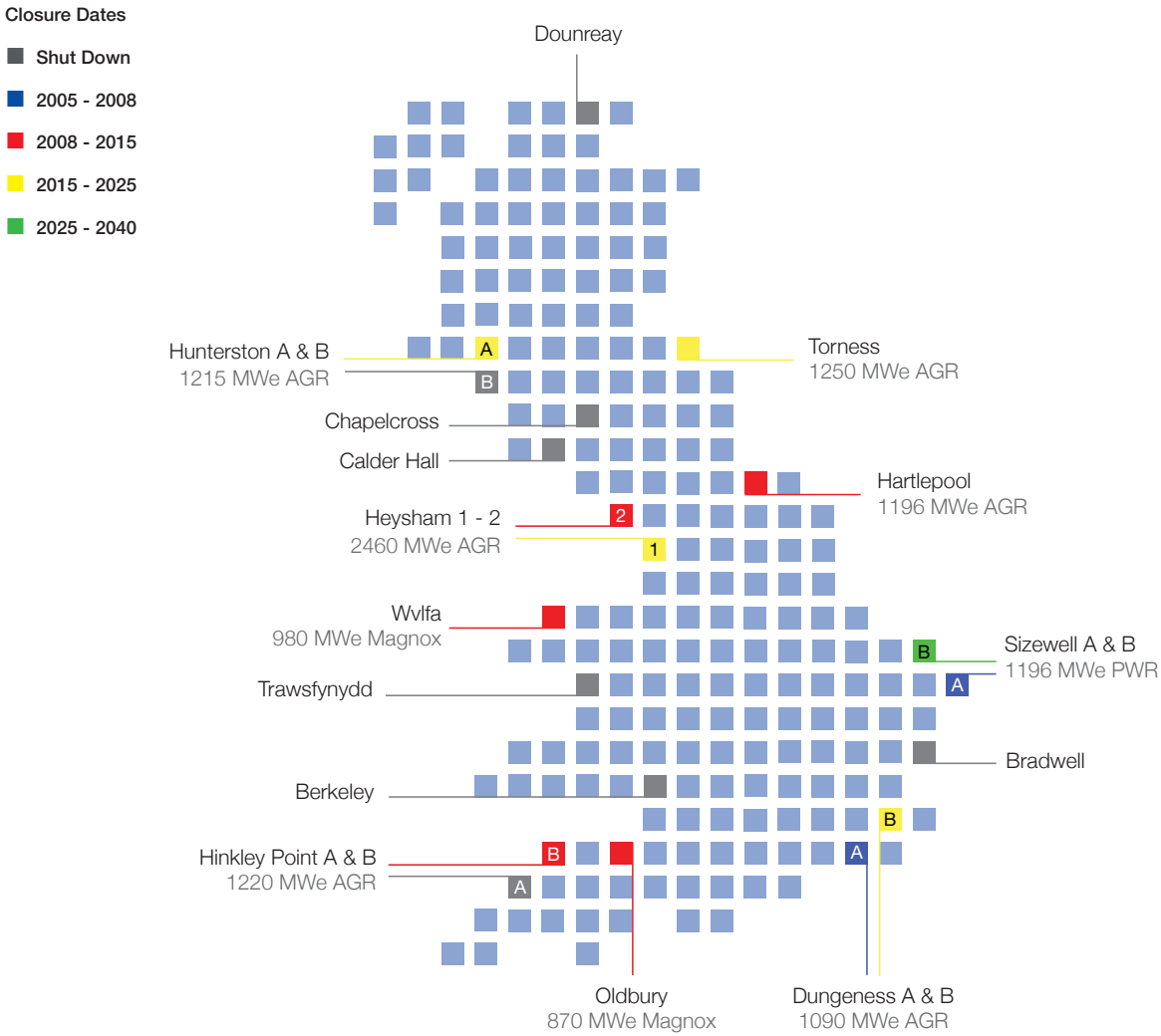
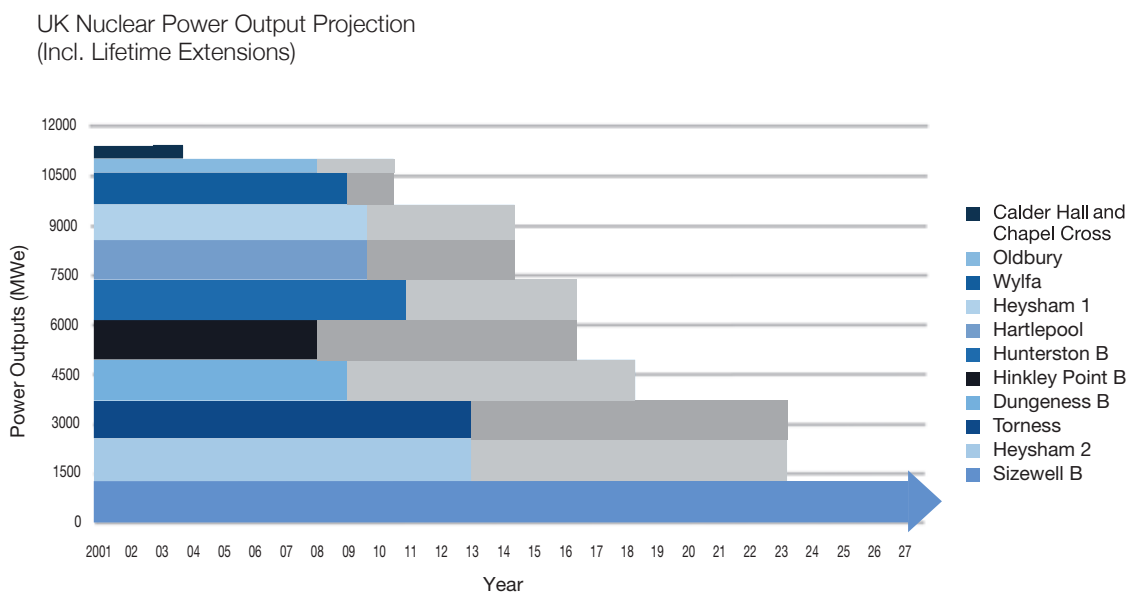


Figure 3.3.3
Current Nuclear Fleet – Reactor Output and Extended Lifetime Potential [20, 21]



[20] British Energy 2009, http://british-energy.com/ pagetemplate.php;
[21] Magnox North 2009, http://www.magnoxnorthsites.com /about-us/our-sites

4. A Skills Review

Cogent's labour market research will inform strategies to ensure that the skills needed for jobs both today and tomorrow are in place to enable a sustainable future for the industry and its strategic contribution to the infrastructure of our society and economy.

Significantly, there is a paucity of comprehensive, national labour market statistics for the nuclear industry; a void which is addressed by this report.

4.1 Labour Market Research

Detailed national, indeed global, manpower data covering the nuclear workforce is in short supply. For example, the international publication 'Nuclear Energy Outlook, 2008', devotes a single page to 'Quantifying Workforce Needs'.[22]

In view of the paucity of national data, Cogent, the Sector Skills Council for the Nuclear Industry, has an important government-licensed role to fulfill in quantifying the nuclear labour market for a highly strategic sector. A single Standard Industry Classification[23] identifies only nuclear fuel processing, despite the fact that power generation and decommissioning are of much greater impact. Further, this industry classification is also associated with the refining and retail sale of petroleum and related fuels. All other civil nuclear economic activity is therefore inherent but not separately attributed within other electricity generation and utility codes.

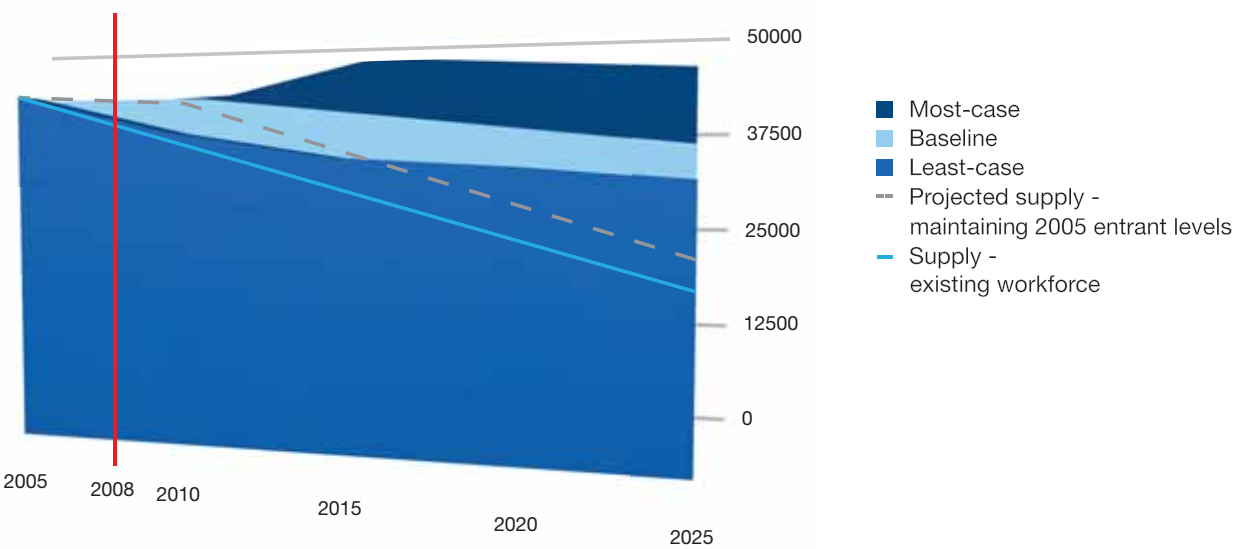
Prior to the renewed new build environment surrounding nuclear, Cogent had published a series of reports based on employer samples.

- Nuclear Employer Survey (2005).[24]
- A Gap Analysis for the Nuclear Industry.[25]
- An analysis of the supply of STEM skills to the nuclear sector. [26]

In 2007, facilitated by the Government department for Business, Enterprise and Regulatory Reform (Business, Innovation and Skills from June 2009), Cogent co-authored a skills response to the Energy White Paper together with the National Skills Academy for Nuclear, Energy & Utility Skills, the Engineering Construction Industrial Training Board and the TUC.[27] While the report concerned the energy sector more broadly, and included Cogent's wider energy footprint in Oil and Gas, and Refining, it did report the first approximation of future skills scenarios encompassing new build models (Figure 4.1.1). It predicted, at the time, that the skills gap would broadly be between 5,000 and 10,000 skilled personnel, driven mainly by the natural attrition of the workforce through retirements.

Figure 4.1.1
Civil Nuclear Workforce – Supply & Demand[27]

Projected Supply and Demand for Nuclear Workforce 2005 - 2025



[22] Nuclear Energy Oulook 2008, Nuclear Energy Agency, OECD, p323
[23] Standard Industry Classification (2007), Fuel Processing = 24.46; Standard Industry Classification (2003), Fuel Processing = 23.30
[24] Nuclear Employers Survey Cogent SSC (2005) http://www.cogent-ssc.com/research/Publications/Archived_Publications/Nuclear_Employers_Survey.pdf
[25] A Gap Analysis for the Nuclear Industry, Cogent SSC (2006) http://www.cogent-ssc.com/pdf/Nuclear_Gap_Analysis.pdf
[26] Choices in Science and Engineering Education for the Nuclear Industry, Cogent SSC (2007) http://www.cogent ssc.com/research/Publications/publications/Nuclear_Choices_07.pdf
[27] Energy Skills: Opportunity and Challenge, A Response to the Energy White Paper, Cogent SSC, (2008), http://www.cogent-ssc.com/research/Publications/publications/EWP_Skills_Reporting.pdf

4.2 Labour Market Developments

In 2008, as the new build potential emerged more clearly, Cogent commissioned in-depth research on the nuclear labour market - Power Generation, Decommissioning, Fuel Processing, Defence and, the most uncertain area, new build nuclear. This work captured the employed operating workforce for which no clear national data repository exists with the Office of National Statistics. This research forms the body of this publication – 'Power People'.

In addition, Cogent has commissioned research on pinch-points in the supply chain for new build, especially the manufacturing and construction contractors. In this endeavor Cogent has worked with the support of the Office for Nuclear Development, the National Skills Academy for Nuclear, the Nuclear Decommissioning Authority and other strategic skills bodies to add value to this work.[28] This forms the body of a subsequent Publication - "Next Generation"

A pre-requisite to the labour market modeling is a robust and verifiable classification of the current nuclear labour force, an analysis of its constituents by job context, skill level, age profile, by nuclear sub-sector and by regional concentration. The following section addresses this stage of labour market data collection, collation, categorisation and characterisation – "The Next Generation".

[28] Includes the National Skills Academy Nuclear, the Nuclear Decommissioning Authority, Construction Skills, the Engineering Construction Industrial Training Board, Energy & Utility Skills, the Department for Business Innovations and Skills , the Office for Nuclear Development

Part C:
The Next Generation

The civil nuclear operating workforce, at 2009, is estimated at 44,000 employees. Up to 24,000 of these are directly employed by the nuclear operating companies with the remainder being contracted-out employment in the supply chain. Decommissioning, with 12,000 employees, makes up over half of the industry employment, while Electricity Generation, with 7,400 employees, constitutes just under one-third of the sector. Fuel processing, with 4,600 employees, drawn from enrichment, fabrication and spent-fuel reprocessing, make up the final fifth of the civil nuclear sector.

Activities such as Energy Production Operations, Decommissioning Operations, Fuel Processing Operations and Maintenance Operations make up 50% of the workforce, with supporting functions such as Business, Safety and Security and Project Management forming up to 40% of the remaining skilled activities.

Skill levels are high in all sectors and include a significant proportion of technical occupations (30-40% depending on sector). But the workforce is older than the general workforce, making retirement projections most severe for the more experienced personnel. It is evidence of the need for long-term commitment to manpower planning and training to attract and retain the industry's most critical group – suitably qualified and experienced personnel.

The skills demand will follow the change in industry landscape over the 2009-2025 'window' of this report. This will be: stable numbers in Decommissioning; decline in old Electricity Generation followed by expansion of new Electricity Generation; and, finally, decline in Fuel Processing (mainly reprocessing). The most striking demand statistic is the demand without new build. In this case, regardless of scenario, the UK faces a reduction of 88% in the workforce employed in nuclear Electricity Production.

Using a scenario that achieves of the order of 12 GWe of capacity by 2025 has provided a useful comparator to the current electricity-generating workforce delivering 11 GWe.

"For the first time in my twenty year experience of the Nuclear Industry, we are now seeing a much-needed national strategy for skills. We are working with employers to help set the strategic direction and ensure the training reflects the changing needs of a sector that will support a low-carbon future."

Dai Hudd
Deputy General Secretary
Prospect

5. A Skills Framework

5.1 National Data

Given the paucity of national data for the sector, the new classification system, described below, provides a systematic and comprehensive methodology for quantifying, qualifying and assessing the national labour market picture of the nuclear industry.

5.2 Job Contexts and Skill Levels

During 2008, as a precursor to the collection of labour market data, Cogent, in conjunction with the Nuclear Decommissioning Authority (NDA) skills and resources task group, developed a common sector classification system comprising 13 Job Contexts and five Skill Levels. This work was progressed with the NDA as this organisation faced a similar challenge in reporting labour market data across the various site license companies whose activities covered all elements of the UK civil nuclear programme. The Skill Levels correspond closely to the Standard Occupational Classifications, while the Job Contexts were derived from an extensive range of roles used by nuclear companies. The classification system was tested against data from other nuclear operating sites and companies (e.g. British Energy, Urenco and the Defence sector) to give confidence in the utility and translational power of a common language on skilled roles. The skilled Job Contexts and the associated Skill Levels are illustrated in Figure 5.2.1. The Job Contexts act as convenient repositories for hundreds of job descriptions.

Job Contexts 1-4 encompass 'core' nuclear operations at a given site.

- Energy Production Operations
- Decommissioning Operations
- Process Operations
- Maintenance Operations

The first three core roles largely reflect the industry activities of Power Generation, Decommissioning and Fuel Processing respectively. The fourth classifies that part of maintenance operations that is retained by the industry as distinct from that which may be out-sourced to the supply chain.

Job Contexts 5-13 classify supporting, value-adding and regulatory roles within the industry that may, or may not, reside on the nuclear site.

Figure 5.2.1
Nuclear Job Contexts

Job Contexts 1-13

1. Energy Production Operations
2. Decommissioning Operations
3. Process Operations
4. Maintenance Operations
5. Safety & Security
6. Radiation Protection
7. Project Management
8. Engineering Design
9. Scientific & Technical Support
10. Business
11. Construction (internal estates)
12. Waste & Repository Operations
13. Commissioning

Skills Levels 1-5

1. Semi-Skilled
2. Skilled
3. Technician
4. Professional / Middle Manager
5. Senior Manager

6. Nuclear Skills at 2009

Companion website - extended range of charts
www.cogent-ssc.com/research/nuclearresearch.php

The nuclear operating workforce is estimated at 44,000 employees. Up to 24,000 of these are directly employed by the nuclear operating companies with the remainder being contracted out employment to the supply chain. Decommissioning, with 12,000 employees, makes up over half of the industry employment while Electricity Generation, with 7,400 employees, constitutes just under one-third of the sector. Fuel processing, with 4,600 employees, drawn from both enrichment and spent-fuel reprocessing, makes up the final fifth of the civil nuclear sector.

The skill levels are high in all sectors although the distribution varies. All sectors employ a significant proportion of technical occupations ranging from 30% for Decommissioning through 35% for Electricity Generation to 40% for Fuel Processing.

Four core skilled contexts, Energy Production Operations, Decommissioning Operations, Fuel Processing Operations and Maintenance Operations make up 50% of the workforce, with supporting functions such as Business, Safety and Security and Project Management forming up to 40% of the remaining skilled activities.

6.1 Introduction

The paucity of Standard Industrial Classifications and Standard Occupational Classifications to clearly articulate the nuclear energy sector, as distinct from general electricity generation, results in a severe under-assessment of the economic and infrastructural impact that the industry and its skilled workforce contribute. Further, projections of demand rely on a robust inventory of the current skills of the industry.

This study is the most comprehensive labour market research undertaken to date for the industry. The Technical Annex (provided in the companion website to this publication) gives details of the methodology, the evidence and the corroboration. The following analysis is drawn from a one-hundred percent return rate of employer data, and is the product of over 250,000 cells of data.

Detailed charts portraying the workforce and skills are compiled in the companion website to this publication for ease of future reference.

The contractor workforce has been estimated from the NIA constituency data.

6.2 The Nuclear Workforce by Region and Nation

The civil nuclear workforce, including the directly contracted supply chain, is estimated to employ of the order of 44,000 people. The core workforce, i.e. those employed directly by the operating companies in Electricity Generation, Decommissioning or Fuel Processing amounts to an operating workforce of 24,000 people (Figures 6.2.1 and 6.2.2 below).

Clearly, the industry is highly dependent on the contracted supply chain. Contractor employment is high in some sectors; as high as a 1:1 induced employment in the Electricity Generation sector. Some details on the supply chain are included in this report but greater granularity will be provided in the fourth report in the Renaissance series.[29]

Regions of concentrated employment include the North West (53% of the industry), the South West (15%), Scotland (12%) and the South East (9%).

Figure 6.2.1
Workforce by Region and Nation

Civil Nuclear Workforce by Region and Nation 2008 incl. Supply Chain

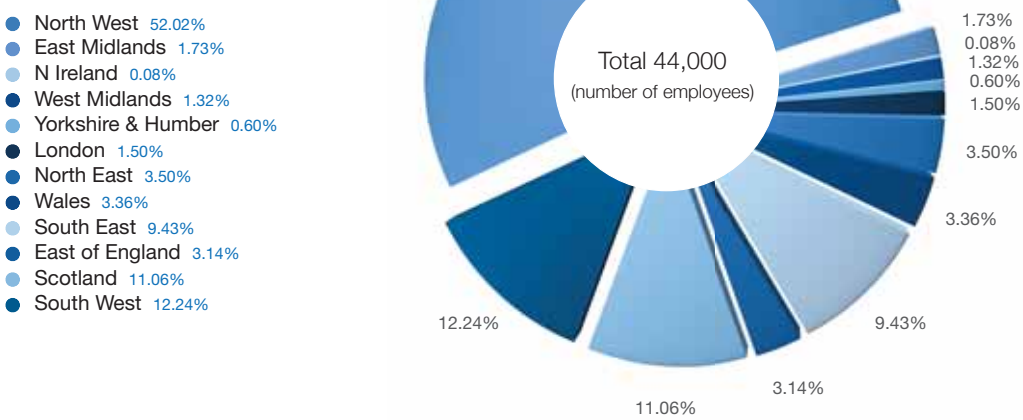
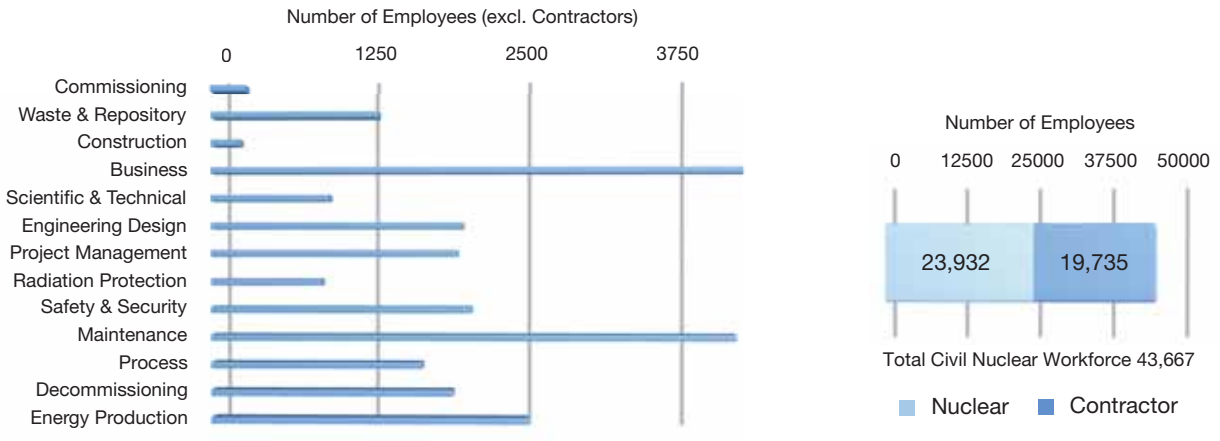


Figure 6.2.2
The Workforce by Job Context

Civil Nuclear Industry - Job Context Population 2009



[29] Renaissance 4 - Illuminations: Future Skills for Nuclear http://www.cogent-ssc.com/research/nuclearresearch.php

6.3 Workforce Activities and Geography

The Nuclear workforce has been segmented into three core activities: Electricity Generation, Decommissioning and Fuel Processing. These activities, in the main, sit across two major employment groupings covered by British Energy and the site license companies governed by the Nuclear Decommissioning Authority (NDA). The industry is distributed across both the private and public sectors, with the private sector being dominant in electricity generation. Urenco, a global company specialising in fuel enrichment is the sole UK-based private sector company operating in Fuel Processing.

The NDA estate includes two Magnox reactor sites which are still in electricity generation and are under lifetime extension plans (Wylfa and Oldbury). The NDA sector also includes a large component of fuel-processing operations if treatment of spent fuel is classified in this category. Furthermore, as the current Advanced Gas Reactor (AGR) fleet progress to the end of planned operating life, decommissioning will become a burgeoning category of activity for the estate of British Energy during the cool-down phase, although manpower planning for decommissioning will eventually come under the aegis of the NDA.

Decommissioning makes up the largest single workforce activity. For Decommissioning 11,951 people are employed (excluding Fuel Processing nested in Decommissioning). This is followed by Electricity Generation (7,400) and Fuel Processing (4,605).

The industry segments portray a regional density with Electricity Generation being most concentrated in the South West (35% of regional civil nuclear employment) and Decommissioning (Figure 6.3.1) being most concentrated in sites in the North West (64% of employment).

Electricity Generation (Figure 6.3.2) is currently spread across 10 sites. The 10 sites include the two Magnox reactors still in operation within the estate of the Magnox North Site License Company. Total employment on each reactor site (whether AGR or PWR) is typically around 7% of the 7,400 workforce required for electricity generation. This translates to an average figure of employment attached a single reactor power station of 500-600. The following sections (6.4 & 6.5) analyse the occupational break-down of this workforce by Job Contexts and Skill Levels.

All civil Fuel Processing capacity is located in the North West (Figure 6.3.3).

Figure 6.3.1
The Decommissioning Workforce

Nuclear Decommissioning Sites 2008

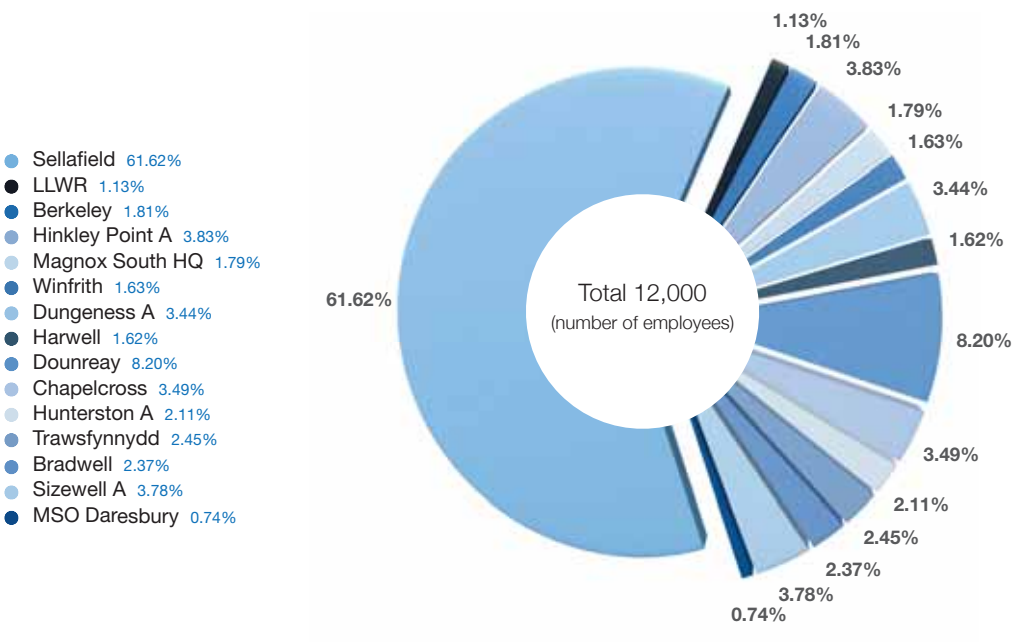


Figure 6.3.2
The Electricity-Generating Workforce

Nuclear Electricity Generation Sites 2008

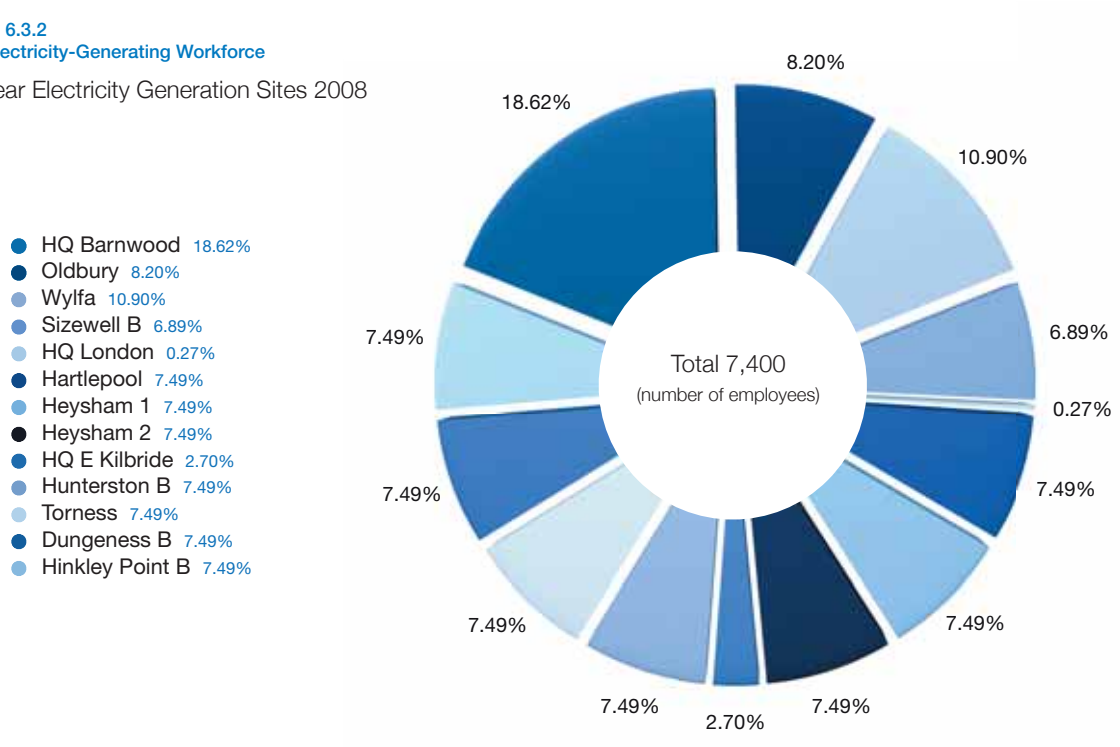
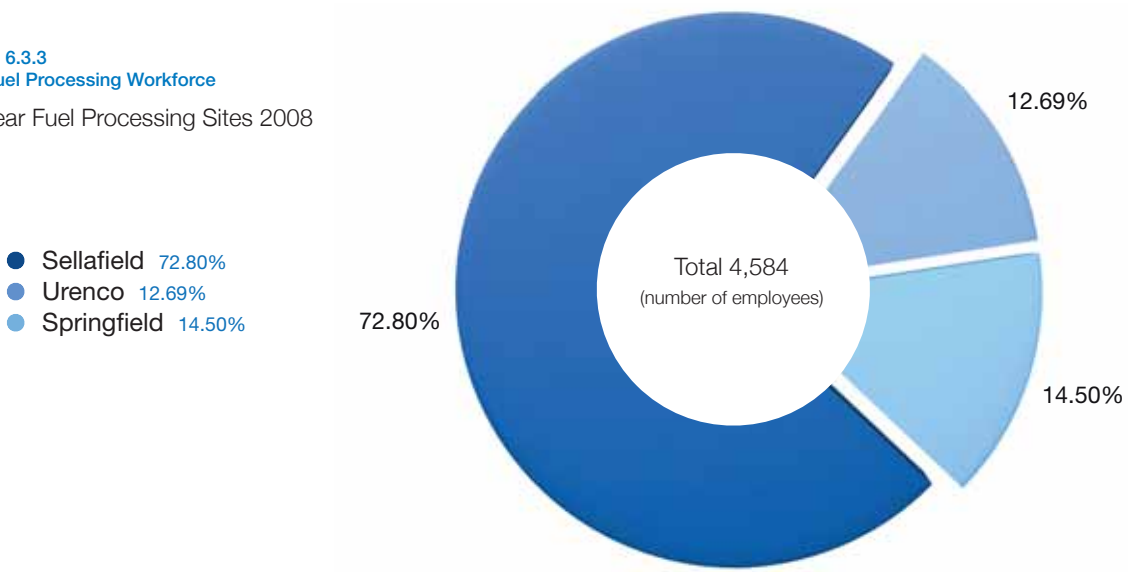


Figure 6.3.3
The Fuel Processing Workforce

Nuclear Fuel Processing Sites 2008



6.4 Skill Levels of the Nuclear Workforce

Comprehensive industry returns against an agreed industry classification template has allowed the first ever complete picture of the skills establishment in each of the sectors.

This study categorised five skills levels: from Semi-Skilled (Level 1 NVQ/SNVQ-equivalent) to skilled (Level 2 equivalent), to Technician (Level 3 equivalent), to Professional (Level 4 graduate equivalent), and finally to Managers and Senior Management (Level 5 postgraduate equivalent).

It is noted that employer assignment of roles and levels in these categories has been based on the job context as a proxy to the educational level of achievement. This approach is well established in labour market analysis.

Of note (Figure 6.4.1) is the large proportion of skills at levels 3 and above - over 45% for Electricity Generation, 35% for Decommissioning, and 35% for Fuel Processing. Further, each industry segment 'peaks' in a skill level category that is either level 3 (technical) or level 4 (professional). In all cases the proportion of technical and professional skills are high and between 30% and 42%, thereby giving a total proportion of at least 70% of the skills employed at these levels.

6.5 Job Contexts of the Nuclear Workforce

The 13 occupational job contexts (Figure 6.5.1) comprise four core occupational contexts: Energy Productions Operations, Decommissioning Operations, Fuel-Processing Operations and Maintenance Operations. These four occupational categories closely resemble the three main segments of the industry as described previously. It is stressed that these four occupational contexts are repositories of many occupations and skill levels.

The four core job contexts make up some of the largest occupational groupings for the industry. Out of a total civil industry core employment of 24,000, the four core job contexts account for over half of the employment and skills: 10% within Energy Production Operations, 8% within Decommissioning Operations, 16% within Fuel-Processing Operations and 17% within Maintenance Operations. This gives an industry ratio of 40:60 for maintenance to operations. This high ratio is not unusual for industries with a high dependency on safety, competency and quality assurance. Indeed, the ratio will be much higher when the contractor workforce is taken into account.

The remaining contexts are designated as supporting. Of these Business (17%), Project Management (10%) and Safety and Security (10%) feature prominently.

Figure 6.4.1
Skill Levels

Skill Level of Civil Workforce 2009 (excl. Supply Chain)

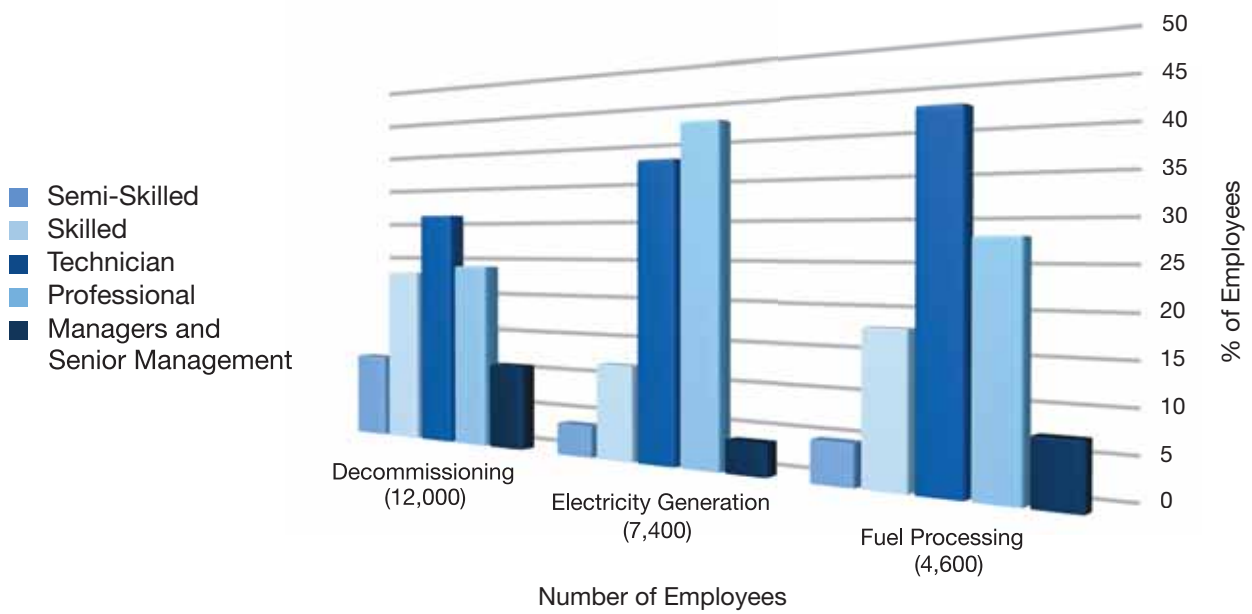
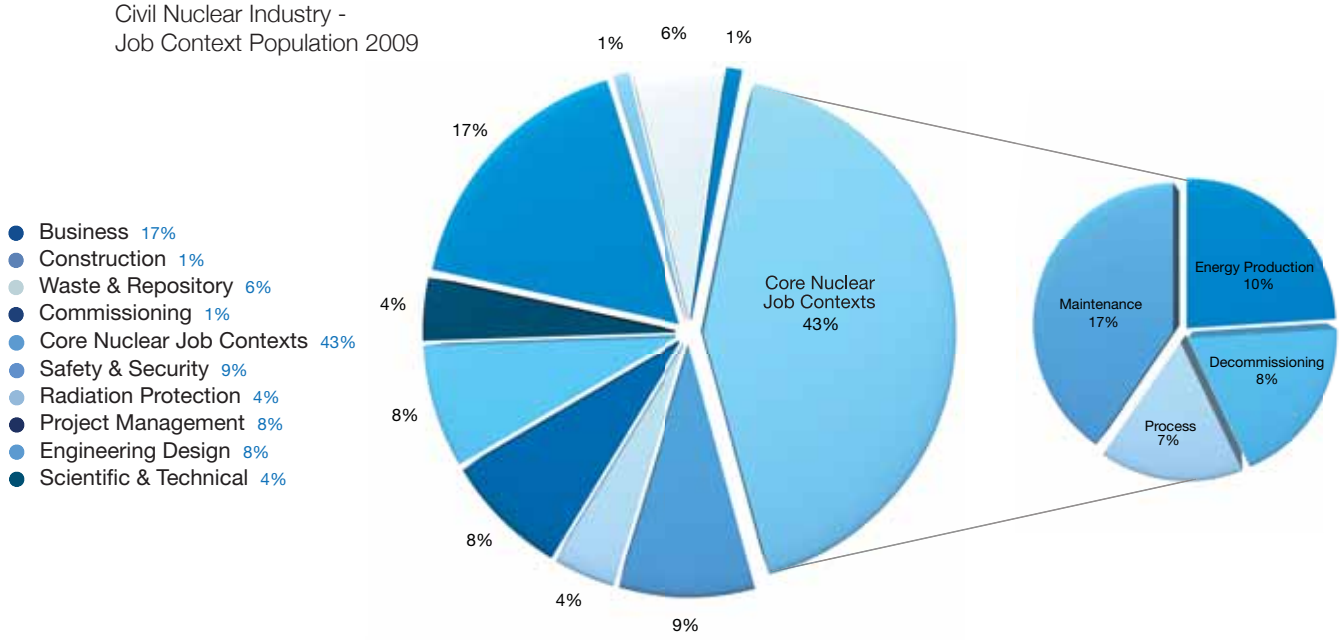


Figure 6.5.1
Core and Supporting Job Contexts

Civil Nuclear Industry -
Job Context Population 2009



7. Age Profiles

Companion website - extended range of charts
www.cogent-ssc.com/research/nuclearresearch.php

The Civil Nuclear Workforce is older than the general workforce and, in parts, significantly older. This portends a potential skills gap in the medium term. The mature profile applies also to each of the industry segments – Electricity Generation, Decommissioning and Fuel Processing. However, in the Decommissioning segment there are signs of managed growth of new young staff in occupations ranging from Semi-Skilled (Level 1) to Technical (Level 3).

The retirement projections are most severe for the more experienced personnel. While this is to be expected, it is evidence of the need for long-term commitment to manpower planning and training to attract and retain the industry's suitably qualified and experienced personnel.

7.1 Age Profile

The ageing profile of the nuclear workforce has been the subject of much anecdotal debate. This research, for the first time, quantifies the age profile by segment of the workforce. Such data are critical in skills gap analysis. Even in scenarios where demand for a skilled category may be in slow decline over a protracted period, the profile of experienced staff, if in decay at a greater rate, will still generate a skills shortage.

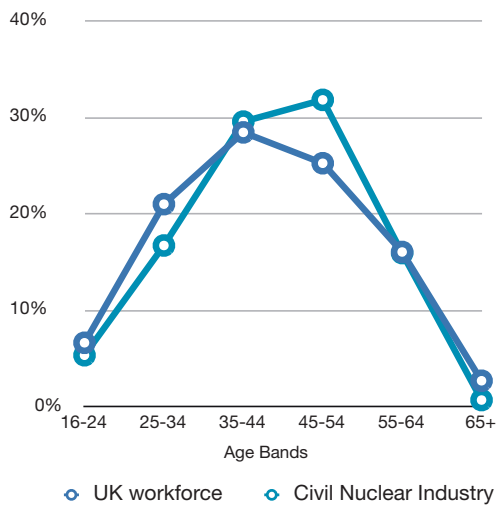
Figure 7.1.1 compares the age profile of the civil nuclear sector with that of the workforce at large. Overall, the nuclear profile is more sharply attenuated when compared to the tapered and flattened profile for the UK workforce generally. The respective plots intersect twice, with each intersection signposting a critical departure of note for the nuclear sector. The first intersection for the age-band 35-44 is due to the continued ageing of the civil nuclear workforce. The nuclear workforce matures to a maximum age band of 45-54 - a decade later than the general workforce.

The second intersection occurs beyond the 55-64 age-band. This suggests that early retirements are more frequent than for the workforce generally. This may be due to a combination of individual choice and workforce planning by the industry.

The profiles may also have resulted from a combination of retention and limited replacement and development in the past. This would be in keeping with the industry's punctuated development over the last half-century.

Figure 7.1.1
Nuclear and UK Workforces

Age Profile Comparison



The critical skills at risk are most likely to be discernable within the industry sectors, each of which have unique skills distributions as established in the previous section.

When viewed by skill level (Figure 7.1.2) the age profile largely follows that of the industry at large. As would be expected, the occupations at level 1-3 are marginally younger than the overall workforce. However, there are demarcations between the industry segments (see companion website). For example, Electricity Generation appears to have a shortage of younger technical occupations feeding through while, in contrast, Decommissioning is showing early signs of a gradual build up of younger staff at the technical, skilled and semi-skilled levels.

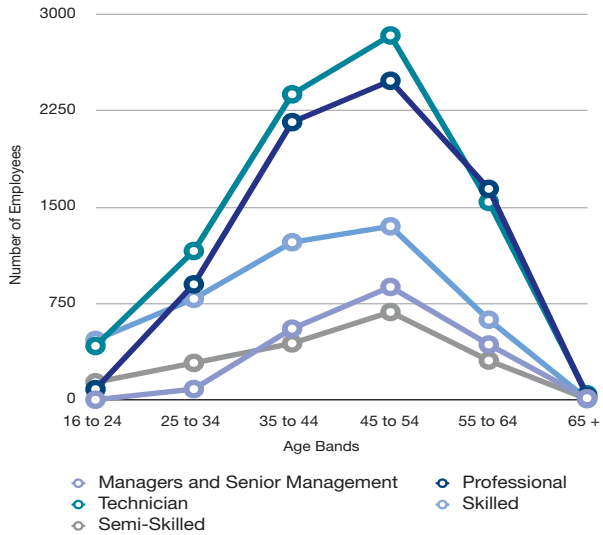
7.2 Retirement Profile

Approximately 5% of the workforce are due to retire every year up to 2025 so that by the end of 2025 over half of the workforce will have left through natural attrition (Figure 7.2.1). As would be expected, the greatest attrition is from the higher and more mature skilled levels, so that at occupational levels 4 and 5 (Professional and Manager/Senior Manager), up to two-thirds of these skill pools will be eroded by 2025 (Figure 7.2.2).

This is a critical erosion of labour as this pool represents an even larger proportion of the sector's experience than is their share of the workforce population.

Figure 7.1.2
Age by Skill Level

Age Profile of Civil Nuclear Workforce 2009



Given that the proportion of higher level skills in the nuclear industry is high, the accumulated retirement projection is likely to be a major determinant of any skills gaps arising out of the future demand scenarios as discussed in the next section.

Figure 7.2.1
Nuclear and UK Workforce Retirement Attrition

Accumilated Retirement Profile Comparison 2008-2025

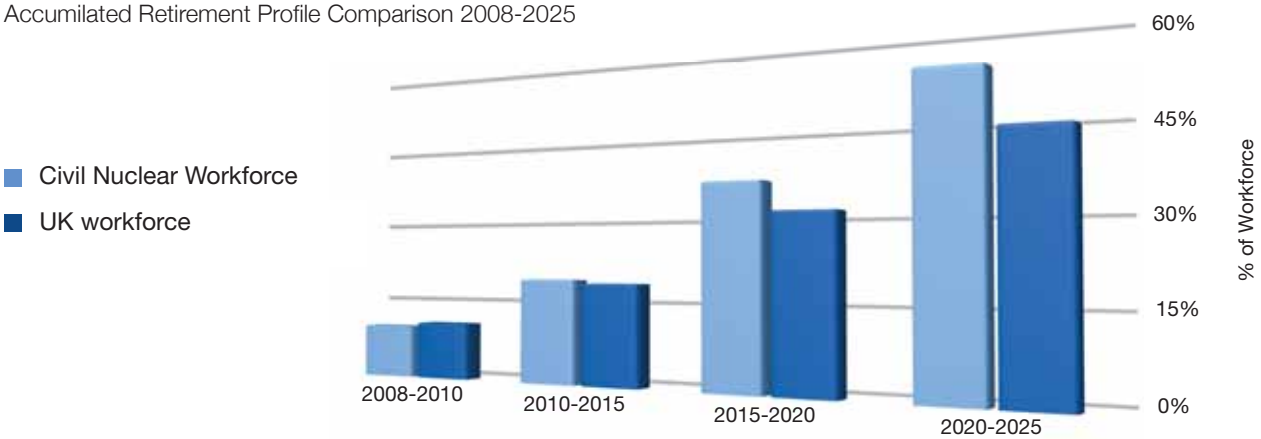
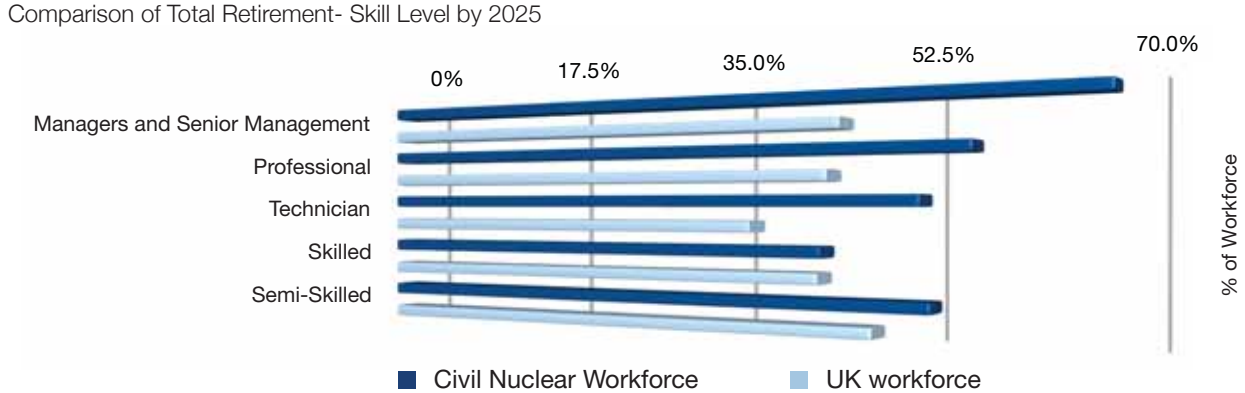


Figure 7.2.2
Retirement by Skill Level

Comparison of Total Retirement- Skill Level by 2025



8. The Shape of Skills to Come

Companion website - extended range of charts
www.cogent-ssc.com/research/nuclearresearch.php

Decommissioning of the Advanced Gas Reactor fleet and new build nuclear for electricity generation are the two activity drivers of the shape of skills to come. The first can be reasonably well defined from published lifetimes plans, while the second is dependent on how new build will emerge after the regulatory approval phase.

Fuel Processing is set to decline by 63% by 2025 as existing capacity expires alongside decommissioning and as reprocessing is no longer policy for new generation. This sector will become dominated by the highly technology driven activities of uranium enrichment and fuel fabrication.

A Replacement Generating Capacity scenario that achieves 12 GWe of capacity by 2025 has been developed as a useful comparator to the current electricity generating workforce delivering 11 GWe. This model projects a demand for 4,600 new jobs in the Electricity Generating sector by 2025.

The most striking shape of skills to come is that portrayed by the Electricity Generating sector if new build fails to materialize. In this event, regardless of scenario, the UK faces a reduction of 88% in this sector by 2025.

8.1 Introduction

The future of the current 24,000-strong workforce that is employed directly by the nuclear operating companies will be determined by the projected demand in each sector, moderated by retirement attrition.

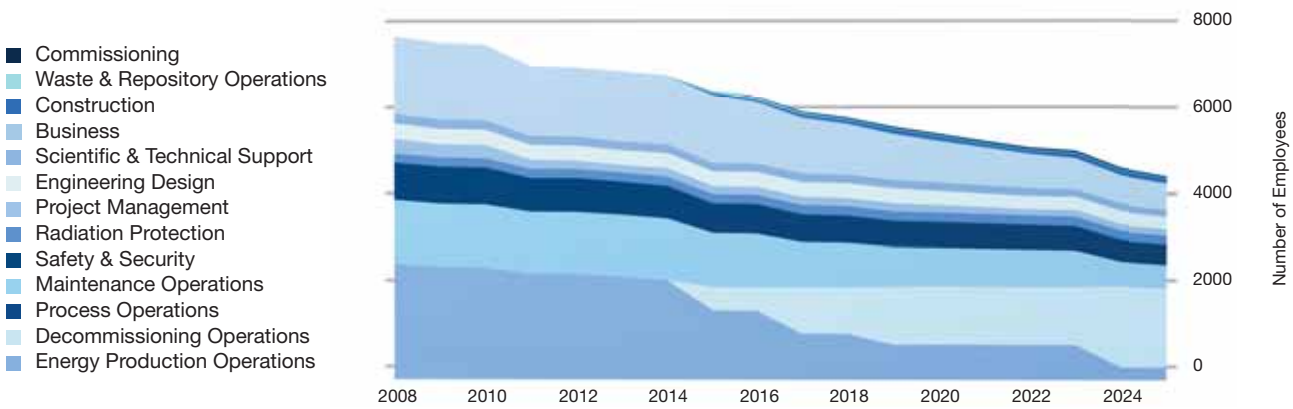
Future projections on Decommissioning are well known from the lifetime plans of the Site License Companies. Future projections on Electricity Generation are less distinct but are becoming more firm in the sector at the time of writing. The following analysis looks at futures without new build for the purpose of determining the baseline demand. This is then over-laid with new build scenarios and workforce age profiles to determine the future shape of the workforce and the demand for new supply of skills.

The main scenario of interest is the Replacement Generating Capacity scenario. That is, replacement of current generating capacity with a, mostly, new estate.

A further report in this Renaissance series will detail the cross-sector labour market research to model the workforce for nuclear new build from planning through construction to new build and finally to operation.

Figure 8.2.1
Electricity Generation Sector – Demand (without new build nuclear)

Nuclear Electricity Generation Sector Job Role Demand 2008-2025



8.2 Decommissioning into the Future

Expansion demand in Decommissioning was determined by modeling the future of the current nuclear fleet according to established lifetime plans. The expansion demand that emerges from the current Electricity Generation sector is shown in Figure 8.2.1. The "lake" of decommissioning that deepens from around 2015 onwards is due to appropriation of the current Advanced Gas Reactor fleet from Electricity Generation into defueling phase and, eventually, into the Decommissioning sector. While this transition in the Advanced Gas Reactor fleet is formally an expansion contribution within Decommissioning, there remains a net decline in the projected workforce overall as the numbers are simply moving from one sector to another with a declining demand as decommissioning progresses. This is captured by Figure 8.2.2.

In conclusion, by 2025, excluding new build, the 600 on-site jobs linked to Sizewell B could be the only nuclear-related jobs in Electricity Generation. Overall, the directly employed operating workforce would reduce by 10,000 from 24,000 to 14,000 in this projection.

Decommissioning sector shows a fairly stable demand (Figure 8.2.2).

8.3 Building into the Future

New build nuclear represents the only workforce expansion demand for the industry. With the earliest new build stations unlikely to come into operation until late 2017, the first wave of new recruitment will begin around early 2015 to allow for training and commissioning. (Construction and commission will occur earlier than this).

The workforce model developed herewith projects demand for a generic reactor using (mainly) historical data for Sizewell B. Differences in the workforce requirements for the two main designs will depend, not only on the design itself and the extent of new build. It will also depend on the concentration of units per site – single, twin or triple units per station, for example.

Figure 8.3.1 illustrates the build up of the workforce for four units (two twinned units) with phased commissioning of each unit from 2017. The workforce projections are based on Sizewell B data as the only current UK comparator currently available and are likely to be marginally generous. The model is currently being refined for the two new designs of PWR that are likely to be present in future. This refined model will be reported in the second "Renaissance" report – "Next Generation".

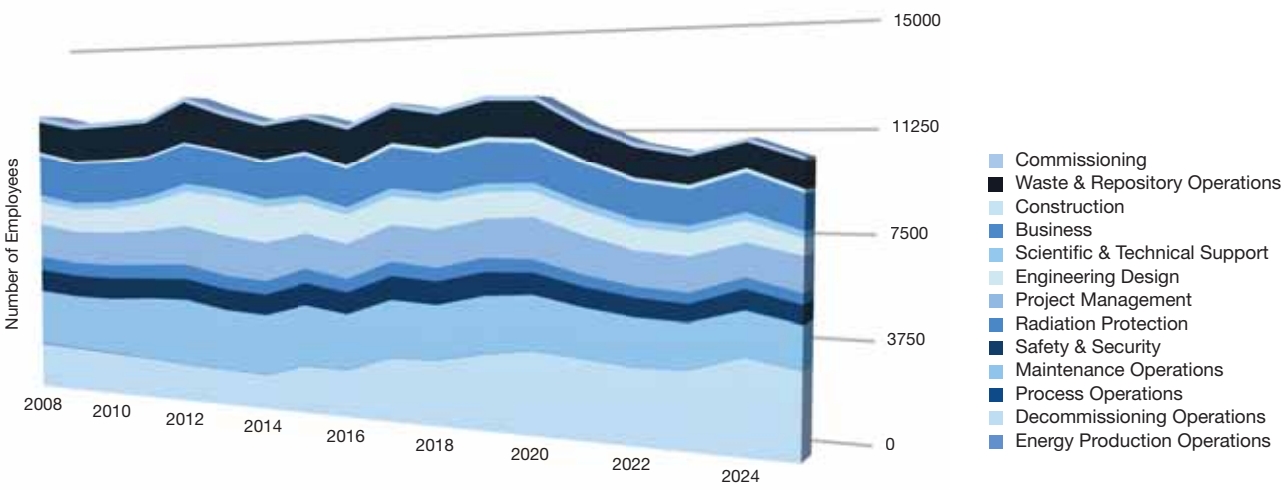
The assumptions for the generic PWR in this report are:

- 500 on-site staff per unit
- 350 on-site for second unit of twin
- 150 headquarter staff for each single unit
- 105 for second unit of twin

From these assumptions two scenarios have been developed.

Figure 8.2.2
Decommissioning Sector – Demand

Nuclear Decommissioning Sector Job Role Demand 2008-2025



• Scenario 1
Four new units becoming available at 18-month intervals from 2017, and configured as two twinned units. In this scenario, the closure of the Advanced Gas Reactor Fleet proceeds according to the extended envelope of Figure 3.3.3.

• Scenario 2
Eight new units becoming available at 12-month intervals from 2017, configured as three twinned units and two single units. In this scenario, the Advanced Gas Reactor fleet closes as in Figure 3.3.3 but with further 5 year lifetime extensions for four of the stations.

Scenario 2, corresponds to the Replacement Generating Capacity scenario. It is regarded as feasible considering: the site nominations declared in 2009; the statements made by the two consortia with land nominated for new build development; and, the performance of the current fleet.

The impact on the workforce of both scenarios, together with an analysis of the retirement profile is dealt with in the next chapter. Projected demand is the key analysis of this chapter.

For Scenario 1, the total new workforce requirement is of the order of 2,200 full-time employed staff by 2023.

Scenario 2 approximates to 11 GWe of new capacity, if averaged across the two main designs proposed. With generation by Sizewell B included, this scenario is equivalent to 12 GWe and is close to parity with current generating capacity. This makes Scenario 2 a valuable replacement capacity comparator to the workforce of 2009.

Scenario 2 gives a total additional workforce requirement of approximately 4,600 by 2025.

8.4 Fuel Processing

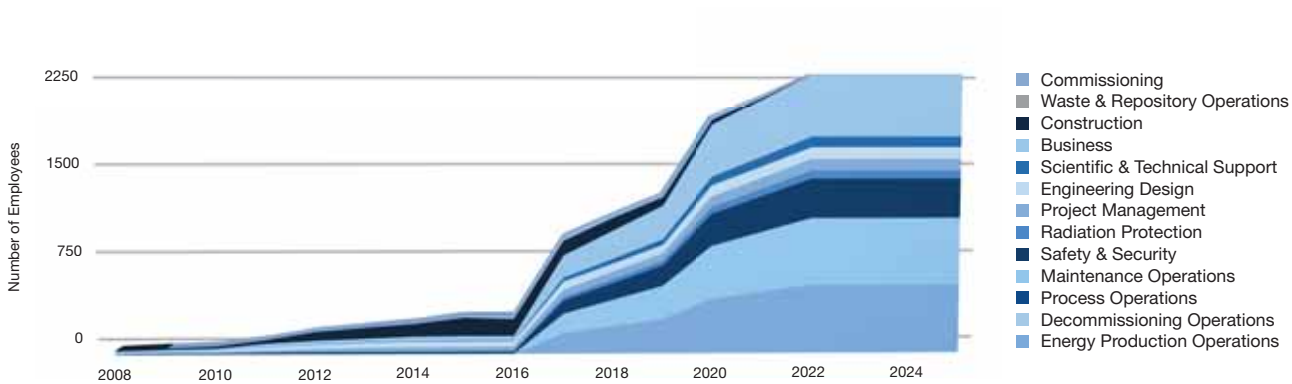
Fuel Processing is not only the smallest sector of the industry in terms of manpower, it is also the sector predicted to decline most severely. Uranium enrichment and fuel fabrication is a technology-driven process with high productivity and a low but highly specialized requirement for people. In addition, the reprocessing facilities at Sellafield have defined lifetimes linked to the requirement of the Magnox and Advanced Gas Reactor estates. The global position on reprocessing varies with only the UK, France, Russia and China having capacity. The future of this market in the UK and the skills to deliver it will be dictated by policy on waste management.

Current policy for the new generation of reactors is not to reprocess but to store on site for the duration of the life of the new reactors. This ensures that capacity and skills capability in UK waste processing will decline significantly in the interim. The Committee on Radioactive Waste Management is currently assessing the UK position in this area but it is unlikely that there will be any major developments until after 2025.[30]

The Fuel Processing sub-sector currently includes fuel reprocessing, fuel fabrication and uranium enrichment. Over the period of this study the reprocessing activities will cease leaving the uranium enrichment and fuel fabrication elements. The Fuel Processing model shown in Figure 8.4.1 illustrates a 63% reduction in this sub-sector workforce of 4,400 to one of 2,000.

Figure 8.3.1
New Build Nuclear – Scenario 1

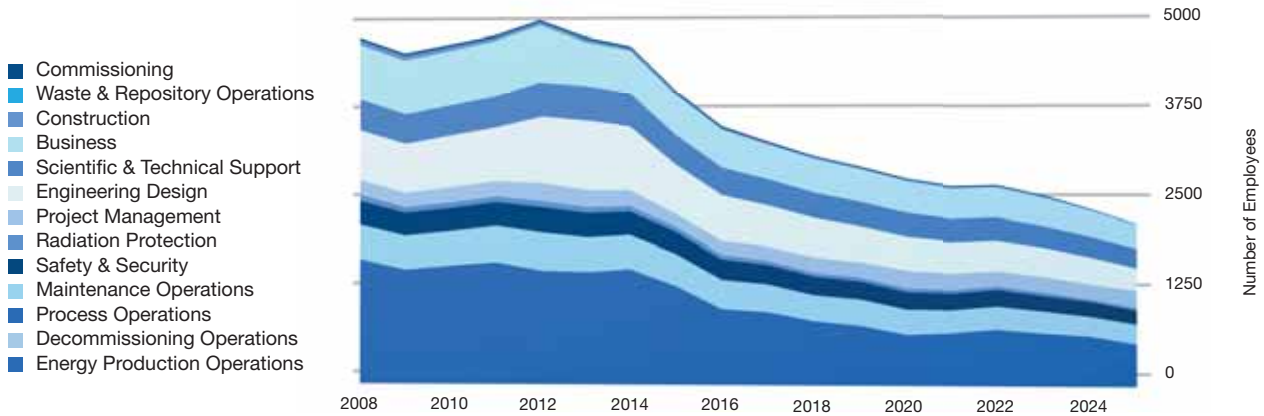
New Build Nuclear Job Contexts - (Scenario 1)



[30] http://www.corwm.org.uk/default.aspx

Figure 8.4.1
Fuel Processing Sector – Demand Projection

Nuclear Fuel Processing Sector Job Role Demand 2008-2025



8.5 The Shape of Skills to Come

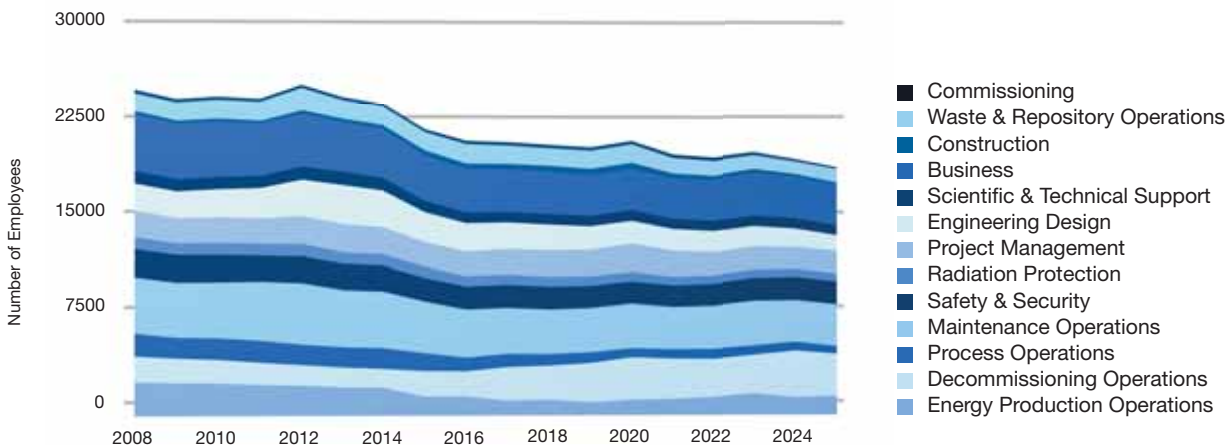
Figure 8.5.1 illustrates the demand on all job contexts across all sectors according to the Replacement Generating Capacity scenario. It articulates a 25% decline in the workforce requirement for nuclear operations overall. The 'movement' within the 'skin' of the workforce envelope shown by the figure is due to the on-going rundown of existing Decommissioning and Fuel Processing, expansion into new Decommissioning by transfer from old Electricity Generation, and expansion in new Electricity Generation.

Figure 8.5.2 contrasts how the core job contexts of Energy Production Operations, Decommissioning Operations, Process Operations and Maintenance Operations fair within this model. The expansion in Decommissioning Operations is in stark contrast to the contraction in Processing Operations.

Finally, Figures 8.5.3 and 8.3.4 together portray the changing shape of skills to come with and without new build scenario 2. Together these illustrate the significant divestment in skilled labour across the sector that the UK risks without new build.

Figure 8.5.1
Job Contexts 2009-2025 – Scenario 2

Scenario - Replacement Generating Capacity 12 GWe



The most telling message of the shape of skills to come is that, without new build, and regardless of scenario, the UK faces a reduction of 90% in the Electricity Generation sector by 2025.

Figure 8.5.2
Core Job Contexts 2009 and 2025 – Scenario 2

Core Job Context Change in Trend 2008 and 2025 (Scenario 2)

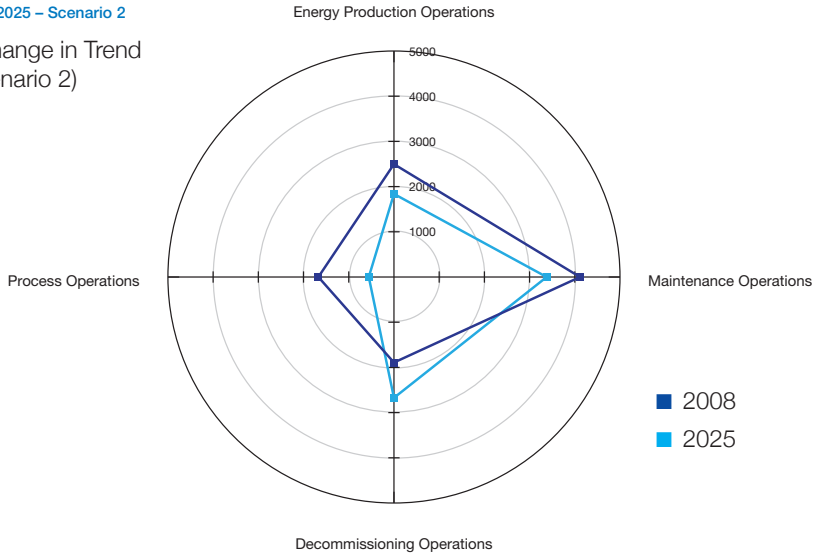


Figure 8.5.3
Nuclear Sectors 2008 and 2025 – Scenario 2

Civil Nuclear Sector Change in Trend 2009 and 2025 (Scenario 2)

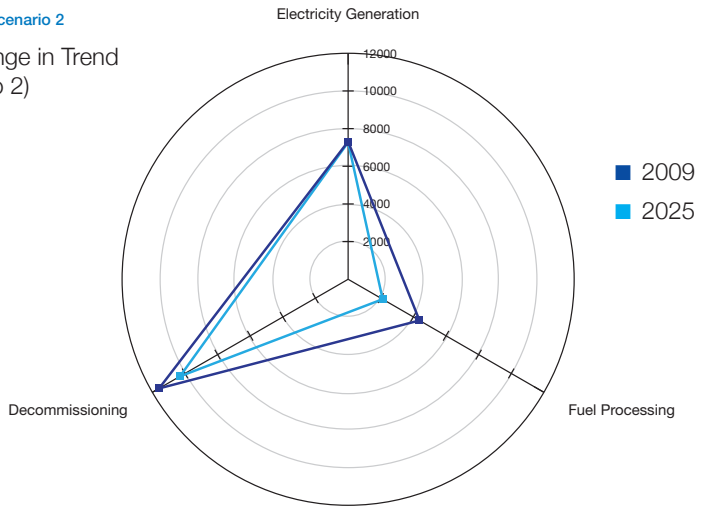
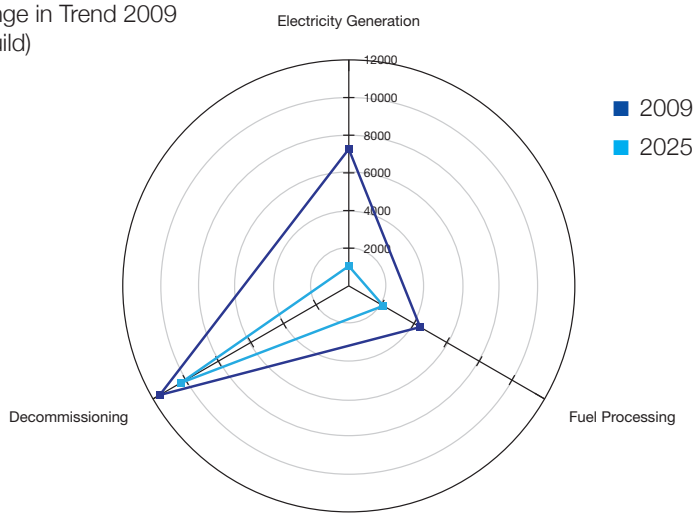


Figure 8.5.4
Nuclear Sectors 2008 and 2025 – No New Build

Civil Nuclear Sector Change in Trend 2009 and 2025(without new build)



The above analysis does not, however, account for the transfer of skills within the sector or the age profile of the workforce. These are both key determinants of projected skills gaps explored in the following section – "Skills Compass".

Part D:
The Skills Compass

Without new build nuclear the industry faces a slow decline in workforce demand to 58% of its current size by employment at 2025. At this point, the Electricity Generating sector would have declined by 90% of capacity and the predominant industry activity would be in the Decommissioning sector.

However, new build consortia are emerging. Two have ownership of sites and have made public plans to operate nuclear generating estates in the future. By 2012 the first new build stations are likely to have completed regulatory approval and site development will have begun. The build-up of the new nuclear operating workforce will be incremental from 2015 onwards and will require new skills for new technology. The new stations will increase the productivity of the operations workforce.

The extent of new build is uncertain, but sufficient capacity can be discerned to achieve replacement of current generating capacity. This would significantly change the projected demand in the workforce.

Beneath the 'tide-line' of the industry workforce, two significant transitions act on the shape of the workforce. The first transition is the interim move away from generation towards decommissioning. The second is the return of generation. Both transitions, but particularly the second, will require significant new blood to the industry to account for the significant retirement profile of the current workforce. An average of 1,000 new entrants, largely graduates and apprentices, per year are likely to be required for the operations workforce alone.

Skills planning is therefore an essential part of the future success of the industry.

"Labour Market Research and development is central to decision making and thinking about the future skills needs of the nuclear industry. Cogent's evidence-based approach is key in shaping strategy and bringing focus to our priorities."

Steve Ball
Head of HR and Organisational Development
URENCO UK Ltd

9. The Skills Compass

Companion website - extended range of charts
www.cogent-ssc.com/research/nuclearresearch.php

According to the Replacement Generating Capacity scenario, a skills shortage for nuclear operations of 8,000 (14,000 including supply chain) is predicted by 2025. This is mainly driven by the ageing workforce. This translates to a requirement for 1,000 new recruits to the sector per year at the graduate and apprentice levels.

By 2015 many of the skills drivers converge: new generation recruitment, expansion of decommissioning, retirements.

9.1 Age is Over-riding

The rate of both new build and decommissioning were discussed in the previous chapter through two scenarios. Scenario 2 is of main interest: Replacement Generating Capacity of 12 GWe by 2025. Scenario 1 is a comparator at half this level of achievement. Figure 9.1.1 illustrates the effect of both scenarios on workforce demand for the industry as a whole (all sectors combined). On this whole-industry scale, it is clear that the difference in workforce demand is approximately 15%.

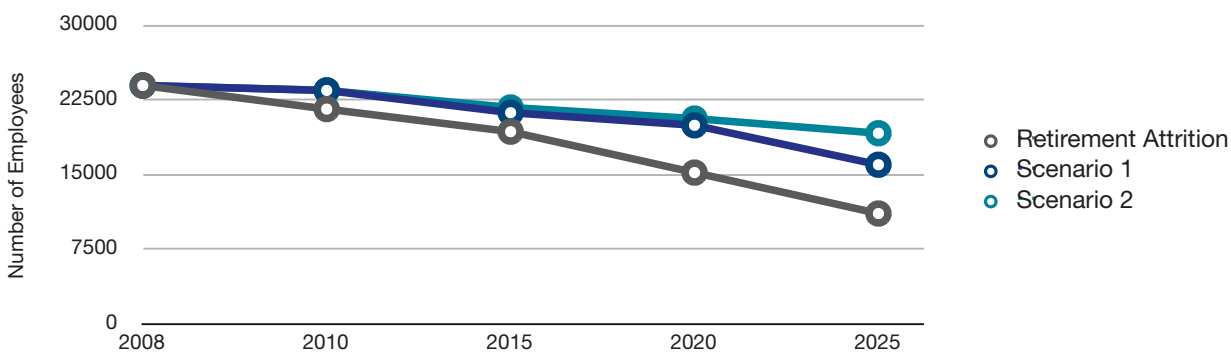
Figure 9.1.1 also projects the retirement profile of the workforce across the industry. This factor gives a very clear image of future gaps in the workforce. For Scenario 2, the gap arising from replacement demand due to retirement approaches 40% of the projected workforce. This gives a projected recruitment requirement of up to 8,000 new people in the operating workforce by 2025. Allowing for the direct supply chain, the total recruitment requirement could be of the order of 14,000, using the current ratio of supply chain to operating workforces.

The conclusion of this analysis is that the industry requires of the order of 1,000 new recruits per year. These will be mainly new apprentices and graduates but the new build driver of demand will potentially draw in suitably experienced personnel from other sectors and possibly globally.

Although a churn of personnel between nuclear companies does take place, there is little evidence of outflow from the nuclear industry to other sectors. Even considering that major expansion in nuclear power throughout the world could lead to migration away from the UK, this cannot be predicted at this stage and there is no evidence to support the case. Therefore, the main loss of nuclear expertise is through retirements with age being the over-riding attrition factor.

Figure 9.1.1
Industry Forecasts

Nuclear Operating Workforce Forecast 2008-2025 (excludes contractor workforce)



9.2 Watershed 2015?

The year 2015 appears to be a watershed year for skills. At this point many of the drivers of skills pick up in intensity. By 2015 the retirement accumulation begins to diverge from that of the UK workforce

(Figure 9.2.1); by 2015 decommissioning of the old fleet will have taken hold (Figure 9.2.2); and, by 2015 recruitment and training for the new fleet must begin if the first are to commence operations from 2017 (Figure 9.2.2).

Figure 9.2.1
Industry Age Profile

Accumulated Retirement Profile of Civil Nuclear Workforce 2008-2025

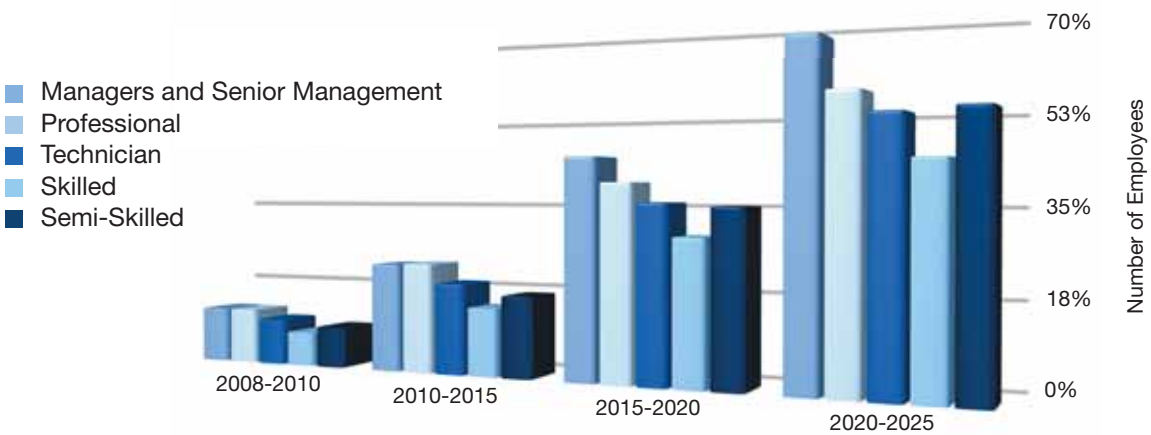
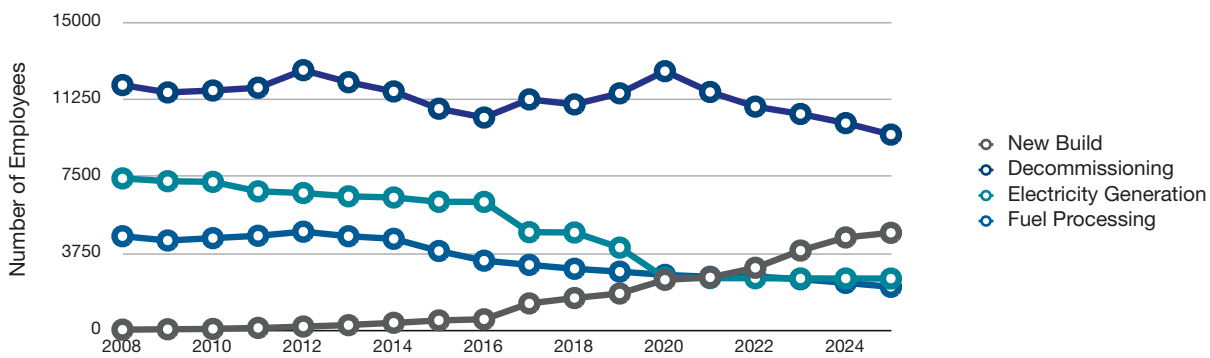


Figure 9.2.2
Demand by Sector

Civil Nuclear Sectors Demand Comparison Scenario 2 (8 PWR plus extended AGR Lifetime Plan)



9.3 Transition Planning

The workforce 'tidemark' at industry level can conceal the ebb and flow in demand by sector. For this reason analysis below the 'waterline' by sector and job context is important.

Two major transitions will affect the industry. The first transition will be from current nuclear Electricity Generation to Decommissioning. The second will be the gradual build up of new nuclear Electricity Generation. Analysis of these factors on the workforce requires closer analysis of the core job contexts, especially those in Energy Production Operations and Decommissioning Operations.

The projected gaps and surpluses for each of the four core job contexts are illustrated in Figure 9.3.1. The changes in Energy Production Operations and Decommissioning Operations work in opposite directions at any given point in time. This is to be expected as surplus in Energy Production Operations becomes demand in Decommissioning Operations when a station comes off the grid.

The surplus for Energy Production Operations is less precipitous for Scenario 2 as this case includes potential lifetime extensions for decommissioning of the Advanced Gas Reactor fleet. Significantly, the surplus only converts to a gap for Scenario 2 as this scenario gradually achieves the Replacement Generating Capacity benchmark from around 2023.

The corresponding gaps in Decommissioning Operations are greater than the aforementioned surpluses. This emphasizes a shortfall and the importance of new-blood recruits to these job contexts. Ensuring retention of the workforce through the transition reskilling and upskilling will also be important.

The projections for Maintenance Operations (gap) and Process Operations (surplus) are also given in Figure 9.1.1. Projections for all 13 job contexts are available via the companion website. The dynamics are similar to those described for Energy Production and Decommissioning Operations.

The workforce transitions will play out in those regions that will have both old and new capacity side-by-side. According to new build site nominations made in 2009 up to six regions may feature this:

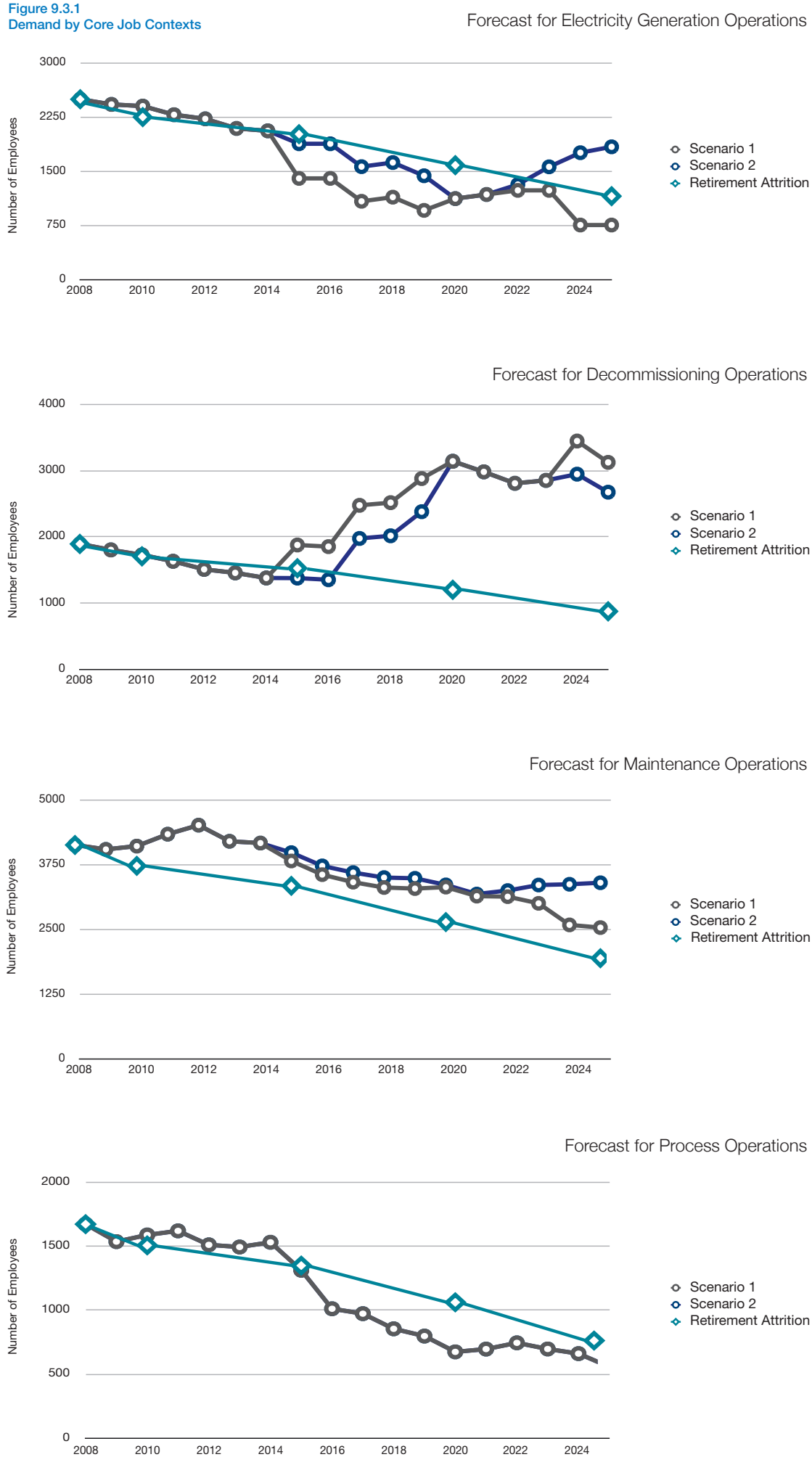
- the East of England (Sizewell, Bradwell)
- North Wales (Wylfa)
- the North East of England (Hartlepool)
- the North West of England (Sellafield, Copeland, Heysham, Braystones)
- the South East of England (Dungeness)
- the South West of England (Hinkley Point, Oldbury)

As the regional futures become clear, drill-down research will be required to inform the development of local skills strategies. However, lead regions in new build are most likely to be those with sites that have access to existing grid infrastructure as indicated below. Early movers, those on-stream before 2020, are most likely to be from the following;

- Bradwell
- Dungeness
- Hartlepool
- Heysham
- Hinkley Point
- Oldbury
- Sizewell
- Wylfa

The regions around these sites will hold nuclear-literate workforces and communities. This will help in the first transition from Electricity Generation to Decommissioning. While it is foreseen that the skills involved in new Electricity Generation will be little changed, new practices, new regulations and new owners may force some changes in skills requirements. This second transition will also take place further down the timeline. It is likely therefore that the second transition will involve a significant proportion of new blood to the industry, introduced and skilled up gradually during the process of new build.

Figure 9.3.1
Demand by Core Job Contexts



9.4 With and Without New Build

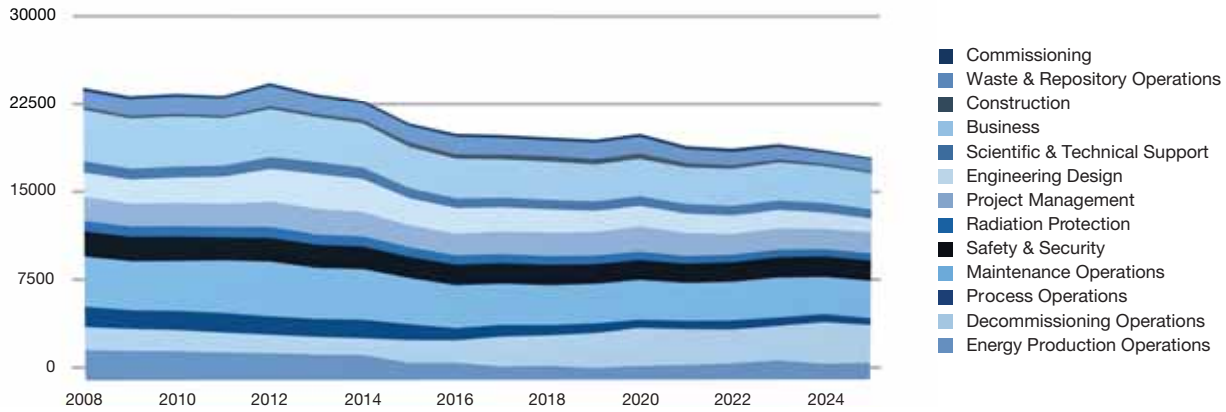
Without new build the industry faces a slow decline in workforce demand. It is predicted to be 58% of current size by 2025 and to be comprised predominantly of the Decommissioning sector (Figure 9.4.1). Within this movement, nuclear Electricity Generating capacity will decline by 90% until Sizewell B is the only site generating electricity. However, new build consortia are emerging and two have site ownership and public plans to operate nuclear generating estates in the future. By 2012 the first new build stations are likely to have completed regulatory approval and site development will have begun. The build-up of the new nuclear operating workforce will be incremental from 2015 onwards and will require new skills for new technology. The new stations will increase the productivity of the operations workforce.

The extent of new build is uncertain but sufficient capacity can be discerned to achieve replacement of current generating capacity. This would significantly change the projected demand in the workforce (Figure 9.4.1).

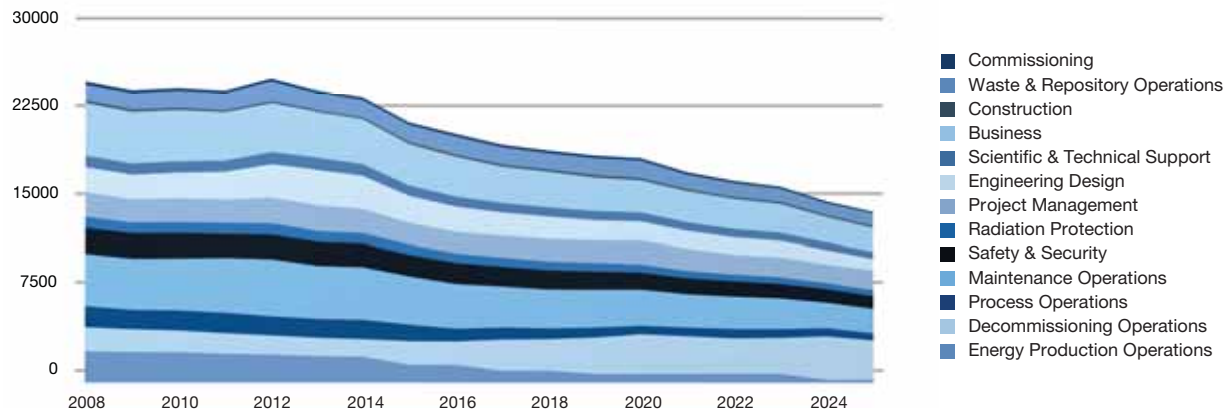
Beneath the 'tideline' of the industry workforce two significant transitions take place. The first transition is the interim shift from generation towards decommissioning. The second is the return of new generation. Both transitions, but particularly the second, whilst not requiring a change of standard of skills, will require significant new blood to the industry to account for the significant retirement profile of the current workforce.

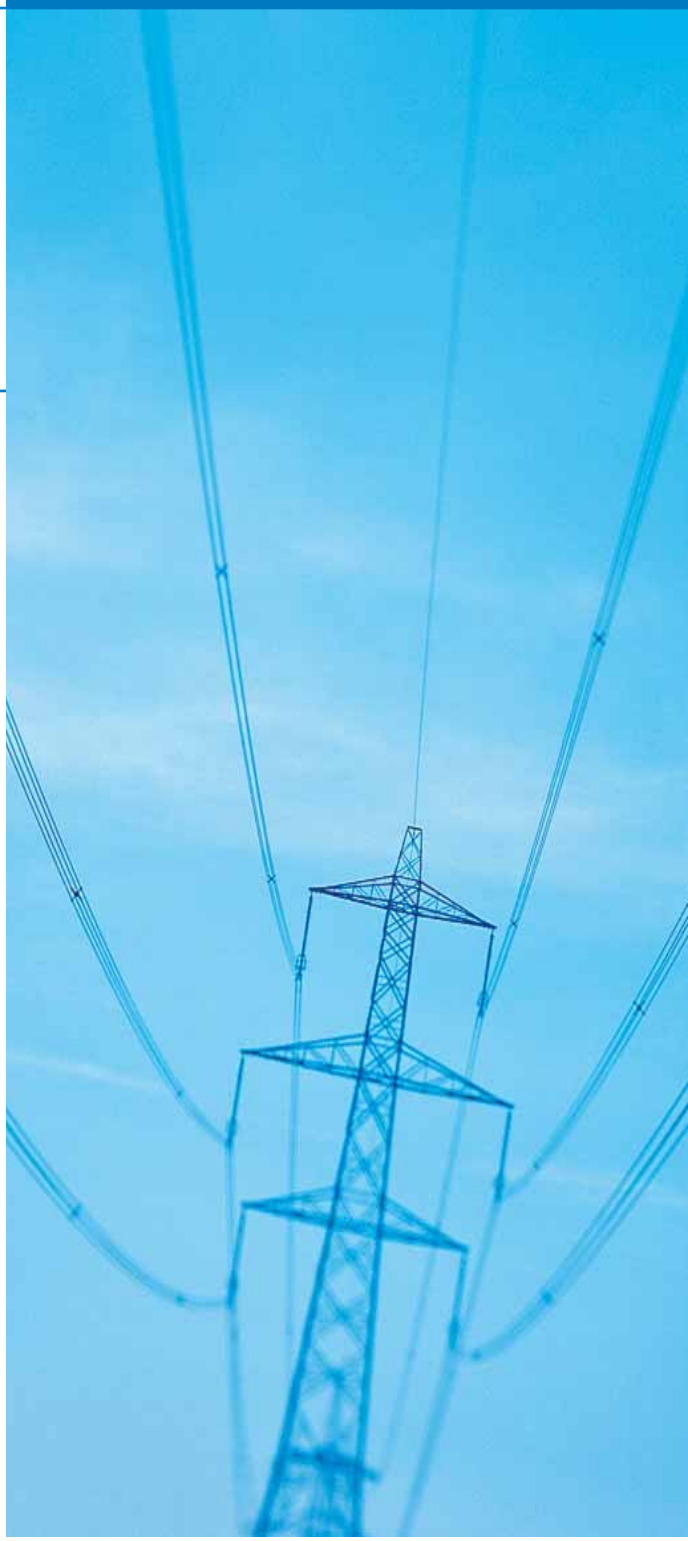
Figure 9.4.1
The Industry - With and Without New Build

Civil Nuclear Industry Demand Forecast - With New Build
Replacement Generating Capacity (12 GWe by 2025)



Civil Nuclear Industry Demand Forecast - Without New Build





Part E:
Concluding Remarks

Cogent's labour market research addresses a major gap in national data and provides the evidence base for the authoritative voice on skills needs.

The research has quantified three skills drivers: an ageing workforce driving replacement demand; a shift in skills to decommissioning; and, new demand for skills to operate a new fleet of nuclear power stations. While, the sector may have been aware (anecdotally) of these drivers, the defining contribution of this report is in the robustness of the figures, the in-depth primary data and the peer-reviewed analysis. This will feed the subsequent reports in the "Renaissance" series which will carry recommendations.

Cogent Sector Skills Council and the National Skills Academy for Nuclear, working with industry, will take a leading role in ensuring these strategies are driven forward and that the skills products (below) continue to develop and evolve to remain capable of embracing these developments.

- *Future Skills*
- *Career Pathways*
- *Nuclear Skills Passport*
- *Nuclear Industry Training Framework (an integral part of the Skills Passport)*

The research underlines the importance of skills to a secure, self-sufficient, decarbonised electricity supply; and one that secures the UK position in nuclear capacity and capability both domestically and globally.

"This first in the series of Cogent reports into the UK skills base, will contribute towards our decision making at a critical point in the UK's energy challenge. The UK has a wealth of valuable experience in nuclear operations, however, much resides in individuals close to retirement. Now is the time to make a positive contribution in building these capabilities as we move forward into a revival of the sector."

Christopher Harrop
Head of Nuclear Projects (UK)
E.ON

10. Concluding Remarks

Prior to this research the sector had been estimated from limited data. As a result future skills projections would have been severely limited. This research has corrected this with an impressive and full industry return of manpower data. In addition, the research is further enhanced with in-depth detail on job contexts, skill levels and age profiles. The analysis reported herewith is the first stage in a comprehensive research programme which quantifies and qualifies the current civil nuclear sector, and develops validated future skills scenarios.

Three follow-up reports will drill into critical sectors to develop recommendations for training and skills interventions.

"Power People" portrays the macro skills picture and future of a 44,000-strong workforce, layered by job contexts and skills. The research has quantified three skills drivers: an ageing workforce driving replacement demand; a shift in skills to decommissioning; and, new demand for skills to operate a new fleet of nuclear power stations. While, the sector may have been aware (anecdotally) of these drivers, the defining contribution of this report is in the robustness of the figures, the in-depth primary data and the peer-reviewed analysis. This will feed the subsequent reports in the "Renaissance" series which will carry recommendations. These reports will address key areas such as new build generation and construction, the Defence sector, Waste Management and regional skills scenarios. There are messages for employers, government, and the education and training sector.

Skills planning is an essential part of the future success of the industry. The findings of this report point to the need for the development of strategies to enhance:

- business confidence in a sector in renewal
- public awareness of benefits
- perceptions of employment opportunity and advancement
- prestige to attract new blood to the sector
- reskilling and upskilling for mobility and retention of valued skills within the industry
- on-site training opportunities and accessible specialist facilities (e.g. reactor simulators) linked to the industry and the colleges and universities involved in skills supply and training.

Cogent Sector Skills Council and the National Skills Academy for Nuclear, working with industry, will take a leading role in ensuring these strategies are driven forward and that the skills products (below) continue to develop and evolve to remain capable of embracing these developments.

- Future Skills
- Career Pathways
- Nuclear Skills Passport
- Nuclear Industry Training Framework (an integral part of the Skills Passport)

Cogent will enhance its work with other strategic nuclear industry bodies,[31] government,[32] and wider sectors[33] for new build construction, for the benefit of the industry.

In conclusion, Cogent's labour market research addresses a major gap in national data and provides the evidence base for the authoritative voice on skills needs.

The research underlines the importance of skills to a secure, self-sufficient, decarbonised electricity supply; and one that secures the UK position in nuclear capacity and capability both domestically and globally.

[31] the Nuclear Decommissioning Authority, the Nuclear Industry Association
[32] The Office for Nuclear Development, the Department of Energy and Climate Change, the department for Business Innovation and Skills
[33] Construction Skills, the Engineering Construction Industrial Training Board,

Cogent SSC Ltd.,
Unit 5, Mandarin Court,
Centre Park,
Warrington,
Cheshire WA1 1GG

www.cogent-ssc.com