Local economic impact scenarios arising from decommissioning and potential new build of Hartlepool Nuclear Power Station

Final report – February 2009

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Executive Summary

This report has been commissioned by Hartlepool Borough Council, Tees Valley Regeneration and the Hartlepool Economic Forum to undertake a socio-economic assessment that investigates, analyses and quantifies the impact associated with plausible scenarios for Hartlepool Nuclear Power Station in terms of generation, decommissioning and potential new build.

One of the aims of Tees Valley Regeneration is to create development and investment opportunities and to deliver sustainable and meaningful economic activity for the long-term development of the Tees Valley region. The nuclear power station at Hartlepool offers a significant level of employment and investment to the area – with a minimum contribution of approximately 1% of the working population of the locality, a total turnover of circa £225 million per annum and an annual salary bill of £25 million. Other materials, good and services are £19 million with rates payments of £7 million.

British Energy Hartlepool is a twin advanced gas-cooled reactor (AGR) power station that began generation in 1983 and is capable of supplying electricity to 1.5 million households. The site is currently due to close in 2014 at which point electricity generation will cease and decommissioning preparations commence.

Decommissioning will result in a significant change to the workforce with a likely change in reliance from permanent employees to an increased reliance on contractors with a number of associated activities requiring altered skills base.

In addition to the decommissioning elements it is possible that Hartlepool could be selected for nuclear new build. It is likely that Hartlepool will request an extension to current operations of approximately 5 to 10 years (deferred decommissioning). This will bring significant economic benefits to the locality – but not as significant as new build would generate over its potential lifetime. Due to grid connection capacity it is likely that a new north east nuclear power station would only be financially desirable once the existing site has ceased generation. The time lag between cessation of current generation and initiation of new build should be minimised to reduce the risk of time periods between resulting in an almost total decline in employment numbers.

New build could have an upfront construction cost of up to £1.5 billion per site, which would be a significant increase to the local economy. However, it is worth noting that construction activities will have civil engineering requirements that mean only the largest construction companies are likely to have the capacity to deal with it. Construction is not a major skills base within the Hartlepool and wider local area; therefore a level of in-migration associated with new build would be expected. It is hoped that the use of larger national based companies would look to reduce the risk of in-migration by ensuring relevant people in sub-contracting organisations operate on a transient basis. It is possible that developing the local supplier chain (including regional considerations) would help to meet the construction needs.

The potential scenarios investigated are:

Scenario 1 - Baseline decommissioning with no nuclear build. Under this scenario, it is assumed that the Hartlepool site ceases power generation as currently planned in 2014 and that the decommissioning timeline continues as expected. No new nuclear build at the site is envisaged under this scenario.

Scenario 2 - Baseline decommissioning with early new nuclear build. Under this scenario, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences at the earliest opportunity conceived on the basis of currently available information. Under this scenario, construction would therefore begin in 2020.

Scenario 3 - Baseline decommissioning with late new nuclear build. Under Scenario 3, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Under this scenario, construction would begin in 2029.

Scenario 4 - Deferred decommissioning with no nuclear build. This scenario assumes that an extension is granted for continued power generation at the Hartlepool site until 2024. No new nuclear build at the site is envisaged under this scenario.

Scenario 5 - Deferred decommissioning with early new nuclear build. The decommissioning timeline is assumed to be consistent with that of Scenario 4 with concurrent decommissioning and new nuclear build. New build would begin in 2020.

Scenario 6 - Deferred decommissioning with late new nuclear build. Under this scenario the decommissioning timeline is consistent with that of Scenario 4. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Under this scenario, construction would therefore begin in 2029.

Associated staff costs, levels and types have been explored for each in addition to consideration of potential supply chain and associated land costs. Please note, that the information presented in this report is based on best judgement available at the time as detailed plans for British Energy sites have not yet been produced (analysis has utilised data from Magnox sites and communication with British Energy).

Key findings from the study are summarised below.

- Nuclear energy currently supplies about 20% of the UK's energy requirements;
- British Energy is the largest UK producer of electricity. They own and operate eight nuclear power stations, including Hartlepool. Their nuclear stations have a combined capacity of almost 9,000 megawatts; and
- The fund set aside for decommissioning the entire British Energy power station fleet is estimated to be currently worth £5.3bn.

Whilst in operation, Hartlepool power station currently:

- is capable of supplying electricity to 1.5 million households;
- employs 500 British Energy staff plus 200 full-time contractors;
- contributes an annual salary bill of around £30 million to the Hartlepool area;
- in addition to salaries, the site contributes £7 million per annum to the region through rates payments;
- has an annual spend of ca. £12 million on materials, goods and services (20% is on the local supply chain, 60% on the national supply chain and 20% on the international supply chain); and,
- employs workers with an average salary of approx. £35k per year (significant proportion, up to 75%, are professionals including scientists and managers).

The station is due to close in 2014 at which point electricity generation will cease and decommissioning preparations commence; but there is a good possibility of a lifetime extension up to 2024.

The decommissioning process would:

- cost approximately £1.1 billion in total;
- require approximately 320 staff for defuel and initial site clearance and Safestore will require approximately 20 staff members;

- be followed by a "Safestore" period for at least 85 years to enable radioactive decay prior to dismantling along with full and final site clearance (around 2100); and
- result in the land being available for other use in approximately 2117.

A new power station would:

- employ approximately 450 people over 70 years;
- during construction require up to 3,000 staff (minimum 1,500) over a 5 year construction period that could result in a wage bill of £75m per year;
- Government aspirations indicate construction commencing in 2013-2014 with the first reactors going online 5 to 6 years after this;
- British Energy have approximately £12.5 bn set aside for new build projects (likely to be 4 in total);
- The building and commissioning of a new nuclear reactor in the UK is estimated to fall within the range of £2.0bn to £3.6bn (inclusive of costs associated with construction, national grid connection, operation and the back-end costs of decommissioning); and
- Generate enough energy to power 1.5 million homes.

The next generation of power stations last 70 years so a new build would have a lifetime effect of:

- £75m wage bill per annum (£375m total) during construction and £20m wage bill per annum during operation (over the lifetime of plant this equates to approx. £1bn); and
- Maintain a supply chain spend of approximately £12m and continue rates payments of approximately £7m.

Of the scenarios considered for the Hartlepool site, economic benefits to the region would be greatest if power generation were extended and this combined with new nuclear build.

1 Introduction

This report has been prepared by Enviros Consulting with assistance from EKOS. It provides an overview of the civil nuclear decommissioning and new build markets and the socio-economic implications for the Tees Valley area.

1.1 Background

One of the aims of Tees Valley Regeneration is to create development and investment opportunities and to deliver sustainable and meaningful economic activity for the long-term development of the Tees Valley region. This includes provision of a co-ordinated approach to the handling of inward investment enquiries, marketing to attract major investment to the region and servicing the needs of indigenous companies.

The Tees Valley region includes the British Energy plc owned Hartlepool nuclear power station which, in 2007, employed around 700 staff and contractors (the majority of which are based in the Tees Valley area) resulting in a local salary bill of £25 million and an additional £19 million input to the local area through the use of the local supply chain[1].

British Energy Hartlepool is a twin advanced gas-cooled reactor (AGR) power station that began generation in 1983 and is capable of supplying electricity to 1.5 million households. The site is due to close in 2014 (but there is the possibility of life extension for 5 to 10 years) at which point electricity generation will cease and decommissioning preparations commence.

Decommissioning of the site will result in a change in focus for the local workforce and supply chain, but will continue to provide economic input to the region. During this time many of the traditional employment roles on the site will be lost, but new skills areas in deplanting and decommissioning will arise. The decommissioning schedule will be followed by a "Safestore" period for at least 85 years to enable radioactive decay prior to dismantling along with full and final site clearance (around 2100). During this Safestore period there will be minimal input from the site to the local economy both from a supply chain and employment perspective[2].

In January 2008 a Government White Paper on Nuclear Power was published, which effectively opens the way for new nuclear build in England and Wales as a means of meeting the future anticipated energy shortfall throughout the UK. In July 2008 this progressed with Government announcement of its intention to consult on draft criteria and processes to assess where new nuclear power plants could be safely and securely constructed in England and Wales. It is intended that this will lead the way to sites being screened as 'strategically suitable' by 2010 with construction at such suitable sites beginning as early as 2013.

Overall the new build programme could result in around 10 new reactors; however, this investment programme could extend over a period in excess of 20 years and no site specific scheduling plans yet exist. New nuclear build could result in a

[1] North East Chamber of Commerce – Hartlepool Committee. Minutes of meeting held on 5 September 2007 at Hartlepool Power Station.

[2] Plans for Magnox sites envisage residual employment of 10-20 personnel, primarily for safety and security with periodic civil engineering surveys and structural maintenance for remaining buildings and infrastructure.

greatly enhanced economic input to the region (and nationally) both from the construction and subsequent operation of the station[3].

The timing of decommissioning and potential new build involves a number of uncertainties associated with the Hartlepool Nuclear Power Station. A socio-economic study assessing the different potential scenarios has been undertaken to demonstrate potential impact to the local and regional (and where applicable national) economy.

1.2 Project Objectives

The objective of the project was to undertake a socio-economic assessment that investigated, analysed and quantified the local, regional (and national where relevant) economic impact associated with the following scenarios for Hartlepool Nuclear Power Station as given in Table 1.

Table 1 Scenarios Under Consideration for Hartlepool Nuclear Power Station

Key Process	Scenarios
Baseline decommissioning (commences 2014, 2-3 years to defuel, 8-10 years for initial site clearance then 85 years of 'safestore')	1. No new build
	2. New build commences 2020
	3. New build commences 2030
Deferred decommissioning (commences 5-10 years after 2014, but rate of decommissioning remains the same)	4. No new build
	5. New build commences 2020
	6. New build commences 2030

This study will be used to inform both Tees Valley Regeneration and Hartlepool Borough Council of the potential economic impacts under a range of different scenarios. The project includes the following tasks:

- Review of the planned decommissioning strategy to identify key project phases and hence workforce and supply chain requirements;
- Identification of potential costs and workforce requirements associated with new nuclear build through review of historical requirements and information currently available within the public domain, Government predictions, recent international experience and consultation with the nuclear power industry;
- Assessment of forecasted impacts from nuclear developments against local and regional current and proposed future situation;
- Identification of alternative end uses of the site through consideration of site end state, current business presence and stakeholder aspirations; and,
- Review of national decommissioning schedules (NDA and British Energy fleets) and evaluate the potential new build requirements for comparison against Hartlepool site aspirations.

3 It should be noted that although any new nuclear station is likely to have a comparable or higher electricity generating capacity, the designs currently being considered are typically small and more efficient and may therefore generate less direct employment opportunities.

1.3 Structure of this report

The following chapters in this report cover the following:

- **Chapter 2** provides a breakdown of the UK nuclear sector;
- An overview of the Hartlepool nuclear site is given in **Chapter 3**;
- **Chapter 4** presents the breakdown of background socio-economic data from the region (Hartlepool, Tees Valley and the North East);
- **Chapter 5** contains the outcome from the economic modelling; and
- Project conclusions are given in **Chapter 6**.

2 The UK Nuclear Power Sector

This chapter aims to give a broad introduction to the UK nuclear sector and the supply chain needs. It has a particular focus on the existing civil nuclear decommissioning liabilities and construction needs associated with new nuclear power stations.

It is important to note that in addition to civil nuclear operations, the decommissioning of the UK nuclear powered submarine fleet will also be important to the UK supply chain. There are also significant other Ministry of Defence (MoD) related nuclear liabilities and associated infrastructure development initiatives (particularly at the Atomic Weapons Agency, AWE at Aldermaston), but that discussion of these are outwith the remit of this report.

The World Nuclear Association [4] reports that today there are some 439 nuclear power reactors operating in 30 countries (59 of which are in France and are operated by the French Utility, EdF). About 35 power reactors are currently being constructed in 11 countries notably China, South Korea, Japan and Russia. Globally over 90 power reactors with a total net capacity of almost 100 GW are planned with over 200 more proposed.

Nuclear energy currently supplies about 20% of the UK's energy requirements[5]. However, about 22 GW of electricity generating capacity (about one quarter of total UK capacity) is projected to close over the next 10-12 years as nuclear plants (and also coal fired stations) retire. Action is therefore needed to avoid a significant energy gap during the period 2015-20[6].

In response to this, in January 2008 the UK Government declared in the White Paper for Nuclear[7] that it was in the public interest for new nuclear power stations to play a role in the UK's future energy mix, along with other low carbon energy sources, which nationally is expected to require over £15bn of private sector investment in upfront construction costs. In addition to this, decommissioning of the existing civil nuclear liabilities in the public sector has a currently estimated lifetime (up to mid 2100) cost of £73bn [8] (current annual expenditure of £2.8bn), but with the expectation that lifetime costs may rise by several more billion[9].

Overall, industry research [10] suggests that the UK nuclear sector represents the fastest growing aspect within the construction industry, estimated to be worth £33bn over the next 25-30 years.

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4 World Nuclear Association (2008) http://www.world-nuclear.org/info/inf17.html

5 Nuclear Industry Association (2008) http://www.niauk.org/

6 Shadbolt/Energy (2008) Nuclear New Build: A Legal Commentary – Financing Options. Briefing Note 5.

7 'Meeting the Energy Challenge: A White Paper on Nuclear Power', BERR, January 2008 (http://www.berr.gov.uk/files/file43006.pdf)

8 The Nuclear Decommissioning Authority: Taking forward decommissioning, page 38, National Audit Office, published 2008-01-30, accessed 2008-06-01

9 Nuclear clean-up costs 'to soar', BBC, May 27, 2008

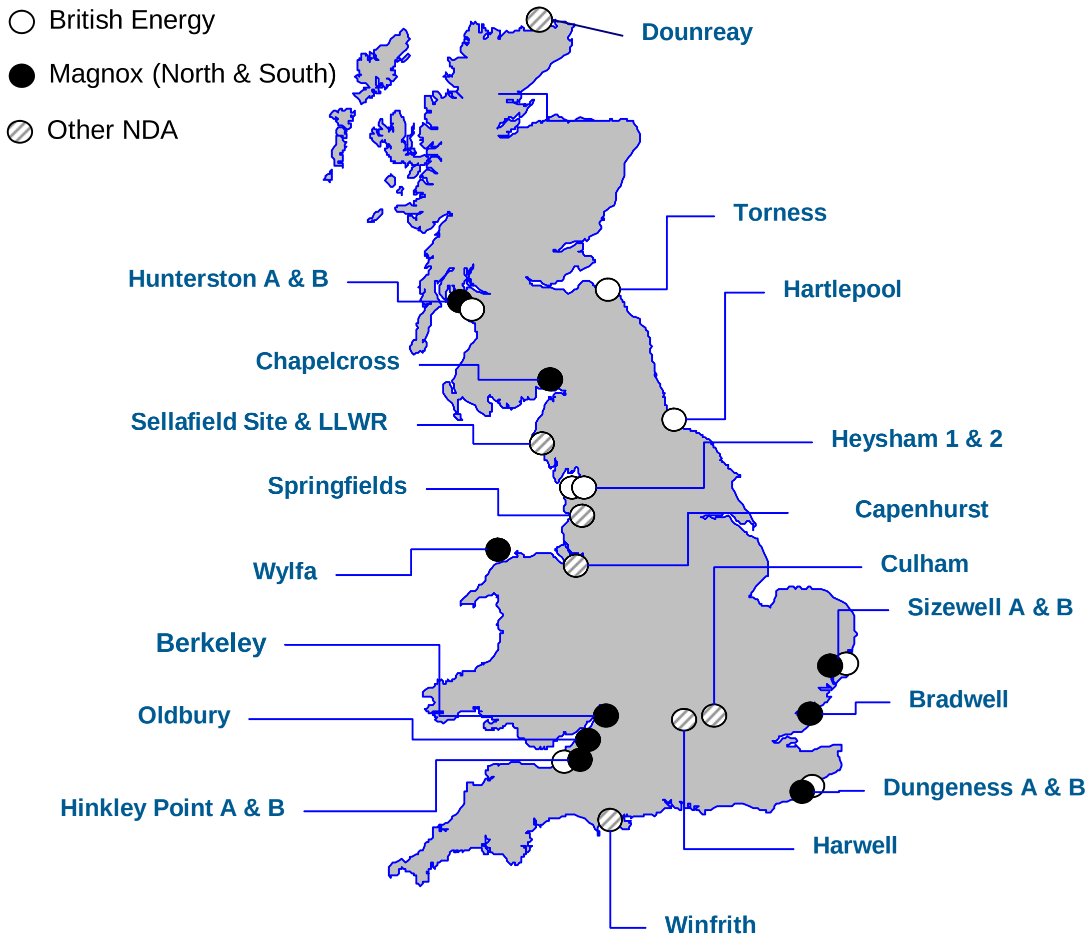
10 AMA Research (2008). Nuclear Energy Construction Programme, UK 2008-2018

2.1 Introduction to the UK Civil Nuclear Sector

The existing UK civil nuclear sector consists of the privatised business of British Energy, responsible for the operation of 8 nuclear power stations (including Hartlepool), and public sector civil nuclear liabilities that are managed by the Nuclear Decommissioning Authority, NDA.

The locations of civil nuclear sites are shown in Figure 1 below.

Figure 1 Locations of Civil Nuclear Sites in the UK



2.1.1 British Energy

British Energy is the largest UK producer of electricity. They own and operate eight nuclear power stations, in addition to one coal-fired power station (plus some interests in renewable energy). Their nuclear stations have a combined capacity of almost 9,000 megawatts, whilst their coal-fired plant adds a further 1,960 megawatts of output[11].

British Energy operates two types of nuclear reactor: the advanced gas-cooled reactor (AGR) including the twin AGR at Hartlepool; and a single pressurised water reactor (PWR) at Sizewell B which is the only PWR nuclear power station in the UK.

EdF operates 58 reactors in France that generate 77% of the country's power. The French utility is pressing ahead with a €35bn investment programme between 2007 and 2010. This involves upgrading their fleet of nuclear reactors in France and developing their nuclear market in the US and UK. In line with this, EdF have recently agreed to pay £12.5bn to buy British Energy Group Plc[12]. Although this acquisition increases their portfolio of existing reactors, their investment is driven by the strategic advantage the existing British Energy Sites offer for new nuclear build (see Section 2.3).

2.1.2 Nuclear Decommissioning Authority

The NDA is a non-departmental public body set up under the Energy Act 2004, responsible for the decommissioning and clean-up of the UK's civil public sector nuclear sites. This responsibility covers the UK's public nuclear legacy formerly under the ownership of UKAEA and BNFL (including two operational Magnox type nuclear power stations). Their mission is to oversee the decommissioning of a number of civil public sector nuclear sites safely, securely, and cost effectively, whilst protecting the environment[13].

As part of their mission, the NDA has restructured the management of those sites formerly under UKAEA or BNFL ownership into a series of Site License Companies (SLCs). These consist of 7 SLC organisations:

- Dounreay Site Restoration Limited (responsible for the Dounreay Site in Caithness);
- Magnox North (responsible for 5 the Magnox type power stations - Hunterston A, Chapelcross, Trawsfynydd, Wylfa, and Oldbury);

[11] British Energy (2008) http://www.british-energy.com/pagetemplate.php?pid=94

[12] It is rumoured that EdF plans to give Centrica Plc the option to buy a 25 percent stake in British Energy

[13] With respect to British Energy Site the NDA is responsible for reviewing and approving annual plans that detail BE's work programme and nuclear liability cost estimates; reviewing and approving BE's strategies and budgets for decommissioning its power plants; confirming whether certain increases in BE's nuclear liabilities arising from changes in its operations should be funded through the Nuclear Liabilities Fund (NLF); and approving, for payment by the NLF, those invoices submitted by BE for work carried out in discharging those liabilities covered by the NLF. Unless otherwise directed by the Government, these are only supervisory functions and the NDA have no direct responsibility for the actual decommissioning work or for discharging uncontracted nuclear liabilities at BE's sites. These remain with BE.

- Magnox South (responsible for another 5 Magnox type power stations - Berkeley, Hinkley Point A, Dungeness A, Bradwell and Sizewell A);

- Sellafield Ltd (responsible for the Sellafield Site, including Sellafield, the Calder Hall Magnox reactor and the Windscale facilities in Cumbria and the Capenhurst facility near Chester);

- Low Level Waste Repository Ltd (responsible for managing the low level waste (LLW) disposal facility near Drigg in Cumbria);

- Springfields Fuels Ltd (responsible for the Springfields uranium fuel manufacture plant near Preston); and,

- Research Reactors Restoration Ltd (responsible for the Harwell site in Oxfordshire and the Winfrith site in Dorset).

In addition, the NDA will take responsibility for the decommissioning of the UKAEA site at Culham near Oxford once research activities there have ceased.

The NDA do not manage the SLCs directly, but instead are in the process of awarding, through competitive tendering, management contracts to Parent Body Organisations (PBOs) who own the SLC shares for the duration of the management contract. New PBOs have been established for the LLWR and Sellafield Ltd SLCs to consortia's of large UK management companies and overseas investors and nuclear decommissioning experts. Timescales for the competition of the other SLCs have not yet been fully defined, but it is anticipated that these will attract a broad range of large international companies.

The NDA strategy as described above aims to capitalise on international decommissioning experience and to provide an open and competitive market, capitalising on innovation and offering cost-savings to the UK taxpayer.

The NDA will also have responsibility for managing the planning and commissioning of the Deep Geological Repository (DGR) which will be used to dispose of higher level radioactive wastes. The location of this facility has not yet been fully considered, but prospective sites include West Cumbria[14]. This facility is not currently expected to be available before ca. 2040, hence higher level radioactive wastes will need to be stored on site until such time that the repository is available.

2.2 Decommissioning and Waste Disposal Requirements

As discussed above, the clean-up of the UK civil nuclear liabilities are funded through the public sector (the annual NDA grant-in-aid spending currently accounts for 42% of the total 07/08 BERR budget[15]). The NDA also makes publicly available detailed decommissioning cost breakdowns and these are discussed below.

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[14] Plans for nuclear dump considered, BBC, 28 October 2008, http://news.bbc.co.uk/2/hi/uk_news/england/cumbria/7696096.stm

[15] Select Committee on Business and Enterprise: Appendix 3: NDA Budgeting Shortfall 2007-08: Lessons Learned Report Summary (http://www.parliament.the-stationery-office.com/pa/cm200708/cmselect/cmberr/994/99406.htm)

British Energy is in the process of assessing in detail their decommissioning needs, schedules and costs and are producing Baseline Decommissioning Plans (BDPs) which they are required to submit to the NDA (see Footnote 13). Over the period 2005 to 2008 BDPs have been produced for the Hunterston B and Heysham 1 sites. Such detailed assessments are not yet available for other sites (those for Hartlepool will be completed by 2011).

Unlike the Magnox fleet of reactors, which reflect an evolution of design over two decades of construction, the British Energy AGR fleet are much more consistent in design, and decommissioning needs and costs are likely to be much more similar between sites compared to those for Magnox. However, it is important to note that British Energy do not make their decommissioning costs publicly available. Although no detailed (or site specific) cost estimates for the decommissioning of the Hartlepool site have yet been assessed these are expected to similar to those of a larger Magnox reactor.

Despite the uncertainties discussed above both Magnox and British Energy AGR sites (which are not dissimilar in design) have very similar overall decommissioning strategies which are implemented post-generation, and are fully compliant with the current UK Government Strategy of 'deferred site clearance'. This involves the following key phases:

- **Defuelling**: During this phase all spent fuel is removed from the reactor core and transferred to the Sellafield Site. Health and Safety and environmental assessments are undertaken and permits and consents for decommissioning are established;

- **Initial Decommissioning Preparation**: During this period of Post Operational Clean Out (POCO), redundant infrastructure, buildings and systems are deplanted/demolished and removed (excluding the reactor buildings). Legacy radioactive wastes that have been accumulated during the sites operation are retrieved and conditioned and where available disposed of. For higher level wastes pending final disposal to the DGR secure waste storage facilities will need to be constructed. The reactor buildings will be re-clad, secured and 'made safe';

- **Safestore**: The reactor buildings, reactor cores and remaining infrastructure which have not been deplanted will be left *in situ* for a period of 85 years to allow radioactivity to decay to much lower levels. During this quiescent period there will be minimal activity and staffing levels on site (basic building and site maintenance and security); and,

- **Final Site Clearance**: In this final stage remaining reactor plant and buildings will be demolished, wastes will be retrieved, conditioned, packaged and disposed of, the site cleared, landscaped and, following regulatory approval, released for Brownfield development.

British Energy estimate that, at Hartlepool, defuelling will require 2-3 years and initial decommissioning preparations 8-10 years. The Safestore period will last for 85 years from end of generation. Final site clearance will then require a further 8-10 years[16].

[16] British Energy (2008) The future of Hartlepool Power Station (http://www.british-energy.com/documents/Hartlepool_Borough_Council_members_3-6-081.pdf)

Strategies for accelerating the rate of site clearance and release have been proposed by some decommissioning contractors with respect to the Magnox reactors (which avoids the need for the extended Safestore period). However, this is not current UK Government strategy and would not be possible under the current system of regulatory constraints. This is an evolving area of debate, but is outwith the scope of this assessment and is not considered further.

2.2.1 NDA Decommissioning Cost Estimates

The total planned expenditure of the NDA[17] in 2008/09 is about £2.9bn, of which £1.5bn is funded by grant-in-aid (via BERR) and £1.3bn represents estimated commercial income (including electricity generation from the Oldbury and Wylfa sites). In total, the NDA plan to spend around £2.6bn on their site decommissioning programme and about £0.26bn on non-site activities. Apart from NDA operating costs, this non-site expenditure includes skills development, research and development (R&D), insurance and pension costs.

In 2009/10, the NDA plan to spend £2.8bn, of which £1.6bn will be funded by grant-in-aid and £1.2bn by income from commercial operations. In 2010/11, the total planned expenditure will be £2.8bn, with £1.7bn grant-in-aid and £1bn from commercial income.

These costs include operational 'running cost' expenditure of the two operational Magnox reactors, Oldbury and Wylfa, of £73m and £79m (total expenditure of £81m and £93m) per annum respectively.

The 2008/2009 annual decommissioning costs for the non-generating Magnox reactors range from £30m to £62m for this period. This cost range covers both defuelling and decommissioning (i.e. defuelled) sites. The site spend is heavily dependent upon site specific waste and environmental liabilities and does not relate well to where the site is in its decommissioning schedule.

It is also important to note that the NDA is prioritising its spending on 'high hazard' facilities, particularly at Sellafield. As a consequence funds for defuelling and decommissioning activities on the Magnox reactor sites are currently limited and hence the rate of decommissioning is slower than is technically possible. Although this strategy reduces the near term spend, it does lead to an increase in the lifetime decommissioning costs (current day value).

2.2.2 British Energy Decommissioning Cost Estimates

The fund set aside for decommissioning the entire British Energy power station fleet is estimated to be currently worth £5.3bn[18] [19]. This is anticipated to be sufficient to cover the entire lifetime decommissioning costs which will be around order of £2bn per site (i.e. comparable to a large Magnox site).

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[17] NDA (2008) Business Plan 2008/2011 (http://www.nda.gov.uk/documents/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=19286)

[18] Nuclear clean-up costs 'to soar', BBC, May 27, 2008 BERR (2008) Government welcomes EDF's £12.5 billion take over offer for British Energy and investment plan to secure UK energy supplies (Announcement - Wednesday 24 September 2008)

[19] Government welcomes EDF's £12.5 billion take over offer for British Energy and investment plan to secure UK energy supplies (Announcement - Wednesday 24 September 2008)

British Energy aim to achieve Safestore within 10 to 13 years following the end of generation. This is typically more rapid than allowed by the funding available to the Magnox sites. It is also our understanding that British Energy will not 'self-perform' decommissioning operations, but will instead look to the supply chain to take over site decommissioning as a turn-key project. This may offer cost savings. Exact annual spend cannot therefore be determined at this point.

2.2.3 Final Disposal of Higher Level Radioactive Waste

Following consultation by the Committee on Radioactive Waste Management (CoRWM) "Managing Radioactive Waste Safely: a Framework for Implementing Geological Disposal[20]" the Government has confirmed broad support for geological disposal of higher level radioactive waste. Such a facility will require around 30 years to design, authorise and build and is likely to cost more than £10bn (i.e. potentially the UK's largest single construction project ever).

2.3 New Nuclear Build and Security of Energy Supply

The UK has 9 Magnox type reactor sites that have ceased power generation and are defuelling or are preparing to defuel (Calder Hall, Chapelcross, Sizewell A, Dungeness A, Hinkley Point A and Bradwell) or are within active decommissioning (Hunterston A, Trawsfynydd and Berkeley).

The UK currently has 19 operational commercial reactors at 10 power stations (the British Energy sites: Hunterston B, Torness, Hartlepool, Heysham 1, Heysham 2, Sizewell B, Dungeness B, Hinkley Point B; and the Magnox sites, Wylfa and Oldbury). However, four of these sites are currently due to cease generation by 2014 with five more closing within the next 10 years. Of the existing operational sites, Sizewell B will be the last to close in 2035.

As discussed above one of the UK Government's most pressing and immediate concerns is to avoid energy shortages and consequent disruption to the UK economy over the next 10-15 years.

In December 2007, British Energy announced plans to invest about £90 million in its fleet of nuclear stations over the next 3 years, including upgrades to boilers and transformers[21]. They have now gained approval to extend the operating lives of: Hinkley Point B and Hunterston B stations (originally due for decommissioning in 2011) by a further 5 years; and it is expected that Hartlepool and Heysham (due to cease generation in 2014) will have a operational life extension by at least a further 5 years[22].

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20 Defra (2008) Managing Radioactive Waste Safely, www.defra.gov.uk/environment/radioactivity/mrws/pdf/white-paper-final.pdf

21 Life extension of Hinkley Point B and Hunterston B power stations, British Energy, 11 December 2007, http://www.british-energy.com/article.php?article=218

22 Extension could be between 5 to 10 years.

As set out on the Nuclear White Paper further nuclear new build is believed to be of public interest. However, it is key to note that the Government stance is that "it will be for energy companies to fund, develop and build new nuclear power stations in the UK…" Key utilities that have expressed an interest in this investment include EdF (who are in the process of acquiring British Energy); RWE, E.ON and others including the UK utility Centrica.

2.3.1 New Build Timescales

The Government has published an indicative timescale for the planning and construction phases of new nuclear build. This has a series of three primary phases. The preparatory phase involves a Strategic Siting Assessment (SSA) to identify criteria for the selection of potential candidate sites. Phase 1 (which will take about 3 years) will involve final site selection, design and environmental impact assessment. Phase 2 (which will take about 2 years) will involve the licensing and Public Inquiry Process. Based on a well established industry of new reactor construction it is envisaged that it will then take around 5 years to construct and commission a new station (Phase 3).

Government aspirations indicate construction commencing in 2013-2014 with the first reactors going online 5 to 6 years after this. It is anticipated that the overall programme of new site construction could stretch over a period of up to 15 years with the later sites contributing to the grid from 2035.

2.3.2 Site Selection

Consultation on the draft SSA began in March 2008 to establish criteria via which the suitability of new sites can be assessed and to identify, at a high level, potential environmental impacts. The Government has also begun to draft the Nuclear National Policy Statement (NPS) to be published for consultation in spring 2009. Following consultation on the SSA and the Nuclear NPS it is anticipated that potential candidate sites will be identified by mid to late 2009.

Whilst the most suitable sites are likely to be adjacent to the existing power stations, as the Policy Framework consultation document identifies: "there might be other attractive sites, for example other nuclear installations and sites with retiring fossil fuel generating stations". It is however, key to note that the current Scottish Government does not support new nuclear build and that this site selection process does not at present relate to Scotland.

Due to the increasing energy deficit in the south east and London, Bradwell, Sizewell, Dungeness and Hinkley Point are prime sites for further development and British Energy has made transmission agreements with National Grid at these sites. In addition E.ON has made a similar agreement at Oldbury[23]. In addition they have also announced that they are considering building two new nuclear power stations in Kent at their oil-fired power station in Sheerness or at their coal-fired plant in Ashford. At the end of December 2008 RWE npower announced it has secured a grid connection for a new nuclear power station at Wylfa on the Isle of Anglesey with the rights to feed 3.6 GW of electricity into the national grid. This grid connection would provide capacity for three reactor units once the existing site has

[23] World Nuclear Association (http://www.world-nuclear.org/info/inf84.html)

ceased power generation and would provide enough electricity to power 5 million homes[24].

In addition availability of land holdings (estimated requirement of between 25 to 75 hectares [25]), local public support and the significant energy requirements of Anglesey Aluminium (the UK's single largest user of electricity), means that the Wylfa site is another high probability for new nuclear build. This is particularly likely as the French utility; EdF, had earlier this year acquired significant privately owned land interests adjacent to the Wylfa site. On the 10th September 2008, the NDA announced a joint marketing agreement with EdF for the combined sale of the EdF land acquisitions and the existing NDA portfolio of landholdings outside of the nuclear licensed site. Concurrent to this sale of land at Wylfa, the NDA will also be assessing tenders for the acquisition of NDA land adjacent to the Oldbury and Bradwell Sites. The NDA also holds significant land holdings surrounding the Sellafield Site. These are also expected to be offered for sale, but as of yet arrangements for this have not be disclosed[26].

Although site selection criteria are also likely to consider regional energy needs and availability of National Grid connection capacity, National Grid (Electric) levy ‘use-of-system’ charges on energy producers. These are higher in the North of the UK compared to the South, reflecting the greater demand for electricity in London and Southern England. National Grid have also determined that demand for electricity in the north will remain low and that there is limited addition grid connectivity available (and could also require major grid infrastructure reinforcement, potentially costing £50m to £200m).

Following on from the discussion above an earlier siting feasibility study, undertaken on behalf of Department for Trade and Industry, postulated that new nuclear build at Hartlepool would be constrained by grid connection capability and would be unlikely to be cost effective while the current site is generating[27].

2.3.3 New Reactor Types

Two reactor types are currently being evaluated through a ‘Generic Design Assessment’ (GDA). This is a detailed design evaluation which involves both the Health and Safety Executive and the Environment Agency to assess the safety and environmental performance of new reactor specification. At present it is unknown where one or both (or neither) will be licensed by the Government. The two reactor types currently being considered in the GDA are described briefly below.

AP1000 (Westinghouse)

This is a pressurised water reactor developed from the previous AP600. It has a 60-year design life with an anticipated electricity output of about 1.1 GW. The AP1000 received design certification from the US Nuclear Regulatory Commission in December 2005.

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24 Nuclear Careers on Line (Dec 31 2008) (http://nuclearcareersonline.net/?p=330)

25 BERR (2007). Future of Nuclear Power (http://www.berr.gov.uk/files/file39197.pdf)

26 Nuclear Decommissioning Authority (http://www.nda.gov.uk/news/edf-agreement.cfm)

27 Jackson Consulting Ltd (2006) Siting New Nuclear Power Stations: Availability and Options for Government. A report for the DTI (http://www.jacksonconsult.com/content_pdf/Nuclear_Siting_Report.pdf)

The design involves a number of passive safety features and extensive plant simplifications compared with the AP600 that serve to enhance construction, operation, maintenance and safety[28]. In particular, the AP1000 is designed for modular construction which results in a greatly reduced construction schedule, field manpower and site congestion and increased factory work thus increasing quality control. The modular design features result in a new build schedule of 5 years from order placement, comprising[29]:

- 18 months for site preparation work;
- 36 months for construction (from first concrete pour to fuel load); and,
- 5 months for start up and testing.

The design of the AP1000 is such that capital costs are estimated to be reduced by 20-30% compared with current PWRs and operation and maintenance staff requirements are estimated to be one third less than current operating nuclear power stations[29].

EPR (Areva)

This is another pressurised water reactor with a design output of about 1.7 GW that is believed to be compliant with the European Utilities requirement and is in line for a design certificate and combined operating license in the US. The EPR is the first Generation III+ reactor being built in the world – construction at the Olkiluoto 3 site in Finland began in 2005.

Like the AP1000, the Areva EPR claims reduced construction times (48 months[30]) and power generation costs, although it should be noted that the first plant of this kind which is being built at Olkiluoto in Finland has suffered some schedule delays.

2.3.4 New Build Costs and Investment

New Build costs and financing options are discussed in this section.

New Build Costs

The Government's cost-benefit analysis, as set out in the White Paper for Nuclear, used a central assumption on construction cost of £1,250/kW, based on a range of studies, plus costs for interest during construction and onsite waste storage. This gives a total lifetime cost[31] of £2.8bn to build a 'first of a kind' plant with a capacity of 1.6 GW. Sensitivities were also modelled for a lower cost of £850/kW (equivalent to £2.0bn total build cost) and two higher cost scenarios of £1,400/kW and £1,625/kW (equivalent to build costs of £3.1bn and £3.6bn respectively).

[28] Cummins, W.E. Corletti M.M., Schulz T.L. (2003). Westinghouse AP1000 Advanced Passive Plant, Proceedings of ICAPP '03, Paper 3235. http://nuclearinfo.net/twiki/pub/Nuclearpower/WebHomeCostOfNuclearPower/AP1000Reactor.pdf

[29] http://www.westinghousenuclear.com/docs/AP1000_brochure.pdf

[30] http://www.euronuclear.org/e-news/e-news-10/Olkiluoto-3.htm

[31] Including the costs of connection to the national grid, operational needs and back-end costs of decommissioning

Most of the cost of nuclear-generated power is up-front capital expenditure on construction. The Government's own analysis suggests, on a "levelised" basis (dividing total lifetime costs by total lifetime electricity generated) that 67% is up-front capital costs, 20% operation and maintenance needs, 11% for fuel and a (surprisingly low) 3% for decommissioning and waste disposal[32]. This equates to around £1.9bn of up-front capital costs. On page 61 of the White Paper the figure of £2.8 bn is quoted (as above), and £1250/kW is equivalent to a capital cost (before interest) of £2 bn for 1600 MW.

However, there has been concern that these could be significantly under estimated[33]. For instance the fixed price contract estimate for construction of the new nuclear station at Olkiluoto in Finland is currently projected to be itself £2.7bn[34] while the cash cost for construction of Sizewell B was in excess of £2.7bn at the time (which is around £3.7bn in today's market) and was subject to 35% cost over-runs, mainly attributable to first of a kind costs.

It is important to note that about 80% of nuclear new build relates to conventional infrastructure and utilities requirements[35] this means that the conventional civil construction needs for a new reactor are likely to be of the order of £1bn per site[36].

The cost estimates discussed above need to, in part, consider whether one or two reactor types will be developed in the UK. It is possible that if a consecutive series of sites involving the same reactor type were constructed, then there might be cost savings. However, this is unlikely if two different reactor types proceed through to the construction phase.

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32 "The Future of Nuclear Power", nuclear consultation document, of May 2007 (www.berr.gov.uk/files/file39197.pdf)

33 However, in early May 2008 Wulf Bernotat (Chief Executive of E.ON) cautioned that, based on E.ON's recent experience at OL3, total (lifetime) costs for each power plant could reach Euros 6 billion (£4.8 billion), significantly in excess of the indicative costs referred to in the White Paper;

34 Thus, in relation to the Olkiluoto 3 project (elsewhere called OL3) in Finland, the operator Teolliswden Voima Oy (TVO) was able to negotiate a fixed price turn-key contract with Areva NP, a joint venture between Areva of France and Siemens of Germany. The project is currently running about two years behind schedule and both Areva and Siemens have made substantial provisions to cover the cost overruns. It is unclear whether Areva NP treated OL3 as a strategic loss-leader or simply under-estimated the time and costs involved, but this is just the sort of delay and cost over-run likely to dismay funders. Further, the Finnish Government is involved in almost every aspect of OL3, providing a level of government support unlikely to be seen in the UK, which can only exacerbate such concerns; By December 2006 the works had fallen 18 months behind schedule and the French Ministry of Industry (the French Government owns 95% of Areva) made provision for £467 million losses (briefing paper 5).

35 The UK capability to deliver a new nuclear build programme 2008 Update (NiA) http://www.niauk.org/images/stories/pdfs/supplement%20for%20web.pdf

36 Of the professional services 55% typically relate to plant and equipment, 30% for civil engineering and 15% for project management and support

In addition to construction costs, there are also significant UK supply chain opportunities for the manufacture of key components for new rector sites. The Nuclear Industry Association (NIA) has backed a recent report from Westinghouse (one of the two prospective reactor vendors), 'Maximising Opportunities for the UK Supply Chain'. This sets out how production of Westinghouse's AP1000 nuclear reactor could deliver in excess of £30 billion of value to the UK's economy via their unique and mutually beneficial 'Buy Where We Build' strategy for supply chain engagement[37].

Financing New Nuclear Build

New nuclear build will be financed entirely from the Private Sector (energy utilities) with no Government subside.

The French utility, EdF is reported to have set-aside a £25bn budget for its nuclear ambitions in the UK. This covers £12.5bn offered for British Energy[38], £10bn for the construction of 4 new nuclear reactors and a further £4bn to £5bn on maintaining the existing British Energy reactor fleet[39]. E.On also has a Europe wide £56bn investment programme that includes a mix of power generation, including offshore wind farms as well as new nuclear. Similarly, Iberdrola's strategic plan for 2007-10 involves a £22bn investment programme[40].

2.3.5 Skills Requirements and Supply Chain

At its peak, the construction of Sizewell B employed over 5,000 people. More than 3,000 UK-based companies were involved in its construction, 630 of those were local companies in East Anglia[41].

British Energy estimates[42] that a prospective Hartlepool B (single reactor) site would involve 1,500 to 3,000 staff on site for a 5 year construction programme with a total wage bill of £75m per annum (£375m total).

The numbers depend on the choice of design, and the extent of off-site prefabrication of components. British Energy also estimate, when building two reactor units, that an on site workforce could be up to 5,000 at the peak of activity.

[37] Westinghouse have signed three UK nuclear supply chain agreements with BAE Systems, Rolls-Royce and Doosan Babcock to collaborate on work associated with bringing the AP1000 nuclear power plant to the UK

[38] It was announced in early January (January 6th) that the bid for BE was accepted wholly unconditional and EdF now control more than 96% of British Energy company shares (Building.co.uk), http://www.building.co.uk/story.asp?sectioncode=284&storycode=3130768&c=3

[39] Thisismoney.co.uk 1st June, 2008 (http://www.thisismoney.co.uk/investing-and-markets/article.html?in_article_id=442347&in_page_id=3)

[40] PowerTechnology.com. 27th November 2008 (http://www.power-technology.com/news/news46636.html)

[41] John Hutton: speech to Unite on 26 March 2008 (http://www.guardian.co.uk/environment/2008/mar/26/nuclearpower.energy)

[42] http://www.british-energy.com/documents/Hartlepool_Borough_Council_members_3-6-081.pdf

The civil construction package alone of a single new reactor is such that only the UK's largest construction companies will be in a position to resource this. Even so it is important to note that in the construction of the Olkiluoto 3 new nuclear power station in Finland, about 30% of the 2,500 directly-employed staff are Finnish nationals and 40% of the 1,800 direct contractors are Finnish companies[43].

Typical companies with a UK base who are key players both with respect to decommissioning and new nuclear build include:

- Civil and Mechanical Engineering: Aker Solutions, AMEC, Babcock, Balfour Beatty, Carillion, Costain, Doosan Babcock, Jacobs, Laing O'Rourke, Norwest Holst, Nuttalls, Sir Robert McAlpine, Taylor Woodrow etc; and,

- Planning Management and Design: Alstec, AMEC, Arup, Atkins, Costain, DGP, Halcrow, INS, Jacobs Babtie, MWH, Nuvia, RPS, Serco etc.

Many of these companies have a broad national if not international base which includes offices in the North East. Nonetheless, any major project is likely to draw in resources from across the supporting company's organisation.

Balfour Beatty, the international engineering, construction, services and investment group, recently announced that it is partnering with AREVA, one of the prospective reactor vendors to ensured effective delivery of a fleet of EPR nuclear reactors (EPRs) in the UK (the reactor type preferred by EdF and E.ON utilities). In a separate development, Balfour Beatty has also formed a joint venture with VINCI Construction [44] to help deliver project management, construction and civil engineering infrastructure for the EPR programme in the UK[45].

In addition a significant supply chain for components and plant will also be needed. For instance Westinghouse Electric Company has signed agreements with BAE Systems, Rolls-Royce and Doosan Babcock to collaborate on work associated with bringing the AP1000 nuclear power plant to the UK. Under this agreement between 70% and 80% of the work and services required to construct the AP1000 would be provided by the UK supply chain[46]. However, it is likely that there could also be strong competition from overseas suppliers particularly relating to the manufacture of turbines, reactors vessels, boilers and other large forgings.

2.4 Relevance of Market Needs to the Tees Valley

Currently British Energy employs ~700 staff and contractors on site at Hartlepool. There is a total turnover circa £225 million per annum, with an annual salary bill of £25 million. Other materials, goods and services are £19 million (predominantly through national supply contracts) with rates payments of £7 million.

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[43] Shadbolt/Energy (2008) Nuclear New Build: A Legal Commentary – Some Challenges. Briefing Note 4. (http://www.shadboltlaw.co.uk/pdfs/Nuclear_Briefing_Paper_4.pdf)

[44] VINCI's UK-based construction and engineering companies include Taylor Woodrow and Norwest Holst

[45] Balfour Beatty Press Release, 4th Dec 2008 (http://www.balfourbeatty.co.uk/bby/media/press/2008/2008-12-04/)

[46] Energy Business Review (5th September 2008) http://www.energy-business-review.com/article_news.asp?guid=6FA60E48-49C6-4901-81F4-6485E016F8A1

From the discussion above, the key points relevant to the Hartlepool site and the Tees Valley are as follows:

- The site is currently due to cease generation in 2014. However, it is probable that British Energy will apply for a life extension (potentially of the order of 5 years[47]) a more realistic closure date may therefore be between 2019 and 2024 (but cannot, at this point, be confirmed);

- British Energy, as a private company, does not make publicly available decommissioning cost estimates. However the overall decommissioning strategy is comparable to those of the Magnox reactor sites and the total costs are also likely to be comparable;

- Hartlepool is being considered as a potential site for new build. British Energy has made a commitment to consider the feasibility of new nuclear build at all their stations there are clear business drivers to develop (at least in the first instance) new sites in the south of the UK. Due to grid connection capacity, it is likely that a new north east nuclear power station would only be financially desirable once the existing Hartlepool site has ceased generation; and,

- There is no way at present to determine, if there was new nuclear build at Hartlepool, which reactor type this might be and hence provide finalised supply chain spend estimates. In addition there is still a lot of uncertainty over the actual construction costs. However, as estimated in this report the building and commissioning of a new nuclear reactor in the UK is estimated to fall within the range of £2.0bn to £3.6bn (inclusive of costs associated with construction, national grid connection, operation and the back-end costs of decommissioning), once operational it would employ approximately 350 to 450 staff and contractors (with up to 3,000 in the construction phase). It would also maintain the figures similar to existing operations of £7 million per annum to the region through rates payments and ca. £12 million on materials, goods and services.

[47] Extension could be applied for between 5 to 10 years.

3 The Hartlepool Site

This chapter provides a broad overview of the British Energy Hartlepool site and potential timescales and supply chain requirements for decommissioning and new build at the site.

It is important to note that, since Hartlepool is a generating site with a remaining generation lifetime of (at least) 5 years, no decommissioning baseline plans are currently available. The information presented below is, therefore, largely based on information outlined for the British Energy Hunterston B site.

3.1 Hartlepool Nuclear Power Station

British Energy Hartlepool is a nuclear power station (NPS) located just south of Hartlepool town centre, on the north east coast of England. The Station is a twin advanced gas-cooled reactor (AGR) design that was built between 1964 and 1983. Power generation began on 1st August 1983 and the site has the capacity to provide electricity to up to 1.5 million households. Power generation is currently estimated to cease in 2014.

3.1.1 Input of the Hartlepool site to the local economy

The Hartlepool site currently employs 500 British Energy staff plus 200 full-time contractors and has provided a stable employment base for the region since power generation began. The site contributes an annual salary bill of around £30 m to Hartlepool and surrounding area.

Of those employed at the site, 45% are based in Hartlepool and a further 42% live in the Tees Valley area. The remaining staff are located within the County Durham/Tyne and Wear areas[48]. The breakdown of skills of staff at the site is provided in Table 2.

Table 2 Skills breakdown at the Hartlepool site[48]

Skills category	Percentage of staff
Engineering/Science	36
Leaders	13
Skilled manual	32
Semi-skilled manual	12
Other professional	2
Administrators	5

48 Information supplied by British Energy Hartlepool to Adrian Punt on 29 October 2008.

In addition to salaries, the Hartlepool site contributes £7 million per annum to the region through rates payments and, out of an annual spend of ca. £12 million on materials, goods and services, 20% is on the local supply chain and 60% on the national supply chain and 20% on the international supply chain.

An additional input to the local economy by British Energy is through the provision of local sponsorship to health services and environmental organisations. An indicative value for total local sponsorship is £40k – this is inclusive of support to health services, environmental organisations, local sporting & community groups[49].

3.2 Hartlepool Decommissioning Strategy

No decommissioning plans have yet been developed for the Hartlepool NPS and, therefore, the following outline plan has been based on that developed for the British Energy Hunterston B site[50].

Once generation has ceased at Hartlepool, decommissioning preparations will commence and operations at the site will move from those associated with power generation to largely waste management activities.

The current strategy for decommissioning of the British Energy fleet of AGR reactors is 'Early Safestore' whereby all fuel and mobile wastes and all plant, equipment, services and buildings (excluding the two reactors and fuel stringer debris vaults) will be removed. The remaining reactors and vaults will be enclosed in a secure 'Safestore' structure for a period of around 75 years to allow for radioactive decay. It is anticipated that 10 years will be required to reach 'Safestore' resulting in a total period of 85 years for radioactive decay prior to reactor dismantling.

As noted in section 2.2.2, it is our understanding that decommissioning of the British Energy fleet of nuclear reactors is likely to be undertaken as large-scale turn key projects. However, British Energy staff with knowledge of operational procedures are likely to be retained on site to ensure that those systems that are required to remain operational during defuelling waste management and other early decommissioning projects are operated safely[51].

3.2.1 Process, key milestones and general timescales

The British Energy Safestore strategy consists of an 11 step process, which is likely to begin three years prior to the end of generation:

1. Pre-closure preparatory work;
2. Defuelling;
3. Site operation and plant preparation;
4. Management of potentially mobile operational wastes;

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49 Information received by email from British Energy Community Liaison Officer, 27/01/2009

50 British Energy. Hunterston B Power Station, Site Summary: Baseline Decommissioning Plan – 2008, Revision 000, March 2008.

51 Personal communication, British Energy employee 2008.

5. Plant decommissioning;

6. Safestore development;

7. Site surveillance, Care and Maintenance (C&M);

8. Site reinstatement;

9. Retrieval and management of stored active waste;

10. Reactor dismantling and reactor building dismantling and clearance; and,

11. Site clearance and release for re-use.

Activities 1 to 6 comprise the first key phase of defuelling and initial decommissioning work and are anticipated to be completed within 10 years following cessation of electricity generation. It is anticipated that, as for Hunterston B, the first reactor will be shut down in the year prior to end of generation to allow remaining slow-burn fuel to be transferred to the second reactor, thus reducing new fuel requirements in the final year of generation and minimising the need for disposal of unused fuel. Defuelling of the reactors will represent the most significant reduction in nuclear hazard potential at Hartlepool. Additional hazard reduction will be achieved through the retrieval, processing, packaging and safe, secure storage of mobile radioactive wastes.

During Phase 1 a number of buildings will require deplanting and demolition to reduce the site footprint to a minimum. This will result in large-scale waste management requirements to dispose of both radioactive and non-radioactive wastes generated during this period. Waste management is therefore likely to become a significant expenditure during Phase 1 of decommissioning and a number of waste brokers may be contracted to transport and dispose of the various wastes produced. Construction activities may also be required to provide facilities for waste management activities. A ‘Safestore’ will also be constructed that will enclose the remaining reactors and vaults to allow for radioactive decay, thus minimising the radiological hazard prior to final decommissioning activities. The Safestore will be equipped with remote monitoring and surveillance systems to ensure security is maintained.

The second key phase in the decommissioning strategy is comprised of activity 7 – site surveillance, care and maintenance. This phase lasts a total of 85 years from the end of generation to allow for radioactive decay of the remaining structures and wastes retained on site. Only minimal site activity will be required during the 75 year period from the end of phase 1 that will consist of periodic monitoring of the site and its environs and general grounds maintenance. Building maintenance activities will also take place as required. It is anticipated that a national geological waste facility will become available from 2040 and the decommissioning strategy therefore allows for the transport of intermediate level waste (ILW) from the site Interim Conditioned ILW Store from this date.

During the latter few years of Phase 2, the site infrastructure will be re-established and the site re-established as a major ‘engineering project site’ whereby facilities required for the final decommissioning and waste management activities will be constructed and final plans developed for reactor dismantling and final site clearance.

A further 10 years will be required for the final key stage of the decommissioning process comprising of activities 8 to 11 – reactor building decommissioning and final site clearance. During Phase 3, all remaining radioactive wastes will be retrieved, packaged and disposed of to the national repository. The Safestore, reactors and waste vaults will be deplanted and demolished and resultant wastes disposed of. Finally, environmental monitoring will be performed to ensure that no residual radiological or chemical hazards remain on the site and remediation activities will be undertaken as appropriate. Once the site has been determined to be hazard-free, it will be delicensed and made available for re-use.

Based on the current planned end of generation at Hartlepool, the following approximate decommissioning timeline can be assumed[52] (Table 3).

Table 3 Decommissioning timeline for Hartlepool nuclear power station

Activity	Anticipated Timeframe
Pre-closure preparatory work	2011-2014
End of generation	2014[53]
Defuelling	2015-2017/8[54]
Plant dismantling (start)	2015-2023 – This should occur 8-10 years after defuelling
Safestore construction	2021-2024
Surveillance, Care and Maintenance	2024-2098
Reactor decommissioning and final site clearance	2098-2108

52 Based on the timeline outlined for Hunterston B

53 Possibility of extension between 5 to 10 years

54 Assumes that the first reactor is shut down 1 year prior to the second to allow for rapid and cost-effective defuelling of the reactors.

3.2.2 Broad-scale costs

As noted in Section 2.2, British Energy has not made available any site specific cost estimates for decommissioning. However, the current British Energy decommissioning fund is currently valued at around £5.3bn which, assuming an even split in decommissioning spend between British Energy sites would equate to a current fund of around £670m for the Hartlepool site. However, it is important to note that, as this is the current fund, the value at the point of final site clearance (which is likely to result in maximum spend due to the complexities of reactor decommissioning[55]) will be significantly greater (because of inflation costs). It would seem reasonable to assume that the overall decommissioning spend will be similar to that anticipated for the Magnox fleet of reactors (approximately £1.1bn per site).

The Wylfa and Oldbury sites were the last of the Magnox fleet to be constructed and Wylfa is also the largest of the Magnox sites (and thus most similar in size to an AGR site). Decommissioning cost estimates for these sites[56] [57] (Table 4) are therefore considered to be most applicable to the potential decommissioning costs arising at Hartlepool and an average of the spend for these sites has been taken as representative of broad scale costs for baseline decommissioning of the site.

Table 4 Summary of decommissioning costs for the Oldbury and Wylfa sites and estimate of decommissioning spend for British Energy Hartlepool

Phase	Wylfa		Oldbury		Hartlepool estimate (£m)
	Estimated spend (£m)	% of Total	Estimated spend (£m)	% of Total	
Defuelling	£139	12%	£112	10%	£126
Plant dismantling and Safestore construction	£341	29%	£359	33%	£350
Surveillance, care and maintenance	£100	8%	£125	11%	£113
Final site clearance	£604	51%	£495	45%	£549
Total	£1,184		£1,092		£1,138

[55] More than 50% of total decommissioning costs (including that associated with defuelling) at both the Wylfa and Oldbury Magnox North sites (the youngest of the Magnox fleet of reactors) will be attributable to spend during Final Site Clearance.

[56] Wylfa Lifetime Plan Site Summary, 2006-07 (http://www.nda.gov.uk/documents/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=4037)

[57] Oldbury Lifetime Plan Site Summary, 2006-07 (http://www.nda.gov.uk/documents/loader.cfm?url=/commonspot/security/getfile.cfm&pageid=4002)

3.2.3 Potential supply chain needs

Decommissioning of the site will result in a change in focus for the local workforce and supply chain, but will continue to provide economic input to the region over the short term as reactors are defuelled and initial site decommissioning preparations are completed. During this period many of the traditional employment roles on the site will be lost, but new skills areas in deplanting and decommissioning will arise.

The following table (Table 5) provides an outline of the key tasks and potential supply chain requirements associated with each of the key decommissioning phases.

Table 5 Supply chain needs by decommissioning phase

Step	Timeline	Tasks	Indicative staffing types
Phase 1 - Defuelling & initial decommissioning (2014 - 2024)			
Pre-closure preparatory work	2011-2014	♦ Defuelling safety case ♦ Detailed decommissioning plan ♦ Near term work plan ♦ Article 37 data submission ♦ Environmental Impact Assessment ♦ Planning application ♦ Decommissioning management arrangements ♦ Decommissioning programme ♦ Outage management programme revision ♦ Discharge and disposal authorisations ♦ Site Safety Management Arrangements	Existing site contingent of staff (managers, engineers, maintenance, cleaning, catering, administration)
Defuelling	2014-2016/17	♦ Enhancement of fuel route performance ♦ Reactor defuelling ♦ Transfer of spent fuel to Sellafield Ltd ♦ Transfer of new fuel off-site	Existing site contingent of staff (managers, engineers, maintenance, cleaning, catering, administration)

Step	Timeline	Tasks	Indicative staffing types
Site operation and plant preparation	2014-2021	♦ Plant operation ♦ Construction, commissioning of new effluent discharge system ♦ Isolation and removal of redundant electrical equipment ♦ Isolation, drainage/flushing and venting of redundant mechanical plant and systems ♦ Removal of hazardous waste (e.g. chemicals, oils) ♦ Service installation and commissioning (electrical supply and distribution system and liquid effluent discharge arrangements) ♦ Plant maintenance	Proportion of existing site staff (managers, engineers, maintenance, administration) Contracting staff (Specialist waste brokers, construction and demolition etc)
Management of potentially mobile operational wastes	2014-2023	♦ Construction & commissioning of operational waste processing facility (OWPF) and interim condition ILW Store (ICILWS) ♦ Operational waste retrieval, processing, packaging and store filling (ion exchange resins, gas dryer desiccant, sludges etc) ♦ Construction/commissioning of mobile active effluent treatment plant (MAETP)	Contracting staff (Specialist waste brokers, construction and demolition etc)
Plant decommissioning	2014-2023	♦ Decommissioning of all redundant plant, equipment, facilities and buildings (excluding reactors and fuel stringer debris vaults) ♦ Removal of radioactive plant and systems (e.g. cooling ponds, fuel transfer system, flask handling plant and active waste treatment systems) within and outside of reactor building ♦ Back fill of tunnels, culverts and basement areas ♦ Demolition of off-shore structures (discharge pipeline) ♦ Ground investigation work and remediation (if required)	Contracting staff (specialist decommissioning and demolition contractors, waste brokers, site surveyors etc)
Safestore construction	2021-2024	♦ Construction ♦ Security equipment installation (remote monitoring and surveillance) ♦ Partial site delicensing	Contracting staff (construction, engineers etc)
Phase 2 - Site surveillance, care & maintenance (2024 - 2098)			

Step	Timeline	Tasks	Indicative staffing types
Site surveillance, care and maintenance	2024-2098	♦ Remote monitoring and surveillance ♦ Visual inspections (site and environs) ♦ Periodic Safestore inspection and monitoring of containment ♦ Radiological monitoring ♦ Environmental monitoring ♦ Grounds maintenance ♦ Refurbishment (building cladding/ supports) ♦ Maintenance of monitoring, surveillance and communications equipment ♦ Transfer of ILW to national GDF (anticipated in 2040) ♦ Decommissioning and dismantling of ILW Store (post 2040)	Contracting staff (site surveyors, civil engineers, facilities management)
Site reinstatement	2093-2107[1]	♦ Dismantling facility and equipment design ♦ Environmental Statements ♦ Planning approval for new facilities ♦ Decommissioning planning ♦ Safety Cases ♦ Discharge authorisation support ♦ Article 37 submission ♦ Infrastructure services (water, electricity, telecommunications, IT) ♦ Construction of site engineering and welfare facilities ♦ Construction and commissioning of waste management centre (WMC) and control centre	Contracting staff (engineers, construction, facilities management etc))
Phase 3 – Reactor building decommissioning & final site clearance (2098-2108)			
Retrieval and management of stored active waste	2101[2]-2104	♦ Retrieval of activated and contaminated components from vaults ♦ Sorting, sampling, packaging and disposal of ILW to the national GDF ♦ Sorting, packaging and disposal of LLW	Contracting staff (waste brokers etc)

Step	Timeline	Tasks	Indicative staffing types
Reactor dismantling and reactor building dismantling and clearance	2098[2]-2107	♦ Procurement of specialist dismantling equipment ♦ Reactor & building dismantling ♦ Waste retrieval, sorting, sampling, packaging and disposal of ILW to the national GDF	Contracting staff (specialist decommissioning and demolition contractors, waste brokers etc)
Final Site Clearance	2107-2108	♦ Deplanting and removal of remaining site buildings and infrastructure ♦ Landscaping ♦ chemical and radiological monitoring of site ♦ land remediation work (as required) ♦ surrender of nuclear site license	Contracting staff (demolition, waste brokers, site surveyors etc)

[1] dates from this point subject to change should a national GDF be unavailable from 2040

[2] Timescale for Phase 3 is not fixed and is therefore subject to change should it be considered technically feasible (and an optimal approach) to undertake reactor dismantling work at an earlier or later stage.

3.2.4 Direct and indirect employment

As discussed previously (see Section 2.2.2), it is the opinion of the authors that decommissioning of the British Energy fleet of nuclear power stations will be performed largely as turn-key projects by the supply chain. However, some retention of current staff will be required for continued operational activities to ensure consistent and safe operations in line with regulatory requirements. Nonetheless, direct employment by the site is likely to decline during the defuelling and initial decommissioning period with an associated increase in spend on the supply chain.

Spend on both direct and indirect employment will be greatly reduced during phase 2 of the decommissioning strategy where the site will be largely dormant. During this period there will be minimal input from the Site to the local economy both from a supply chain and employment perspective[58].

During the final phase of decommissioning, employment on the site will be dominated by contractors, again through turn-key projects.

[58] Plans for Magnox sites envisage residual employment of 10-20 personnel, primarily for safety and security, with periodic civil engineering surveys and structural maintenance for remaining buildings and infrastructure.

3.3 Deferred decommissioning

Due to the anticipated shortfall in energy supply in the UK, British Energy have stated their intent to, where possible, extend the generating lifetime of their fleet of nuclear reactors[59] and extensions until 2016 have already been granted for the Hunterston B and Hinkley Point B power stations[60]. In relation to the Hartlepool nuclear power station, it has been reported that British Energy are intending to extend the generation lifetime of the site by a minimum of 5 years, but potentially up to 10 years[61] resulting in continued power generation until 2024 and a continued annual input to the local economy of around £30m in staff wages alone.

3.4 New Nuclear Build

3.4.1 General time-scales

The overall new nuclear build programme is anticipated to last around 5 years for each power station. It is Government aspiration that new power stations could be contributing to the national grid from around 2018 and lower priority sites, such as those in the north, could become operational from 2035.

Partial delicensing of the Hartlepool site could occur in 2024 (see Table 5) resulting in the release of land that could be made available for new nuclear build. However, it is unlikely much of the area currently within the site fence could be released as it may be needed for decommissioning activities. A five year build programme (see Section 2.3.1) from this date would fit within the Governments new build timeline for lower priority sites and is considered the most likely scenario for new nuclear build at Hartlepool. However, land to the north and east of the Hartlepool site may be available for new nuclear build, which would enable concurrent new build with decommissioning of the existing site. This would enable new build to occur earlier and it may not be unreasonable to assume that build could begin from around 2020. This would lead to possible generation from 2025.

3.4.2 Broad-scale costs

As outlined in Section 2.3.4, the building and commissioning of a new nuclear reactor in the UK is estimated to fall within the range of £2.0bn to £3.6bn (inclusive of costs associated with construction, national grid connection, operation and the back-end costs of decommissioning). Taking the Government's central assumption on construction costs (resulting in a total cost of £2.8bn) and the division of spend between the various aspects of new build, the following broad-scale costs can be derived (Table 6).

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[59] British Energy Company Strategy - http://www.britishenergyrenewables.com/pagetemplate.php?pid=80

[60] Life extension of Hinkley Point B and Hunterston B power stations, 11 December 2007, http://www.britishenergyrenewables.com/article.php?article=218

[61] Nuclear plant may stay open longer, 22 June 2006. http://www.hartlepoolmail.co.uk/news/Nuclear-plant-may--stay.1582104.jp

Table 6 Broad-scale costs associated with new nuclear build

Process	Spend (£bn)
Capital (construction)	1.9
Operation & maintenance needs	0.6
Fuel	0.3
Decommissioning & waste disposal	0.1

3.4.3 Supply chain needs

New nuclear build within the UK will provide a number of supply chain opportunities across a broad range of sectors, including engineering, science, mathematics, radiation and health protection, project management and administrative support. The requirements upon the supply chain will vary with the different stages of build, operation and decommissioning.

During the first stages of a new build project, requirements will focus upon planning and licensing thus requiring legal and financial, planning and licensing, nuclear consultancy and engineering and design services [62]. Please note that these services may not be from the local area.

During the reactor construction the focus of supply chain needs will be on services related to build such as engineers, project managers, construction companies and those companies involved in the production of structural products and goods such as concrete, steel, pipe, and machinery and equipment including pumps, switchgear, transformers and more specialist reactor components and nuclear fuel[38 63]. Support industries such as catering, accommodation, communications, finance, business and legal services and transport will also be of importance to the new build process.

Once operational, site requirements would be focused more upon operation and site management, engineering and technical, and waste management and disposal services. There would also be an ongoing requirement for the supply of nuclear fuel.

The majority of the services and products required for nuclear new build are available from both the local and national supply chain. However, the global market for nuclear services and products means that competition for contracts to supply such services and goods may be high and a component of international supply can therefore be envisaged.

[62] NAMTEC (2008). The supply chain for a UK nuclear new build programme.
[63] John Hutton MP (26 March 2008) - New Nuclear Build: How do we make progress? http://www.berr.gov.uk/aboutus/ministerialteam/Speeches/page45417.html

3.4.4 Direct and indirect employment

Potential employment for nuclear new build at Hartlepool can be divided into both the construction and operational phases with peak employment occurring during construction. The operational phase would result in long-term employment either of those currently within the Hartlepool and Tees Valley region or of those currently outwith the area that would relocate to the region.

During construction of a single reactor station at Hartlepool, it has been estimated[64] that up to 3,000 staff (minimum 1,500) may be employed over a 5 year construction period which could result in a wage bill of £75m per year. Should a twin reactor station be commissioned, workforce requirements could increase to a maximum of around 5,000 during peak construction activities. The prospects of a twin unit are not particularly high because of transmission constraints and land availability at the Hartlepool site.

The current Hartlepool power station employs around 700 staff and contractors[40]. However, as previously discussed, it is considered more likely that a Hartlepool 'B' site would be based around a single rather than twin reactor design. This in itself is likely to have a lower staffing requirement, in the region of 350 to 450 staff and contractors, and more modern reactor designs may reduce staffing requirements further (the AP1000 design suggests a third reduction in staffing requirements compared with current stations). It may not, therefore, be unreasonable to assume that a single modern reactor site could have a staffing requirement of approximately two thirds (ca. 450 staff) of the current employment requirement of the Hartlepool site.

3.5 Scenarios for Hartlepool Nuclear Power Station

Based on the information outlined above for both decommissioning of the current Hartlepool nuclear power station and potential new build at the site, the following scenarios can be postulated:

Scenario 1 - Baseline decommissioning with no nuclear build. Under this scenario, it is assumed that the Hartlepool site ceases power generation as currently planned in 2014 and that the decommissioning timeline continues as outlined in Table 3. No new nuclear build at the site is envisaged under this scenario.

Scenario 2 - Baseline decommissioning with early new nuclear build. Under this scenario, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences at the earliest opportunity conceived on the basis of currently available information. Under this scenario, construction would therefore begin in 2020.

Scenario 3 - Baseline decommissioning with late new nuclear build. Under Scenario 3, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Under this scenario, construction would begin in 2029.

[64] http://www.british-energy.com/documents/Hartlepool_Borough_Council_members_3-6-081.pdf

Scenario 4 - Deferred decommissioning with no nuclear build. This scenario assumes that an extension is granted for continued power generation at the Hartlepool site until 2024. No new nuclear build at the site is envisaged under this scenario.

Scenario 5 - Deferred decommissioning with early new nuclear build. The decommissioning timeline is assumed to be consistent with that of Scenario 4 with concurrent decommissioning and new nuclear build. New build would begin in 2020.

Scenario 6 - Deferred decommissioning with late new nuclear build. Under this scenario the decommissioning timeline is consistent with that of Scenario 4. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Under this scenario, construction would therefore begin in 2029.

4 Socio-Economic Background Data

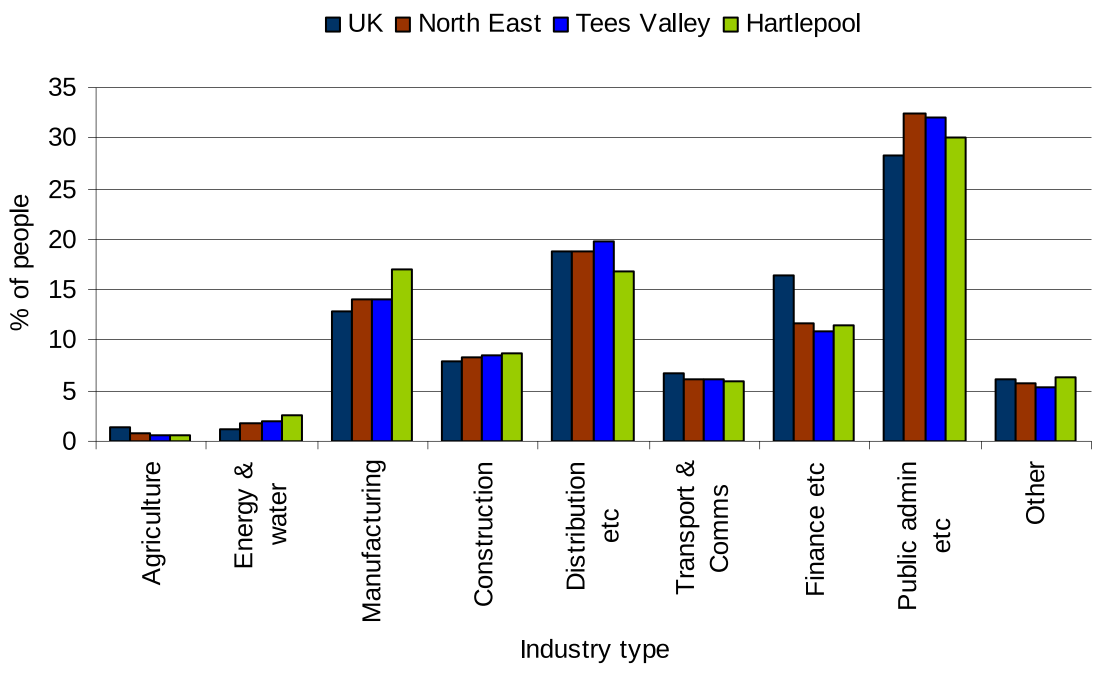
Information included in the 'Economic Profile for Tees Valley' (April 2008 edition) highlights that Tees Valley has undergone massive economic structural changes in the last quarter of a century. The area still has a strong manufacturing base contributing nationally to exports. However, it is important for the Tees Valley to develop the competitiveness of the manufacturing base to improve economic performance and promote higher household incomes.

Although a significant number of jobs in the manufacturing industry have been replaced by growth in the service sector often these jobs have been poorer paid. Tees Valley has made a significant achievement in recent years, of getting more people into work that shows the success of the area in overcoming such massive structural changes in its industrial base.

4.1 Economic and Employment Profile

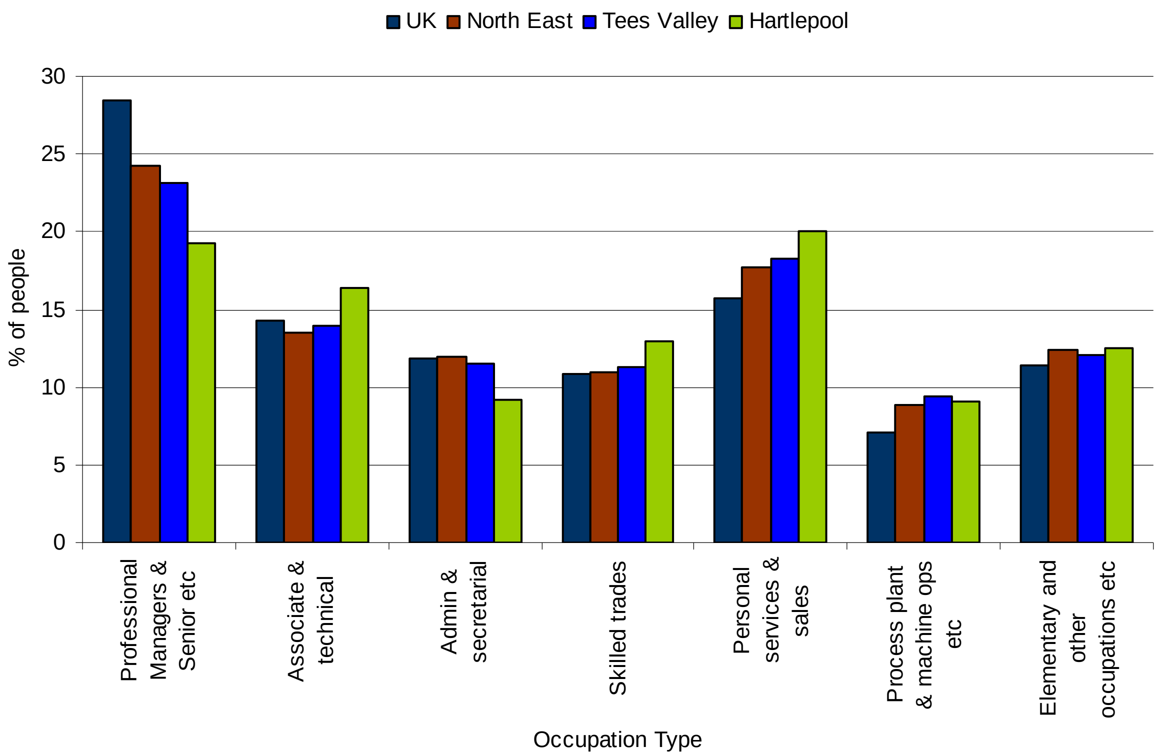
Figure 2 shows the percentage of all in employment by industry type and highlights that public administration bodies are particularly prevalent in the area with distribution being another major employer. Manufacturing has a particularly strong role in Hartlepool.

Figure 2 Percentage of all in employment by industry (year to end September 2007)



In terms of the types of roles that are dominant in the region then senior positions (professional and managerial) are particularly strong at all levels (but slightly below the UK average). Personal services & sales along with skilled trades and associate & technical demonstrate key skill bases within the area, see Figure 3.

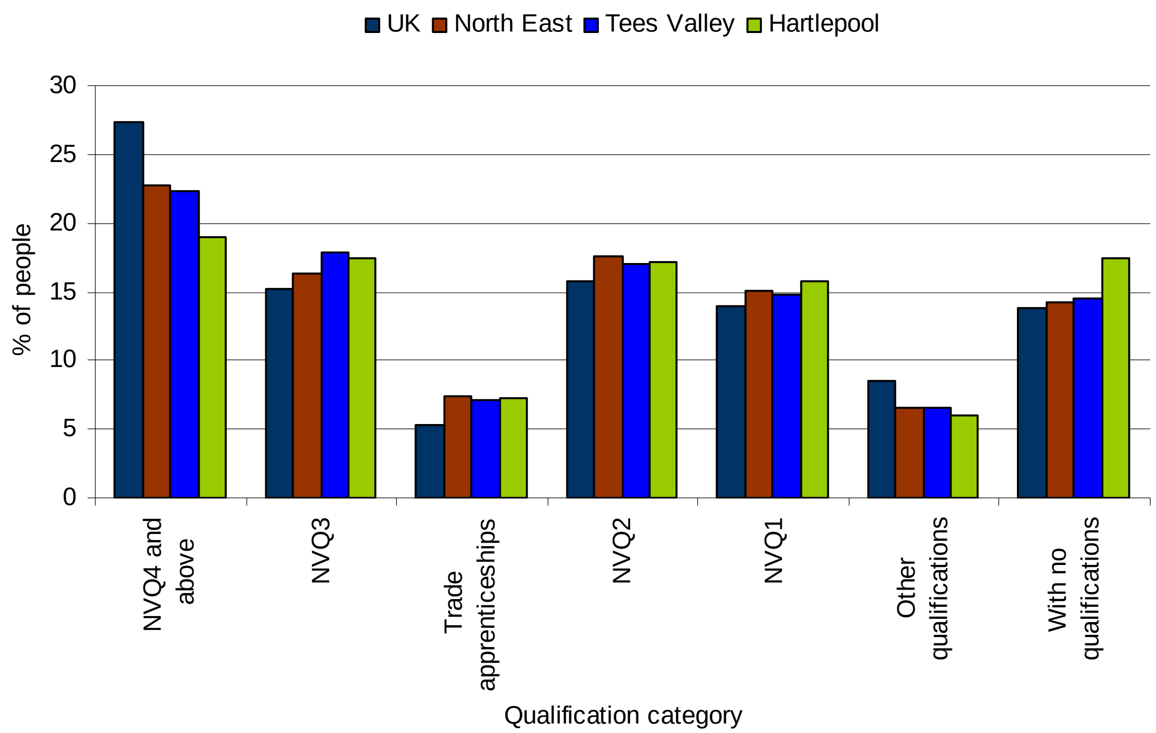
Figure 3 **Percentage of all in Employment by Occupation (year to end September 2007)**



Notes: Agriculture – includes forestry and fishing. Energy & Water includes electricity and gas. Distribution – wholesale and retail, hotel and restaurants. Financial – includes real estate and business activities. Public admin – includes social security, education and health. Other includes social and personal service, private households with employed persons etc.

The skills sets within the region, Figure 4, show below UK average on the number of those with NVQ4 and above (higher degrees and professional qualifications). NVQ2 and NVQ3 are above average (A Level standard) with trade apprenticeships being particularly popular within the area. Hartlepool has a particularly high percentage of people with no qualifications.

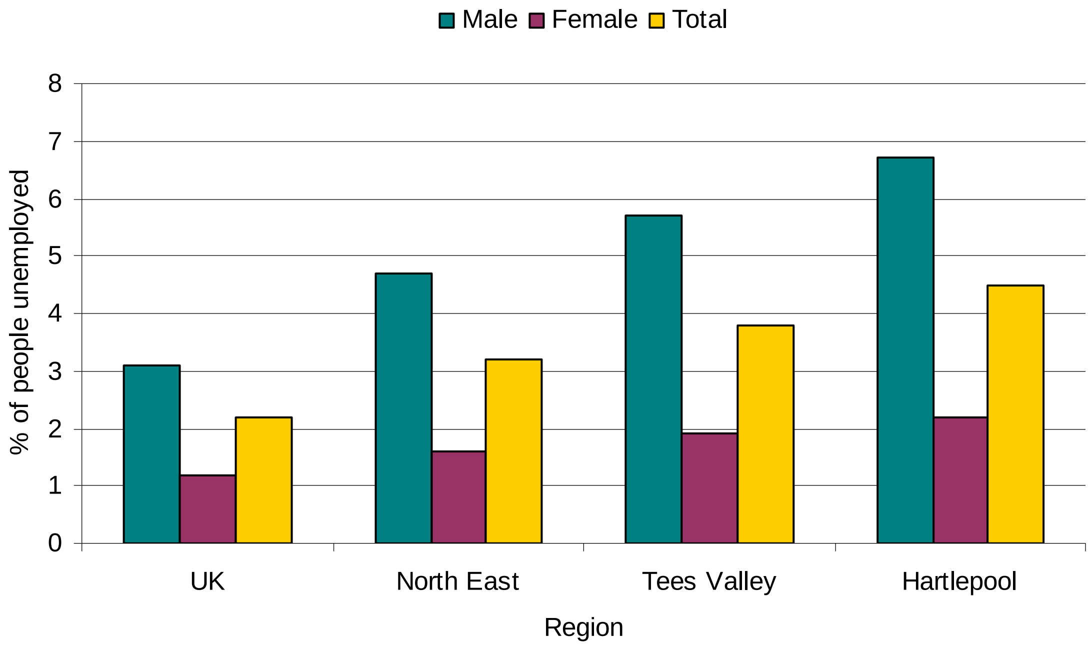
Figure 4 Qualifications of working age population – 2006 Annual Population Survey



Notes: NVQ4 and above – degree, higher degree, professional qualifications. NVQ3 – 2 or more A Levels. NVQ2 – 5 O levels, 1 A Level. NVQ1 – 1 O Level, 1 CSE/GCSE. Other – other or level unknown.

Unemployment rates have declined over the period of 1999 to 2008; however, Hartlepool has the highest percentage of unemployment, as shown in Figure 5. The percentage of males unemployed is particularly high (compared to the national and regional averages).

Figure 5 Unemployment Figures – March 2008



4.2 Household Economics

Gross Domestic Household Income (GDHI) represents the amount of money that households have available for consumption expenditure or saving. GDHI in Tees Valley in 2004 (the latest data available) was the lowest of any similar sized area in the country and that has been the case in the last decade. Also, there is evidence that the gap in GDHI per head between the Tees Valley and the national average has, in fact, widened in recent years. One of the reasons for the relatively low household income figures for the Tees Valley is the relatively high proportion of people dependent on income benefits.

Figures from the Tees Valley Joint Strategy Unit show that earnings of full-time employees in the Tees Valley were above the regional, average but below those nationally, see Table 7. Previous studies have shown a widening gap in earnings between Tees Valley and national averages principally due to reductions in employment in sectors such as chemicals and manufacturing, which traditionally pay higher salaries and the growth in some lower paid service sectors.

Table 7 **Weekly Earnings by Place of Work and Residence (Source: Tees Valley Joint Strategy Unit – Using 2008 ONS ASHE data)**

	Weekly Earnings by Place of Work 2008 (£ per week, FT)			Weekly Earnings by Place of Residence 2008 (£ per week, FT)		
	Males	Females	All	Males	Females	All
Darlington	483.5	348.4	438.7	481.5	346.1	415.3
Hartlepool	465.7	361.9	388.3	482.6	372.8	461.7
Middlesbrough	458.5	354.0	412.3	441.5	345.1	415.3
Redcar & Cleveland	519.8	n.a.	486.4	518.8	332.2	415.3
Stockton-on-Tees	499.2	338.8	426.3	518.4	378.0	456.1
Tees Valley	487.2	349.0	430.7	493.0	358.1	435.3
Durham	408.3	353.0	387.5	440.1	362.3	408.6
Northumberland	462.3	345.0	400.5	478.5	362.5	432.9
Tyne & Wear	466.5	388.8	433.3	456.2	364.6	421.5
North Yorkshire	491.6	369.4	440.8	507.4	377.7	454.7
North East	464.1	364.3	420.6	464.6	362.9	421.6
Great Britain	523.5	412.4	479.1	525.0	412.7	479.3

The gross weekly full-time earnings from 2000 to 2007 have increased by 31% in Hartlepool, by 26% in Tees Valley and 22% in the North East.

House prices (Table 8) in Tees Valley are now at such a level that they are almost outside the availability of many first time buyers. The average price of residential property sold in Tees Valley in March 2008 was approximately £130,000 below the average for the North East of £134,000. The average for England and Wales was £185,600. The Quarterly Economic Summary (February 2008) details that in the North East house price growth is slowing in conjunction with falling property sales.

Table 8 **Average House Prices March 2008 by Type of Property**

Region	Detached (£)	Semi-detached (£)	Terraced (£)	Maisonette/ Flat (£)	All (£)
England & Wales	278,900	173,700	144,800	172,700	184,800
North East	248,400	131,400	89,900	91,900	133,600
Hartlepool	225,000	117,300	54,500	85,900	109,400

4.3 Hartlepool Neighbourhood Profile

Many of the people who live in this sort of postcode will be older families living in prosperous suburbs. These are known as type 9 in the ACORN[65] classification and 2.11% of the UK's population live in this type. These are established suburbs, housing larger professional families, with some empty nesters and retired. Children tend to be older, including some home-based students. Homes are typically semi-detached and family incomes are high.

People are well educated, to A-Level or degree level. They usually have managerial and professional jobs.

Table 9 Certain Characteristics from 2001 Census

Characteristic	North East	Tees Valley	Hartlepool
% people with a health problem	22.7	21.8	24.4
% single parent households with child(ren)	7.4	8.1	8.7
% households with no car	35.9	34.2	39.3
% households owner-occupied	63.6	67.9	63.0
% social housing	27.7	23.4	26.7
% ethnic minorities (non-white population)	2.4	2.8	1.2

65 ACORN stands for 'A Classification Of Residential Neighbourhoods.' There are approximately 2 million postcodes in the U.K. (the average postcode being shared by around 14/15 addresses). The marketing-data firm CACI has produced this classification to include every street in England, Scotland and Wales, fitting them into 17 distinct groups, which, in turn, contain 56 'typical' ACORN neighbourhood categories. The basic idea is that streets of broadly similar people are grouped together.

5 Economic Modelling/Forecasting of Each Scenario

Based on the information for current employment levels a number of economic models for the scenarios under consideration have been investigated and are explained in this chapter.

British Energy is not releasing details of post-generation employment (level, numbers and skills). Therefore, in the absence of exact data on staff projections the information contained is based on best estimates[66]. Employment levels will be heavily biased towards engineers (up to 75% of the total employment figures will be professional staff. The categories used are unskilled (includes catering, cleaning and security staff), skilled (includes maintenance, administration and construction staff) and professional (includes managers, engineers and scientists).

5.1 Assessment Methodology

Information on staff numbers have been taken from a variety of sources and based on the information presented within Chapter 2 and 3 of this report. Orthodox economic impact assessment techniques have been applied to examine the direct employment associated with each of the six scenarios.

Table 10 summarises the direct employment that will be generated over each of the project life cycle stages. Current generation practices offer the highest level of direct, permanent employment whilst new build presents the most significant level of sub-contractor direct employment. The basic breakdown of staff for the different phases of the site's lifetime is given below.

Table 10 Breakdown of Staff Based on Site's Life Stage

Staff	Gener -ation	Defuel	Initial site clearance	Safe-store	New build	New build generation
TOTAL	**700**	**320**	**320**	**10**	**1000**	**630**
Permanent total	**500**	**0**	**0**	**0**	**0**	**441**
Permanent – Unskilled	20%	0%	0%	0%	0%	20%
Permanent – Skilled	20%	0%	0%	0%	0%	20%
Permanent - Professional	30%	0%	0%	0%	0%	30%
Contractors – total	**200**	**320**	**320**	**10**	**1000**	**189**
Contractors - Unskilled	10%	30%	30%	20%	20%	10%
Contractors – Skilled	10%	50%	50%	60%	60%	10%
Contractors - Professional	10%	20%	20%	20%	20%	10%

[66] The full (estimated) data breakdown with associated calculations and dedicated assumptions sheet has been submitted as a separate Excel sheet model. The information presented here is 'high level' please refer to the Excel sheet for more specifics.

The information presented in this table has been analysed to give a picture of employment for each of the scenarios. This has been based on yearly operation taking into account the potential changes that each will present (as given in Table 1 of this report).

The staff numbers show a decrease following cessation of generation. The reduced number of employees associated with new build generation as opposed to current situation is taking into account the possibility that more efficient reactors will be in place as highlighted in Section 2.3.3.

The new build element offers a significant opportunity in terms of skilled contractors and this life stage is likely to be associated with a level of short-term in-migration to the surrounding area. This can bring a level of economic upturn to the local area – but if managed incorrectly can lead to negative impacts in the medium to longer-term because of the risk of increased unemployment. This can occur if these workers decide to remain within the local area and there is insufficient alternative work for them once the construction phase has been completed.

A major consideration associated with the analysis is the loss of permanent British Energy employees following cessation of generation on site (this is an assumption as explained in more detail in Section 5.2). The loss of permanent employment to the area is likely to increase unemployment figures and place additional pressure on surrounding contractors to mobilise their workforce and have them available. Whilst it can be assumed that a significant number of British Energy staff will be able to be employed by associated contracting organisations there could be a potential time lag that may place additional strain on local government benefit schemes.

5.2 Uncertainties, Assumptions and Limitations

Following our investigations in relation to this project we have assumed that British Energy permanent employment will effectively cease on cessation of generation and subsequent defuelling. This is the worst case scenario, as detailed previously it may be possible that some staff can be maintained, but the level of uncertainty on exact numbers was inconclusive; therefore, the assumption has been made for the purposes of this report there will none.

When undertaking the study the following salaries were used as indicative of roles within the main skill sets that were assessed.

Table 11 Assumption: Salary Expectations

Job Type	Average yearly salary
Permanent – Unskilled	£20,000
Permanent – Skilled	£30,000
Permanent – Professional	£40,000
Sub-consultant – Unskilled	£25,000
Sub-consultant – Skilled	£40,000
Sub-consultant - Professional	£65,000

A breakdown of salary levels for the different activities was undertaken with the inclusion of a yearly inflation increase. The inflation rates included are as follows:

Table 12 Assumption: Inflation Rates

Job Type	Yearly Inflation Rate
Permanent – Unskilled	3%
Permanent – Skilled	3%
Permanent – Professional	5%
Sub-consultant – Unskilled	3%
Sub-consultant – Skilled	4%
Sub-consultant - Professional	5%

Inflation was considered but resulted in significant numbers when the complete life stages were investigated (running up to approximately 2113) it led to numbers that were so large they were in danger of becoming meaningless. For example, a permanent unskilled worker on £20,000 per year in 2113 taking 3% inflation into account would be paid over £400,000 per year. At numbers in such proportions it was felt unrealistic to include consideration of inflation in the calculations. Therefore, all figures are based on today's pay scales (as highlighted in Table 13).

We have assumed a minimum employment level associated with new build of 1000 contractors. This figure could increase up to 5000 but represents the minimum likely and is sufficient to demonstrate that the new build elements will require a significant influx of workers to the area; particularly, as the area is not particularly strong in the construction sector.

5.3 Assessment Results

The decommissioning of Hartlepool will generate substantial employment impacts, 500 employees represents approximately 1% of the working population of Hartlepool. The energy sector represents a small proportion of employment areas within the region. Therefore, there is likely to be limited absorption of skill sets within other higher proportion employment areas (such as service and sales). The areas of Hartlepool, Tees Valley and Hartlepool are above the national average in terms of unemployment. The end of current generation will therefore have significant implications.

Skilled trades are particularly high within the region so it is likely that construction projects would be able to be met by companies and individuals within the region and local employment would ideally by encouraged by any proposals by British Energy. However, it is likely to require a greater number of workers than the area would have available in the construction sector.

This section provides the basic breakdown of employment based on permanent and contractors associated with each scenario. The details of the scenarios have been covered comprehensively in previous chapters (and summarised in Table 1).

Scenario 1 (Figure 6) demonstrates baseline decommissioning with a loss of permanent employees from 2014 onwards. The most significant impact in terms of the local economy will occur around 2014 and 2026. It would be hoped that some of the contractors could be maintained through to 2026, following cessation of generation; this will represent approximately 50% of the total number of contractors required.

Figure 6 Scenario 1 – Employment Breakdown: Permanent and Contractors

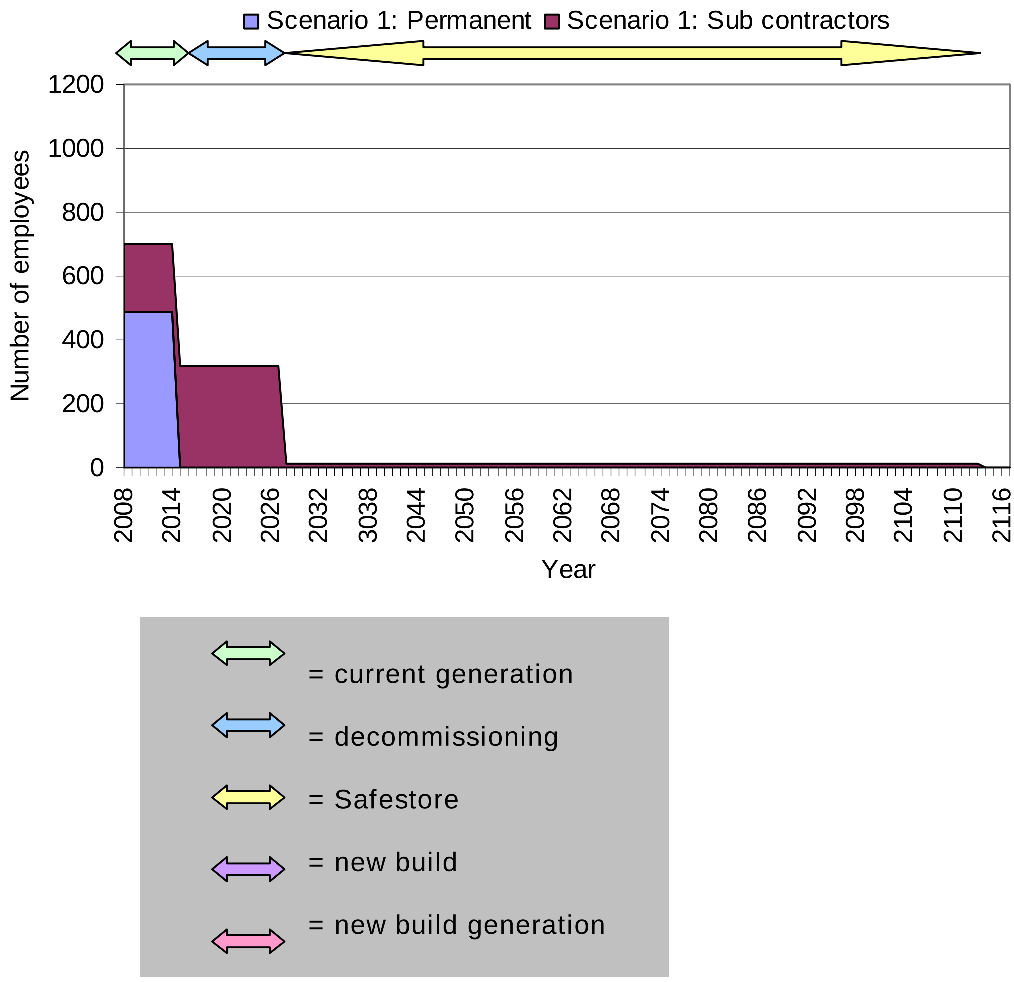


Figure 7 provides more detail on the exact breakdown of employment figures. In terms of cessation of operation the biggest losses in employment will be for permanent professional workers and there would be no opportunity for them for further work. This would be a particular concern as the local and regional picture shows a significant proportion of the population have higher qualifications and work in more professional roles. The most significant increases in employment from 2014 to 2026 will be in skilled contractors. Post 2026 there likelihood of further work for all employment types will be minimal.

Figure 7 Scenario 1 – Complete Employment Breakdown

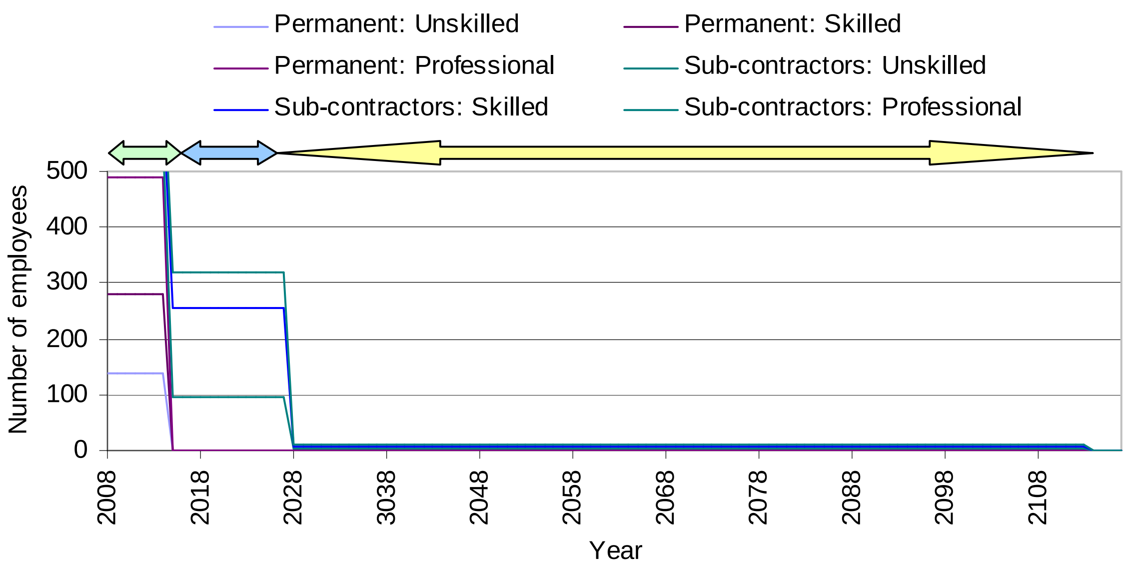
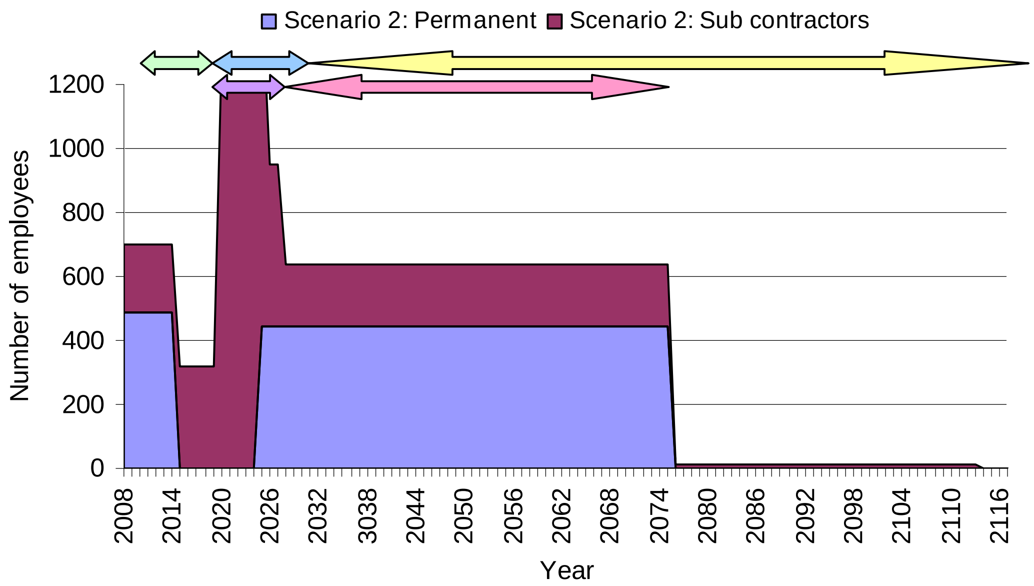


Figure 8 presents the information on employment breakdown for Scenario 2. This is assuming that new build will commence in 2020.

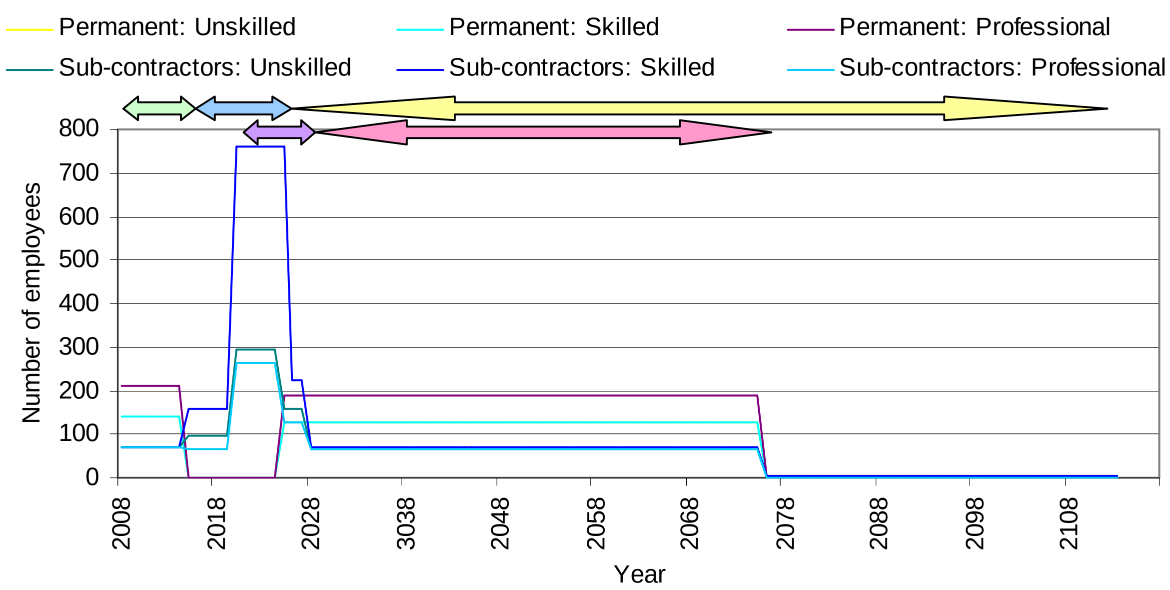
Figure 8 Scenario 2 – Employment Breakdown: Permanent and Contractors



Scenario 2 shows a significant loss of permanent employees from 2014 to 2026 with limited requirement for contractors from 2014 to 2020. The new build also provides a considerable increase in contractors required around 2026. This level of employment represents 2% of the total working population in Hartlepool and therefore as the figures are given as a minimum it is likely to require a significant level of additional workers to meet requirement. Figure 9 demonstrates the employment breakdown.

The graph demonstrates that the peak around 2026 is due to the requirement for additional skilled contractors. It would suggest that ideally this element of the potential project that is related to new build employment should be carefully managed by British Energy. It would be hoped that they could employ a team of skilled contractors that could travel around the UK to the sites associated with development. This would help minimise local issues from potential requirement for un-managed in-migration and associated socio-economic impacts that could result. If this approach was used this scenario demonstrates a good level of employment through to around 2076. It would be hoped that the transition period between cessation of generation and initiation of the new build generation could utilise the permanent employees within associated sub-consultant infrastructure.

Figure 9 Scenario 2 – Complete Employment Breakdown



Scenario 3 refers to a later new build proposal (commencing in 2030). Figure 10 shows the breakdown between permanent and sub-contractor staff. The most significant concern in regards to this scenario would be almost complete decline in employment around 2028 to 2030. This is just a representative of a particular 'scenario' and so the likelihood of this occurring would be minimal but it is worth ensuring that plans do not cause this complete decline in employment numbers. If it did, this would place significant impact on the socio-economic profile of the local and regional structures.

Figure 10 Scenario 3 – Employment Breakdown: Permanent and Contractors

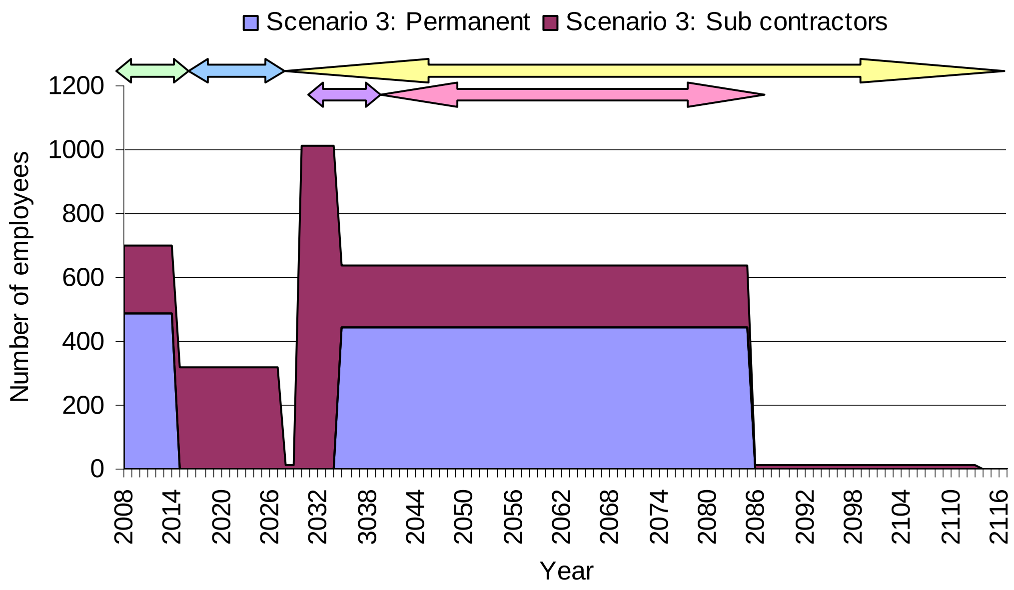
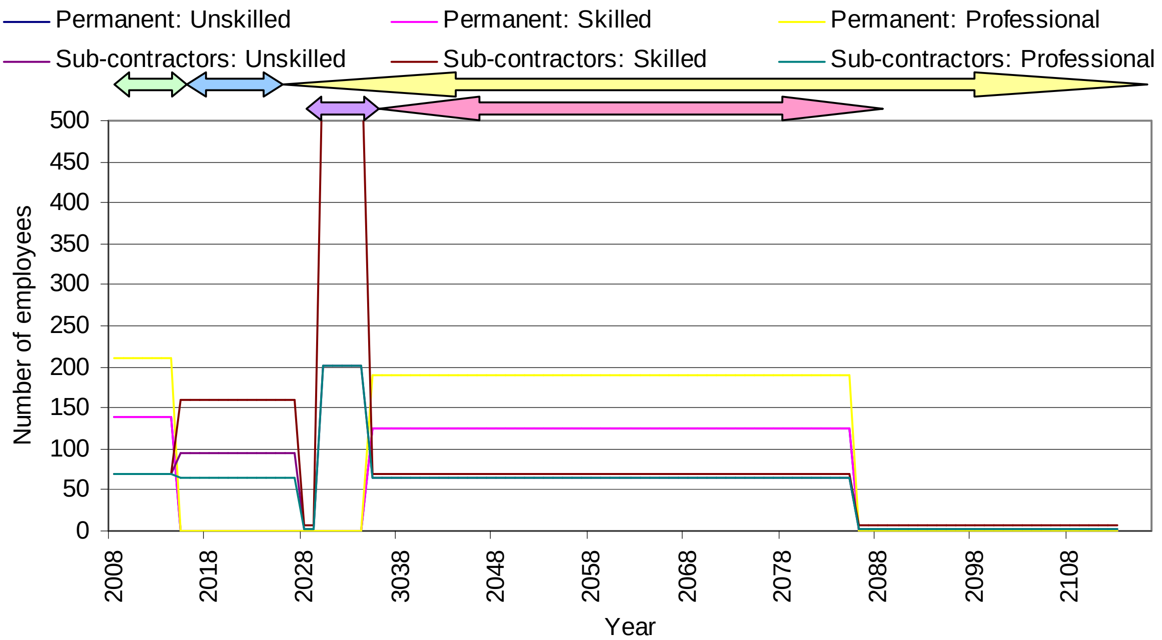


Figure 11 demonstrates the more detailed employment breakdown. Again, there appears to be a peak associated with the new build element of skilled contractors and it re-iterates the importance associated with British Energy maintaining a team of skilled contractors to work on new build nuclear projects throughout the UK to minimise the potential for socio-economic impact on local and regional context where new build is scheduled.

Figure 11 Scenario 3 – Complete Employment Breakdown



Scenario 4 is the baseline for the deferred decommissioning (scenarios 4, 5 and 6) that will occur 5-10 years after 2014. Figure 12 shows the employment breakdown for permanent and sub-contractor employment. It is similar to scenario 1 – but with a slightly longer period of generation.

Figure 12 Scenario 4 – Employment Breakdown: Permanent and Contractors

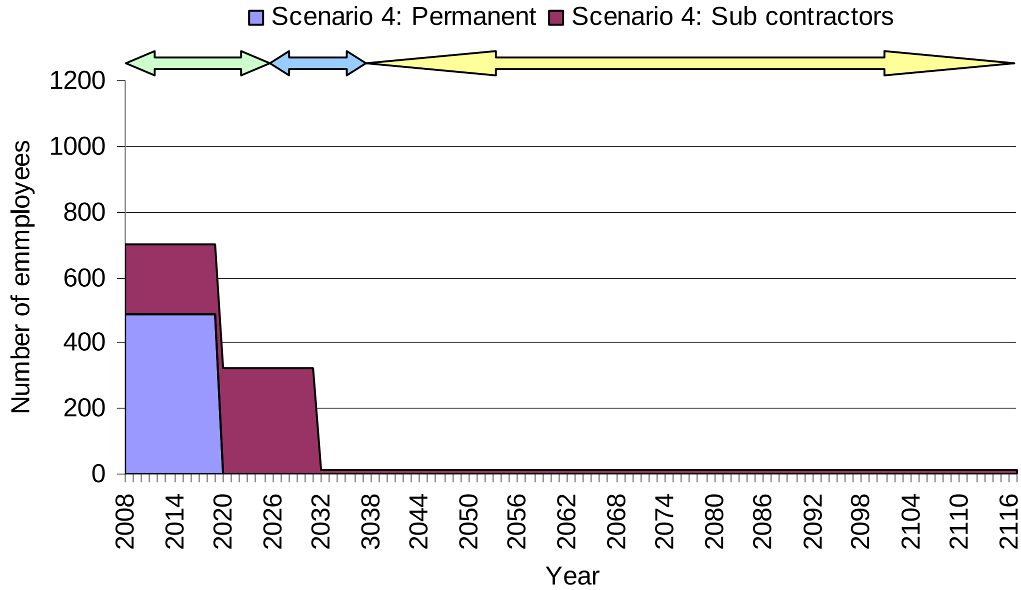


Figure 13 presents the detailed breakdown on employment. It would be hoped that the transition from permanent to contractors could again ensure a number of current permanent staff are utilised within sub-contractor organisations to enable continuity of knowledge and enable a smooth transition of employment levels through to approximately 2030.

Figure 13 Scenario 4 – Complete Employment Breakdown

Scenario 5 relates to new build commencing in 2020. Figure 14 shows the breakdown between permanent and sub-contractor staff. It demonstrates a good level of employment in terms of permanent and sub-contractor employment through to approximately 2074.

Figure 14 Scenario 5 – Employment Breakdown: Permanent and Contractors

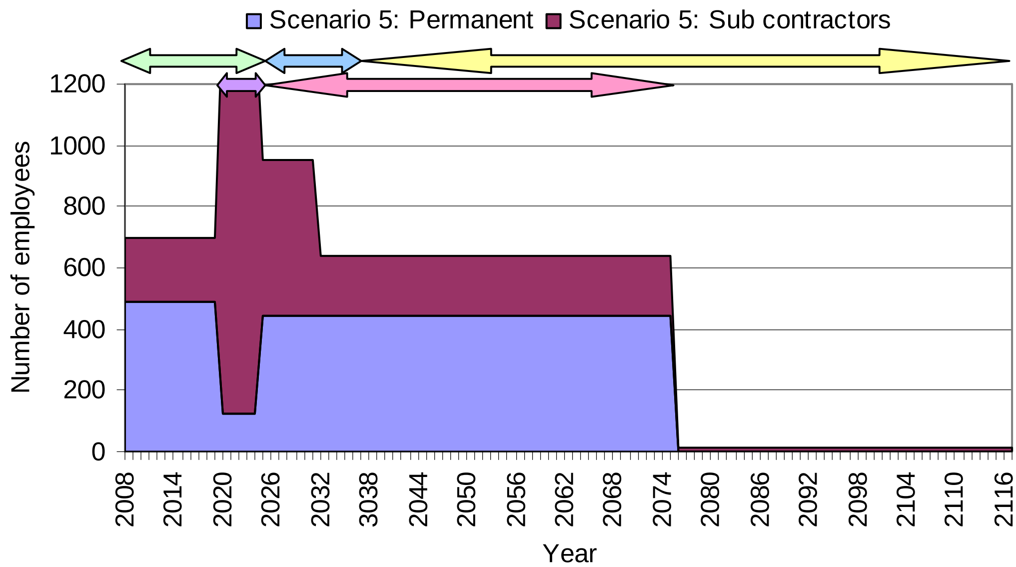


Figure 15 demonstrates the employment breakdown requirements. Again, there is a peak associated with new build elements in terms of skilled contractors as demonstrated in Scenarios 2 and 3 (and 6). Otherwise employment levels remain constant and in socio-economic terms would offer a good level of stability for the region.

Figure 15 Scenario 5 – Complete Employment Breakdown

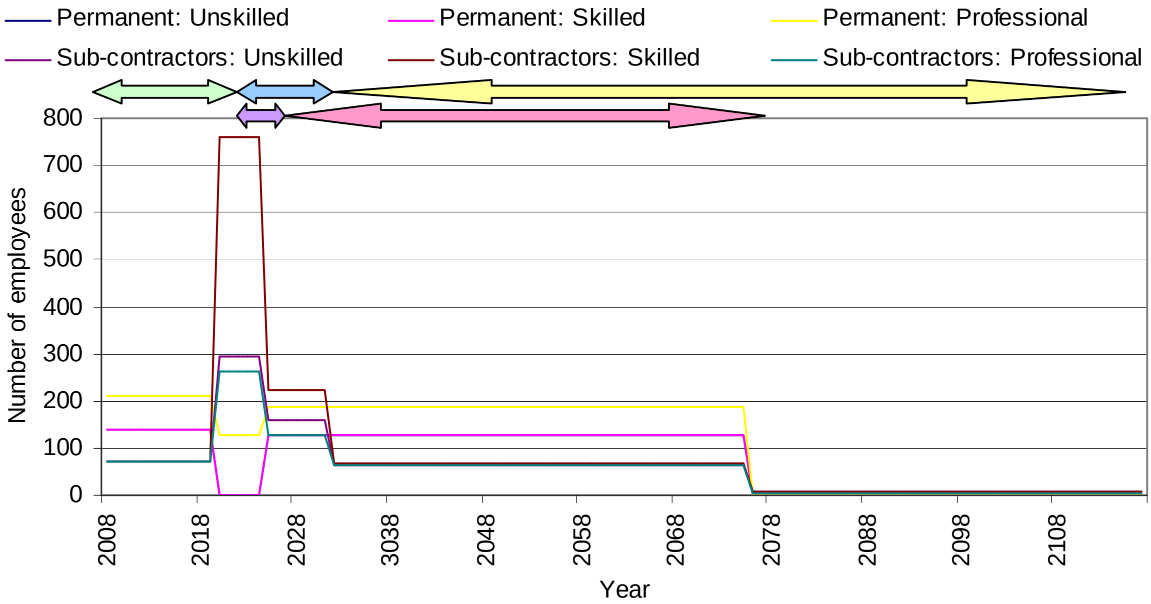


Figure 16 contains the employment split between permanent and contractors for scenario 6. The additional time for current generation has meant that the complete decline in employment seen in Scenario 3 is not present in this scenario, which means it offers a preferable position in socio-economic terms.

Figure 16 Scenario 6 – Employment Breakdown: Permanent and Contractors

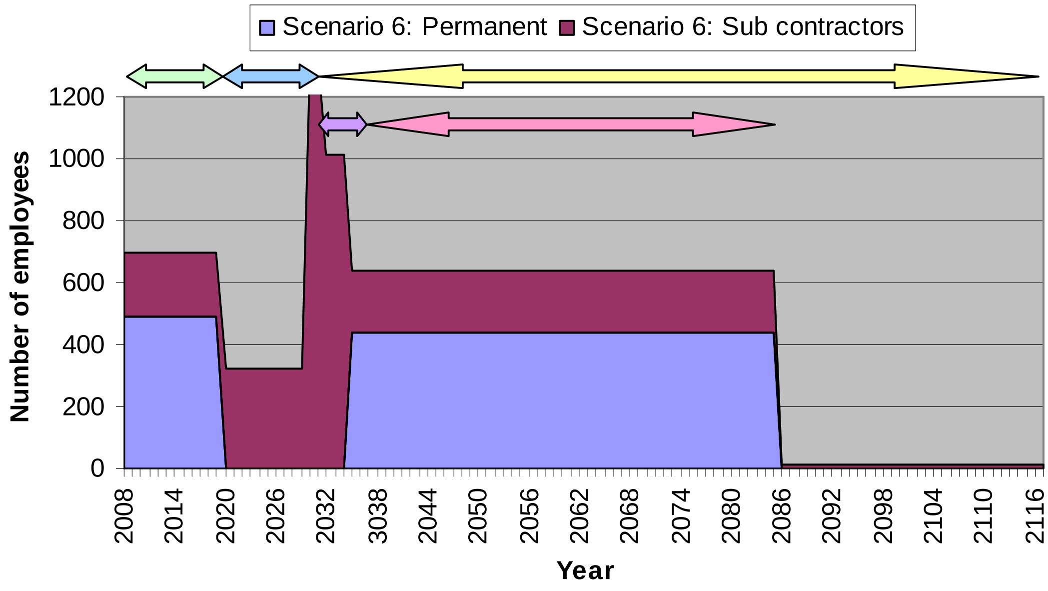
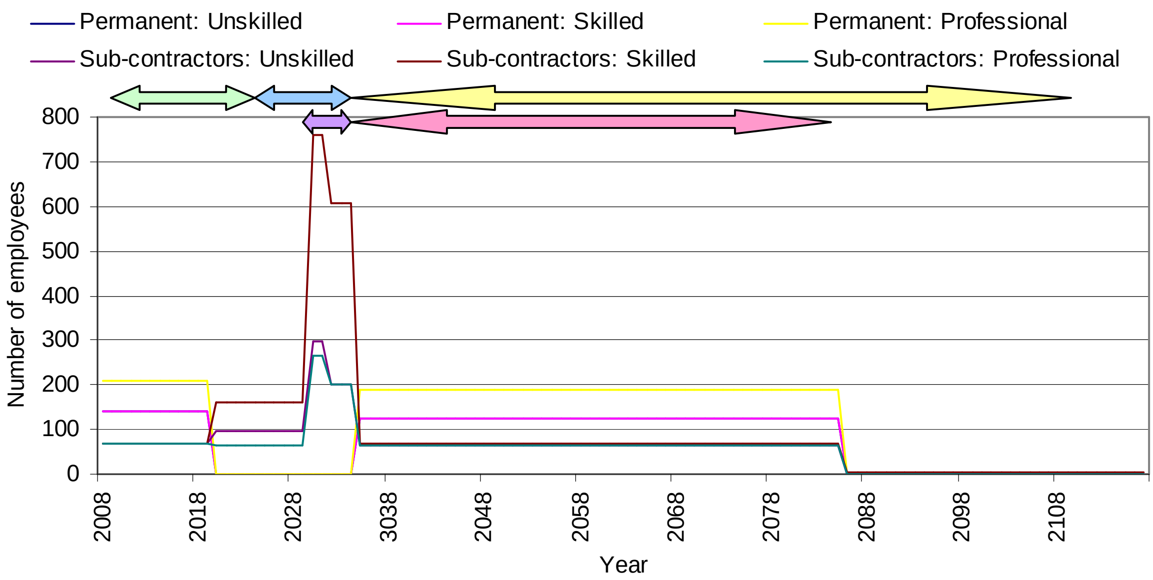


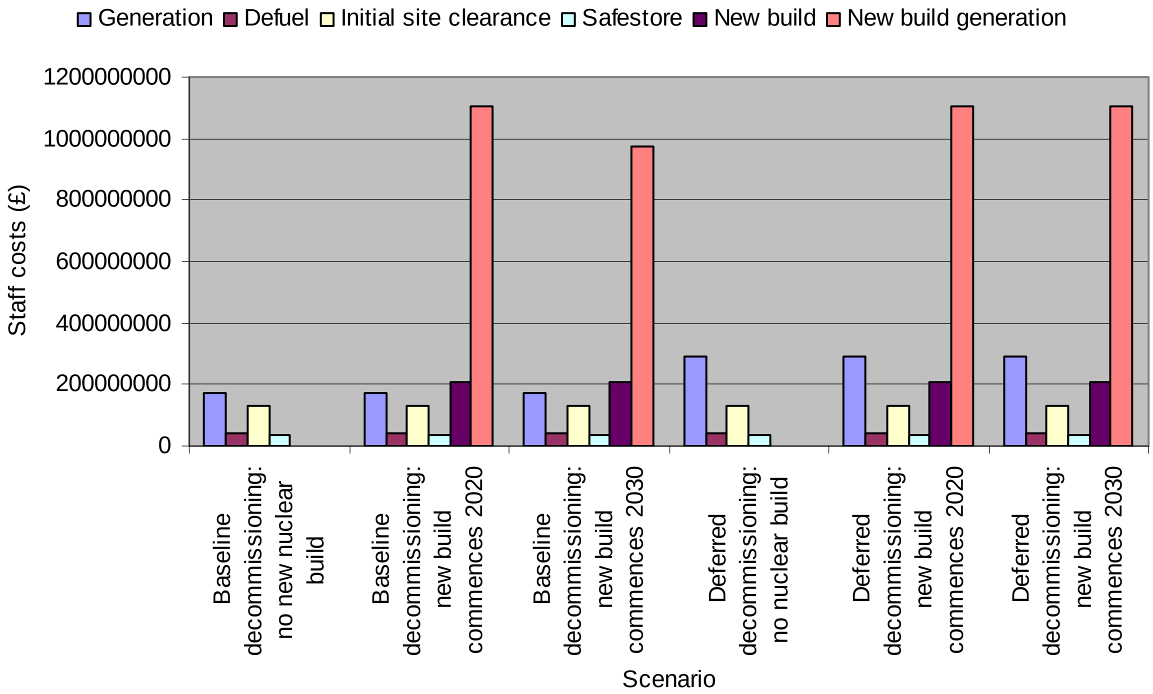
Figure 17 contains the detailed breakdown and highlights the peak in skilled contractors associated with new build of a plant as demonstrated in the previous scenarios. If British Energy have a skilled set of designated contractors involved in the new build element it is likely this would improve the company's efficiencies in terms of increasing experience as the programme for new build is rolled out across the country and utilising the same individuals. The use of a dedicated sub-contractor resource and not relying on local or regional employment should be clearly discussed with British Energy in any planning discussions for new build elements.

Figure 17 Scenario 6 – Complete Employment Breakdown



Each of the scenarios and their respective total direct employment costs has also been calculated and the breakdown is included in Figure 18. New build element offers a significant income to the local and regional economy in terms of staff costs. In economic terms the deferred decommissioning offers a good level of economic input to the region.

Figure 18 Staff Costs Associated with the Scenarios



5.4 Potential Land Released

One of the opportunities from decommissioning Hartlepool is that it will release land for alternative developments. While it is expected that the full site would not be available until approximately 2117 it will be possible to undertake partial development on some portions of the site before then. No industries are excluded from building on ex-Nuclear land. However, public acceptance is likely to be a critical factor and it is generally agreed that they are more likely to be supportive of heavy industry using a site of this type. In addition, it is worth noting that the land would not be released until final de-licensing (which will follow the Safestore period) so the land would not be available until around 2117. So whilst the site as a whole would be redeveloped for general use, it is likely that industrial/manufacturing use is more likely. Once the main operational buildings have gone from the site the remaining structures would include canteens, office buildings etc and any industry would be able to use them with engineering, fabrication, industrial related development being most likely. However, site clearance may include complete demolition of buildings currently on site.

It is also worth noting that there may be scope for a nuclear research facility to be located on the site. However, NNL (National Nuclear Laboratories) is currently being established in West Cumbria. There are also nuclear research institutes such as Dalton Research Institute that are also located in the North West of England (part of Manchester University). This means the likelihood of anything being used in Hartlepool would be minimal (taking into account that the land would not be released for this purpose until final de-licensing in 100+ years). Liaison with relevant organisations (such as those given) would help ensure any future requirements for research facilities include consideration of the Hartlepool site.

The site takes up approximately 24 hectares. On the basis that 50% (as a minimum) of the site would be available for use from 2024 (following initial site clearance). This will equate to 12 hectares and based on the assumption that the employment levels on site will equate to one FTE per 25 m^2 (based on an assumption that an industrial premises is likely to utilise the area) this would lead to employment creation of space for 400 potential employees per hectare or 4800 if 50% of the site was available. Once the entire site is available it could result in potential space for 9600 employees.

Having the land available for alternative uses would generate substantial levels of employment over the time horizon regardless of the scenario considered but the impact and availability is greatest with scenario 1 (followed by scenario 4). It is; however, very difficult to assess the likelihood of success for take-up of this land once it had been released to wider use. However, forecasting for the region suggests that the service and sales sector will increase and current employment areas demonstrate a significant level of employment in public administration areas. These types of office based sectors are less likely to want to utilise space that was previously used for nuclear operations.

6 Summary and Conclusions

Further new nuclear build is believed to be of public interest (in terms of economic considerations and enabling the UK to meet energy targets) and recent press reports have re-iterated the continuing nuclear role. Recessionary pressures on voters, including concerns over rising energy costs have been cited by Mike O-Brien, the energy minister, as a central reason for backing nuclear plants. In a speech in London he warns "…*without nuclear, the costs of generating the country's electricity could be up to 40 per cent higher. And higher costs could mean higher prices for consumers*." (November 2008).

Decommissioning cost estimates have not yet been assessed for the British Energy operated site at Hartlepool; therefore, information and analysis contained in this report is provided as indicative and draws from knowledge of the decommissioning strategies for the Magnox Nuclear Power Stations.

This study has investigated the socio-economic impacts associated with decommissioning and potential new build activities at Hartlepool nuclear power station under a number of potential scenarios relating to decommissioning and potential new nuclear build:

Scenario 1 - Baseline decommissioning with no nuclear build. Under this scenario, it is assumed that the Hartlepool site ceases power generation as currently planned in 2014. No new nuclear build at the site is envisaged.

Scenario 2 - Baseline decommissioning with early new nuclear build. Under this scenario, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences at the earliest opportunity conceived on the basis of currently available information and construction would therefore begin in 2020.

Scenario 3 - Baseline decommissioning with late new nuclear build. Under Scenario 3, baseline decommissioning occurs as with Scenario 1. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Under this scenario, construction would begin in 2029.

Scenario 4 - Deferred decommissioning with no nuclear build. This scenario assumes that an extension is granted for continued power generation at the Hartlepool site until 2024. No new nuclear build at the site is envisaged.

Scenario 5 - Deferred decommissioning with early new nuclear build. The decommissioning timeline is assumed to be consistent with that of Scenario 4 with concurrent decommissioning and new nuclear build. New build would begin in 2020.

Scenario 6 - Deferred decommissioning with late new nuclear build. The decommissioning timeline is consistent with that of Scenario 4. However it is assumed that new nuclear build commences following the release of land as a result of partial site delicensing of the current Hartlepool site. Construction is therefore assumed to begin in 2029.

If baseline decommissioning is used then scenario 3 (baseline decommissioning with late new nuclear build) highlights a potential significant impact if there is a considerable time lag between the cessation of current generation and initiation of new build.

New build elements will involve a substantial input of resources to the area in terms of contractors. For the purposes of this assessment, a worst case scenario has been assumed that following cessation of generation on site, there will be a total loss of permanent employees and all subsequent activities transferred to contractors. This is a worst case scenario and it may be possible that some staff would be maintained.

Analysis demonstrates that a significant time lag between cessation of generation to potential new build could have significant socio-economic impacts with a risk of complete employment decline for a period associated with the nuclear industry.

In addition, new build will require significant reliance on skilled contractors. It is unlikely that requirements for skilled contractors could be met by the local area (for the purposes of this investigation 1000 workers has been assumed, but this could easily be raised to 5000 depending on the proposed level of development activity). Therefore, if new build becomes a definite option for Hartlepool then it will be important that the skills base is developed.

Without new nuclear build, land (approx. 24 hectares) could be made available following initial decommissioning activities for other types of development; the total site area would not be available until final site clearance and delicensing (approx. 2117). However, public perceptions and siting issues are likely to limit the type of business activity that would locate to the released area of the site. So, whilst the site would be prepared for general use, it is more likely that industrial/manufacturing premises would be placed there – businesses with high void rates and low density of employment. Forecasting for the region suggests that the service and sales sector are particular growth areas and these are less likely to be placed on the land made available.

Whilst it is not possible to state categorically which scenario is the most likely it is possible to suggest a number of declarations (bearing in mind the assumptions listed in the report):

- Currently British Energy employ approximately 700 staff and contractors on site at Hartlepool. There is a total turnover of circa £225 million per annum and an annual salary bill of £30 million. Other materials, good and services are £19 million with rates payments of £7 million;

- Of those employed at the site, 45% are based in Hartlepool and a further 42% live in the Tees Valley area. The remaining staff are located within the County Durham/Tyne and Wear areas;

- Deferred decommissioning on the site is likely and will maintain significant economic benefit in terms of staff and associated spend to the locality;

- Approximate decommissioning costs for Hartlepool would be:

    - Defuelling - £125.5 million;

    - Plant dismantling and safestore construction - £350 million;

    - Surveillance, care and maintenance - £112.7 million;

    - Final site clearance - £549.4 million;

    - Total decommissioning - £1,137.5 million;

- Cessation of generation may cause significant impact in terms of loss of permanent employment, but a significant proportion of employees could become part of contractor organisations;

- The greatest loss in terms of employment upon cessation of generation is likely to be to permanent professionals;
- New build is likely to require an upfront construction cost of £1.5bn per site;
- Site selection criteria are unlikely to place Hartlepool among the lead sites for new build; but significant rises in public support may lead to an increase in favourability;
- Due to grid connection capacity, it is possible that a new north east nuclear power station would only be financially desirable once the existing Hartlepool site has ceased generation;
- The locality will have insufficient numbers of construction workers to meet the demands that new build will generate and a level of in-migration would be required; and,
- The civil construction package is such that only the largest construction companies will be in a position to resource new nuclear build.

Once analysed the scenarios considered in the study present the following key findings:

- Baseline decommissioning without new nuclear build offers the least amount of economic input to the locality;
- Baseline decommissioning with new nuclear build commencing in 2020 maintains a good level of employment with particular increases associated with new build activity;
- Baseline decommissioning with nuclear build commencing around 2030 causes concerns in offering the possibility for almost complete reduction in employment numbers for a period (around 2028 to 2030);
- Deferred decommissioning without new nuclear build presents a preferable level of economic input to baseline decommissioning;
- Deferred decommissioning with nuclear build commencing in 2020 maintains a good level of employment with a reduced risk of erratic peaks and troughs in the numbers of employees required.
- Deferred decommissioning with nuclear build commencing in 2030 maintains employment but does have peaks associated with new build that could lead to issues associated with in-migration.

Of the scenarios considered for the Hartlepool site, economic benefits to the region would be greatest if power generation were extended and this combined with new nuclear build.

Appendix 1: Summary of Key Facts

Local Economic Impact Scenarios Arising From Decommissioning and Potential New Build of Hartlepool Nuclear Power Station

Nuclear energy currently supplies about 20% of the UK's energy requirements;

- British Energy is the largest UK producer of electricity. They own and operate eight nuclear power stations, including Hartlepool. Their nuclear stations have a combined capacity of almost 9,000 megawatts; and
- The fund set aside for decommissioning the entire British Energy power station fleet is estimated to be currently worth £5.3bn.

Whilst in operation, Hartlepool power station currently:

- is capable of supplying electricity to 1.5 million households;
- employs 500 British Energy staff plus 200 full-time contractors;
- contributes an annual salary bill of around £30 million to the Hartlepool area;
- in addition to salaries, the site contributes £7 million per annum to the region through rates payments;
- has an annual spend of ca. £12 million on materials, goods and services (20% is on the local supply chain, 60% on the national supply chain and 20% on the international supply chain); and,
- employs workers with an average salary of approx. £35k per year (significant proportion, up to 75%, are professionals including scientists and managers).

The station is due to close in 2014 at which point electricity generation will cease and decommissioning preparations commence; but there is a good possibility of a lifetime extension up to 2024.

The decommissioning process would:

- cost approximately £1.1 billion in total;
- require approximately 320 staff for defuel and initial site clearance and Safestore will require approximately 20 staff members;
- be followed by a "Safestore" period for at least 85 years to enable radioactive decay prior to dismantling along with full and final site clearance (around 2100); and
- result in the land being available for other use in approximately 2117.

A new power station would:

- employ approximately 450 people over 70 years;

- during construction require up to 3,000 staff (minimum 1,500) over a 5 year construction period that could result in a wage bill of £75m per year;

- Government aspirations indicate construction commencing in 2013-2014 with the first reactors going online 5 to 6 years after this;

- British Energy have approximately £12.5 bn set aside for new build projects (likely to be 4 in total);

- The building and commissioning of a new nuclear reactor in the UK is estimated to fall within the range of £2.0bn to £3.6bn (inclusive of costs associated with construction, national grid connection, operation and the back-end costs of decommissioning); and

- Generate enough energy to power 1.5 million homes.

The next generation of power stations last 70 years so a new build would have a lifetime effect of:

- £75m wage bill per annum (£375m total) during construction and £20m wage bill per annum during operation (over the lifetime of plant this equates to approx. £1bn); and

- Maintain a supply chain spend of approximately £12m and continue rates payments of approximately £7m.

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