

A full-page background image with a warm, orange-yellow tint. It shows a construction worker in profile, wearing a hard hat and a safety vest, looking towards the left. In the background, a large crane arm is visible against a bright, hazy sky. The overall scene is industrial and focused on construction work.

**PART G**

Conclusions and  
Recommendations

# 10. Conclusions and Recommendations

## 10.1. Conclusions and Recommendations – UK and World Nuclear Decommissioning

The main conclusions and recommendations drawn from this study for UK and world decommissioning are:

- Nuclear decommissioning both within the UK and in global markets will become a major opportunity for the UK's energy supply chain.
- The commercial opportunity offered by a programme of work , (the responsibility of the NDA), is worth approximately £56 billion, with a stated annual expenditure of around £2 billion.
- Although not part of the civil nuclear programme AWE at Aldermaston undertakes legacy work through a Legacy Programme which extends over 70 years with a total cost of about £2.5 billion. It includes a 10 year programme with a £30M annual spend.
- The MOD has requested proposals from industry regarding the safe disposal of decommissioned nuclear powered submarines. Over the next 30 years up to 27 submarines will be taken out of service and decommissioned.
- The global reactor decommissioning opportunity outlined in this report is estimated to be worth around £300 billion over the next thirty years. Additional global nuclear industry support infrastructure and deterrent decommissioning and clean up activities could add £150 billion to this.
- It is likely that a long term waste store will be built in the UK in the foreseeable future. This together with its supporting infrastructure is likely to become significant worth several £Billion.

Nuclear decommissioning opportunities in the UK and globally provide hugely significant opportunities for the UK's energy companies, both for existing companies and committed new entrants to establish a major market share and deliver cost effective and innovative solutions. This is heightened when one considers the future worldwide demand for a number of potentially similar skills across the whole industrial arena in areas such as new nuclear power plant construction and non nuclear industries such as oil, gas, shipbuilding, conventional power plant, rail, aerospace, mining, defence, etc; some of which have some very large projects currently being formulated. All of these may provide further opportunities.

However, there are a number of key issues relating to the existing UK nuclear supply chain capability and capacity to exploit future global opportunities in nuclear or non nuclear decommissioning. Creating an open and competitive environment has opened up greater opportunities for companies at all tiers in the supply chain. The level of awareness in other industry sectors, especially by Small or Medium Enterprises (SME's) of potential supplier opportunities, understanding supply chain dynamics and scope for technology/skills transfer is mixed. There is generally lower awareness overall of the greater opportunities offered by the global nuclear decommissioning market, in terms of scale, timing and demand forecasts. This has implications on the UK's supply chain capability and capacity to exploit the global market place. Companies therefore need to be better informed in order to respond to future opportunities. This report has been produced to address all of these issues.

The key issues resulting from this report are presented in the table below from which recommendations are drawn and cross referenced to the relevant parts of the report from which the issues emanate.

**Table 10.1 – Nuclear Industry Findings and Recommendations for the UK**

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.1.1 (a),(b) & (c)	5.4 5.1	Supply chain capability	<p>For the UK, project management (high value ), nuclear design, facilities management, health physics services, safety case services and depository design are all areas where there is likely to be shortages and major development is needed. Development is also needed in the areas of contaminated coolant treatment.</p> <p>It is generally considered that project management skills for major projects are in high demand and this is an area where significant development could be required.</p> <p>Whilst there are a number of companies providing nuclear design services the number does not reflect the shortage of specialists involved such as knowledge of how radioactivity affects systems and what process design issues this raises. The shortage of radiochemistry professionals reported needs to be addressed.</p> <p>Safety case service providers are reporting difficulty in locating safety case authors with appropriate specialist experience. Hence whilst there are a number of companies providing the service they are all competing in a common pool of resource and this is an area in need of development.</p>	<p>(a) DTI, NDA, Sector Skills Councils and the nuclear industry prime companies and contractors should examine the capability shortages reported here and consider whether existing initiatives being implemented are catering for these needs and whether more can be done</p> <p>(b) The NDA and industry prime companies and contractors should consider where alternative resources that satisfy the capabilities in short supply and increasing demand can be obtained from.</p> <p>(c) Companies in other industries such as oil and gas should consider whether the capabilities in demand are areas that they could diversify into.</p>

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
			<p>The UK capability survey indicates a shortage of companies providing nuclear ventilation, asbestos removal, effluent treatment and utility fabric upgrading services. There also appears to be fewer companies providing Health Physics and nuclear decontamination services, contaminated coolant treatment, remote mechanical handling and ILW process design and packaging. These activities are in demand early in the decommissioning process and as a result development of the supply chain is required in these areas. A distinct shortage of radio chemists has been reported by those involved in servicing the industry and also Radiation Protection Advisors and Health Physics Monitors.</p> <p>It is likely that overseas companies will be needed to provide some or all of the services such as those reported above that are in demand and in short supply. There is also some opportunity for diversification from other UK industries.</p>	
10.1.2 (a) & (b)	5.3	Supply chain capacity	<p>Russia and the Ukraine have significant nuclear legacies that they do not have the resources to deal with alone and are receiving international funding and technological assistance. These countries have significant projects employing European, Japanese and North American companies involved in nuclear clean up and decommissioning work including the UK. These countries and some other FSU and Eastern European countries may provide the best opportunity for a Small or Medium Enterprise wishing to enter the overseas decommissioning market by partnering or alliancing with a UK or foreign company already having a presence in the market.</p>	<p>(a) Larger companies in the nuclear industry supply chain seeking global opportunities may consider Russia, Ukraine and other FSU and Eastern European countries which have legacies they do not have the resources to deal with alone and have significant externally funded projects being undertaken by international contractors.</p> <p>(b) SME's seeking to enter the global market should consider whether alliancing or partnering with a UK or foreign company already working there would provide the best opportunity for market entry.</p>
10.1.3 (a) & (b)	5.1 5.4	Supply chain capacity	<p>From the gap analysis it can be seen that for the UK, project management (high value ), nuclear design, facilities management, health physics services, safety case services and depository design are all areas where there are likely to be shortages and major development is needed. Development is also needed in the areas of contaminated coolant treatment. Areas requiring more resource and where demand is strong include: decontamination services; nuclear ventilation; effluent treatment; mechanical handling; remote mechanical handling and EC&amp;I</p> <p>This is likely to be made up from external sources either from overseas or by diversification from other UK industries.</p>	<p>(a) The NDA and industry prime companies and contractors should consider where alternative resources that satisfy the capabilities in short supply and increasing demand can be obtained from.</p> <p>(b) Companies in other industries such as oil and gas should consider whether the capabilities in demand are areas that they could diversify into.</p>

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.1.4	5.3	Supply chain capacity	<p>For all countries it is clear that the demand for the techniques, technology and skills required for decommissioning is set to increase greatly over the next 10 to 15 years and it is by no means clear that sufficient capability will exist in these areas of supply at the appropriate time.</p> <p>This is heightened when one considers the future worldwide demand for a number of potentially similar skills across the whole industrial arena in areas such as new nuclear power plant construction, nuclear waste repositories, defence, oil, gas, shipbuilding, conventional power plant, rail, aerospace, mining etc.</p>	Engineering techniques, technologies and skills required for decommissioning, many of which are required in major construction projects, already in demand and which is set to grow, will not be sufficient for the demands placed upon it. It is inevitable that resources will need to be obtained from external sources.
10.1.5	3.1	Supply chain awareness of global markets	<p>For any UK company, identifying the right global decommissioning markets to enter is very important since it can be a major determinant of success or failure and hence a systematic approach to selection of global markets has been used in this study to identify and prioritise the top ten global markets. From the results a market attractiveness/competitive strength matrix was produced. This was used to compile the top ten global markets in order of priority as follows:-</p> <ul style="list-style-type: none"> <li>UK</li> <li>USA</li> <li>France</li> <li>Germany</li> <li>Canada</li> <li>Japan</li> <li>Sweden</li> <li>Russia</li> <li>Spain</li> <li>Ukraine</li> </ul> <p>These markets represent the best choice for a UK company wishing to establish a presence in a country for the long term. Going international can be expensive, in terms of both money and management time and commitment, so a company needs to gain competitive advantage by going international. This top ten may not necessarily be the choice for all companies and the selection process used and described above in section 3 may be followed by any company wishing to establish a best choice according to its own criteria.</p>	Companies already in the global nuclear industry supply chain and those wishing to enter it should consider the information in Parts D and F of this report, the nuclear decommissioning market summaries, for each of the top ten identified markets. The process outlined in section 3 may be followed for other countries if a company wishes to adopt its own criteria.

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.1.6	4.2 4.3	Supply chain awareness of global markets	<p>Global and UK nuclear market entry strategies- Ten global target markets have been identified in the study and the question arises as to the best way to enter those markets. The reasons for exporting, major market entry modes and the criteria for selecting them are considered to allow companies in the UK decommissioning supply chain to select markets that are best for them, given for example that they vary in size and nature of product or service.</p> <p>Additionally a UK nuclear market entry strategy has been included which offers practical advice on how and where to gather information about the prospective markets and identifies some of its potential risks, as an input to the development of a business strategy.</p>	Companies already in the global nuclear industry supply chain and those wishing to enter it should consider the information in the report and use the process outlined to determine the global and UK market entry strategy that is most appropriate for them.
10.1.7	Figs 2.1,2.2 &2.3 Parts D and F	Supply chain awareness of global markets	<p>Demand forecasts - The information presented on global nuclear decommissioning markets shows that significant opportunities are fast developing associated with the decommissioning of civil nuclear power plants and their support facilities across the world. This together with global environmental clean up of sites associated with nuclear weapons manufacture, deterrents and defence mean a tremendous opportunity for the UK nuclear industry supply chain in global decommissioning is happening now and is set to grow over the next few decades.</p>	<p>Companies already in the global nuclear industry supply chain and those wishing to enter it should consider the forecast in global demand for significant opportunities in decommissioning civil nuclear power plants, their support facilities and environmental clean up of weapons and deterrent sites.</p> <p>DTI and the NDA should consider the implications of this for UK decommissioning.</p>
10.1.8	5.3	Supply chain awareness of global markets	<p>For all countries it is clear that the demand for the techniques, technology and skills required for decommissioning is set to increase greatly over the next 10 to 15 years and it is by no means clear that sufficient capability will exist in these areas of supply at the appropriate time.</p>	Companies already in the global nuclear industry supply chain and those wishing to enter it should consider the implications for themselves of increased demand for decommissioning techniques, technology and skills over the next 10 to 15 years. This could mean a potential resource shortage for some or diversification opportunity for others as an example.
10.1.9	5.3	Supply chain awareness of global markets	<p>In the USA a survey highlighted shortages of Health Physicists, nuclear engineers and radio chemists together with welders and an ageing workforce in the industry.</p>	Companies already in the global nuclear industry supply chain and those wishing to enter it and having the necessary specialist expertise should consider whether this niche in the USA can be exploited.
10.1.11 (a) & (b)	1.5. 4.3.	Supply chain awareness of other sectors	<p>Supply chain dynamics - The nuclear decommissioning supply chain is restructuring and the number of direct suppliers to the licensees is reducing. Suppliers at tier 3 &amp; 4 level will need to refocus on the likely prime contractors. The procurement systems of these companies is less well developed than the existing tier 1 licensees and the issue of SME's passing on information about their capabilities and the potential for gaining work via this route is an issue for further consideration by the industry prime contractors, the NDA and DTI .</p>	<p>(a) Nuclear industry suppliers at tier 3&amp; 4 levels should increasingly focus on the prime contractors at tier 2 level for contract opportunities.</p> <p>(b) DTI NDA and industry Prime Contractors should consider the supply chain procurement issues associated with the changing dynamics.</p>

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.1.12	6.1.1	Supply chain awareness of other sectors	<p>The analysis of potential for capability transfer in the nuclear decommissioning supply chain into other sectors of industry in the UK shows there is good potential.</p> <p>Other sectors include oil/gas offshore, ship breaking, MOD /defence, mining, fossil power generation plant refineries and other industrial plants, e.g., pharmaceuticals, district heating etc.</p> <p>Capabilities that could be transferred into these sectors include project management, asbestos removal, decontamination services (chemicals etc), general construction, conventional design, conventional demolition and mechanical. Companies already in the global nuclear industry supply chain and those wishing to enter it should consider the forecast in global demand for significant opportunities in decommissioning civil nuclear power plants, their support facilities and environmental clean up of weapons and deterrent sites.</p>	<p>(a) DTI and RDA's should note the potential for transfer of the capabilities listed into other industry sectors and consider how this may be best accomplished and led.</p> <p>(b) Existing nuclear industry suppliers should note the potential for transfer of the capabilities listed into other industry sectors and consider whether they wish to access these markets as part of their company marketing strategy.</p>
10.1.13	5.1	Supply chain awareness of other sectors	<p>The survey of UK supply chain capability indicates relative strength in project management for smaller projects and consulting services and this has implications for global resource diversification.</p>	<p>Existing nuclear industry suppliers and those wishing to enter it should note the relative strength in project management for smaller projects and consulting services and the potential for global nuclear or alternative UK market diversification.</p>
10.1.14	4.3.5.3	Supply chain awareness of other sectors	<p>DTI's report, "Nuclear and Radiological Skills Study" (December 2002) identified that (excluding any demand arising from new build) an estimated 50,000 recruits (60% of the current skilled population) would be required over the next 15 years. The report goes on to point out that the industry will require to recruit these skills against a backdrop of declining numbers of mathematics, engineering and physical science graduates, the fragile state of undergraduate education and the unpopular image of the industry as a career choice. In particular the report identifies the following 'hot spots' of skill shortage:</p> <ul style="list-style-type: none"> <li>■ Radiological protection - health physics</li> <li>■ Radiochemistry</li> <li>■ Regulation</li> <li>■ Safety case writing</li> <li>■ Criticality assessment</li> <li>■ Nuclear safety research</li> <li>■ Control and instrumentation</li> <li>■ Corporate capabilities (eg. design)</li> </ul> <p>There has been little feedback on progress with implementation of recommendations arising from the report of 2002.</p>	<p>This study finds that the shortage of skills noted by the study published in December 2002 still exists and the nuclear industry has had little feedback on progress with implementation of the recommendations from that report. This should be addressed by DTI.</p>

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.1.15 (a), (b)& (c)	4.3.5.3	Supply chain awareness of other sectors	<p>Another area of potential risk to the fulfilment of the NDA's objectives which constrains the ability of the supply chain to deliver is in the existing techniques and technologies and the availability of skills.</p> <p>In general, existing techniques and technologies are adequate for decommissioning projects although ways of improving them and their performance are being sought. Decommissioning operations are based on the use of a variety of techniques of which the most important are:-</p> <ul style="list-style-type: none"> <li>■ Radioactivity measuring techniques</li> <li>■ Decontamination techniques</li> <li>■ Cutting techniques</li> <li>■ Techniques for treating, preconditioning and conditioning wastes</li> <li>■ Remote control techniques</li> <li>■ Techniques for worker and environmental protection</li> </ul> <p>All of the above techniques are used in a variety of ways for a number of different purposes and can be broken down into very large number of methods and processes involving a variety of specialised tools and equipment. Account has to be taken of the secondary wastes being produced during some of the operations. Many techniques used in conventional industries can be used for work in a hostile environment on condition that they are adapted to suit the nuclear industry.</p>	<p>(a) Research into improving decommissioning techniques would lead to enhanced performance and potential significant economic gains. Additionally, many techniques used in non nuclear industries can be adapted to suit the nuclear industry.</p> <p>(b) A study on the techniques employed in nuclear decommissioning to understand how those available in non nuclear industries may be adapted to suit the nuclear industry.</p> <p>(c) The NDA and UK companies should consider those decommissioning techniques that could be enhanced/improved through research.</p>
10.1.16	General	Government / RDA awareness of global decommissioning impact	<p>How many jobs are likely to be created as a result of global decommissioning activities (a) in the UK and (b) globally? The jobs at UK decommissioning sites can be split into permanent site staff and contract staff employed at site required at each stage of decommissioning. The global picture will depend upon the known uptake by UK companies. This report does not provide a complete answer to these questions and there is a need for further research in this area to understand, monitor and address the impact on regional and national economies.</p>	<p>DTI and appropriate Regional Development Agencies should consider whether any further research into job creation is required as a result of UK and global decommissioning to understand the impact on regional and national economies.</p>
10.1.17	General	Government / RDA awareness	<p>What will be the impact upon unemployment and income in the UK and its regions as a result of decommissioning activities? There is a need for further research in this area to understand the impact on regional and national economies and allow any deterioration to be addressed.</p>	<p>DTI and appropriate Regional Development Agencies should consider whether any further research is required into unemployment and income in the UK and its regions as a result of decommissioning to understand the impact on regional and national economies and allow any deterioration to be addressed.</p>

## 10.2 Conclusions and Recommendations – UK Non Nuclear Decommissioning

The main conclusions and recommendations drawn from this study for UK non nuclear decommissioning markets are:

- Non-nuclear decommissioning in the UK offers new growth opportunities for the UK energy supply industries over the next 30 years and beyond.
- The UK has a relatively strong non-nuclear decommissioning supply industry, especially in general construction/dismantling, waste management/recycling, environmental services, site remediation, maintenance and monitoring. The main supplier capabilities that could be transferred to nuclear decommissioning are remote cutting/removal, remote control/handling, shielding and installation of appropriate ventilations, safe handling and waste management of hazardous wastes.
- The top three non-nuclear decommissioning markets that offer greatest potential are offshore installations, fossil power generation plant and MOD/defence facilities, jointly estimated to be worth £20 billion over the next thirty years.
- Green ship recycling, which is being driven by EU and IMO adopted legislation, offers potential opportunities to break up and recycle the world's fleet of over 36000 merchant vessels under an accelerated phase out scheme. However, there are currently no approved facilities in the UK although existing shipyards and oil rig construction yards could possibly be adapted. This would require major investment and there could be major planning issues and public concern.
- The UK non nuclear industry has capability strengths that fit with capability/capacity shortages in nuclear decommissioning. These include asbestos removal, effluent treatment, mechanical handling and remote handling/control. These offer potential product/market diversification opportunities for capability transfer into nuclear decommissioning.
- Other non-nuclear decommissioning markets include industrial plant, mining and refineries/petrochemicals, although there is limited scope for development or product/market diversification by the nuclear industry.
- However, as opportunities are usually driven by the same or similar international environmental legislation and drivers, there are potentially major opportunities for the UK supply chain in global markets.

Recommendations to address issues raised and develop attractive opportunities highlighted in UK non nuclear decommissioning markets are summarised in the following table.

**Table 10.2 – Non Nuclear Industry Findings and Recommendations for the UK**

Rec Ref	Report Ref	Finding Area	Finding	Recommendation
10.2.1	3.2.1 3.2.2 3.2.3	Supply chain awareness of UK markets	Limited information is available and there is low supply chain awareness of potential opportunities in attractive long term UK non nuclear decommissioning markets e.g. offshore, fossil fuel power and MOD defence.	(a) DTI and SE to increase industry awareness of potential opportunities through dissemination programmes e.g. industry alerts, briefings etc.
10.2.2	6.2.2	Supply chain awareness	The UK non nuclear decommissioning industry has capability strengths where there are supply chain gaps in the UK nuclear decommissioning industry e.g. asbestos removal, effluent treatment, mechanical and remote handling/control. This offers potential opportunities for technology/skills transfer and product/market diversification, although there are capability/capacity issues.	(a) DTI, NDA and SE to increase industry awareness of potential opportunities for technology/skills transfer and product/market diversification through stakeholder consultation.
10.2.3	3.2.4	Supply chain capability	No approved green ship recycling facilities exist in the UK to meet the demand for accelerated phasing out single hull tanker, and the UK has 9% of the EU tanker fleet, although there are potential facilities that could be adapted. However, there are potential investment, planning and public concern issues relating to future development of a facility in the UK.	DTI to assess the feasibility of the need for and development of green ship recycling facilities in the UK.
10.2.4	3.2.1 3.2.2	Supply chain development	Decommissioning offshore and fossil fuel power plants will also have to take place in countries around the world. This provides opportunities for UK non nuclear and nuclear decommissioning supply industries. However, limited information is available on the scale and timing of decommissioning programmes.	UKTI to sponsor export market studies to identify opportunities and development options for UK industry.

## 10.3 Conclusions and Recommendations for Scotland

Nuclear decommissioning both within the UK and in global markets will become a major opportunity for Scotland's energy supply chain.

The commercial opportunity offered by a programme of work (the responsibility of the NDA), is worth approximately £56 billion, with a stated annual expenditure of around £2 billion.

A recent NIA study has estimated the potential NDA spend with the supply chain by site in **Scotland** during 2005/06 to be as follows:-

Site	Total by site £M	External spend £M
Hunterston A	56.1	34.8
Chapelcross	67.3	41.7
Dounreay	149.7	104.8
<b>Totals</b>	<b>273.1</b>	<b>181.3</b>

Although not part of the civil nuclear programme, AWE at Aldermaston undertakes legacy work through a Legacy Programme which extends over 70 years with a total cost of about £2.5 billion. It includes a 10 year programme with a £30 million annual spend.

The global decommissioning opportunity outlined in this report is estimated to be worth around £300 billion over the next forty years. Full details are available in this report.

The MOD has requested proposals from industry regarding the safe disposal of decommissioned nuclear powered submarines. Over the next 30 years up to 27 submarines will be taken out of service and decommissioned.

The global reactor decommissioning opportunity outlined in this report is estimated to be worth around £300 billion over the next thirty years with a further £150 billion for global nuclear industry support infrastructure and deterrent decommissioning and clean up work.

It is likely that a long term waste store will be built in the UK in the foreseeable future. This together with its supporting infrastructure is likely to become a significant worth several £Billion.

These nuclear decommissioning opportunities in the UK and globally provide hugely significant opportunities for the UK's energy companies, both for existing companies and committed new entrants to establish a major market share and deliver cost effective and innovative solutions.

This is heightened when one considers the future worldwide demand for a number of potentially similar skills across the whole industrial arena in areas such as new nuclear power plant construction and non nuclear industries such as oil, gas, shipbuilding, conventional power plant, rail, aerospace, mining, defence, etc some of which have some very large projects currently being formulated. All of these may provide further opportunities.

These nuclear decommissioning opportunities in Scotland, the UK and globally provide hugely significant opportunities for Scotland’s energy companies to establish a major market share and deliver cost effective and innovative solutions. It is necessary for Scotland to capitalise on these opportunities to utilise them to full advantage and the question is how best to do this?

All of the information in the findings and recommendations in table 10.1 above for the UK pertaining to supply chain capability, capacity, awareness of global markets and other sectors apply to Scotland and only those that are considered to be especially pertinent to Scotland in establishing a nuclear strategy are included in the table of recommendations below. The information in Table 10.1 should be considered by Scottish companies together with the additional findings and recommendations in table 10.2 below.

**Table 10.3 – Nuclear Industry Issues and Recommendations for Scotland**

Rec Ref	Report Ref	Issue Area	Issue	Recommendation
10.3.1	Part H	Supply chain capability	The current decommissioning resource in Scotland, the companies and their supply capability are made known to a certain extent in this report. However, there is an additional resource in Scotland that has yet to be tapped and it is this resource and its capability that needs to be identified.	Scottish Enterprise, HIE, their LEC’s and SDI should ascertain who those Scottish companies are that have already entered and are interested in entering the Scottish, UK and global decommissioning supply chain and their capabilities.
10.3.2	Part H	Supply chain awareness of other sectors	For nuclear decommissioning the right business environment has been created by the advent of the NDA to attract companies and industries to Scotland. It has not been made clear which companies /organisations wish to set up businesses in Scotland and where, to take advantage of the opportunities. What more can and needs to be done to enhance the business environment, e.g., communications infrastructures or research? There is need for further research to answer these questions.	Scottish Enterprise, HIE, their LEC’s and SDI should ascertain which companies and organisations may wish to set up business in Scotland and where, now that the NDA have created the appropriate environment for decommissioning service providers. Also, what needs to be done to enhance the business environment in terms of communications or research facilities?
10.3.3	Part H 4.3.5.3	Supply chain awareness of other sectors	Are the correct skills for decommissioning available in Scotland, where they are needed and which companies want them?	Scottish Enterprise, HIE, their LEC’s and SDI should map out the prime companies and contractors working at Scottish decommissioning sites, ascertain the skill shortage areas and the company requirements.

Rec Ref	Report Ref	Issue Area	Issue	Recommendation
10.3.4	Part H	Supply chain awareness of other sectors	There is likely to be much competition from companies and organisations elsewhere in the UK and overseas not only for decommissioning contracts but also from other regions wishing to develop their own infrastructure. How should Scottish companies and organisations counter these potential threats?	Scottish Enterprise, HIE, their LEC's and SDI should establish a strategy for countering such potential threats with recognition of other requirements for mutual benefit to all organisations.
10.3.5	3.1 4.2.1 5.3	Supply chain awareness of global markets	Having considered the market opportunities Scotland and its regions can exploit, which opportunities have the most potential for Scottish companies? This is dependant upon company internal and external factors described in the main body of this report and the guidance provided on market selection should be followed by Scottish companies and organisations interested in entering the global nuclear market. However, the majority of Scottish companies wishing to enter the decommissioning supply chain are likely to be tier 3 and 4 suppliers and global markets may not be the initial best choice. Going international can be expensive, in terms of both money and management time and commitment so a company needs to gain competitive advantage by going international. Some of the FSU and Eastern European countries may provide the best opportunity for a Small or Medium Enterprise wishing to enter the overseas decommissioning market by partnering or alliancing with a UK or foreign company already having a presence in the market there.	(a) Larger Scottish companies in the nuclear industry supply chain seeking global opportunities may consider Russia, Ukraine and other FSU and Eastern European countries which have legacies they do not have the resources to deal with alone and have significant externally funded projects being undertaken by international contractors.  (b) Small Scottish companies seeking to enter the global market should consider whether alliancing or partnering with a UK or foreign company already working there would provide the best opportunity for market entry.
10.3.6	4.3.5.3	Supply chain awareness of other sectors	What are the skills required for decommissioning and what needs to be done for Scottish suppliers to improve the decommissioning skill base? The skills required for Scottish companies will be the same as those companies already working in the nuclear industry and which are identified in the main body of this report which also points to those skills that are in short supply.	Initiatives for enhancing decommissioning skills are already taking place in Scotland. However, Scottish decommissioning skill needs remain to be identified in some areas and where this has not already happened, Scottish Enterprise, HIE and the LEC's together with SDI and the prime companies and contractors concerned should consult on this.
10.3.7	6.1.1	Supply chain awareness of other sectors	It is also necessary to understand what opportunities exist for diversification of companies working in other industries in Scotland into nuclear decommissioning, such as North Sea Oil& Gas and overseas and how best to exploit this opportunity. This report provides some answers to this question in a number of areas. However, this is particularly relevant to the North Sea oil/gas and Scottish situation and whilst identification is one factor it begs the question as to how it should be implemented and led.	(a) DTI and Scottish Enterprise, HIE, their LEC's and SDI should note the potential for transfer of the capabilities listed into other industry sectors and consider how this may be best accomplished and led.

Rec Ref	Report Ref	Issue Area	Issue	Recommendation
10.3.8	General	RDA awareness of global decommissioning impact	How many jobs are likely to be created as a result of global decommissioning activities in Scotland (a) in Scotland (b) globally? The jobs at Scottish decommissioning sites can be split into permanent site staff and contract staff employed at site required at each stage of decommissioning. The global picture will depend upon the known uptake by UK companies. There is a need for further research in this area to understand, monitor and address the impact on regional and national economies.	Scottish Enterprise and HIE in conjunction with their LEC's should consider whether any further research into job creation is required as a result of Scottish and global decommissioning to understand the impact on regional and Scottish economies.
10.3.9	General	RDA awareness of global decommissioning impact	What will be the impact upon unemployment and income in Scotland and its regions as a result of decommissioning activities? There is a need for further research in this area to understand the impact on Scottish regional and national economies and allow any deterioration to be addressed.	Scottish Enterprise and HIE in conjunction with their LEC's should consider whether any further research is required into unemployment and income in Scotland and its regions as a result of decommissioning, to understand the impact on Scottish regional and national economies and allow any deterioration to be addressed.
10.3.10 (a) & (b)	4.3.5.3	Supply chain awareness of other sectors	<p>DTI's report, "Nuclear and Radiological Skills Study" (December 2002) identified that (excluding any demand arising from new build) an estimated 50,000 recruits (60% of the current skilled population) would be required over the next 15 years. The report goes on to point out that the industry will require to recruit these skills against a backdrop of declining numbers of mathematics, engineering and physical science graduates, the fragile state of undergraduate education and the unpopular image of the industry as a career choice. In particular the report identifies the following 'hot spots' of skill shortage:</p> <ul style="list-style-type: none"> <li>■ Radiological protection – health physics</li> <li>■ Radiochemistry</li> <li>■ Regulation</li> <li>■ Safety case writing</li> <li>■ Criticality assessment</li> <li>■ Nuclear safety research</li> <li>■ Control and instrumentation</li> <li>■ Corporate capabilities (eg. design)</li> </ul> <p>There has been little feedback on progress with implementation of recommendations arising from the report of 2002.</p>	<p>(a) This study finds that the shortage of skills noted by the study published in December 2002 still exists and the nuclear industry has had little feedback on progress with implementation of the recommendations from that report. This should be addressed by DTI.</p> <p>(b) Scottish Enterprise, HIE, their LEC's and SDI should consider these skill shortages when formulating their nuclear strategy.</p>

Rec Ref	Report Ref	Issue Area	Issue	Recommendation
10.3.11 (a), (b)& (c)	4.3.5.3	Supply chain awareness of other sectors	<p>Another area of potential risk to the fulfilment of the NDA's objectives which constrains the ability of the supply chain to deliver is in the existing techniques and technologies and the availability of skills.</p> <p>In general, existing techniques and technologies are adequate for decommissioning projects although ways of improving them and their performance are being sought. Decommissioning operations are based on the use of a variety of techniques of which the most important are:-</p> <ul style="list-style-type: none"> <li>■ Radioactivity measuring techniques</li> <li>■ Decontamination techniques</li> <li>■ Cutting techniques</li> <li>■ Techniques for treating, preconditioning and conditioning wastes</li> <li>■ Remote control techniques</li> <li>■ Techniques for worker and environmental protection</li> </ul> <p>All of the above techniques are used in a variety of ways for a number of different purposes and can be broken down into a very large number of methods and processes involving a variety of specialised tools and equipment. Account has to be taken of the secondary wastes being produced during some of the operations. Many techniques used in conventional industries can be used for work in a hostile environment on condition that they are adapted to suit the nuclear industry.</p>	<p>(a) DTI , NDA, Scottish Enterprise, HIE and their LEC's and SDI together with UK nuclear industry companies and suppliers should note that research into improving decommissioning techniques would lead to enhanced performance and potential significant economic gains. Additionally, many techniques used in non nuclear industries can be adapted to suit the nuclear industry.</p> <p>(b) A study should be conducted into the techniques employed in nuclear decommissioning to understand how those available in non nuclear industries may be adapted to suit the nuclear industry should be carried out.</p> <p>(c) The NDA, Scottish Enterprise, its LEC's and SDI and UK Companies should consider those decommissioning techniques that could be enhanced/improved through research.</p>
10.3.12	General	RDA Awareness	What needs to be done to address the above questions further?	<p>Scottish Enterprise, HIE and their LEC's together with SDI should consider the following course of action:-</p> <ul style="list-style-type: none"> <li>■ Formulate a nuclear strategy/plan</li> <li>■ Identify and prioritise the opportunities</li> <li>■ Identify what needs to be done to implement them</li> <li>■ Identify how are they to be led and funded</li> </ul> <p>An underlying infrastructure to support a nuclear decommissioning strategy for Scotland will need to be created which should comprise representatives from all stakeholders and customers, businesses and local communities.</p> <p>NB: The potential for new nuclear build in the UK should not be forgotten in developing a nuclear industry strategy.</p>