CUMBRIA ECONOMIC STRATEGY
2008 - 2028

ENERGY & ENVIRONMENTAL TECHNOLOGIES

STRATEGY ACTION PLAN NO. 1

Purpose

The purpose of this Strategy Action Plan is to bridge the gap between the strategy as outlined in the Economic Plan and the delivery of the actions which will be outlined in the next Sub-regional Action Plan (due for release in December 2008). Each document accordingly takes a long term view when seeking to provide clarity and strategic prioritisation to an otherwise 'wish-list' of projects and programmes.

It should be noted that these Strategy Action Plans are progressive documents which look up to 20 years ahead; but which nonetheless focus on providing, where possible and evidenced, hard targets and economic impact over the next 10 years. The Strategy Action Plans thus begin to describe a future Cumbria and show, through aspiration, what the spatial impact of the Economic Plan could be across the 4 distinct delivery areas in the county; Barrow, Carlisle, West Coast, South Lakes & Eden

Whilst these Strategy Action Plans acknowledge existing Cumbrian strategies, they try to reflect the impacts of an aspirational level of future economic growth. Each document is therefore deliberately challenging and ambitious, yet remains non-prescriptive in nature.

The plans attempt to identify the impacts and inter-relation between other closely linked priority industry sectors and assess the cumulative effects on cross-cutting themes highlighting, for example, how the spatial patterns of growth may necessitate the provision of appropriate housing, connectivity, employment land etc., and thereby examining whether current strategies could meet requirements in terms of employment, skills, infrastructure and the like, if we were to grow in accordance with our aspirations.

A significant amount of debate has already taken place to get to this point and we now open up the floor for full public discussion of the themes and actions highlighted by each Strategy Action Plan.

Whilst all comments are welcome, we would appreciate, in particular, comments which will aid in the prioritisation of the key actions. For example: What do you think would or would not work? Where should we be focusing most of our attention? What key actions would achieve the greatest results or which would bring little benefit?

Vision

"Cumbria will be the UK's leading county for the development and deployment of low-carbon technology, and become a net exporter of nuclear & renewable energy. Through positive exploitation of its natural assets creating jobs and wealth for the county, it will be internationally recognised as an exemplar of sustainable production and consumption."

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STRATEGY ACTION PLAN NO. 1

2. 0 EXECUTIVE SUMMARY

2.1 THE VISION – Where we are going

"Cumbria will be the UK's leading county for the development and deployment of low-carbon technology, and become a net exporter of nuclear & renewable energy. Through positive exploitation of its natural assets creating jobs and wealth for the county, it will be internationally recognised as an exemplar of sustainable production and consumption."

2.2 THE CURRENT SITUATION

Across the County, it is estimated that 19,000 people are employed in this sectors providing over £2bn in output and £1.2bn Gross Value Added (GVA) contribution. 160 firms identified, 28 nuclear.

Barrow has world class technology clusters, particularly in sub-sea associated technology, with both design and manufacturing capability. Barrow has significant (and growing) off shore wind capacity, gas production, distribution, storage and power generation, and contains nuclear reactor build knowledge through BAE Systems (looking to diversify)

West Cumbria has significant nuclear capability with Sellafield and associated sites from research & development, (R&D), through to decommissioning and storage. Home to the Nuclear Decommissioning Authority, National Skills Academy Nuclear and the 'Energus' Academy, it is well setup with supply chain links to create sector clusters and is looking to diversify reliance solely on Sellafield for high value jobs.

Carlisle is the headquarters of the University of Cumbria and has strong links throughout the county for R&D and Knowledge Transfer Partnerships in Energy & Environmental Technologies. There is a National Grid connection just north of the city, and big employment/housing expansion plans.

Eden & South Lakeland areas are seen as largely rural with inter-reliance on agribusiness, tourism and retail with key service centres providing employment opportunities. Dig deeper, and we find a photonics cluster together with a plethora of micro and macro generation installation and service companies including wind, sun and hydro. It also contains significant capacity for under-managed woodland to fuel Combined Heat & Power (CHP) boilers in domestic and business premises and for community led schemes.

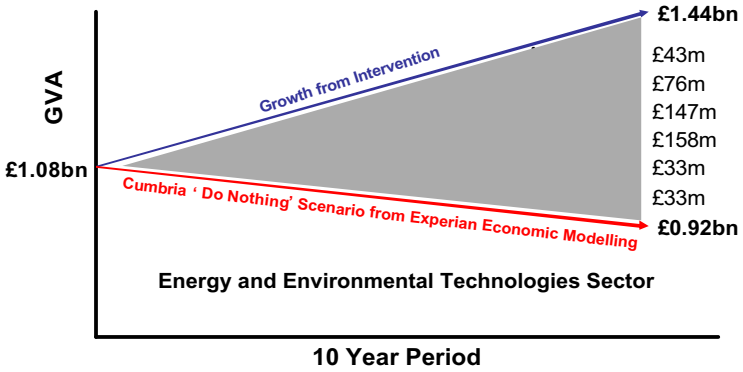
2.3 THE KEY ACTIONS

Biomass/Biogas: develop the supply chain and utilise waste to energy appropriate to area.
Energy Efficiency: develop local supply chain from advice to installation & service.
'Green' Tourism Capital: advice & assistance to tourist firms and promote destination.
Nuclear: new build with grid connection, skills development and attract inward investment.
Britain's Energy Coast™: fully develop energy projects to diversify local economy.
Micro-generation: stimulate local projects and suppliers, especially off-grid applications.
Wave, Hydro & Tidal: support development of projects e.g. Morecambe Bay & Solway.
Planning: policies to reflect and promote the use of most appropriate micro/macro generation.
Transport: develop sustainable system to cope with demand from tourism.
Place Shaping: public sector to play lead role through buildings, procurement & transport.
Employment Site: development of cluster business park to generate innovation & enterprise.
Grid Development: appropriate and proportionate for decentralised micro/macro generation

2.4 INDICATIVE OUTPUTS

1,500 new jobs created.
2,300 further jobs safeguarded.
80 new companies added to business stock.
£500m added to Gross Value Added figures.

Copeland figures above have taken account of job restructuring at Sellafield



Data does not always total correctly due to rounding up.

2.5 THE GOALS - What Cumbria will look like in 10-20 years time

2.5.1 Energy saved to reduce cost and increase competitiveness

Cumbria will have met and exceeded its greenhouse emission targets. 500 jobs created/safeguarded (£15m GVA) in the energy efficiency supply chain, large firms, Small to Medium Enterprise companies (SME) and low carbon homes. The majority of business and housing stock will have been substantially upgraded in terms of energy efficiency and new house build will achieve zero carbon 'in use' targets with micro renewable energy.

2.5.2 Cleaner, secure & reliable energy

1860 jobs created/safeguarded (£93m GVA) in the nuclear and renewable energy supply chains Cumbria will be a net exporter of energy and not withstanding issues connected with its largely rural area, will aim to be in the upper quartile of the lowest carbon economies in UK. Nuclear power, wind & water will all underpin our pre-eminent role in the region through large scale generation. The proximity and secure availability of energy will have attracted new inward investment of energy intensive companies such as chemical sector or hydrogen production.

2.5.3 Jobs & wealth creation

Cumbria will have the best developed low-carbon energy 'mix' and will be net exporter of energy. In addition to other figures, 1200 jobs created/safeguarded (£36m GVA) in the Green Tourism sector and new business start-ups. Britain's Energy Coast™ will have been a catalyst launch for significant energy & environmental sector growth. Cumbria will be internationally recognised as a centre of excellence in sector skills, jobs and business support, with particular emphasis on nuclear. There will have been strong employment diversification on the West Coast. Through the development of new and implementation of existing technologies, value will be increasingly exploited from waste streams in our principal industry sectors, (e.g. agriculture, tourism, retail, food & drink), eg. energy from waste, better utilisation of secondary material. Should it be proven that we can mitigate the environmental impact, obtain planning consent and gain strong public support, we will 'aspire to inspire' with world acclaimed projects such as Bridge Across the Bay, and The Solway Barrage.

2.5.4 Public sector will play lead advocacy role with 'place-shaping'

The public sector will have been seen to take lead in developing climate change adaptation measures and it has a key role in raising awareness and building capacity in the community. Procurement policy could promote supply chains with relevant environmental accreditations and lead with low carbon buildings. Despite still being a largely rural county, Cumbria will have made significant progress towards an integrated, sustainable transport system, particularly in The Lake District. Planning policy may chose to fast-track applications for appropriate renewable deployment.

This strategy is linked and therefore must be understood in conjunction with: Specialist Manufacturing, Tourism, Food & Drink, Education & Skills, Housing, Enterprise & Business, Rural and Agriculture & Connectivity.

3.0 Overview

There are 3 issues we have to address;

3.1 **Over the next 20 years most of the UK's energy generation facilities will reach the end of their designated lifespan**. Most power stations in the UK are gas/coal fired with a small percentage nuclear and an extremely small renewable input. Energy security is an issue and we will become more prone to increased pricing due to increasing global demand. We therefore need to build new energy generating facilities to meet demand across the UK. Security of supply is key and we therefore need to ensure our energy needs are primarily met by indigenous resources and technology

3.1.1 **Climate change and its effects on the economy is a reality**. Technology must deliver more efficient ways of generating and using energy in order to deliver a low-carbon economy. In economical terms, industry has to understand the impact, and take proactive measures in order to benefit from the opportunities. As outlined in the Stern report, taking action now will cost less in the long term.

3.1.2 **Fossil fuels are running out** and our reliance upon them in not sustainable in the long term. Hubbert's theory of 'Peak Oil' (production reaches peak and following this point we are on the downward slope experiencing increasing costs and scarcity of product) originally predicted to be in 1970 has been prolonged due to new finds and better extraction technology

3.2 The Government's Energy White Paper 2007, defines this as prioritising the need to:

- save energy
- develop cleaner energy supplies; and
- secure reliable energy supplies at prices set in competitive markets

There is a direct correlation and strategic fit from the European Union strategy, through to National (Government), Regional (NWDA) and Sub-regional (Cumbria Vision) between;

- energy/environmental requirements
- skills needed to develop business clusters and deploy technology
- Increased Gross Value Added (GVA)

We are at a time when there are significant investment opportunities to maximise the benefits to our economy through development of adaptation and mitigation measures with new Environmental Technologies & Services (ETS).

In November 2006, the UK Centre for Economic and Environmental Development (UK CEED) undertook a study on behalf of the then-DTI entitled "Emerging Markets in the Environmental Industries Sector". This report identifies a smaller number of sub sectors as either being of current significance or as emerging prospects for growth. This study has focussed on opportunities for manufacturing within these sub-sectors, as follows:

Estimated/Forecast UK Sales	2005	2015	Growth
Waste management	£8.1bn	£15.9bn	96%
Water & wastewater treatment	£9.4bn	£10.3bn	11.7%
Renewable Energy	£290m	£7.5bn	2580%
Energy management/efficiency	£2.7bn	£6.9bn	255%
Contaminated land remediation	£500m	£800m	60%
	£22.5bn	£43.5bn	93%

Our involvement in the Nuclear industry since inception has been well documented. Irrespective of the socio economic opportunities with new build and high level waste repository, decommissioning and contaminated land remediation represent cutting edge waste management capability in the county.

In January, 2008, DBERR published its White Paper on Nuclear Energy. The Government's overall conclusion notes that it……
"…has taken the decision to allow nuclear power stations to be built against the very challenging backdrop of climate change and threats to our energy security." The Government's conclusion is that nuclear power is:

- **Low Carbon** – helping to minimise damaging climate change
- **Affordable** – nuclear is currently one of the cheapest low-carbon electricity generation technologies, so could help us deliver our goals more cost effectively.
- **Dependable** – a proven technology with modern reactors capable of producing electricity reliably
- **Safe** – backed up by a highly effective regulatory framework.
- **Capable** – of increasing diversity and reducing our dependence on any one technology or country for our energy or fuel supplies……"

We aim to build on this position of strength and fully expect that the term 'waste' in 20 years time will be completely different to that of today, where sustainable product development will focus on reducing environmental impact through understanding the full life-cycle from 'soup to nuts'. Speaking on behalf of the Associates in Industrial Ecology, Dr. Stuart McLanaghan defines this as needing to move from "…..our buy, use & throw society for grey, brown and white goods……..to one of hire, use and return".

Cumbria is a largely rural county with an industrialised West Coast, and its people are historically tuned in to the environment and its special geography. There is an affinity between the people and the land which makes for a higher level acceptance to develop and deploy low carbon technology

4.0 Energy & Environmental Technologies Summary

Energy & Environmental comprises two distinct but interrelated sectors: Environmental Technologies & Services (ETS)[1] and the Energy Sector;

ETS covers a wide range of technologies and services associated with managing/protecting the environment and developing cleaner, more resource efficient products and processes. It includes the renewable energy and energy efficiency sub-sectors.

The energy sector/supply chain covers firms involved in fuel supply and the production, distribution, supply and usage of energy. This includes the oil & gas, energy generation (including nuclear), energy transmission, distribution and storage sectors.

The Nuclear industry dominates the Energy & Environmental Sector in Cumbria with around 12,000 direct employees at Sellafield and a further 2,600 involved in the local supply chain. There is also a strong nuclear R&D and technical resource based in West Cumbria with plans to develop this further e.g. through the establishment of the National Nuclear Laboratory.

. Other important sub-sectors include:

- Gas exploration, production, distribution and storage;
- Sub-sea/marine technologies which support the oil & gas and offshore wind industries;
- Environmental consultancy with specialism in safety/HAZOP work, EIAs, the marine and natural environments;
- Renewable energy (offshore/onshore wind, hydro and microgeneration);
- Waste management and recycling with specialists in the nuclear, paper & board and wood sectors;
- Energy efficiency products and services (e.g. in solid state lighting and insulation).

Employment in the above sectors (excluding nuclear) is estimated to be 4500 to 5000 in about 160 firms. The majority of firma are small (less than 50 employees) but there are a number of significant firms such as Acrastyle, Agrilek, Diamould, Gilkes, Marl and Oxley (Note: there is some overlap here with the Specialist Manufacturing Sector);

Major concentrations are in Allerdale and Copeland (nuclear sector) and Furness (92 firms in the energy supply chain employing 2,200) but the environmental consultancy, renewable energy and waste management sectors are spread around other locations in Cumbria including Carlisle, Kendal and Penrith.

[1] Defined by UKFEI to include 11 sub-sectors: Air Pollution Control (APC); Cleaner Technologies & Processes (CTP); Environmental Consultancy (ECS); Environmental Monitoring, Instrumentation and Analysis (EMI); Energy Management/Efficiency (EM); Marine Pollution Control (MPC); Noise and Vibration Control (NVC); Remediation and Reclamation of Land (RRL); Renewable Energy (RE); Waste Management, Recovery and Recycling (WMRR); Water Supply and Wastewater Treatment (WWT).

4.1 Short Term Impacts of Climate Change Legislation

- Potential for new nuclear build in Cumbria;
- Growth in renewable energy (RE) supply to meet EU/UK targets will provide major opportunities for developers, RE technology providers and their supply chains especially for offshore/onshore wind, hydro and biomass
- Built environment drivers will stimulate the market for energy efficiency and building integrated renewables;
- Low carbon energy and waste targets/legislation will stimulate market for energy-from-waste (EfW)
- Need to upgrade and strengthen electricity transmission and distribution networks to accommodate nuclear and large RE generation. There is also potential to address local networks for distributed generation
- Scope for load/demand side management to avoid network reinforcement with links to smart metering;
- Consultancy and monitoring services associated with measuring the impacts of climate change and assessing carbon footprints and energy performance;
- Big increases in funding for R&D and demonstration of emerging low carbon energy technologies and hence potential to build on local R&D and technical capabilities;
- Increasing interest from private sector investors in low carbon technologies with some specialist funds emerging.

4.2 Long Term Impacts of Climate Change Legislation

- Opportunities to develop, deploy and support marine renewables especially tidal and wave power;
- Potential for carbon capture and storage e.g. using offshore gas expertise and depleted gas fields;
- Opportunities associated with development of the hydrogen economy based on renewable and nuclear energy sources and expertise in gas handling and storage

5.0 The Goals - What Cumbria will look like in 10-20 years time

5.1 The Cumbrian economy will operate within the **'One Planet'** living framework, where the county's carbon and ecological footprint reflects a fair share of the Earth's resources

5.2 The Cumbrian economy will have substantially benefited from a low-carbon economy, using the **opportunity for business growth** and better paid jobs, as well as 'proofing' itself against the direct and indirect impact of environmental legislation, climate change and threats to security ranging from flooding to acts of terrorism

5.3 **Britain's Energy Coast™** will have been a catalyst launch for significant energy & environmental sector growth. Cumbria will be internationally recognised as a centre of **excellence in sector skills**, jobs and business support, with particular emphasis on nuclear. There will have been strong employment diversification with new business stock having less reliance on Sellafield.

5.4 With Government support, the majority of **old housing stock** will have been substantially upgraded in terms of energy efficiency and new housing build will achieve zero carbon 'in use' targets with micro renewable energy.

5.5 Cumbria will be a **net exporter of energy** and not withstanding issues connected with its largely rural area, will aim to be in the upper quartile of the lowest carbon economies in the UK. Nuclear power, wind & water will all underpin our pre-eminent role in the region through a balance of large scale, decentralised mid sized, and micro generation. The proximity and secure availability of energy will have **attracted new inward investment** of energy intensive companies such as the chemical sector or hydrogen production.

5.6 Cumbria will have **exceeded its greenhouse gas emission targets** if allowed to count all Cumbrian offshore development and any technology deployed in Solway

5.7 Despite still being a largely rural county, Cumbria will have made significant progress towards an integrated, **sustainable transport system**, particularly in The Lake District.

5.8 Through the development of new and implementation of existing technologies, **value will be increasingly exploited from waste streams** in our principal industry sectors, (e.g. agriculture, tourism, retail, food & drink). For example: Energy from Waste and better use of secondary materials.

5.9 Should it be proven that we can mitigate the environmental impact, obtain planning consent and gain strong public support, we will '**aspire to inspire' with world acclaimed projects** such as Bridge Across the Bay, and The Solway Barrage

5.10 3,800 jobs created/safeguarded over the next 10 years. 80 companies added to business stock.

6.0 UK Context – Climate Change

The Government has signed up to the Kyoto Protocol, the international agreement on climate change. This commits the UK to reduce our emissions of greenhouse gases by 12.5% from 1990 level by 2008-12. In the longer term the Government has accepted that far more significant cuts in greenhouse gas (GHG) emissions will be required, and the need to cut emissions by at least 60% by the middle of this century is now recognised.

Action to cut emissions is set out in the recently revised UK Climate Change Programme. Published in March 2006, this details how the Government intends to reduce emissions of Greenhouse Gases (GHGs) produced in our homes, transport and industry and through other means such as land use change. It also sets out the Government's commitment to support the process of adapting to the changes in climate that will occur over coming decades.

The government funds a range of bodies that support action on climate change by Local Authorities and others including; The UK Climate Impacts Programme, The Carbon Trust and The Energy Saving Trust

The UK government committed itself, in the 2003 Energy White Paper, to a 60 per cent reduction in emissions, while keeping energy costs competitive and securing supplies. Today, we in the UK are emitting about 150 million tonnes of carbon per annum. We are committed, therefore, to reducing that to 60 million tonnes a year by 2050. Each and every sector will need to be squeezed hard if we are going to achieve that. Each will be required to contribute a growing "wedge" of carbon reductions over the next 50 years.

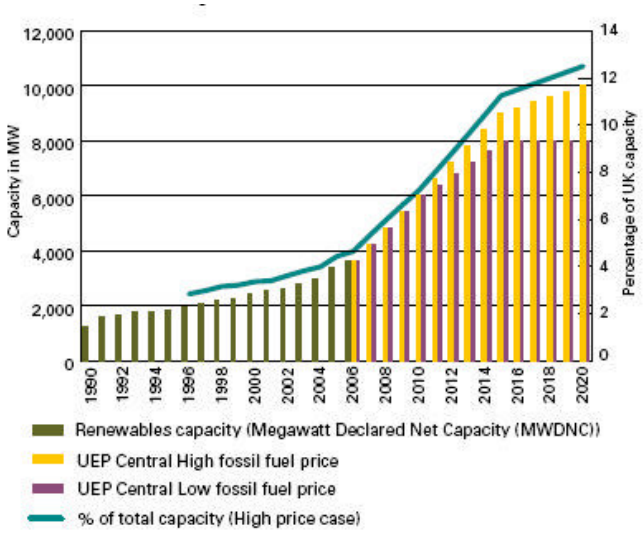
These wedges have to include each of the following: energy-efficiency gains; an ambitious programme of energy renewables; de-carbonising the transport sector; a programme to reverse the decline of nuclear energy on the grid; distributed energy generation with combined heat and power; energy microgeneration, making much of the built environment independent of the national grid; and carbon capture and storage. In effect, this has been set out in the Energy Review.

With each of these wedges pursued to optimal outcomes, we can manage that 60 per cent reduction within a healthy, growing economy. If any wedge can be developed faster, even bigger reductions may be achieved, taking us more quickly to our goal of a zero-net carbon economy.

7.0 UK Context

7.1 Energy

The UK has historically enjoyed self-sufficiency in supplies of fossil fuels supplying the energy market. However, with domestic stocks in substantial decline we will become a net importer before the end of the decade. Irrespective of the debate surrounding fossil fuel availability, energy costs have increased dramatically and are anticipated to continue rising due to global demand. The benefit this has given is that energy from renewables has now become a cost effective solution.



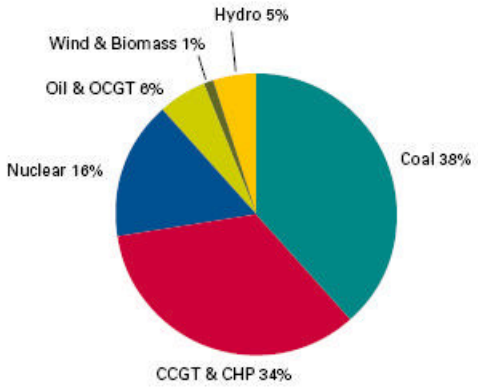
Source: BERR

The Energy White Paper highlights **four energy policy goals**;

- Reduce UK's carbon emissions by 60% to 2050, and real progress by 2020
- Maintain reliability of energy supplies
- Promote competitive markets, raise sustainable economic growth and productivity
- Ensure every home is adequately and affordably heated.

It also states that;

- 2/3 of the worlds carbon dioxide emissions come from the way we produce and use energy.
- The UK will need around 30-35GW of new generation capacity over the next 20 years
- 20% saving of energy consumption needed by 2020 through improved efficiency
- Set energy efficiency standards for new products and services Government procures from
- At the end of 2007, Great Britain had a total electricity generating capacity of 75GW



Source: National Grid

7.1.1 Fossil Fuels

Power from fossil fuels provides the UK with around 75% of its total energy needs. Given the low penetration and slow start-up of affordable renewable energy technology, we cannot rely on it alone and will continue to use fossil fuels, but will do this in conjunction with Carbon Capture & Storage which could reduce emissions by as much as 90% (technology which is still unproven on a large scale, though a competition 'call' was recently announced by DBERR). Current projections estimate that we are going to have to increase our gas import capacity by 15-30%, which obviously highlights the issue of energy security. Much of the work has been done, but there is a need to streamline the planning and licensing process in order to stimulate new offshore gas storage facilities and unloading Liquefied Natural Gas.

7.1.2 Coal

As at August 2006, the UK coal industry employed around 5,600 people. The majority of jobs are in England (over 3,750 employees); Scotland has approx 1,100 and Wales about 750. In 2005, total UK production was 20 million tonnes. Very little UK-produced coal (steam or anthracite) is exported. Figures shown that in recent years just over 0.5 million tonnes have been exported. Imports in 2005 rose to a record 44 million tonnes. Major sources of imports include Russia, Australia, Colombia, South Africa and Indonesia.
Overall coal consumption in 2005 was up 2.3% at 61.8 million tonnes. Some 34% of electricity generated in 2005 came from coal. Demand for coal for generation has risen as coal has become more competitively priced compared to gas, which is the main alternative feedstock. Prices for internationally traded steam coal imported into North West Europe were around £25/tonne in 2003, but rose strongly in 2004 and peaked at £37/tonne. Between 2004 and 2005, international imported steam coal prices fell back to £32/tonne. Prices received by UK producers for sales to generators have been in the range £26/tonne to £29/tonne over the period 2003-05.

7.1.3 Oil

The UK oil and gas extraction industry covers the exploration, extraction and initial processing of North Sea oil and gas from around the UK, both onshore and offshore. The UK Continental Shelf is facing significant challenges as the province matures. In future its ability to compete will depend critically on rapid and continual improvement in performance. This, in turn, will depend on greater collaboration to ensure this performance can be delivered with the resources available. The UK still has substantial recoverable reserves of oil and gas, however many existing large producing fields are declining and discoveries are becoming fewer and smaller.

The UK is ranked 11th globally for crude oil production with latest estimates of annual offshore production standing at 70.07million tonnes. Latest data for the import and export of crude oil and natural gas stand at 51.4million tonnes and 47.5million tonnes respectively.

The industry as at 2006 had a turnover of £35.17bn, GVA contribution of £21.73bn, making almost £750,000 average GVA per employee. IT contributed a mammoth £9.1 billion in direct taxation to the UK Exchequer!

In 2006 the UK produced around 2.9million barrels of oil equivalent (boe) per day (approx 55% oil/45% gas). This figure is expected to rise slightly for 2007.
Total expenditure rose to £11.5bn in 2006, representing a 40% increase over the previous 2 years, with:

- Capital investment increasing 66% over the last two years to £5.6 billion, the largest of any industrial sector;

- Costs to operate the offshore fields, pipelines and onshore terminals rising to £5.5 billion;
- Exploration expenditure of £0.6 billion;

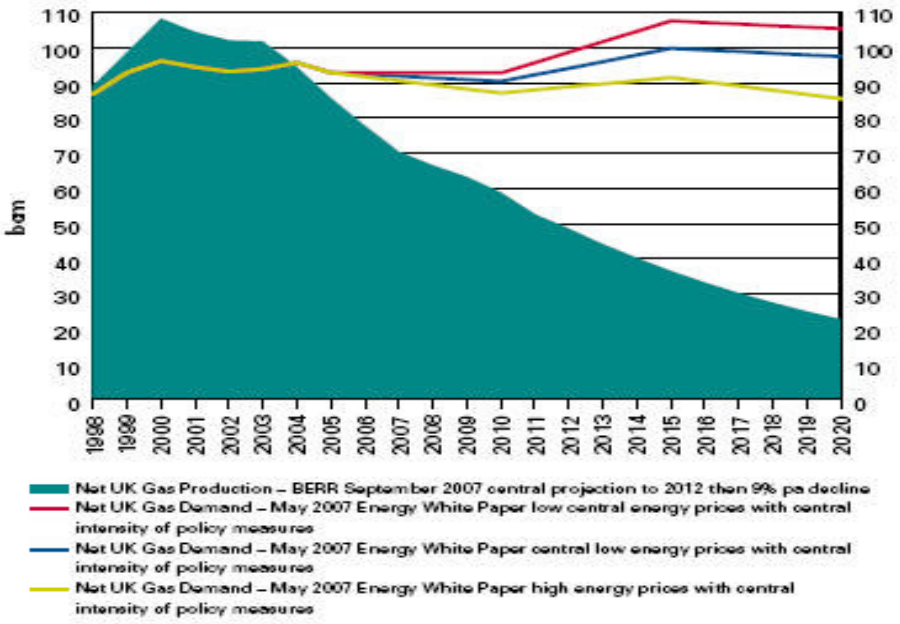
Of the 290,000 people employed by the sector:

- 35,000 are directly employed by operators;
- 170,000 are employed by contractors and the supply chain;
- 85,000 are employed in jobs that are created through the economic activity above.
- 32% in Scotland;
- 25% in the South East of England;
- 11% within the North West of England and East Anglia.

7.1.4 Gas

Gas fired power stations remain the cleanest form of generating large scale electricity and remain the most efficient when operated as Combined Heat & Power generators. As we increase dependence upon renewable technology there could be in increased need for 'instant on' energy production. Providing base load is not the best use of a dwindling resource, but delays in new nuclear or coal fired power plants could further increase the short-medium term reliance on gas. With the decline in domestic production, coupled with increased demand, DBERR has recently undergone consultation with the industry into the provision of natural gas storage and liquefied natural gas import facilities. This consultation considers the need for, and requests views on, changes to existing legislation with regard to the following activities:

- storage of natural gas in non-hydrocarbon features (e.g. salt caverns);
- storage of natural gas in hydrocarbon features (e.g. partially depleted oil and gas fields);
- the unloading of Liquefied Natural Gas (LNG) offshore.



7.1.5 Nuclear

The UK currently has 19 operating reactors at 10 power stations, which provide approximately 18% of the electricity in the UK. Nuclear power plays an important role in helping the UK to meet its climate change targets. Nuclear generation currently reduces national carbon emissions by between 7 and 14%. The tables below give the nuclear stations currently operating in the UK together with published lifetime dates. .

Nuclear Generating Facilities

	Capacity MW	Published Lifetime
Oldbury	434	1967 - 2008
Wylfa	980	1971 - 2010
Hinkley Point B	1220	1976 - 2011
Hunterston B	1190	1976 - 2011
Hartlepool	1210	1989 - 2014
Heysham 1	1150	1989 - 2014
Dungeness B	1110	1985 - 2018
Heysham 2	1250	1989 - 2023
Torness	1250	1988 - 2023
Sizewell B	1188	1995 - 2035

Nuclear power accounts for approximately 18% electricity generation and 7.5% of total UK energy supplies, though as the table above indicates, all will be closed within 30 years against published lifetimes.

Whilst there is debate on the issue, it's generally accepted that it is a low-carbon form of generation, (at least if you take out the build and decommissioning process from the equation!), with virtually no 'in-use' emissions.

Following consultation, the Government have reviewed the evidence and announced that, "….*nuclear power should be able to play a part in the UK's future low-carbon economy*".

7.2 **Renewables**

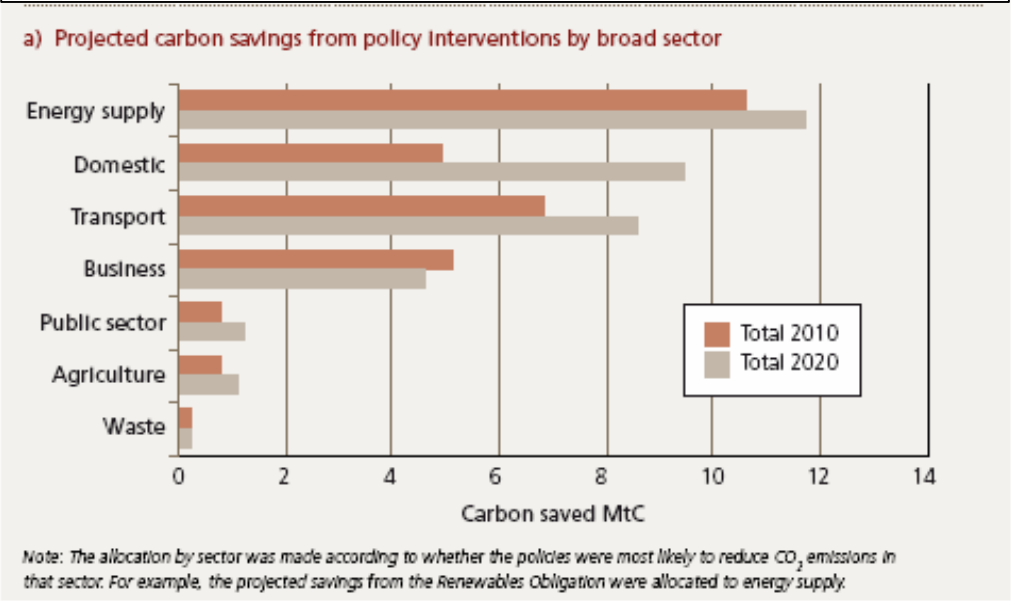
Gordon Brown's speech on 19th October, 2007, in the commons quoted that, "The annual turnover of environmental goods and services sector is more than £25bn in the UK, and is expected to roughly double by 2015, creating at least 100,000 jobs".

Whilst the Government emphasises the need for a 'mix' of energy sources, it's clear that renewables are key to the strategy in order to react to climate change.

The UK currently has around 4% of energy sourced through renewables, but has a target of 10% to reach by 2010 and an aspirational target of 20% by 2020. The Government is developing a policy framework which encourages the development of a wide range of low carbon technologies in order to minimise the costs and risks to the economy in achieving those goals.

Based on National Audit Office research, the SQW report 'Carbon Reduction: Obligation and Opportunity', shows where the biggest opportunities are to reduce carbon emissions using interventions from the Governments Climate Change Programme

Projected carbon savings and cost-effectiveness of interventions from UK Climate Change Programme



Source: BERR

The Government has committed £500 million to develop longer-term renewables, such as offshore wind, wave and tidal, solar, biomass and community projects.

7.2.1 Wind Power

There are now some 1,769 turbines in 137 locations. Generating 10 per cent of UK electricity from renewables by 2010 could mean an increase by around another one and half times the current number. A single 1.8-megawatt turbine can produce enough power for 1,000 homes.

A recent survey (May 2006) of awareness and attitudes towards renewable energy has discovered that public support for renewables remains high. The DTI (now DBERR) commissioned GfK NOP Social Research to conduct a quantitative research project to explore awareness and attitudes to renewable energy amongst the general public in Great Britain, and determine influences on their opinions of this subject. The survey revealed that 85% of the general public support the use of renewable energy, 81% are in favour of wind power and 62% would be happy to live within 5km (3 miles) of a wind power development.

A study by the Royal Institution of Chartered Surveyors (RICS) suggests that wind farms do not impact on residential property values in a uniform way. Results suggest that wind farm development reduces property values to some extent but prices begin to recover after wind farms have been up and running for two years.

Ministers have made it clear that wind farms should only be located in an 'appropriate' place and that local concerns should be listened to. All wind farm proposals are subject to a strict planning process, addressing environmental, visual and community impacts. Local planning authorities consider onshore proposals up to 50 megawatts (the vast majority of applications to date). For applications over 50 megawatts, local authorities can trigger an independent public inquiry if they object.

Less turbulent times ahead

Onshore wind is currently the most economically viable renewables technology with scope for expansion, but it will increasingly operate as part of a renewables mix as other technologies come on line. The UK is already the world's second-biggest offshore wind generator. There is a sense that Cumbria has 'done it's bit' and our support for future development must be proportionate to what it delivers to the economy and community.

7.2.2 Solar

There are 3 types of solar technology design:

Passive solar design

Passive solar design involves the application of design principles (such as south-facing windows) to make sure that excess heat loss is avoided and solar radiation is captured, in order to minimise the need for heating and lighting. The reverse is also true, so that minimising the capture of solar radiation, coupled with the use of natural ventilation, helps to reduce dependency on mechanical systems such as air conditioning. This is most extensively used on new build commercial premises.

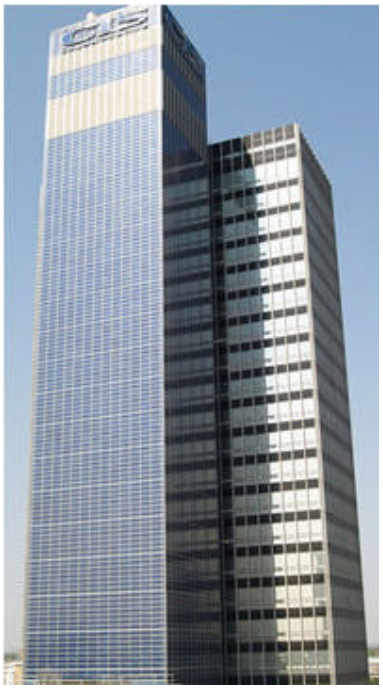
Active solar water heating

Active solar water heating uses collectors, usually on the roof of a building, to capture and store the sun's heat via water storage systems. The collectors provide heat to a fluid that circulates to a water tank. The heat is primarily used for heating water in domestic dwellings, industrial facilities and commercial buildings. This includes the growing market for solar swimming pool heaters.

Solar photovoltaics

Solar photovoltaics (PVs) convert energy from daylight into electricity using a semiconductor material such as silicon. When light hits the semiconductor, the energy in the light is absorbed, 'exciting' the electrons in the semiconductor so that they break free from their atoms. This allows the electrons to flow through the semiconductor material (in a similar manner to a normal electrical circuit) producing electricity.

Solar PV cells can be arranged in panels on a building's roof or walls, and can often directly feed electricity into the building. With the latest PV technology, cells can also be integrated into the roof tiles themselves. Solar PV cells can be used in both stand-alone and grid-connected systems. In the case of small-scale solar PV systems, batteries or other forms of electricity storage can be used to store the electricity for periods when the output is low but the demand is high.



Passive solar design is a proven design approach that can reduce energy costs for buildings. In the UK, significant progress has been made in solar uptake in the non-domestic buildings sector. Uptake in the domestic sector has been slower. However, its application is expected to continue to grow as part of the practice of good building design.

A small, established market currently exists for active solar heating (also known as 'solar thermal' or 'solar water heating') in the UK, with fairly steady sales into the domestic and commercial sectors since the mid-1980s. Around 10,000 solar thermal systems are installed in the UK every year, and there are now over 100,000 systems in place.

In 2003, total capacity for solar photovoltaics in the UK was approximately 6 megawatts. This is a small proportion of its potential.

Under the Major Photovoltaics Demonstration Programme (PV MDP) there have been a number of installations given grant funding. These range from individual household installations to schools, social housing and a number of prominent buildings, including the London Transport Museum and the CIS Tower in Manchester, which is one of the largest PV installations in Europe .

Solar PV can deliver clean, silent electricity at point of use, and has the potential to meet a significant proportion of our electricity needs in the future. However, due to its current cost it is only likely to make a small contribution to the 2010 renewables target.

The future is looking bright

PV systems are becoming more efficient due to thin film technology. Increased take up means decreasing prices. DBERR's Renewables Innovation Review estimated that solar PV could become cost-competitive with other forms of electricity generation by 2020–30. The bottom end of the range indicates the case where solar panels are incorporated into buildings at the stage of construction, which is cheaper than retrofitting. This will increase the economic appeal of systems and the range of attractive applications. There are also thousands of PV systems currently in operation in the UK, meeting small power requirements in applications such as phone booths and roadside monitoring systems.

7.2.3 Biomass

In 2003, biomass used for both heat and electricity generation accounted for 87 per cent of renewable energy sources in the UK. The majority of this came from landfill gas (33 per cent) and waste combustion (14 per cent) (source: BERR, *UK Energy in Brief*, July 2004). Smaller amounts also came from sewage gas, domestic wood and industrial wood. Electricity produced from biomass accounted for 1.55 per cent of total electricity supply in the year.

Biomass falls into three main groups:

- **Dependent resources:**

These are the co-products and waste generated from agricultural, industrial and commercial processes. This includes forest products, waste wood, straw, slurry, chicken litter and industrial and municipal wastes (such as food processing wastes). For example, for every tonne of wheat harvested, a certain amount of 'waste' straw is created, or for every tree felled to make furniture, a certain percentage cannot be used. These co-products can be utilised as biomass fuels, for example, in anaerobic digestion, pyrolisis or gasification as they have the added benefit of producing useful co-products.

- **Dedicated energy crops:**

These are short-rotation crops generated through coppicing of miscanthus, willow and poplar, which are grown specifically to generate biomass fuel.

- **Multi-functional crops:**

These are crops that can be used to create different types of energy. For example, the ears of wheat can be used to create fuel (including bioethanol and biodiesel), while straw can be used to generate electricity.

Biomass can be converted into heat and electricity in a number of ways. Depending on its source, these processes include burning, pyrolysis (the decomposition or transformation of a compound caused by heat), gasification (the conversion of solid biomass into a gaseous fuel), anaerobic digestion (the decomposition of an organic biodegradable material by bacterial action in the absence of air, and in warm, moist conditions) or fermentation.

Woody biomass
Energy can be derived from woody biomass sources (including forest products, waste wood and straw) using combustion systems, which can be used to heat anything from a domestic stove or hot water system to an entire community. Biomass can also be used on its own or by co-firing it with fossil fuels in power stations, reducing greenhouse gas emissions by replacing a component of the fossil fuel required. In industrial or agricultural use, boilers fuelled by woody biomass such as cardboard, wood and waste pellets or straw can help reduce waste removal costs.

Biogas
Biogas is generated from concentrations of sewage or manure. These are usually in the form of slurry comprising mostly water (almost 95 per cent). The slurry is fed into a digester, either continuously or in batches. Digestion takes from about 10 days up to several weeks, at elevated temperatures around 35°C depending on the substances being digested.

Landfill gas
Landfill gas arises from waste deposited underground in landfill sites. Biodegradable organic waste decomposes anaerobically to produce a gas that is roughly an even mixture of carbon dioxide and methane. The methane content gives it the potential as a fuel, which can then be used to generate electricity or to provide process heat. The amount of gas available from a landfill site depends on the type of waste, moisture content, temperature, acidity of the waste and the design of the site. Gas is drawn up from vertical or horizontal wells through a system of pipes. The generating equipment is usually contained within the same area as the extraction plant.

Fermentation
Fermentation occurs when anaerobic digestion converts sugars into ethanol with the use of micro-organisms, usually yeast. Bioethanol can be used as a transport fuel by mixing it with petrol or using it directly in a modified combustion engine. Sugar cane or beet is the most efficient source but potatoes, corn, wheat and barley can also be used. Processes that produce bioethanol from woody material, such as forestry residues, energy crops and waste paper, are also approaching commercial viability and a number of pilot plants are proposed for the UK.

Bio-fuels
Bio-diesel can be made from vegetable oils, animal fats or recycled cooking oils. However, the production of bio-diesel requires a high amount of energy, offsetting its ability to reduce carbon emissions. However, it still provides an improvement over fossil fuels, typically reducing lifecycle carbon dioxide emissions by over 60 per cent (source: British Biogen). Bio-ethanol or methane seems to give more efficient energy, but bio-fuels are controversial with limited resources to cultivate and a potential inevitable impact on food prices.

The EU plans for 10% of all transport to run on bio-fuel.

Where there's muck, there's brass
Biomass has the potential to make a significant contribution to UK heat and energy generation in the future. Development of some forms of biomass may be constrained by limited resources, for example landfill gas. Energy crop-based solutions are also difficult to import economically, although there is the potential for many biomass feedstocks to be grown within the UK. In some cases, crop yields will need to be improved before the process becomes economic. Likely areas for development are smaller-scale regional projects, and the promotion of energy crops such as short-rotation coppice.

7.2.4 Wave

There are two wave power devices in the UK. Total capacity currently stands at 1.25 megawatts.

The first type of device is the LIMPET (Land Installed Marine Powered Energy Transformer), a 500-kilowatt shoreline oscillating water column on the Scottish island of Islay.

The second, the 750-kilowatt Pelamis sea snake, is an example of a hinged contour device. It is the first deep-water grid-connected trial and is currently installed at the European Marine Energy Centre in Scotland, where it is undergoing testing.

Wave 'Hello' to the future

Wind-generated waves on the ocean surface have a total estimated power of 90 million gigawatts worldwide. Due to the direction of the prevailing winds and the size of the Atlantic Ocean, the UK has wave power levels that are among the highest in the world. Wave energy has the potential to provide as much renewable energy as the wind industry, but the development of wave technology is currently at the same level as the wind industry was 10 years ago.

7.2.5 Tidal

Although tidal power is variable, it is reliable and predictable and can make a valuable contribution to the diversity, and therefore security, of an electricity system. The technology required to harness tidal energy is well established; however, tidal power remains expensive and there are relatively few applications worldwide. Tidal stream technology is still in its infancy and there are no projects currently contributing to electricity supplies in the UK; however, development work is still ongoing. Initial trial was deemed successful.

The large tidal range along the west coasts of England and Wales provides some of the most favourable conditions in the world for the utilisation of tidal power. If all reasonable exploitable estuaries were utilised, the annual generation of electricity from tidal power plants could achieve a potential level of 50 terawatt hours, equivalent to about 15 per cent of current UK electricity consumption.

Good tidings ahead

There are only about 40 sites around the world, including some sites on the west coast of the UK, with the appropriate magnitude of tidal range. The higher the tides, the more electricity can be generated from a given site, and the lower the cost of electricity produced. Worldwide, approximately 3,000 gigawatts of energy is continuously available from the tides. However, due to the constraints outlined above, it has been estimated that only 2 per cent or 60 gigawatts can potentially be recovered for electricity generation. The country is at the forefront of the development of these technologies.

7.2.6 Hydro

There are three main categories used to define the output from hydroelectric power:

Large-scale capacity (> 20 megawatts) in the UK is currently 907 megawatts.
Small-scale capacity (< 20 megawatts) in the UK is currently 503 megawatts.
Micro-scale capacity (< 1 megawatt) in the UK is currently 46 megawatts.

Total hydroelectric capacity in the UK is approximately 4,244 megawatts (including 2,788 megawatts of pumped storage capacity).generating about 0.8 % of its electricity from hydroelectric schemes – most of which are large-scale schemes found in the Scottish Highlands. Hydroelectric is a proven and efficient technology. The most modern plants

have energy conversion efficiencies of 90 per cent and above. Many smaller schemes already exist and more continue to be developed.

Water, water everywhere

Opportunities to increase large-scale hydroelectric in the UK are limited as most commercially attractive and environmentally acceptable sites have by now been utilised. Some old watermills are being refurbished and brought back into the energy supply network. If small-scale hydroelectric power from all of the streams and rivers in the UK could be tapped, it would be possible to produce 10,000 gigawatt hours (1 gigawatt hour = 1,000,000 kilowatt hours) per year – enough to meet just over 3 per cent of our total electricity needs and making a significant contribution to the Government's renewables target of 10 per cent by 2010.

7.3 Sustainable Technologies

Cleaner Fossil Fuels; Hydrogen; Fuel Cells; and Distributed Generation can all be said to be low carbon energy technologies. Whilst not renewable, these technologies offer significant potential to meet the UK's environmental and economic policy objectives over the medium - long term. It should be stressed that hydrogen production through electrolysis or synthesis is currently expensive and very energy intensive.

Whilst for some of these technologies mass deployment/commercialisation may appear to be some time away, the Government is taking action now to enable the development of these technologies. Development, demonstration and ultimately deployment of these technologies will help realise the Government's target of 60% reduction of CO2 emissions by 2050.

On the 19 September 2006, the DTI (now BERR) launched the Hydrogen, Fuel Cell, and Carbon Abatement Technologies Demonstration Programme. This £50m funding will run for 4 years. On 8th November 2007 the Technology Strategy Board announced a new competition for proposals for collaborative research and development, representing a Government investment in innovation of around £100m, which includes calls on materials for energy and low carbon energy.

7.3.1 Fuel Cells

A fuel cell is an energy conversion device that uses an electrochemical process to convert hydrogen into electricity without combustion. It produces electricity with a conversion efficiency of up to 50 per cent. In a combined heat and power (CHP) installation, an overall efficiency of up to 80 per cent may be possible by utilising the heat that is also produced as a by-product of this process. The ideal fuel for fuel cells is hydrogen, but other hydrogen containing fuels (such as natural gas or petrol) may be. This chemical process generates electrical and thermal energy and in the case of hydrogen, produces pure water as a by-product.

The world's first fuel cell was invented and demonstrated in the UK by British scientist, Sir William Grove in 1839.

Fuel cells are also seen by many as acting as an enabler for the "hydrogen economy" and have the potential to contribute the Government's energy policy objectives. Offering virtually zero emissions at the point of use, with water as the only by-product, they have a range of potential applications. These include:

- Stationary power generation/combined heat and power (CHP), which could be installed into the home, school, or office building.
- Transport, replacing the internal combustion engines in cars, buses, trucks, motorbikes and scooters.
- Portable applications, with fuel cells replacing batteries in mobile phones, laptop computers and power tools.

7.3.2 Hydrogen

The 'hydrogen economy' is thought by many respected groups in industry and academia to have real potential to deliver a low carbon future over a timescale of 30-50 years if manufactured via a low carbon process such as nuclear. A DTI commissioned report by the consultants E4Tech, Element Energy, and Eoin Lees indicated that for the UK the use of hydrogen as a transport fuel offers significant opportunities for cost-competitive CO_2 (carbon dioxide) reduction by 2030.

7.4 Carrots & Sticks

Saving energy is key to achieving UK emission targets. Reliance on market forces alone will not make the step-change needed in domestic and business energy use adaptation. Policy frameworks together with legislation is needed to ensure high polluters don't just get penalised more, but are rewarded through greater efficiency and adoption of new technology and processes.

Energy intensive businesses can elect for Climate Change Agreements and can capitalise on efficiency through the European Union Energy Trading Scheme. Large non-energy intensive organisations from public and private sector (>6,000MWh per year) will have a mandatory cap & trade scheme through the Carbon Reduction Commitment. From 2008, all businesses will be required to produce an Energy Performance Certificate when being built, sold, rented or leased – as with the homes market. It is likely that in the future, these Certificates could be to ensure all businesses make their contribution to energy efficiency.

7.5 Housing

Government has an aim to make all new-build housing zero carbon (in use) mandatory by 2016. Energy efficiency is existing stock is also being targeted through incentives such as grants for the deployment of renewables and working with manufacturers to phase-out old inefficient technology where there is a proven alternative such as with lighting and electrical domestic white goods. This is now sometimes called 'choice editing'.

Energy suppliers now have Carbon Emission Reduction Targets, to reflect the emphasis and in addition to having more information on their bills, there is a trend towards the notion of Energy Services COmpanies which charge for service(s) rather than unit pricing, as an incentive to provide in the most efficient manner. CO2 calculators are readily available and it is anticipated that smart meters will be provided for every household over the next 10 years. Government has a goal to eliminate household fuel poverty, despite increasing energy costs, (fuel poverty – a term used to describe a situation where more than 10% of household income is spent on energy).

7.6 Transport

Transport accounts for 36% of energy use in the UK and clearly has an over reliance on liquid fossil fuels, especially with domestic cars. New cars have increasingly stringent emissions targets, and this will force manufacturers to accelerate research into better technology such as electric or hydrogen fuel cells. Tax measures and excise duty will increasingly be used to reward use of efficient vehicles together with penalising less efficient. The Low Carbon Innovation Strategy will help stimulate innovation to bring more efficient modes of transport to market. The Renewable Transport Fuel Obligation will make suppliers of fuel ensure that at least 5% comes from a renewable source.

7.8 Public Sector

The Public Sector can be clearly used as an instrument to make change happen sooner. Energy efficiency targets in all areas of building and transport, even the way it conducts its business can have demonstrable positive effects. From 2008, the Government will set efficiency targets for all new products and services that it procures. Combined with

procurement initiatives such as LM3 where it reflects a value of 'localism', it can have a stimulating effect on the local economy.

8.0 Cumbria context

In his speech to The Commons on the environment in December, 2007, Gordon Brown stated that, "….efforts to tackle climate change offer economic opportunities in the development of new low carbon technology. It is possible to be both pro-environment and pro-growth".

Our vision for energy and climate change is entirely complimentary with that of The North West Operational Programme and Regional Economic Strategy which aims to be: "…*a dynamic, sustainable international economy which competes of the basis of knowledge, advanced technology and an excellent quality of life for all..."*

8.1 Carbon Emissions

Cumbria is a relatively large emitter of CO_2 per capita, due largely to having a large land mass and sparse population. Rural populations are heavily reliant on travelling by car as the primary source of transport, and in the more rural areas of the county there is an over reliance on oil/coal for domestic heating.

Local Authority and Government Office Region	Industry and Commercial	Domestic	Road Transport	Land use change and forestry	Total	Population Thousands (1)	Per capita Total CO2 (tonnes)	Domestic per capita CO2 (tonnes)
Allerdale	804	254	305	41	1404	93	15.0	2.7
Barrow-in-Furness	323	159	75	5	563	72	7.8	2.2
Carlisle	480	265	363	25	1132	101	11.2	2.6
Copeland	290	179	132	4	606	69	8.7	2.6
Eden	803	135	628	26	1593	50	32.0	2.7
South Lakeland	500	296	589	23	1409	102	13.8	2.9
TOTAL NORTH WEST	27201	16872	16637	607	61317	6730	9.1	2.5

Source: AEA, 2007 – currently being revised

Cumbria County Council has signed up to the 'Nottingham Declaration', in which they pledged to actively tackle climate change in their area and work with others to reduce emissions country-wide.

The NWDA have launched the region's Climate Change Action Plan (*Rising to the Challenge*), in which they identify some 27 separate actions in order to meet our obligations to reduce emissions. The NWRA Energy and Greenhouse Gas Emissions study conducted by the AEA Group, have made a series of recommendations which consider relevant issues such as ownership, delivery and monitoring down to the Sub-Regional level.

The Cumbria Strategic Partnership (CSP) have established the CSP Climate Change Task Group in order to address requirements throughout the county including the public sector, private sector and general public. The climate change task group have made a series of

recommendations which is expected to inform and act as a catalyst document for the public sector to take a lead in reducing emissions principally through adaptation measures.

Whilst there is some sub-regional data which looks at GHG's and specifically carbon dioxide emissions, we need to do more in order to fully understand the impact from the current agricultural use and land use businesses, as well as contribution to emissions and waste from our 16 million visitors each year. Current measures per head give a highly skewed view of who contributes what in a sparsely populated county such as Cumbria.

It is also worthy to note that whilst it contributes greatly to the tourism, food & drink & outdoor sectors, agriculture alone employs relatively few and it's GVA contribution is around 3% of the total Cumbrian value, it's waste and Greenhouse Gas emissions are significant and contain proportionately higher element of more damaging methane and nitrous oxides.

8.2 Energy

The "Energy in Englands Northwest" report from NWDA seeks to use our energy 'cluster' in order to maximise wealth creation, help secure energy supply and environmental improvement. Its Action Plan for the region is estimated to:

- create 7,600 new direct jobs
- Increase energy suppliers sales to £800m per year
- create additional £5bn investment
- reduce current CO2 emissions by 30%

Published in 2003, we need to revise the recommendations through understanding new commercial and legislative business drivers

8.2.1 Energy Generation

Cumbria is a net importer of energy, unlike our friends in Yorkshire, who can boast to be currently net exporters. However, our future is in our history, as Cumbria is synonymous with developing and deploying new technology. The only current large scale producer is the 226Mw Roosecote gas fired power station, though there are plans approved for 2 enormous off shore wind farms which also highlight the biggest obstacle to large scale energy production in Cumbria – the lack of large grid connections! Sub-sea connection needs to be considered as well as how to ensure the grid capacity and infrastructure is not a barrier to deployment of microgeneration and mid sized decentralised power systems

8.2.2 Nuclear Industry

Our historical links with the nuclear industry are well known internationally, as well as being the county of birth to John Dalton, father of the atomic theory. The Sellafield site contains the biggest concentration of nuclear activity anywhere in the world, due to everything being located within 2 square miles. The National nuclear laboratory has some of the most skilled and experienced engineers and scientists and promotes its services throughout the world. Cumbria is home to the National Skills Academy for Nuclear and has a Nuclear Academy to provide higher and further education.

We still build nuclear energy generating facilities in Barrow which are used in the defence industry. There is a strong community acceptance of the nuclear industry along the west coast, based on the economic benefit it brings, and the County Council has also recently indicated its conditional support based on the outcome of the government's nuclear waste strategy.

We need to make Sellafield and attractive investment proposition for new build, and our target customers to make those investment decisions are the Utility Companies. Currently the biggest drawback is the lack of a 400kv grid connection. Partners in Cumbria need to work together in order to mitigate the significant investment this would have to be. We

also need to work within the new planning regulatory regime and gain domestic and local authority acceptance.

8.2.3 Gas

Gas pipeline, storage and processing facilities in Barrow employ directly more than 200 people. The Roosecote power station delivers a significant proportion of the North West's electricity.

8.2.4 West Coast Masterplan – Britain's Energy Coast

The Britain's Energy Coast™ masterplan is a catalyst document which aims to provide the platform for economic growth and sustainability through a number of measures designed to address the historic reliance on large scale manufacturing and the nuclear industry. However, we believe this could also be the basis for creating energy sector clusters for the benefit of the whole county. Through using the engineering skills, talents and PR contained in the county, we have the opportunity to develop 'triple-helix' clusters using our academic facilities, private sector interest and assistance from the public sector.

8.2.5 Planning & Grid

Deployment of renewable technologies is key to ensuring the UK and our region meets its EU legal obligations. Planning processes and in particular grid connection in Cumbria have been highlighted as barriers to progress, though Planning Policy Statement 22 should help, and dialogue continues with Electricity North West to influence their investment decisions.

Some expertise already exists with wind & hydro project management and installation. Manufacturing could be undertaken in West Cumbria or Barrow where sites and skills are available. Interest is also shown with local business in terms of solar thermal panels.

We must work with planning authorities to identify suitable sites for renewables for example on derelict land where community support would be easier.

8.2.6 Coal

Cumbria still has reserves of coal, though it's not proposed that any of this will be mined, as there currently appears to be a lack of any community support. There may be future potential of trialling underground gasification, and this is currently under investigation in the North of the County.

8.2.7 Renewables

Some renewable technology could have more resonance in Cumbria than others. Bio-fuel requires relatively large sections of arable land (which we don't have) given over to production, but given current questions about impact on food pricing and overall energy gain, we don't feel this is appropriate in our strategy. Others are more suitable and could create sustainable jobs if we work on the supply chain, e.g. Biomass, Anaerobic Digestion, Solar PV, Hydro and off-shore wind.

Wind is already producing significant output and has currently more than 1GW capacity going through the planning process across 2 off-shore sites:

	Capacity (MW)	Homes equivalent
Winscales	6.8	3,802
WWU High Pow	3.9	2,181
Wharrels Hill	10.4	5,815
Siddick	4,2	2,348
Lowca	4.6	2,583
Haverigg III	3.4	1,901
Kirkby Moor	4.8	2,684
Askam	4.6	2,583
Lambrigg	6.5	3,634
Barrow (Offshore)	90	50,323
Total	139.2	77,854

(Source: http://www.bwea.com/ukwed/map-operational.html)

Further land based sites have been identified to help Cumbria achieve Government targets, but these tend to be currently controversial. Future acceptance of wind farms may change as society accepts gains momentum, but in the near term, offshore seems to be more promising. We must ensure greater contribution to the local economy than to date, and one way forward could be through community led social enterprises.

8.3 Low Carbon Technology

Cumbria has several specialist developers of low carbon technology, and much of the manufacturing is still located in the county. Examples include;

MARL	Ulverston	Photonics
Oxley	Ulverston	Photonics
Sun-dog	Matterdale	Solar
Bendalls	Carlisle	Hydro Turbines
Gilkes	Kendal	Hydro Turbines
Hydro Ellay Enfield	Workington	Hydro Turbines

Other skills and expertise exist in the county, and several small companies are being established in order to meet the needs growing interest as the market develops. Raising awareness of how to 'adapt' energy usage and what grants or subsidies there are is extremely important and several organisations or agencies are working to promote awareness. These include:

- Cumbria Futures Forum
- Cumbria Green Business Forum
- Cumbria Energy Efficiency Advisory Centre
- Envirolink
- Cumbria Business Environment Network
- EdenLA21

9.0 Strategy

Through working with partners in Cumbria, scores of ideas and initiatives have been conceived, developed and researched. Experience has shown that where we dilute capacity and capability, this has an adverse effect on our ability to deliver. It is also true that our plans are being developed in line with new Government initiatives at a time when the newly enlarged Europe has fewer funds for projects in relatively wealthy countries such as the UK. We must therefore prioritise our strategy against a smaller number of larger initiatives, and within these priorities we must have an adequate mix of things we can impact now and things in the medium to longer term.

We have identified 4 Key Strands against which to develop action plans

E.1 Save energy to reduce cost and increase competitiveness

500 jobs created/safeguarded (£15m GVA) in the energy efficiency supply chain large firms/SME's and low carbon homes

E1.1 Waste management underpins a low carbon economy:
and we must exploit what we should now consider as resources or natural assets. Biomass/Biogas plants of varying sizes need to be developed in suitable areas depending on what waste products are available in any given area. Promote the notion of 'closed loop' production systems to displace raw materials wherever practicable. Need to move from buy-use-throw towards hire-use-return

E.1.2 Promote Climate Change awareness:
and build adaptation capability within public, private and domestic markets. Energy efficiency measures will in part be driven through legislation and market forces as costs rise, but to stay ahead of the game we must consider adaptation measures by understanding what the options are and how to access grant funding or loans. KPMG 2007 Climate Change Business Leaders Survey shows that only 14% of the FTSE 350 companies can demonstrate a serious strategy for tackling climate change. Social marketing needs to be promoted in order to persuade public opinion.

E.1.3 More emphasis on 'adaptation' as oppose to 'mitigation':
Mitigation is not sustainable in the long term, as it has an implicit acceptance that to pollute is ok, as long as its paid for. Whilst there have been short term benefits in raising awareness with carbon offset schemes, (these schemes have recently been heavily criticised and their claimed benefits have been questioned), we are going to have to change or 'adapt' the way we live and work. It is through adaptation to a new low-carbon business environment that we can begin to realise the economic benefit potential of development and deployment of new technology.

E.1.4 Energy efficiency is the best way to reduce CO_2
and can also be seen as an opportunity to reduce costs through using low-carbon technology. Examples such as solid state lighting instead of incandescent, wool insulation instead of manufactured alternatives, and solar thermal instead of central heating can also benefit Cumbrian businesses and jobs.

E.2 Develop cleaner, secure, reliable energy

1860 jobs created/safeguarded (£93m GVA) in the nuclear and renewable energy supply chains

E.2.1 Attract and promote enterprise in renewable and low carbon technology:
work with Invest in Cumbria and through relevant agencies to encourage new jobs and companies developing products and services for this new technology.

E.2.2 Promote energy generation opportunities building on Cumbrian assets:
Nuclear skills and facilities, water and wind resources, in particular off-shore and tidal & yes, even sun. Continue to lobby government and work internationally to attract inward investment. Local communities must be fully engaged and endorse decision, whilst benefiting from socio economic funding.

E.2.3 Triple-helix' (Academic, Public & Private) industry clusters will be developed:
with clear strengths in Research & Development in order to capitalise on spin-off technology, intellectual property rights & new businesses from our Nuclear industry

E.3 Create jobs & wealth

In addition to other figures, 1200 jobs created/safeguarded (£36m GVA) in the Green Tourism sector and new business start-ups

E.3.1 Market Sellafield effectively to utility companies in order to make the case for their nuclear 'new build' investment:
Working in partnership with industry and the NWDA, we must demonstrate that there is significant 'ease' of doing business here. Through emphasising our higher level of public acceptance and influencing planning authorities, we must lobby to ensure that we can assist utility companies in making a business case which stacks-up in the boardroom including the potential cost of grid connection, transmission fees and waste management costs.

E.3.2 Governments' strategy for energy generation supports more medium sized decentralised facilities.
We should also be looking to assist businesses to provide household district heating schemes, where there is energy intensive production, (e.g. Iggesund, British Gypsum, Pirelli, James Cropper, Kimberly-Clark & Innovia etc).

E.3.3 Britain's Energy Coast™ Masterplan will be catalyst document leading diversification of the economy and 'Industries for the Future':
In response to the restructuring of the nuclear industry and its renaissance, the concept of Britain's Energy Coast™ will galvanise the energy and environmental activity based on the immense engineering and science base of the West Coast.

E.3.4 Skills requirements in a low carbon economy must be understood and developed:
It is highly likely that the development and deployment of new micro generating facilities and environmental technologies will require the appropriate skill bases to be identified and deliver across: design, construction, commissioning, operation and maintenance

E.4 Public Sector will play lead advocacy role with 'place-shaping'

E.4.1 Promote and support local businesses through public sector procurement:
The North West Sustainable Energy Strategy, 2006, states that the NWRA, NWDA, GONW and the Environment Agency will lead together on sustainable energy practices. Together with the Climate Change Action Plan, it will seek to implement a series of actions to accelerate the region towards a sustainable energy future. When considering the wider planning policy context, it states that *"Local authorities should integrate energy efficiency principles into their procurement policies, as far as possible using locally produced goods and services that meet the appropriate standards"….*requiring the use of locally produced sustainable and energy efficient inputs.

E.4.2 Support business efforts to minimise impact on the environment:
ISO14001 is the Environmental Management accreditation which ensures an organisation manages and reduces impact on the environment. As with 9001, it is believed that it will become increasingly pervasive and that any large procurement contracts will require ISO14001 or equivalent. Some smaller businesses may not be able to justify the investment, so public support for similar schemes such as the ENWORKS supported 'Resource Efficiency' scheme.

E.4.4 Fully engage with the newly announced Energy & Environment Institutions:
Energy Innovation Centre, Joule Centre, Environmental Technology Institute, Energy Savings Trust and Technology Strategy Board are all possible sources of funding and collaboration. Other academic institutions are also linking together to provide a lead in this area, and through the University of Cumbria, we need to ensure our place at the table. European funding themes are also concerned with the environment and we need to identify a Cumbrian lead.

E.4.5 Planning Policy Statement 22 (PPS22) sets out the principles to include the use of on-site renewables:
We must work with planning authorities to ensure that proposed developments make the best and most appropriate use of technology available given environment, cost and effect. The greater the contribution, the better the decision! Full implementation of the 'Merton Rule' would also promote low carbon developments.

E.4.6 Promote Social Enterprise as method of early adoption:
Whilst acknowledging that Social Enterprise isn't exactly the public sector, it can embrace 3rd and voluntary sectors which are closely aligned. Community Interest Companies gain local buy-in, particularly where there traditionally has been little community benefit for the deployment of renewables and hence localised opposition.

10.0 Delivering the Key Actions

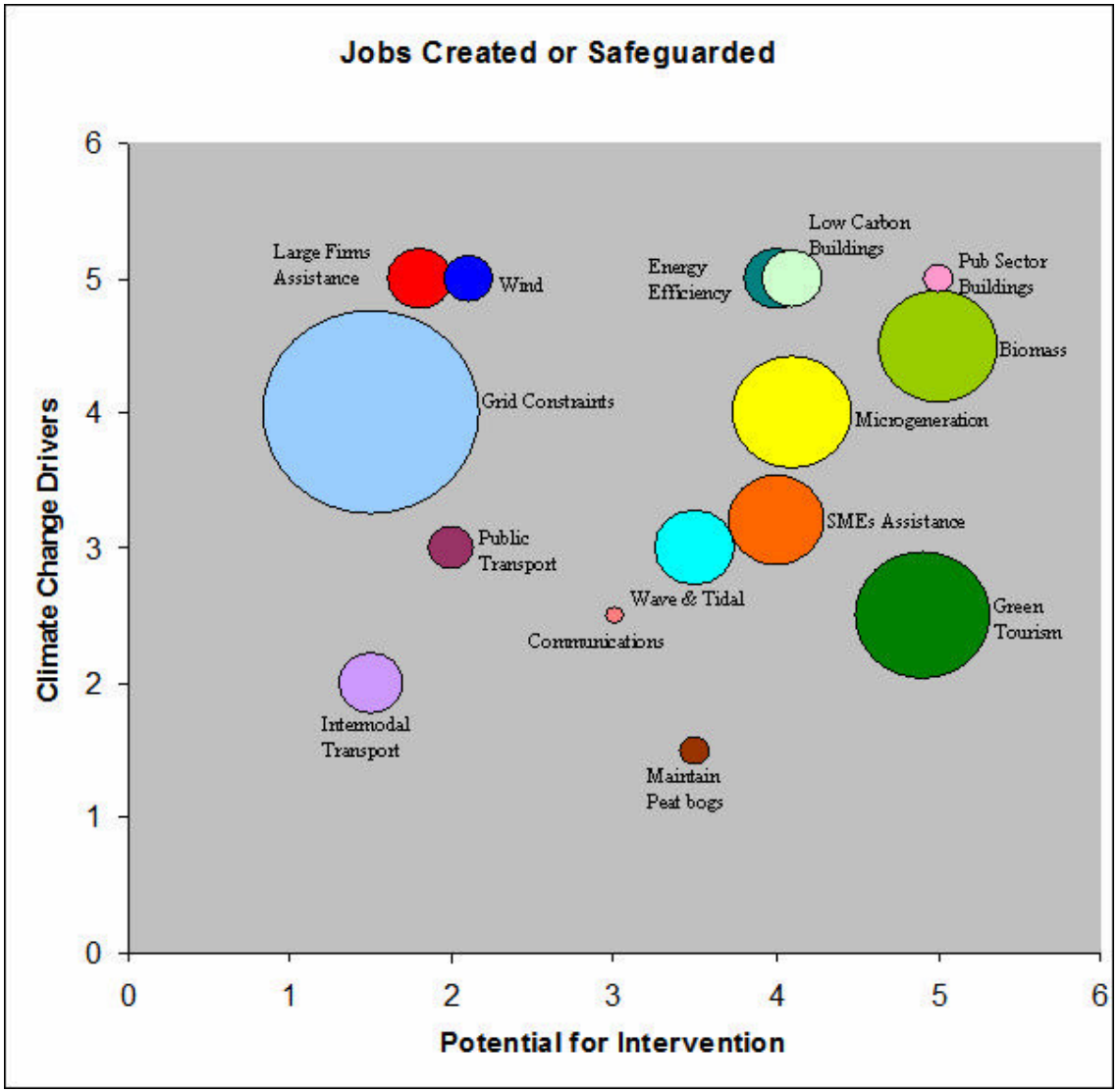
Timeframe	E.1	Save energy to reduce cost and increase competitiveness	Detail	County wide	Allerdale	Carlisle	Copeland	Eden	Barrow	South Lakeland
Immediate	E1.1	Waste management underpins a low carbon economy	Biomass supply chain to be developed. Also covers biogas from anaerobic digestion of agriculture, food Municipal & business waste Domestic, business & community CHP schemes	Exploit natural assets and 'waste' resources from principal business activities, providing jobs in rural areas too.	+++	++	++	+++	+	+++
Immediate	E1.2	Promote climate change awareness	Develop and Cumbria as a leader in 'Green Tourism', and promote Low-carbon Lakeland initiatives. University can lead on 'social marketing'. Cumbria climate change officer to co-ordinate activity	Rural and urban centres to benefit from early adoption. Benefits need to include reduction in waste and energy use.	++	++	++	++	++	++
Long term	E1.3	More emphasis on 'adaptation' as oppose to 'mitigation'	Cumbria needs a sustainable and reliable integrated public transport system. Business needs support, advice and access to finance in order to adapt	It's expensive to live and do business in a largely rural poorly connected county.	++	+++	++	+	+++	+
Mid term	E1.4	Energy efficiency is the best way to reduce CO_2	Resource efficiency advice, guidance and hand-holding to business & domestic market to reduce consumption is required. Support low-carbon technology development such as LED & wool insulation etc.	Ease fuel poverty particularly to older housing stock and off-grid (gas) buildings	+++	+	+++	+++	++	+++

Timeframe	E.2	Develop cleaner, secure, reliable energy	Detail	County wide	Allerdale	Carlisle	Copeland	Eden	Barrow	South Lakeland
Mid term	E.2.1	Attract and promote renewable and low-carbon technology	Develop and support micro generation companies. Link with technology hubs or business parks to cluster and incubate new start ups. Further research and support for iconic projects needed, e.g. Solway Barrage & Bridge across the bay.	Hubs and clusters proposed in South Lakes & LDNPA with links to manufacturing on the West Coast and in rural areas where appropriate	+++	+	+++	+	+++	+++
Immediate	E.2.2	Promote energy generation opportunities building on Cumbrian assets	Low head hydro, nuclear, tidal, potential to investigate geothermal, support wind developments where they are accepted and benefit the community	Largely based on the West Coast, but with pockets in rural areas where community is engaged	+++	+	+++	+	+	+
Immediate	E.2.3	'Triple Helix' (Private, Public & Academic) industry clusters will be developed	Create industry and stakeholder forums with individual panels of mutual interest as advisory bodies, also enabling R&D and innovative ideas to attract further external funding	Representation county wide and appropriate to area of technology interest. Need to identify lead body	++	+++	++	++	++	++

Timeframe	E.3	Create jobs & wealth	Detail	County wide	Allerdale	Carlisle	Copeland	Eden	Barrow	South Lakeland
Mid term	E.3.1	Market Sellafield effectively to utility companies in order to make the case for their nuclear 'new build' investment. Support PBO to develop site as UK hub of renaissance	The area contains the biggest concentration of technical capability on one site in Europe. New build is just one facet to retain capacity, others include reprocessing, the 'National' Nuclear Labs for further R&D and decommissioning,	West Coast, but with job and training opportunities to all Cumbrians	++	+	+++	+	++	+
Long term	E.3.2	Governments' strategy for energy generation supports more medium sized decentralised facilities.	We must work with energy industry to ensure the grid is fit for purpose. Support required to develop supply chain.	Woody Biomass and Energy from Waste, low head hydro and some wind	++	++	+	++	+	++
Immediate	E.3.3	Britain's Energy Coast™ Masterplan will be catalyst document leading diversification of the economy and 'Industries for the Future'	R&D led research & appropriate employment sites with support for enterprise start-ups. Inward Investment will come from companies wishing to capitalise on skills.	Predominantly West Coast and Barrow, but links throughout supply chains	+++	+	+++	+	++	+
Immediate	E.3.4	Skills requirements in a low carbon economy must be understood and developed:	Led through a developed portfolio of industry relevant training which links schools, colleges, Energus Academy, University of Cumbria & Dalton Institute	Throughout Cumbria, but higher education facilities based on West Coast	+++	++	+++	+	++	+

Timeframe	E.4	Public Sector will play lead advocacy role with 'place-shaping'	Detail	County wide	Allerdale	Carlisle	Copeland	Eden	Barrow	South Lakeland
Mid term	E.4.1	Promote and support local businesses through public sector procurement:	LM3 style procurement initiatives and sustainability clauses to be written into contracts helping to support employment of local people	To benefit all supply chain, especially tier 2 & 3	+++	++	+++	+	++	+
Mid term	E.4.2	Support business efforts to minimise impact on the environment	Assist Cumbrian businesses through waste management advice and support. Assist with ISO 14001 style accreditation.	To benefit all supply chain, especially tier 2 & 3	++	++	++	++	++	++
Immediate	E.4.4	Fully engage with the newly announced Energy & Environment Institutions:	Energy Innovation Centre, Joule Centre, Environmental Technology Institute, Energy Savings Trust, the EU and Technology Strategy Board are all possible sources of funding and collaboration. Identify Cumbrian lead.	Niche businesses and HE institutions	++	+++	++	+	+	+
Mid term	E.4.5	Planning Policy Statement 22 (PPS22) sets out the principles to include the use of on-site renewables	All Local Development Frameworks must promote adoption where appropriate including the 'Merton Rule', but to support, not hinder economic development.	All development growth areas	+++	+++	++	++	++	+
Mid term	E.4.5	Promote Social Enterprise as method of early adoption	Community Interest Companies can often be the answer to areas of market failure. Look into potential of 'Salix Finance' style capital loan fund for social enterprises	Local community interest companies throughout Cumbria.	++	+	+	+++	+	++

10.1 Prioritising the Actions



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The height of the bubble shows to what extent legislation is forcing a change and gives a clear imperative for businesses.

The lateral position shows which interventions are more likely to have an impact in Cumbria on jobs and likelihood for development

The size of the bubble indicates to what extent any intervention will contribute towards GVA in the county

Hence, any intervention in the top right quartile gives a clear indication of how we should prioritise projects and programmes

Source:- Economic Implications from Climate Change for Cumbria, May 2008, Quantum Consulting

11.0 **Strategy Development List of Contributors**

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Many people have given their time and input to the development of this action plan, from Stakeholders, Academia, Private Sector, and independent specialist consultants. We have also had direct Cumbria Vision Board input from industry and elected members. Through Cumbria Economic Development Officers Group (CEDOG) we have held a series of workshops to ensure that we have given consideration to the widest possible interested parties, - and all this before we go to official consultation. Our aim has been to get 85% agreement on the key issues relevant to the topic paper, and then through wider engagement still (consultation June – August, 2008), we can be assured our strategy and subsequent actions whilst aspirational, will have buy-in to ensure deliverability and a more prosperous Cumbrian future.