Cumbria Renewable Energy Capacity and Deployment Study

Final report to Cumbria County Council

August 2011

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Contents

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Approved by:	Chris Fry Associate Director	Date:	4 August 2011

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This study has been produced to provide a renewable energy evidence base for Cumbria's Local Development Frameworks.

It has been prepared by SQW for Cumbria County Council, Allerdale Borough Council, Carlisle City Council, Copeland Borough Council, Eden District Council, South Lakeland District Council, the Lake District National Park Authority and for the Yorkshire Dales National Park Authority for the part of Cumbria that lies within its jurisdiction. The study covers the whole of Cumbria.

Photographs are courtesy of Carlisle City Council, Persimmon Homes, Lake District National Park Authority and Cumbria Woodlands.

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Executive Summary

The purpose and scope of the study

1. This study on Renewable Energy Capacity and Deployment in Cumbria provides a comprehensive evidence base for developing appropriate and robust local planning arrangements with regard to renewable energy. It is a technical study only and does not constitute policy for any of the Cumbrian Local Planning Authorities. The work was undertaken by SQW and Land Use Consultants and was overseen by a Steering Group consisting of representatives from Cumbria County Council, Allerdale Borough Council, Carlisle City Council, Copeland Borough Council, Eden District Council, South Lakeland District Council and the Lake District National Park Authority (LDNPA).

2. The study draws on previous work including the *Northwest Renewable and Low Carbon Energy Capacity and Deployment Study (2010)* and the DECC/CLG methodology *Renewable and Low Carbon Capacity Assessment Methodology for the English Regions (2010).*

3. This study has involved a detailed and localised assessment of the amount of resources available that could be used to generate renewable energy up to 2030 – in other words the overall ***potential technical capacity*** (expressed in MW). The resources and technologies investigated include wind, biomass, energy from waste, hydropower, solar and heat pumps. In recognition of the high environmental quality in Cumbria, specific research was undertaken into capacity within Protected Landscapes.

4. The study was also concerned with taking these results a step further and translating them into a level of renewable energy deployment that is realistic to reach by 2030 i.e. the ***deployable capacity***. This involved the analysis of a number of key constraints and opportunities associated with economic viability, supply chain, grid connection/distribution, planning acceptance rates and other factors. It also took into account the amount of renewable energy already installed, and in the pipeline (under/awaiting construction or consented), within each Local Planning Authority (LPA). Scenario testing was undertaken to examine different mixes of renewable energy technologies that could be deployed.

5. The study has been undertaken against a backdrop of a rapidly changing national policy context for planning and energy. Table 1 provides a summary of the key policy developments for renewable energy generally, and specifically in relation to Cumbria.

Table 1: Summary of policy context

Planning policy

- National planning policy: Planning Policy Statement 22 Planning for Renewable Energy and Supplement to PPS1: Planning and Climate Change; national planning system review imminent, Localism Bill intending to shift power from central government back into the hands of individuals, communities and local authorities.
- Regional Spatial Strategies likely to be revoked, but still remain a material considerations although renewable energy targets have little weight.
- All LPAs locally have or are developing renewable energy targets aiming to support the increased deployment of renewable energy. Cumbria's Wind SPD is of particular benefit.

Energy Policy

- Policy on renewable energy capacity is fast moving and changing to take into account emerging technologies and targets at the national and global level.
- Government is committed to furthering deployment of renewable energy.
- Key current policy: UK Renewable Strategy, 2009 (source 15% of energy needs from renewable sources by 2020).
- Key financial incentives:
  - The Renewables Obligation which is the main mechanism for supporting large-scale generation of renewable electricity.
  - Renewable Heat Initiative announcement in March 2011 – phase 1 non-domestic from June 2011, phase 2 domestic from autumn 2012.
  - Premium Payment scheme for domestic renewable heating systems targeted at off gas grid properties starting 1 August 2011.
  - Feed in Tariffs support renewable energy generators with capacity less than 5 MW – currently under review to make efficiency savings due to be complete by end 2011. In June 2011 fast track decisions were announced on changes to the tariffs for anaerobic digestion plants and larger solar projects >50kW.
- Energy Bill 2010 – 3 key measures: The Green Deal, measures to enable low carbon technologies, further provisions including support to the private sector, the Energy Company Obligation and measures to support energy efficiency.
- Electricity Market Review White Paper, 2011, identifies key challenge of meeting electricity demand as 25% of current capacity is removed over the next 10 years due to plant closures and introduces specific measures to attract investment, reduce the impact on consumer bills and create a secure mix of electricity sources including gas, new nuclear, renewables and carbon capture and storage.
- UK Renewable Energy Roadmap, 2011, sets out shared approaches (across England, Wales, Scotland and Northern Ireland) to unlock renewable energy potential by building on existing actions and introducing new measures to promote greater deployment of eight key technologies.
- Emerging legislation: potential revision of Climate change levy; more support to LAs & communities re: ownership of renewable assets.
- Sub-regional energy initiatives such as Britain's Energy Coast and recent EZ submission provide further supportive policy environment.

Source: SQW

What is Cumbria's overall energy demand and how much renewable energy is already generated?

6. Using regional energy consumption statistics from DECC, Cumbria's total energy demand in 2007 was identified as approximately 18,000 GWh (i.e. energy output rather than generation capacity) with demand from Industrial and Commercial sectors being 50% higher than the domestic sector. Road transport demand is substantial and is spatially linked to the path of the M6. Domestic demand is higher in more rural areas probably linked to older and less energy efficient dwellings.

7. To provide a benchmark level for consideration of renewable energy generation potential and policies/targets, projections of Cumbria's energy demand to 2030 have been made. These projections are based on two of DECC's published national energy 'Pathways': the Reference case (no attempt made to de-carbonise or maximise energy generation from renewable sources) and Pathway Alpha which involves a concerted effort to reduce overall energy demand, to increase energy generation from low carbon electricity and to produce and import sustainable bioenergy:

- Reference case – energy demand for Cumbria increases by 7% between 2010 and 2050 driven by a 40% increase in domestic energy demand and a 12% increase in Industrial and Commercial demand, offset by a 28% fall in demand for energy for

land transport. Emissions are likely to increase. Energy demand in 2020 and 2030 is projected to decrease slightly to 17,900 GWh and 17,800 GWh respectively.

- Alpha Pathway – energy demand for Cumbria falls by 14% between 2010 and 2050 driven by a 38% fall in energy demand for transport, partly offset by a 13% increase in Industrial and Commercial demand. Domestic demand falls by 6% to 2030 then rises to match 2010 levels by 2050 and emissions decrease. Energy demand in 2020 and 2030 is projected to decrease to 16,000 GWh and 14,200 GWh respectively.

8. Cumbria's current renewable energy installed capacity, plus the projects that are planned and about to be developed (i.e. the "pipeline") was just over 295 MW at April 2011. The analysis indicates that this is provided from just under 400 separate installations. Interestingly, the installed and pipeline capacity exceeds the North West Regional Spatial Strategy target for electricity for Cumbria of 237 MW at 2010 showing that the sub-region is already progressing well in contributing towards the national renewable energy target of meeting 15% of the UK's energy needs from renewable sources by 2030.

Cumbria's potential resource for generating renewable energy

9. The detailed assessment of potential renewable energy resources in Cumbria has been undertaken in relation to 2030 as this fits well with planning horizons and is also realistic in terms of the time it can take for renewable energy developments to be consented and installed. In addition, we have also noted where the identified capacity is likely to increase (or decrease) considerably by 2050 to provide a longer term view. The assessment involved first, identifying the opportunity for harnessing the renewable energy resources on the basis of what is naturally available within the context of the limitations of existing technology solutions. Second, the assessment included addressing the some of the more "fixed" constraints to the deployment of technologies in relation to the physical environment and planning regulatory limitations to identify a more realistic measure of capacity and potential.

10. The total onshore potential technical capacity (i.e. the accessible renewable energy resource) in Cumbria is assessed to be 4,542 MW or 4.5 GW. Table 2 summarises the potential for each technology. The capacity results in italics and red font are not included in the aggregated results because they are provided for context rather than as accurate assessments. Those additional results cover sources such as offshore renewables and solar farms as well as CHP/district heating which are not renewable sources and so are not included in the aggregated total.

Table 2: Potential technical renewable energy resource capacity in Cumbria by technology (at 2030)

Technology group	MW by technology group	Sub Category Level 1	Sub Category Level 2	MW by sub-category
Wind (onshore)	2885.6	Wind - commercial scale	Wind – commercial scale	2858.3
		Wind – small scale	Wind – small scale	27.3
Wind (offshore)	*2900*	Wind (offshore)	Wind (offshore)	*2900*
Tidal	*6200*	Tidal	Tidal	*6200*

Technology group	MW by technology group	Sub Category Level 1	Sub Category Level 2	MW by sub-category
Wave	*500*	Wave	Wave	*500*
Geothermal	---	Geothermal	Geothermal	---
Biomass	212.0[1]	Plant biomass	Unmanaged woodland (electricity)	6.8
			Unmanaged woodland (heat)	41.4
			Energy crops (electricity)	6.2
			Energy crops (heat)	23.6
			Waste wood (electricity)	4.4
			Waste wood (heat)	3.8
			Agricultural arisings	3.0
		Animal biomass (aka EfW)	Wet organic waste	90.0
			Poultry litter	2.8
		Waste	Municipal Solid Waste (MSW)	19.4
			Commercial & Industrial Waste (C&IW)	20.7
		Biogas	Landfill gas	1.8
			Sewage gas	4.9
Hydropower	69.7	Small scale hydropower	Small scale hydropower	69.7
		Commercial scale hydropower	Commercial scale hydropower	0
Microgeneration	1374.7	Solar	Solar Photovoltaics (PV)	150.5
			Solar Water Heating (SWH)	135.4
		Heat pumps	Ground Source Heat Pumps (GSHP)	213.2
			Air Source Heat Pumps (ASHP)	852.7
			Water Source Heat Pumps (WSHP)	22.9
Large scale solar	*326.2*	Solar farms	Solar farms	*326.2*
		Solar infrastructure	Solar infrastructure	0.02
Combined Heat & Power	*126.5*	CHP	CHP	*126.5*
TOTAL	**4542.0**			**4542.0**

Source: SQW and LUC

[1] Unmanaged woodland (Electricity), Energy crops (Electricity) and Waste wood (Heat) have been excluded as heat and energy production for these technologies are mutually exclusive.

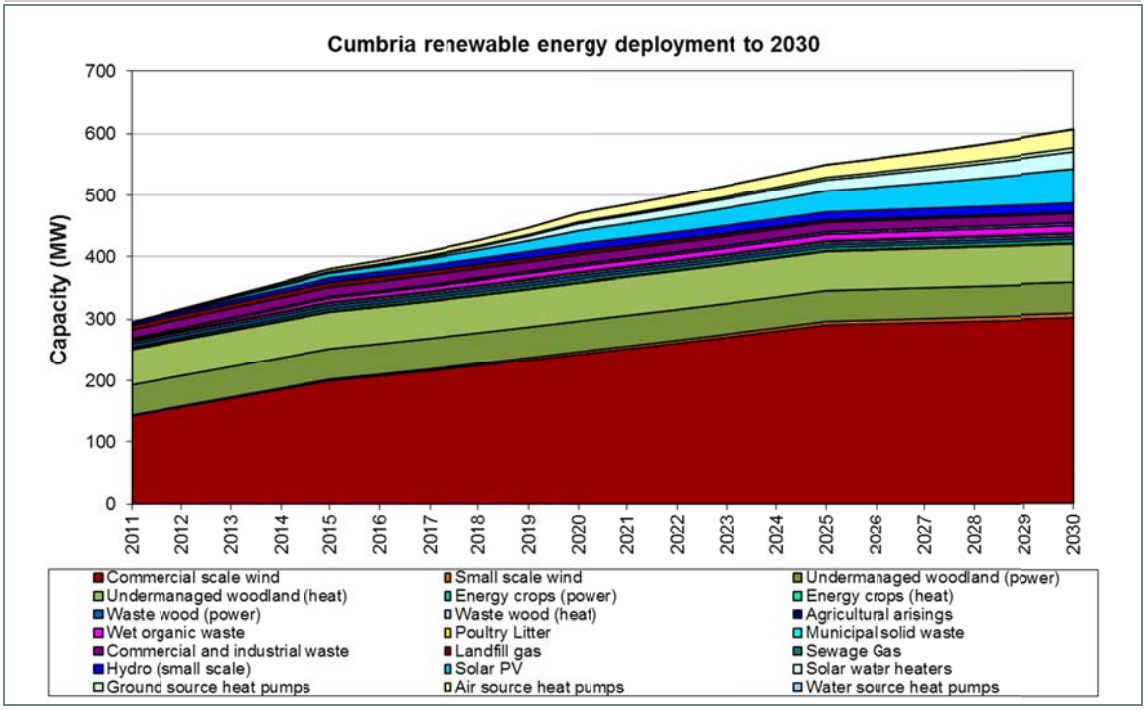
11. Commercial onshore wind provides the largest proportion of the onshore resource at 62% followed by microgeneration – 30% of the total resource. In addition the potential from Solar PV farms could provide an additional 326.2 MW although it is recognised that this assessment is highly caveated due to a number of assumptions being taken into account and the outcome of the recent FIT review resulting in a much reduced financial incentive to develop solar PV farms. Finally, the potential heat demand for combined heat and power (CHP) which could be met through district heating systems is 126.5 MW – this is significant potential and the introduction of the Renewable Heat Incentive combined with technological progress is likely to lead to many more schemes coming forward. Only those resource technologies that contribute to the overall total capacity (i.e. excluding offshore sources, solar PV and CHP) were subject to the deployable resource analysis in the remainder of the study.

How much of that potential resource is realistically deployable?

12. The Deployment Projections prepared in this study have forecast that 606 MW renewable energy could realistically be deployed within Cumbria by 2030 (including that which is already installed or in the pipeline). For all of the technologies except commercial wind, the potential technical capacity figures were used as the reference point or absolute ceiling of the amount of resource. For commercial wind, a reduced ceiling figure of 1,623 MW was used as this takes account of landscape capacity and was therefore considered to be a more realistic limit for Cumbria. The Deployment Projections were generated using SQW's *RE:Deploy* spreadsheet based tool.

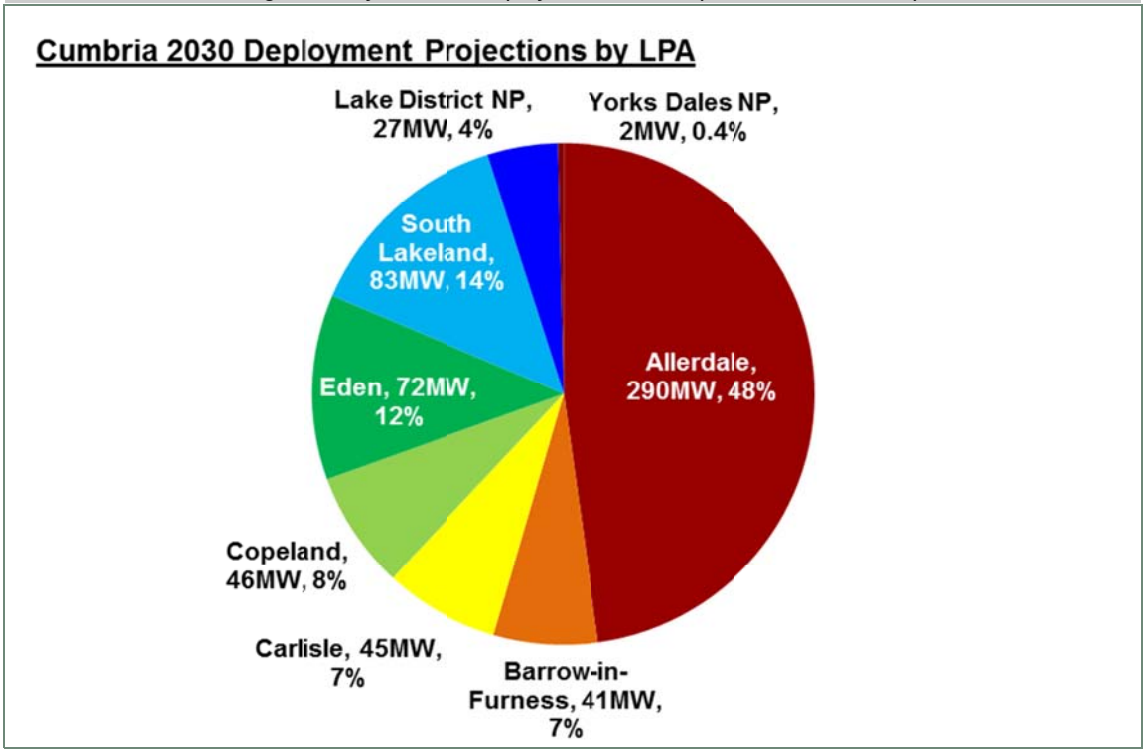
13. Figure 1 shows the deployment curve or "build rates" for the different technologies under the Deployment Projections. Based on locally specific data on the installed/pipeline capacity and potential resources, the anticipated contributions of the eight LPAs to achieve the 606MW for Cumbria are shown in Figure 2.

Figure 1: Cumbria deployment curve to 2030



Source: SQW

Table 3: Local Planning Authority share of deployment at 2030 (NB: total = 606 MW)



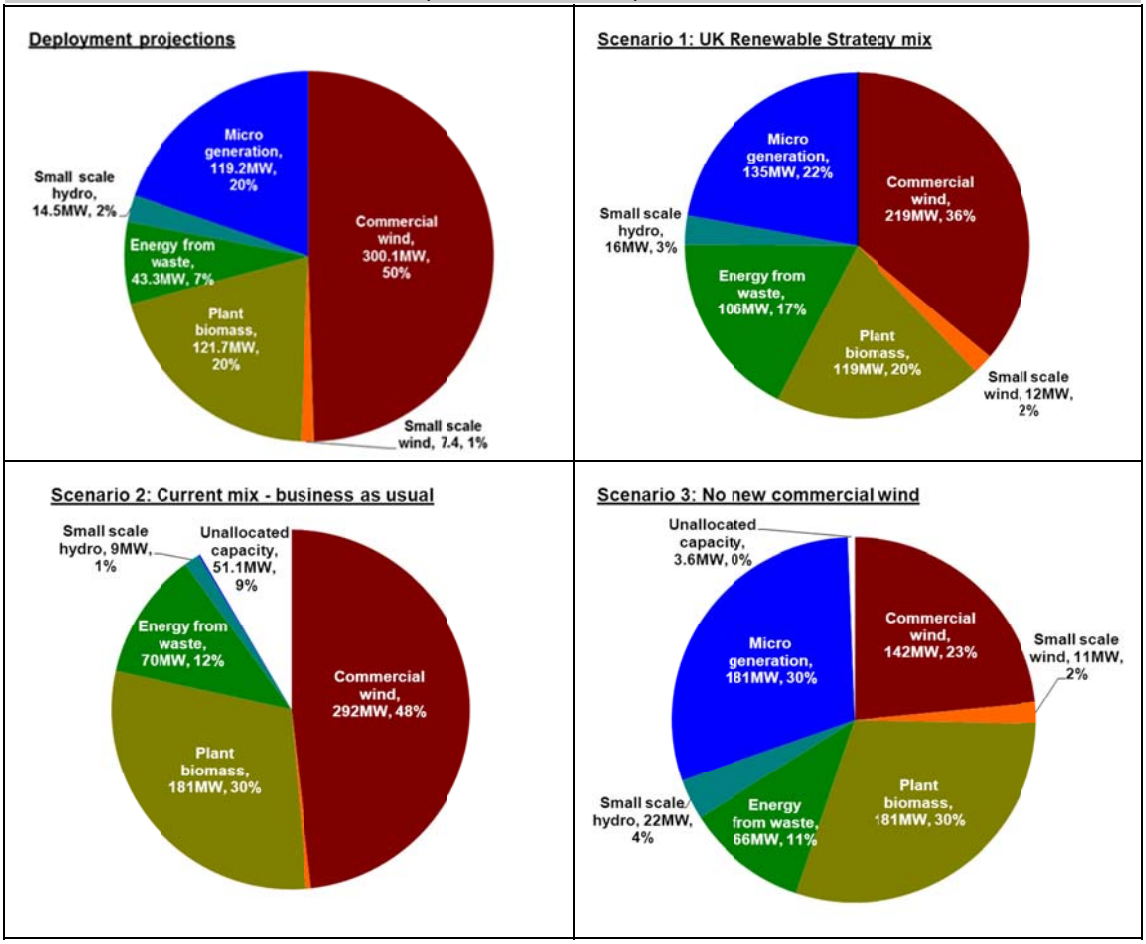
Source: SQW

14. Three further scenarios were investigated to illustrate how Cumbria could achieve the same level of deployment at 2030 by different mixes of technology. The three scenarios were agreed following consultation with the Steering Group and their main features and differences between them are:

- ***Scenario 1: 'UK Renewable Strategy mix'***, which reflects the indicative national technology proportions identified within the UK Renewable Energy Strategy 2009 to obtain 15% of the UK's energy needs from renewables by 2030.
- ***Scenario 2: 'Current mix – business as usual'*** projects forward the current installed capacity mix within each of the Cumbria LPAs (the mix differs between LPAs according to characteristics of current installed capacity).
- ***Scenario 3: 'No new commercial wind'*** assumes that there will be no new commercial wind deployment over and above that which is currently installed, under construction, awaiting construction or consented.

15. Table 4 illustrates the different mixes associated with the Deployment projections and the three further scenarios.

Table 4: Scenario results for Cumbria (NB total = 606 MW)



Source: SQW

Strategic impacts and opportunities associated with increased deployment

16. A **qualitative analysis of risks and opportunities** for Cumbria accompanied the quantitative work on constraints and scenarios. That analysis indicated that in terms of:

17. Economic viability

- Cumbria has the potential to deliver renewable energy on a significant scale if it is made sufficient economic policy priority.
- Continued financial incentives will be important to maximise deployment specifically from commercial scale wind and microgeneration.
- A coordinating group, with dedicated offer support, promoting renewable energy would be beneficial.

18. Supply chain

- The need for skill development in hydropower and biomass installation was highlighted by consultees although experienced engineering and design, and turbine

manufacture companies are based in Cumbria. Addressing any skills shortages will be important to reach the uplift in deployment envisaged regardless of the scenario – although these technologies feature most predominantly in the *No new commercial wind scenario.*

- Fuel supply is an issue for biomass, as is the need for sustainable woodland management and known, engaged woodland owners – the potential for significant woodland creation should be maximised as a way of meeting demand within the sub-region, but importing may also be required in future.

19. Planning and political

- More certainty and consistency in planning policy interpretation and decision making should help encourage greater deployment
- Sustained objection to commercial scale wind, albeit by the minority, is an important consideration that needs to be taken into account and managed pro-actively.

20. Technology development

- CHP and heat pumps are two technologies for which there is significant untapped technical capacity. National technological developments are needed for deployment to be fully maximised, and locally there will be opportunities to support firms involved in the associated supply chains (manufacture and installation).
- The large uplift in microgeneration in all scenarios, but particularly for the *No new commercial wind* scenario may prove challenging.

21. Community ownership

- There is limited interest in community ownership of renewables schemes although there are examples of successful projects such as the Bay Wind community initiative. Awareness raising, including visiting other projects such as the Bay Wind Community projects and the development of informed guidance, e.g. 'how to' guide covering technical and financial issues, could help to increase the current uptake which is minimal.

22. Job creation

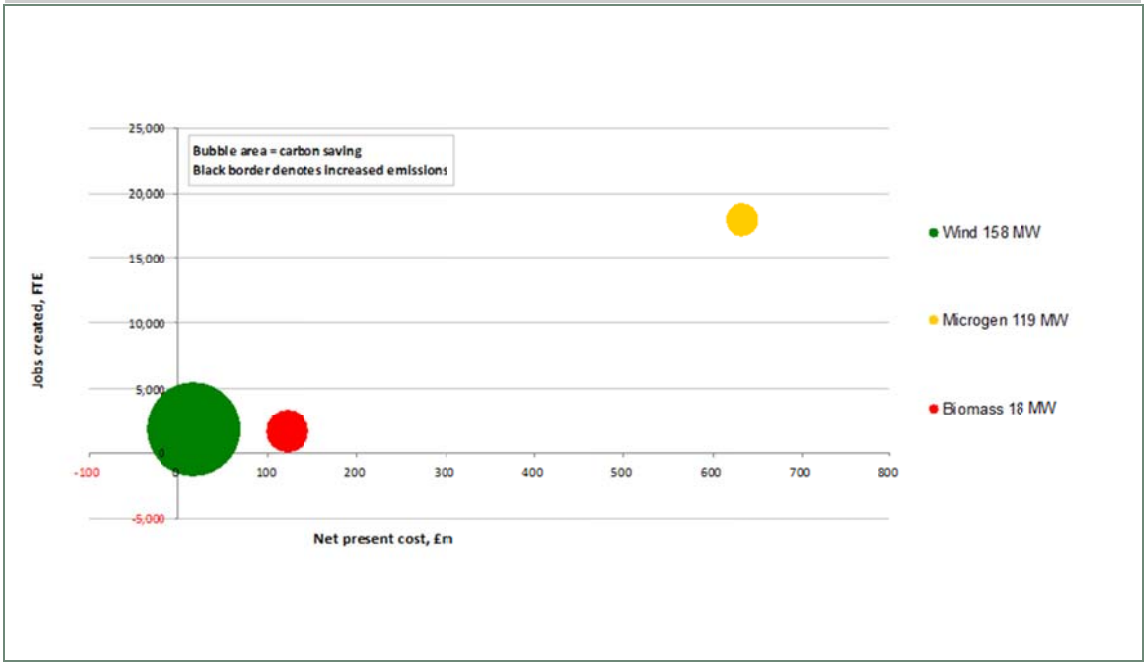
- Positive job creation impacts can be created through the increased deployment of renewable energy, particularly microgeneration which through its individual-property based characteristics is labour intensive.

23. Specific attention was also placed on the anticipated **environmental impacts** associated with the Deployment Projections. Overall, the most significant environmental impacts are likely to result from commercial scale wind, plant biomass and energy from waste. These technologies are prevalent in all scenarios (except the *No Commercial Scale Wind* scenario), and so it is envisaged that each of the deployment scenarios would result in landscape and visual impacts. As such, the cumulative landscape and visual impact resulting from future development of these technologies, combined with the existing deployment, is likely to be of a high

magnitude given the sensitivity of the landscape in Cumbria. Noise is also considered to be a potential impact (both short and long-term) in the case of these technologies. However, this potential is highly dependent on the location of future developments, and is only likely to occur where these technologies become concentrated within a locality, with the magnitude being enhanced where schemes are in proximity to sensitive receptors (e.g. residential development, schools etc.). There are also potential impacts associated with air quality and traffic and transport (both short and long term). Cumulative impacts are likely to arise where biomass and energy from waste plants become concentrated in a specific locality. Depending on the degree of concentration and the scale of individual plants, this would be of a medium-high magnitude.

24. Further analysis was also undertaken to consider the likely **carbon and economic impacts** using the PACE tool[2] which is a transferrable model to compare the impact of various interventions associated with moving towards a low carbon economy. This tool was applied to the Deployment Projections for Cumbria looking specifically at three technologies: commercial scale wind, energy from waste in the form of anaerobic digestion and solar photovoltaics. Figure 2 summarises the impacts analysis through illustrating the costs, jobs and carbon savings all in one chart. It is evident that commercial wind deployment is likely to save the most tonnes of carbon (largest bubble) and cost the least amount of money (furthest to the left). Nevertheless, in employment terms, microgeneration deployment has the potential to create the most new jobs (highest up the y-axis).

Figure 2: Total cost v jobs created (FTE, person years)



Source: SQW Note: The job figures are full-time equivalent person years. They include manufacturing, build and installation jobs for deployment until 2030 and operation and maintenance jobs associated with this deployment.

[2] The PACE (Prioritisation of Actions for low Carbon Economy) tool was developed by SQW for Cornwall Council as part of the EU INTERREG Regions for Sustainable Change programme

Main conclusions from the study

25. This study has provided a wealth of updated evidence and new analysis of the local possibilities for renewable energy across the Local Planning Authorities in Cumbria to 2030 and beyond. The main conclusions arising from the study are that:

- **Cumbria has abundant natural resources for renewable energy, but the deployment of these need to be undertaken in such a way that does not compromise the value and inherent quality of its natural landscapes, many of which are designated. Throughout this study, we have respected the need to ensure that projections for future energy deployment do not detract from Cumbria's outstanding environment. Taking this and a range of other constraints into account it is forecast in this study that Cumbria has deployable onshore renewable energy resources of 606 MW by 2030.** When converted into energy generation (GWh) and taking into account load factors for the various technologies, the potential energy generation figure is 1,861 GWh. This compares with the energy demand projections provided in Chapter 3 which suggest, depending on which pathway is followed, that future energy needs could be between 14,000 and 18,000 GWh at 2030. This suggests that Cumbria could provide between 10 and 13% of its energy requirements from onshore renewables by 2030. The UK Renewable Strategy, 2009, suggests that 15% of total future energy needs (and 30% of electricity) should come from renewable sources by 2020, but it should be noted that this aspiration is not expected to be disaggregated to local areas. Cumbria is currently a net exporter of energy and this is likely to be the case for renewable energy due to the abundance of natural resources.

- Interestingly, the **current installed and pipeline capacity (295 MW) already exceeds the North West Regional Spatial Strategy electricity target for 2010 for Cumbria which was 237 MW**. However it should be noted that this target was based on the North West Sustainable Energy Strategy which was published in 2006 since when there have been considerable advances in technological developments for renewable energy and more financial incentives are now available. In addition, the targets were calculated on a top down basis by identifying projected energy demand for the North West at 2030, calculating 20% of this (as the North West Sustainable Energy Strategy set out for the North West to meet 20% of its energy needs by 2020) and then dividing this amount between Cumbria, Cheshire, Merseyside, Lancashire and Greater Manchester. Cumbria is a net energy exporter and likely to continue to be so, particularly for renewable energy and therefore it is important that targets are developed on a capacity rather than a demand basis capitalising upon the natural resources with which the county is endowed.

- **Cumbria needs to significantly increase its current level of deployment (295 MW) if it is to meet the 606 MW that is considered deployable.** The Deployment Projections provide the most easily achievable mix as they are based on realistic assumptions concerned with economic viability, supply chain, grid constraints and recent planning acceptance. The *UK Renewable Energy Strategy mix scenario* would require a substantial increase in energy from waste which may not be realisable,

whilst the *No new commercial wind scenario* which is likely to be more politically acceptable and has the least environmental impacts, requires a substantial uplift in the deployment of microgeneration. Some microgeneration technologies are not yet economically viable on a widespread basis and this target is extremely challenging in terms of the scale of the uplift and viability of deploying this with regards to owner interest, availability of financial incentives, quality of stock and technological development.

- **Microgeneration provides an exciting opportunity in terms of economic benefits and particularly job creation.** The analysis of qualitative aspects revealed that there are a good number of existing microgeneration installers so there is a local labour market benefit that can be achieved. Continued support via Feed in Tariffs, or other financial incentives in the future, plus a supportive local policy environment should help maximise take up. Potential funding sources for wider scale roll-out retrofit and new housing include European funding (already being accessed in Cumbria for retrofit including renewable energy measures), section 106 and the Community Infrastructure Levy. Supportive planning policies are also important particularly those that require more than the minimum Code for Sustainable Homes requirements and Merton type policies where it is specified that a certain proportion of energy should be generated on site.

- **Continued deployment of commercial wind is likely to be required to meet the identified level from the deployment modelling and it is notable that some LPAs with large technical capacity have no existing or planned developments**. An appropriate planning environment, which is in place across Cumbria particularly with the Wind SPD in place, is essential as will be the continuation of financial incentives. Wind also provides the cheapest option as identified through the carbon and economic impact analysis and will achieve the highest carbon saving. Whilst noting the importance of commercial wind in Cumbria's future renewable energy deployment mix, it is important to have cognisance of the cumulative environmental impacts that this can impose. Allerdale for example has a significant installed capacity with regards to commercial wind (at just under 90 MW) yet could realistically deploy a further 60 MW over the next 20 years. This is a fairly significant deployment of commercial wind within one district which would not be without environmental impacts.

Recommendations

26. The key recommendations from the study are summarised below:

- We are aware that Cumbria County Council and the Cumbria Local Planning Authorities are **planning a series of dissemination events**. This is important and should not be restricted to climate change officers or planning officers, but include economic development colleagues due to the important of renewable energy to the Cumbrian economy as recognised through Britain Energy Coast's proposals. Related to this, we are aware that a series of training events have been undertaken throughout 2011 to raise awareness of different types and scale of renewable energy technologies

amongst officers and communities. This could be built upon with further awareness sessions for elected members linked to the findings from this report and including site visits to provide first hand experiences of different types and scales of renewable energy developments.

- Individual LPAs may wish to undertake **further work to refine the results** and select the most appropriate scenarios to provide the evidence base to help to take forward their renewable energy ambitions. This could be linked to target setting to set a clear goal and also enable measurement of progress. In addition, further analysis may be important for individual LPAs in relation to economic viability, opportunities, carbon abatement potential and environmental impacts.

- **Increasing the profile of renewable energy to an overarching policy priority** linked to Britain's Energy Coast proposals could provide substantial economic and environmental opportunities for Cumbria in to the future. In addition, the skills opportunities presented through the growth of the sector and its supply chains need to be fully optimised and it is recommended that **supply and demand mapping concerning skills and supply chain** are undertaken for the increased deployment of biomass, hydropower and microgeneration. Whist recognising the significant economic boost that can be provided through capitalising upon renewable energy opportunities, it is important to also acknowledge the importance of tourism to Cumbria's economy and the role of the natural environment in attracting visitors. Therefore cumulative impacts and the consideration of landscape character must be taken into account with regards to the siting of individual developments.

- Related to the above point, there is an identified need to **develop an ongoing co-ordinating group working to raise the profile of renewable energy** and ensure that future deployment is maximised, within environmental constraints, and that its benefits are fed back into local communities via the development of local supply chains, community schemes etc. The Cumbria Renewables Panel could potentially provide the vehicle.

- Whilst there is already a **reasonably well developed planning environment in place** with regards to local policies and the wind SPD, there appear to be some concerns with regards to the **interpretation and delivery of said policy**. Reviewing the consistency of interpretation and implementation of existing policies including the Wind SPD across LPAs will help foster a more supportive environment for the deployment of renewable energy within Cumbria.

- Due to the **landscape quality across Cumbria and prevalence of Protected Landscapes**, we recommend that **further work** is undertaken to fully understand and assess all of the impacts from a significant uplift in renewable energy deployment, particularly commercial scale wind.

- In order to take the **assessment of heat demand and potential for CHP developments** further, **additional research** should be undertaken concerning future development and its heat demand, potential future waste heat sources and a review of existing and planned heat infrastructure across the county.