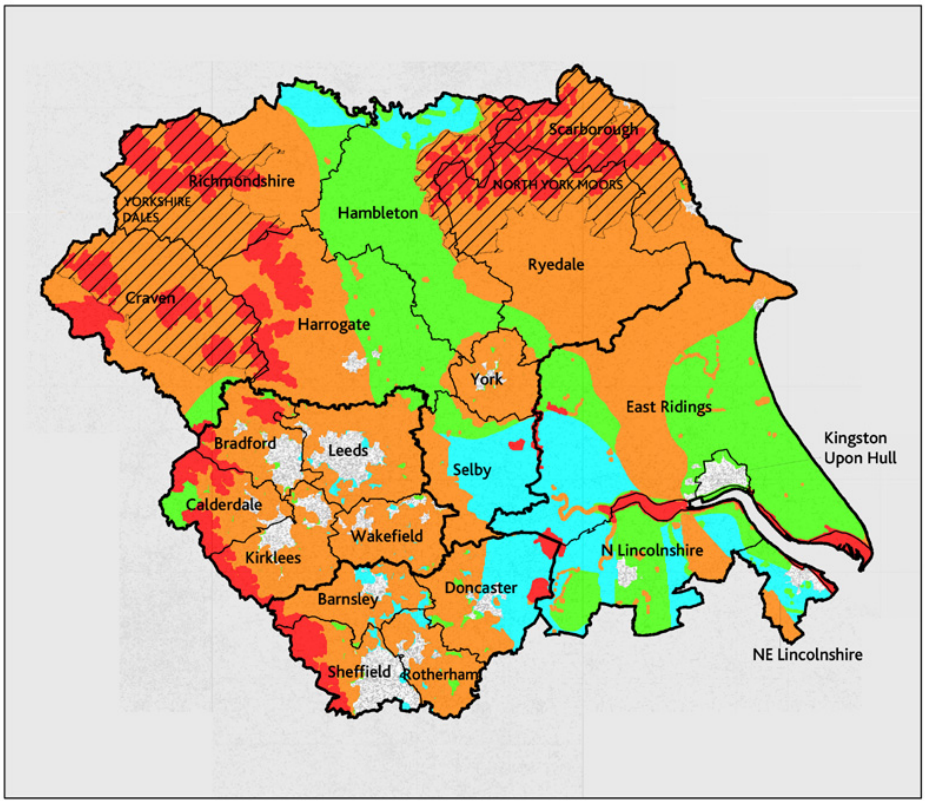
Planning for Renewable Energy Targets in Yorkshire and Humber

FINAL REPORT, VOLUME 2: Renewable Energy Resources

A report produced for

Government Office for Yorkshire and Humber

and the Yorkshire and Humber Assembly



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Foreword

Volume 2 of this report is one of a set of three Volumes. Volume 2 contains supporting information for Volume 1. To ensure that each section is coherent and can be read independently there is some overlap between some sections. Maps accompanying this report are also available in electronic format.

Contents

1 Renewable Energy Resources

Many of the renewable energy resources are indirectly related to energy from the sun. Solar energy can be exploited directly as heat and light or converted into electricity through photovoltaic cells. Wind power too is derived from the solar energy that drives the weather systems. Biomass is dependent on sun light for growth while geothermal energy is directly related to energy heat in the Earth. Renewable resources are continually replenished or are present in such huge quantities that they may be regarded as infinite. This contrasts directly with fossil fuels which are present only in specific places and because they take so long to form, are not replaceable.

This study has considered those renewable energy resources within the region that are most likely to be exploited by 2010 and 2021. In drawing up the list of significant renewable energy resources the following criteria have been used:

Accessibility - The renewable energy source must be reasonably accessible. For this reason geothermal energy which probably exists deep underground in the region may be available but is inaccessible and therefore not economic to exploit.

Quantity - The amount of resource available is a key factor. Wind and solar energy are available in plentiful supply but hydro power for example is obviously limited to available water courses.

Technology - The technology must be developed and available. For this reason wave and tidal energy potential are not estimated for 2010 as the technologies are under development. However by 2021 some deployment of these technologies is predicted.

Economics - If the previous three criteria are met then the remaining barrier to exploitation is the economics of the technology. Therefore technologies like photovoltaics (PV) which uses easily accessible daylight through well developed PV cells is constrained by its current high capital cost.

The renewable energy sources for which potential has been estimated are:

Wind - both onshore and offshore

Solar - energy from the sun in the form of light and heat exploitable through PV for electricity generation and through solar water heating. Solar energy can be exploited directly in buildings using passive solar design i.e. exploiting daylight and heat from the sun.

Biomass - this covers all material from naturally grown and recurring materials including energy crops for example from willow, wood from forestry management, straw, various farm wastes etc. The biomass category also includes biogas - a gas containing methane derived from the decomposition of natural materials for example by the process of anaerobic digestion.

Hydro - the use of water flow to drive a turbine for electricity generation.

Marine - technologies exploiting water movement (tides, currents and waves) at sea.

There are other energy sources available within the region that may be classified as renewable but have not been specifically evaluated in this study:

Landfill Gas - gas derived from decomposition of waste in landfill sites.

Sewage Gas - gas derived from anaerobic digestion of sewage.

Municipal and Other Waste - energy can be derived from incineration, pyrolysis, gasification and anaerobic digestion.

Ground Heat - Use of low grade heat from ground sources.

2 Wind

2.1 Technology

Wind turbines comprise a rotor of normally three blades. Wind turns the rotor which drives a turbine. The turbine is mounted on a tower so that the rotor is subjected to higher wind speeds and less turbulent air. Wind turbines are available in a very large range of sizes ranging from a few kilowatts suitable for powering one house to 3 or more MW suitable for supplying thousands of homes. The power from a wind turbine is very dependent on wind speed and so prime locations are on higher ground in open country, on the coast or offshore. However such sites are often regarded as the very sensitive in terms of visual impact, hence the need to also deploy wind turbines in areas of moderate average wind speed of 6 metres per second and above.

Wind turbines have undergone significant development in the last decade. Wind energy is seen as the single most important technology to enable UK to meet its renewable energy targets by 2010 and 2020. Wind turbines can be cost competitive with generation form conventional fossil fuel sources. The main barrier to deployment of wind turbines is visual impact. Commercial scale wind turbines can range in height from about 100-150m and so wind farm schemes are very visible in the landscape. Landscape issues are detailed in section 4.4 and Volume 3 to this report.

2.2 Wind Resource

The available wind resource is determined by the average mean wind speed at any location. Annual mean wind speed of 6m/s at 45m above ground level has been assumed as the threshold for commercially exploitable wind power for both 2010 and 2021. Areas of wind speed less than this threshold may be used for wind farm developments but have been excluded for the purpose of developing the refined potential.

In the process of evaluating the potential for wind technology within the region we have taken account of a number of issues:

- wind speed
- available space for wind schemes
- likelihood that wind schemes might be acceptable (environmental and landscape sensitivities)
- cumulative impact - the size of turbines and wind farms, spacing and density of wind schemes
- grid and other development constraints

Refined renewable energy potentials have been developed at the local authority level for onshore wind only. However, offshore wind will make a very significant contribution to the region's renewable power supply.

2.3 Existing Wind Farms

There are four existing wind farms (one in each sub-region) that collectively provide about 25MW capacity. These wind farms have been taken into account in determining the potential in the local authority and sub-regional areas for 2010. We have assumed a separation between established schemes and other possible future schemes of 15km for 2010. By 2021, the existing schemes will probably be outdated. We believe that these existing schemes will either have been upgraded (repowered), enlarged or removed and thus for the purposes of evaluating potential for 2021 we ignored the existing schemes.

2.4 Size and Spacing of Wind Turbines and Wind Farms

The following data has been used for turbine size and spacing:

Year	Turbine capacity (MW)	Hub height (m)	Rotor diameter (m)	Height to blade tip (m)	Turbine density (no. per sq km)
Current	1.5	60-80	66	93-113	6.0
2010	2.0	60-80	80	100-120	4.5
2021	2.5	60-105	80	100-145	4.4

Where more than one wind turbine is present then the scheme is referred to as a wind farm. We defined the size of wind farms as follows:

No. of turbines	Wind Farm Size Designation
2-5	Small
6-25	Medium
>25	Large

The study has recognised that wind farms can have a cumulative impact. A minimum separation distance between wind farms was therefore used to reduce the cumulative visual impact of adjacent wind farms. For 2010 a 15km minimum separation of wind farms was assumed. For 2021 a 10 km minimum separation was used. The reduction for 2021 was based on an assumption that by 2021 wind farms would be more familiar within the landscape and therefore more generally acceptable to the public.

These assumed separations were used for development of maximum potential only and should not be used for any other purposes

2.5 Landscape

Wind turbines operate most efficiently in non-turbulent air streams i.e. well above ground level. Wind turbines are therefore necessarily tall structures that are prominent features in a landscape. The rotation of the rotor blades increases their visual impact. The acceptability of wind turbines within a landscape is an emotive issue and one where some compromise is needed. Whilst it is generally accepted that the most valued landscapes should not be compromised, those landscapes of lower value can integrate some wind power development but in a controlled way to minimise the impact. This study has developed a methodology for

assessing landscape sensitivity that can be used to determine the potential size of wind farm developments and hence the potential for wind power capacity within a locality.

2.6 Impact of Scale

In order to derive the maximum wind potential for each local authority we needed to produce rules for the size of wind development for different categories of landscape sensitivity to wind developments. Four categories of landscape sensitivity to wind development were used: very high, high, medium and low. The subject of landscape sensitivity is covered in Volume 3.

For the purposes of developing the maximum potential (but not for any other purpose) the sizes of wind farms that we used for each category was as follows:

Very High Sensitivity - no wind farm developments were assumed (but in practice some wind development may be possible in such areas.

High Sensitivity - no wind farm developments were assumed (but in practice some wind development may be possible in such areas.

Medium Sensitivity - only small and medium sized wind farms were assumed (but in practice it may be possible to accommodate a large wind farm in such areas).

Low Sensitivity - wind farms of all sizes were assumed in such areas.

2.7 Community, Green Belt and Urban Schemes

In addition to large rural areas that provide opportunities for medium and large wind farms we have now taken account of significant opportunities for wind generation from smaller community and private schemes and schemes within green belt and urban areas. Without very detailed studies of each local authority area it is difficult to estimate the potential of these smaller schemes. However we believe that each LA should be able to accommodate at least 10MW of additional capacity by 2010 and 15MW by 2021 from such schemes. However we have recognised that for 2010 both Scarborough and Hull may have difficulty in accommodating this capacity due to MOD radar restrictions and so their potential has been proposed at a lower level of 5MW.

2.8 Network and Other Constraints

It is not always possible to link new generating capacity onto the existing network[1]. YEDL and NEDL were consulted on this. For 2010, constraints on new generation linked to the existing network have been taken into account where possible. This has reduced the maximum potential for 2010. By 2021 it has been assumed that the electricity network will be strengthened where necessary to accommodate all new generation to the level of the estimated potential in the region.

Other constraints on wind developments are discussed in section 3.

[1] See - Energy and the Regional Spatial Strategy, a report for the Yorkshire & Humber Assembly, September 2004.

2.9 Maximum Potential

The potential for wind farms in open rural locations is derived through a process of placing *notional* wind farms within the region at the lowest possible separation distances as follows:
2010 2MW turbines, wind farms are placed at least 15km apart, size constrained by electricity network capacity and other constraints (see section 3).
2021 2.5MW turbines, wind farms are placedat least 10km apart. Electricity network constraints that are relevant in 2004 are not taken into account in the 2021 exercise. Other identified constraints (see section 3) are however used in the placement of the notional wind farms.

Trials using this process revealed that the maximum number of the largest possible wind farms (according to the sensitivity criteria in section 2.6) that could be placed within any local authority boundary was not particularly sensitive to the positioning of the first notional wind farm. Thus, as in real life, there is uncertainty as to the actual position of the first wind farm in any area but this is not particularly important in influencing the overall potential of the area.

The **maximum potential** for each local authority within the region is estimated by summing the rural potential and the small scale/green belt/urban potential. For 2010 the capacity of existing wind farms is also added. For 2021 the current existing wind farms are not included as it is assumed that they will have been redeveloped.

2.10 Refined Potential

Refined potentail has been expressed in MW but can also be expressed in terms of numbers of turbines and possible numbers of schemes and their size. The refined potential can also be expressed as annual energy output from the schemes in GWh. This is anyway a consequence of the MW capacity and the wind speed and typical hours of operation per year. For the sake of simplicity refined potential is expressed in MW only.

2010
The 2010 total refined wind potential is 336MW which is similar to the total proposed in June 2004 and slightly higher than the RPG onshore wind target of 305MW. The local refined potentials are based on 50% of the maximum potential for that year but with a lower limit of 10MW generally. Exceptions are Hull and Scarborough which fall almost completely within the most restricted MOD radar consultation zone and have therefore been allocated a lower target at 5MW each. To take account of the short timescale the 2010 potentials have been limited to an upper limit of 40MW. The estimates have been based on wind turbines of 2MW capacity and a minimum15km separation between wind farms.

2021
The 2021 total refined wind potential is 725MW which is considerably lower than the first estimate of 948MW proposed in June 2004. The refined potential is close to the target in RPG of 740MW. The 2021 refined wind potential for each local authority is based on 50% of the rural potential plus the small scale/green belt/urban potential of 15MW. By 2021 we have predicted that turbines will be slightly larger at 2.5MW rather than 2.0MW for 2010. We have also predicted that by 2021 wind schemes will be familiar to the general public and that they will be more readily accepted. Thus for setting maximum potential it was assumed that separation between wind farms could be as low as 10km. However in practice the separation distance is likely to be much greater as the potential is based on a proportion of the maximum potential.

While the methodology is believed to provide fair estimates of potential generally, there are locations where the deployment at those levels would put an unacceptably high pressure on the local authorities. The potential for these authorities have therefore been limited to 90-120MW . However, these and all the other wind potentials should be regarded as minima.

2.11 Wind Developers Meeting

A meeting to discuss Wind Energy Development issues in the Region was held in Leeds on 31st March 2004. Represenatives of Renewable Energy Systems, Powergen, National Wind Power, Gillespies and Future Energy Solutions attended. The meeting was chaired by Ian McCubbin (IMcC) of Future Energy Solutions and the notes of the meeting are included here for reference. These notes do not necessarily represent the views of the consultants.

Background

IMcC explained the background for the LA study and the reason for inviting representatives of wind energy developers to a meeting to discuss wind energy issues with the Yorkshire and Humber region. He hoped that this would:

- Allow developers to input their views on the interaction between their needs and development plans and other stakeholders needs
- Provide some opportunities for the developers to inform both this study and other parallel national activities in this area
- Identify key obstacles and best practice to assist further development of wind power within the region to help meet the regional 2010 targets

Discussion

Included the following points:

- There is a substantial context surrounding wind farm development, both nationally and regionally, including the potential regional economic benefits arising. Reports cited in this respect include:
- ODPM Planning Circular 1/2003
- The Regional Economic Strategy (from Yorkshire Forward web site)
- DTI Energy White Paper 02/03

Current development climate within the region

- Comments were encouraged as to how developers perceived the current development climate in the Yorkshire and Humber region. Issues arising included:
- Planners and the public within the region are more reactionary than in many other areas and the report needs to be a vehicle to ‘put old myths to rest’. A lot of misinformation is circulated during the planning process from objecting stakeholders and also from some local government staff. There is a need for re-education of planning staff to ensure that they are able to present a balanced and informed view of the implications of development proposals.
- The region has an excellent wind resource so represents a key area for development if 2010, 2020 and 2050 targets are to be achieved

- Local government officers fail to see the 'bigger picture' with regard to renewable energy in their region, issues such as tackling global warming and the Kyoto protocol are not perceived by them to be within their control or remit of duty despite national government policy
- Local plans only pay lip service to renewable energy development crediting it with little more than a line or two in the text. Developers feel that it is currently being 'ghettoised' and that the lack of formal policy statements within local plans are inhibiting further growth
- Wind developers are expected to do too much of the ground work in the planning process, more co-operation from all stakeholders is needed Developers not local authorities are currently charged with boosting public knowledge and opinion of renewable energy development due to a lack of local authority resources being spent on this issue
- Local Authorities still view renewable energy targets as maximum thresholds to reach, there is no desire to exceed targets despite the fact that these are essentially rolling figures designed to increase to meet the 2050 target established by the Royal Commission on Environmental Pollution

Barriers to further development

- Developers feel that the planning process is a real obstacle to increasing the renewable energy capacity of the region. It can sometimes be seen as 'easier' to pursue schemes that are over 50MW and require DTI perusal under Section 36 of the Electricity Act as opposed to running the gauntlet of trying to succeed with obtaining local planning permission for smaller schemes
- RES current strategy is typical of many developers in their focus only on large (usually 50MW+) schemes
- Unfortunately were this approach to become commonplace wind developers would miss out on a lot of generation opportunities and the likelihood of meeting RE targets could be hampered.
- Powergen in particular see the benefit of pursuing small scale single turbine schemes through the planning system.
- The real difficulty lies in obtaining planning approval for mid-range schemes (i.e. schemes larger than a single turbine but smaller than 50MW) To meet the renewable energy potential levels proposed it is not a case of either large or single turbine systems being selected but rather that all scales of opportunities need to be maximised.
- At present wind development is difficult to justify to local communities using a local. consumption benefit / community identification argument, because in large developments the vast majority of electricity produced is exported to national transmissions systems to be used in the South of England where need for energy is greatest.
- Small scale single turbine schemes such as those promoted by Powergen's community renewables initiative have the advantage of being able to win over local support because the power they produce is embedded and distributed locally – hence a sense of community ownership of projects is more easily fostered at the planning and public inquiry stages.
- The issue of cumulative impact is increasingly important within the region. For example at the Thorn Moors site there has been a case of a 'proposal too far' whereby the most recent United Utilities application has resulted in there being five large schemes proposed to be located within one area close to the important habitat of Thorn Moors.
- This has in turn resulted in English Nature's demand for a cumulative impact study for all 5 proposals. This study could take up to 6 years and obviously would hamper the region's ability to meet the 2010 targets

- Developers feel that their aims and schemes are misunderstood because they are often misrepresented.
- Planners need to break from the assumption that public opinion is set in stone.
- People tend to object to renewable energy developments because of a lack of understanding, failure to recognise the need for the development, lack of consultation and unfamiliarity with the issues, implications and reality of what living next to a wind farm really entails
- Local authorities need to actively promote information about renewable energy development to their local communities in a positive light – as part of their local plans / LA21 strategies for example. This is vital to ensure that the public are able to act in an informed manner as opposed to the reactionary and sometimes hostile reaction elicited at present by wind farm planning proposals
- Many of today's most 'loved' schemes were vociferously opposed at the planning stage by their neighbours. The same neighbours are now positive in their opinion of wind energy. Recent studies undertaken by the Scottish Executive have revealed that the closer people live to a wind farm, the greater their support for wind energy is.

Developers requirements

IMcC then invited the developers to discuss what their needs were - in essence what factors determine the selection of a site. The following points were raised:

- Sites need to be windy, and the resource can only be exploited where it occurs.
- The wind speed needed to make a scheme 'add up' financially is decreasing as technology and policy drivers such as the ROC advance.
- Today sites of 6.5 m/s average wind speed are now financially viable for development
- Sites need to be sited close to an appropriate grid connection to make the economics 'stack up' at present.
- This is scheduled to change in April 2005 when reinforcement costs will be paid for by distribution companies and developers will only face the cost of local connection charges
- Mid –range wind farms (5 – 30 MW) need to be sited within 8 km of a 33kV / 132kV cable.
- Large wind farms can afford to be sited between 10 – 15 km of a 33kV / 132kV cable.
- Single turbine schemes are most sensitive to high connection costs because their financial pay-back is lowest and whilst they don't have to be sited close to the highest voltage transmission cables they too are constrained in their location by the grid. Single turbines require sites that are no more than 2km from an 11kV line
- Wind farms needed to be sited at an appropriate distance from homes and other buildings for noise as opposed to safety reasons
- Established practice is to build a turbine no nearer than 10 rotor diameters from a dwelling
- Typically this is 600m or so although it can vary according to prevailing wind direction and other conclusions obtained from noise monitoring studies prior to development
- Can build as close as 100m to a home if there is a higher level of background noise – such as where a site is located close to a busy road
- There is less constraint on siting turbines due to safety concerns, noise is far more of an issue. With regard to safety the largest limitation is to avoid construction within the 'topple distance' of a major road i.e. turbines needed to be sited back from a road by the same distance as their vertical height so that if toppling were ever to occur traffic would not be affected

Implications for the study

- The wind developers were asked by IMcC and AF what steps they felt could be taken to ensure greater understanding from all stakeholders and facilitate the wider dissemination of wind farms in the Yorkshire and Humber region
- LAs need to spend more resources in educating their constituents on the realities of RE generation as part of their LA21 strategies
- LAs need to reconcile their often conflicting landscape policies, and ensure that their Local Plan, Local landscape designations and LA21 strategy all promote a consistent, reasonable, educated and joined up attitude to renewable energy generation within their region.
- Unfortunately even with the most positive planning committee – many developments are refused by council members acting from a somewhat uninformed and parochial attitude. In Yorkshire and the Humber some councillors have been uncooperative and unwilling to hear both sides of the argument and are indeed key members of anti-development organisations. This does not help to foster a climate where developers have confidence in investing their time and effort
- Formalised policy needs to be developed for mid-scale wind farms which are at present the most useful and also the most difficult to obtain planning approval for. At present farms of between 5 – 30 MW are consistently falling victim to the planning system
- Planning proposals could be approved with a timeline. Wind turbines have a life span of typically 20 – 30 years, after which point they will either be decommissioned or replaced. A farm could be approved for 20 years on the proviso that it is taken down after this period and a) replaced with smaller / less visually intrusive generating systems as technology has advanced or b) the provision that the site should be moved to a new community on this date if residents still feel that the site represents a visual blight
- The report should be used as a vehicle to dispel common misconceptions about wind farms such as putting wind generation's 30% capacity in the context of other generation methods efficiency rates.
- It should be stressed that there are no hidden impacts on wind energy, it is a transparent technology with no known impacts on health and quick and cheap decommissioning
- House price impacts, bird strike rates, ultrasonic noise issues all need to be clarified by the report so that planners can take an informed opinion on them to planning meetings with the council.
- Above all the developers urged that the report should reiterate the importance of considering the silent majority of the population who are in favour of wind farms to the planning community

2.12 Meeting on Wind Energy & Aviation Issues

A meeting was held in Leeds on 17th March 2004 to discuss issues on wind development and aviation. The following organisations were represented: Doncaster Finningly Airport, Leeds / Bradford Airport, Nottingham EMA on behalf of Humberside Airport, Future Energy Solutions and Gillespies. The meeting was chaired by Ian McCubbin (ImcC) of Future Energy Solutions. Notes from the meeting follow but the views do not necessarily represent those of the consultants:

Background

IMcC explained the background for the LA targets study and the reason for inviting representatives of the regional airports to a meeting to discuss wind energy issues. He hoped that this would:

- Allow regional airports to input their views on the interaction between aviation concerns and regional wind deployment
- Provide some opportunities for the airports to influence both this study and other parallel national activities in this area

Discussion

Include following points:

- There is a substantial context surrounding airport operations and development, both nationally and regionally, including the potential regional economic benefits arising. Reports cited in this respect include:
  - ODPM Planning Circular 1/2003
  - CAP 738 (CAA document)
  - Aviation White Paper (The Future of Air Transport DfT 16.12.03)
  - The Regional Economic Strategy (from Yorkshire Forward web site)
- Airports have a duty to operate safely. This duty is not incompatible with wind energy development but it must take precedence, particularly where doubts and uncertainty arise on the nature and detail of schemes
- ODPM PPS22 places the onus on the developer to ensure that all of the safety implications posed by wind turbines have been met – which is a topic of great concern to airports
- The aviation situation in the UK is more complex than that in other European countries as we have two radar systems; Primary and Secondary Surveillance, which create a flying environment second to none in terms of safety. Denmark and Germany, which have witnessed large growth in turbine developments in recent years only operate primary radar which is less susceptible to interference by wind farms, and as such the lessons learnt from their experiences are limited
- The CAA, having subscribed to the draft guidelines (DfT 'Safeguarding aerodromes, technical sites, and explosive storage areas' Direction 2001), has subsequently relinquished responsibility for safeguarding of aviation. This has now been devolved to individual operators. There has been little or no guidance made available from CAA to operators on how to apply or referee the guidelines
- The current highly competitive nature of wind energy development runs counter to a planned and "organised" interaction between the wind industry and aviation interests. If ways can be found to encourage better channels of meaningful communication, all parties stand to gain
- Lessons could be learned by the wind community from the telecoms 'revolution' of the late 1990s. This resulted in a similar surge of naïve applications from developers seeking airport approval without providing adequate documentation for the safeguarding process. As a minimum wind developers should be providing details of the full height of turbines (to blade tip – not just to hub height) so that airports can see at a glance if their take off and landing surfaces are pierced. 6 figure grid references should be included and elevation of the ground needs to be noted clearly on the proposal. If in doubt of the final turbine locations, developers should submit proposals assuming a 'worse case' scenario whereby the highest point of the potential site is used as the base for radar modelling. Airports also worry about the limited number of radar modellers able to assess the impact of development proposals, and of those that do exist the aviation industry has concerns about their impartiality so extra services have to be paid for by the airport to check applications

- There appears to be widespread lack of understanding within the wind developer community of the issues facing civil airports when they respond to potential wind energy schemes
- Airport authorities do not have unlimited resources to deploy in "refereeing" or adjudicating on wind energy schemes. The current system where several proposals are received by an airport for every site available is cumbersome and can lead to all being rejected simply due to a lack of time and resources to devote to ensuring that they do not threaten the safety of an airport. Similarly planning documentation issued from LPAs needs rapid turn-around and many airports can find this problematic due to staff shortages
- There are likely to be regionally appropriate ways of illustrating "indicative areas of restriction" surrounding civil (and military) airports. These should be seen as indicative and not "black and white". It should be possible at some level to derive areas of high, medium and low restriction in line with the approach that Gillespies will adopt in this study for a regional wind capacity assessment. These should note the landing and take-off funnels, holding areas and radar limits of airports. The proliferation of wind farms also warrants attention as LAs are not 'looking over their fences' to see what developments are occurring in neighbouring LAs – the cumulative effect of wind farms is as yet little understood
- It is appropriate to consult further with:
  - MOD Defence Estates (and thence to individual site Air Traffic Managers) especially with regard to the blanket bans currently in operation around UK ASACS Radar sites such as Staxton Wold and Fylingdales which are within the geographical remit of the study
  - NATS
  - CAA – Air Traffic Standards
  - Other airports, outside of the geographical remit of the study whose radar may be affected by developments in the Yorkshire and Humber areas i.e. Teeside and Manchester
- Future growth plans for airports are well set out within the Regional Economic Strategy, however future changes to their flight patterns which may result from expansion are not yet quantified and it could mean that turbines not previously impacted on radar or flight funnels become troublesome in the future
- The technology used by airports for radar has a working life of 20 years, hence the area of radar which may potentially be affected by wind farms is subject to change because replacement equipment may have a different range from that operating at the time of a wind farm development

Implications for this Study

1. Maps indicating "indicative areas of restriction" surrounding civil airports can be produced, and would be a useful tool for informing all parties to these issues. These safeguarding maps are lodged with the relevant LPAs however representatives at today's meeting are keen to assist in providing more detailed information.

2. These maps are not a substitute for meaningful interaction between wind developers and aviation interests.

3. There are a number of additional parties whose input to "indicative areas of restriction" are potentially important, as cited above.

Wider Implications for Wind and Aviation

1. Some form of greater “control” of on-shore wind energy development is highly desirable, in the view of civil airports. The precedent set by offshore wind development prospects may be relevant in this respect. Recent DTI interest in the current state of prospective on-shore schemes in the South Humber area should encourage this view.

2. There is a need to encourage continuing evolution of the existing draft Guidelines (DTI ‘Wind Energy and Aviation Interests’ DTI/Pub URN 02/1287). This should also be seen as a means to encourage greater interaction between individual developers and aviation interests. Additionally a greater usage, on the part of the wind farm developers of the pro-forma included in this guide when lodging proposals would be looked upon favourably by the aviation industry who are keen to see it become a standard procedure.

3. It was suggested that a new form of interaction (a joint working group?) between aviation and wind interests would be useful to foster an atmosphere of increased trust, openness, communication and general joined up thinking. The Airports Operating Authority could be an appropriate representative on such a group.

3 Wind Development Constraints

3.1 Introduction

The Government's latest thinking on the policy approach to the development of renewable energy is set out in PPS 22 – Renewable Energy. This document steers regional and local planning authorities away from making assumptions abut the technical/commercial feasibility of renewable energy projects. It is clear that this approach must be sensible given the propensity in the field for technological and scientific advancement. However, notwithstanding this, for the purposes of setting meaningful targets, some level of development reality must be brought to bear. Set out below is the approach taken to the mapping and interpretation of wind energy development constraints for the purposes of setting targets in Yorkshire and the Humber.

3.2 The Approach

The approach has sought to identify those parts of the region where there are likely to be significant constraints where wind energy development would only be considered in exceptional circumstances. Using a GIS developed mapping process, a constraints model has been developed to map the range of development 'constraints' and consultation areas to be considered when locating wind energy developments at the strategic level. This approach is designed as a strategic appraisal and therefore does not go into the level of detail that is needed at either local plan or individual project level.

3.3 The Methodology

Identified constraints to wind development were mapped on to a 1:100,000 OS base. These include *firm or absolute constraints* i.e. anything, which imposes a restriction on the location of wind turbines within current or foreseeable levels of technology, and *consultation constraints*, that is, areas within which consultation is required.

Absolute Development Constraints
Those issues that directly effect wind energy development are identified as follows:

Wind Speed
Clearly the ability to provide some level of commercial reality is critical in setting targets for renewable energy. This is particularly the case in the period up to 2010 where it is possible to make some assumptions about the rate of change of technology and the scope for development that arises. In this light of this, the interpretation applied to wind speed has been future proofed as far as possible to ensure the ongoing use of the study as technology advances. A nominal figure of below 6.5m/s at 45m height has been used in other studies and is adopted here as the threshold of wind speed viability for development purposes. It should be noted that this is a relatively crude guide to potential viability and areas with lower wind speeds may still be viable.

Strategic Transport networks as set out in RPG12

For this study, a separation distance of 150m from motorways, Class A roads and railways has been adopted to cover 'topple zones' or safe separation distances from key transport infrastructure.

Existing Wind Energy development
There are four existing wind farms (one in each sub-region) that collectively provide about 25MW capacity. These wind farms have been taken into account in determining the potential in the local authority and sub-regional areas. We have assumed a separation between established schemes and other potential schemes of 15km for 2010. By 2021, the existing schemes will probably be outdated. We believe that these existing schemes will either have been upgraded (repowered), enlarged or removed. Thus for 2021 we effectively ignore the existing schemes and start the target process with a clean sheet.

Visual Amenity/Noise.
Developers normally take the approach of setting a minimum separation distance from settlements to overcome issues of noise and visual impact. At this stage, a 400m-separation distance from settlements is proposed. This would not relate to individual dwellings but instead would concentrate at this strategic level on significant areas of population. Clearly, in practice this could be more or less depending on the scale of development proposed.

Consultation Development Constraints
Those issues that require consultation related to wind energy development are as follows:

Civil Airports
Civil Airports generally have a 30km consultative zone centred on the airport. In practice the restrictions on wind turbines covers a funnel shape in line with flight paths for take-off and landing. We have consulted with the Civil Aviation Authority and taken their views into account when estimating the maximum wind potential in local authority areas. We have used a 10km exclusion zone around airports as a means of reducing the area potential i.e. an exclusion zone of about 78 square kilometres. Our work has shown that the 10km radius is not critical and that maximum potential is not significantly affected by increasing this radius to say 15km. This would however effect the siting of any wind farm. Civil airports that reduced the maximum potential were Humberside Airport in North Lincolnshire and the new Robin Hood Airport in Doncaster. Other airports (e.g. Leeds Bradford) are within zones covered by other constraints and therefore do not further reduce the maximum potential.

MOD Air Defence Radar
The MOD have a consultation zone for tall structure developments within a 74km radius of the radar base at Saxton Wold. This consultation zone is divided into four categories. About half of the zone permits structures up to 150m. Wind turbines of up to 2.5MW capacity are likely to be lower than 150m to maximum rotor tip height and so we have assumed that this area should be able to accommodate wind turbines. For the purposes of estimating the maximum wind potential we have excluded the remaining area for rural wind farms but have retained a target for smaller turbines. The MOD radar restrictions are assumed for 2010 target purposes only. By 2021 is has been assumed that new radar and /or other air defence facilities will be in place that will place fewer restrictions on wind farm developments.

RAF Airfields
Whist there are areas of tactical low flying for the MOD across the UK, these do no affect the Yorkshire and Humber region. Therefore the RAF airfield identified here is not being used for this purpose. Notwithstanding this, two RAF sites, Leeming and Linton-on-Ouse, have been taken into account in determining the maximum wind potential. We have used a 10km exclusion zone around each site. If this were extended to 15km then there would be loss of one potential wind farm site.

Other Airfields

We have applied a 5km exclusion zone to other airfields for the purposes of estimating the maximum potential. The airfields considered are: North Yorkshire - Dishforth, Topclife Airfield, Catterick, Tockwith, Church Fenton. Humber - Hibaldstow, Sandtoft, Sherburn, Brough, Breighton, Alderthorpe, Full Sutton. If other airfields in the region are not listed then this means that they have already been accounted for by other constraints for the purposes of estimating the maximum wind potential.

4 Wind Energy Development and Natural Heritage

This section forms an extract from the report *Strategic locational guidance for wind energy development in respect of the natural heritage* which is produced in its entirety in Volume 3 to this report including supporting information.

4.1 Introduction

This guidance sets out to define, on the basis of natural heritage, the sensitivity or potential capacity of different areas of Yorkshire and the Humber to accommodate onshore wind energy development. It has been developed specifically for the purposes of this study and has been undertaken at a strategic and relatively coarse scale. It is not prescriptive at an individual site level and does not replace the need for local planning authorities to assess their own areas in more detail for forward planning purposes. Neither does it replace the need for specific local landscape and visual impact assessment as part of an Environmental Impact Assessment. It does, however, set the context in which targets for individual local authority areas can be formulated in line with the regional and sub-regional renewable energy targets.

4.2 Potential Impacts on the Natural Heritage

Landscape Sensitivity
Wind turbines are tall structures, which can bring about major changes in a landscape due to the often-complex visual interplay between different lighting conditions and the scale and form of groups of turbines. The rotation of the rotor blades attracts the eye and in certain lighting conditions moving turbines can be highly visible from a long distance. The acceptability of wind turbines within a landscape is generally an emotive subject and one where compromise is needed. Whilst it is generally acknowledged that the most valued aspects of the natural heritage should not be compromised, those landscapes of lesser value can normally integrate some wind energy development albeit in a controlled way to minimise the impact. This guidance uses a recognised methodology for assessing landscape sensitivity that can be used to determine the potential for wind power capacity within a locality.

Biodiversity Issues
Wind energy development can have an impact on biodiversity issues, including both species and habitats. Construction of turbines together with their ancillary infrastructure, such as access tracks, grid connections and substations can result in habitat disturbance and loss. Wind farm operation and maintenance may disturb sensitive species or interfere with habitat functioning and there is a risk of bird collision with the moving blades and any additional overhead lines. The risk of bird strike is greatest where wind farms straddle flight lines or where birds make use of a site for hunting. Geese, raptors, divers and some sea birds are particularly vulnerable. Rare and protected species and sensitive habitats outwith designated areas require careful risk assessment on a site specific and species-specific basis.

4.3 The Approach

The methodology set out below is a derivation of others undertaken at a regional and sub-regional scale, most notably strategic locational guidance for onshore wind farms prepared by Scottish Natural Heritage[2]. The approach is based on the premise that wind energy development should be encouraged in the most suitable areas and should avoid areas that are valued for their scenic, recreational and undeveloped qualities or their high biodiversity interest.

The locational approach adopted provides broad guidance on those areas where wind energy development is most acceptable in terms of the natural heritage constraints and sensitivities covered by the study and those areas where there are likely to be significant adverse impacts on the natural heritage. At a strategic level it identifies the natural heritage sensitivities, which should be considered by planning authorities and wind energy developers. It also provides a broad steer on the scale of development that could potentially be accommodated in different areas.

The locational guidance interprets the following principles:

There should be a broad presumption against development on environmental or amenity interests safeguarded by international or national designations.
Development should be guided to landscapes, which are already significantly modified or developed, as far as this is reasonably practical within the context of national, regional and sub-regional targets.
Wild and remote landscapes associated with little obvious human intervention (built development) should be safeguarded.
Elsewhere, wind energy development should be broadly acceptable in areas where any adverse effects can be mitigated through sensitive design and siting at the local level.

The above principles were taken and applied across Yorkshire and the Humber. The accompanying maps, text and tables, produced for each of the sub regional areas show the range of natural heritage constraints, which were considered. The sensitivity of each of these constraints was assessed, based on the importance of the interest and its susceptibility to impact by wind energy development. Maps 1 and 2 describe sensitivity arising from landscape interests, covering designated areas and non-designated areas respectively. Maps 3 and 4 describe sensitivity arising from biodiversity and earth science interests, covering designated and non-designated habitats and species respectively. A final Map 5 combines all the natural heritage sensitivities into four broad categories or zones, representing relative levels of opportunity and constraint for wind energy development. Where areas of different sensitivity overlap, the sensitivity shown is that of the most sensitive interest. It should be emphasised that these are generalised categories and that for any particular sensitivity it is important to refer to the detail in the accompanying text and tables. The following zones of sensitivity have been identified:

Zone 1: Areas of greatest sensitivity to wind energy development and therefore least opportunity for development. Proposals for wind energy development in these areas are unlikely to be acceptable. This zone includes many important natural heritage sensitivities, which are considered incompatible with wind energy development. These include Special Areas for Conservation, Special Protection Areas and Ramsar Sites.

[2] Policy Statement No. 02/02, Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage, Scottish Natural Heritage, 2002

Zone 2: Areas of high sensitivity to wind energy development, with little opportunity for development other than some very localised sites where limited proposals could be accommodated only if all potential impacts on natural heritage interests were fully explored and mitigated against. This zone includes many landscape and biodiversity interests, which are protected under national legislation and subject to firm planning policy. It includes National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts, National Nature Reserves, Sites of Special Scientific Interest and Important Bird Areas. It also includes landscapes whose character is considered highly sensitive to wind energy development.

Zone 3: Areas with some sensitivity to wind energy development. Within these areas, there is likely to be scope to accommodate development of an appropriate scale, siting and design and taking regard of cumulative impact. Zone 3 includes regional and local natural heritage interests only where they have strategic locational implications, such as local landscape areas.

Zone 4: Areas with the lowest sensitivity to wind energy development and the greatest opportunity for development. Within these areas a significant number of developments could be acceptable, if they are undertaken sensitively and with due regard to cumulative impact.

Landscape Sensitivity
The approach to designated ***landscape sensitivity*** has been to include landscapes that are protected at national level within Zone 2 and landscapes protected at regional or local level within Zone 3. The assessment of relative sensitivity of non-designated landscapes is based on a broad-brush landscape appraisal, which is outlined in Section 4.0. Essentially, areas whose character would be significantly adversely affected by wind energy development are mapped within Zone 2. Areas, which are considered broadly suitable for wind energy development, if potential impacts on landscape character are fully explored and guarded against through good design and siting, are included within Zone 3. Landscapes, which are considered acceptable for a significant number of wind energy developments, are included within Zone 4.

Biodiversity Sensitivity
The approach to ***biodiversity sensitivities*** has been to include within Zone 1, all habitats with legislative protection at international level whilst Zone 2 includes all habitats protected at national level.

Birds are considered the most vulnerable species to wind energy development. There is a danger of bird collision, particularly when wind turbines are erected along bird flight paths, or impact on species that are sensitive to disturbance. Special Protection Areas within which birds are protected at international level have been included within Zone 1. Other known bird sensitivity areas (as defined by RSPB's Important Bird Areas) have been mapped within Zone 2.

4.4 Appraisal of Landscape Sensitivity

The assessment of relative sensitivity of non-designated landscapes is based on the Countryside Agency's current approach to landscape assessment set out in "*Topic Paper 6: Techniques and Criteria for Judging Capacity and Sensitivity*" published in January 2004. Essentially, this uses an understanding of countryside character to help inform broad assumptions as to what makes one landscape relatively more or less sensitive than another to wind energy development. The assessment of sensitivity is based on professional

judgement informed by an analysis of the key features of the regions 24 Character Areas as reflected in the Character Map of England[3] and associated descriptions.

The analysis comprised a consideration of the complex interrelationships of both the physical and perceptual characteristics of each Character Area, and the potential effects of wind energy development on the fabric, character and quality of the landscape. The effects are concerned with the nature of the likely change to physical landscape components including landform, settlement, landscape pattern and visual composition and experiential characteristics such as naturalness, sense of remoteness and how the landscape is experienced. An assessment was made on the sensitivity of each of these characteristics to wind energy development.

Finally, all the considerations outlined above were brought together and a qualitative judgement was made on the sensitivity of each Landscape Character Area to wind energy development. This sensitivity was categorised as high, medium or low as indicated in Map 2 for each sub regional area.

The judgement was arrived at through a balanced assessment of all the criteria, with reasons for the judgement clearly stated in the accompanying text, which also provides the background to the defined sensitivities and makes broad comments on the location and form of any wind energy development (in terms of small, medium and large groups of wind turbines) where relevant. The study is strategic in nature, therefore any analysis of the relative sensitivity of different Character Areas can only be indicative. A finer grain of characterisation and analysis undertaken at the local level would provide more detailed information on the relative opportunities and constraints for different scales of wind energy development within specific Character Areas.

4.5 Summary

The maps and accompanying text and tables arising from the study provide an overview of where there is likely to be scope for wind energy development and where there are the most significant constraints.

As they are drawn at the strategic scale, they are not intended to give guidance for either local plans or individual applications. Specific designations in local plans or Individual proposals may be appropriate within the highest sensitivity zones, whilst there may be objections or a refusal to an application within the low sensitivity zone if it is inappropriately designed or sited.

Similarly, within due course, cumulative impacts may increase the level of sensitivity to further development.

Caveats

The study has not gone into the level of detail undertaken by developers or commensurate with the requirements of a project environmental impact assessment, which might include issues such as tree cover, microwave links, detailed visual terrain modelling, effect on bird habitats, visual impact and noise disturbance, landowner attitudes.

[3] *Countryside Character Volume 3: Yorkshire and the Humber* and *Countryside Character Volume 2: North West* published by the Countryside Agency, 1998.

No relative weight has been assigned to the constraints plotted. The approach has been one of defining a threshold at which relevant constraints apply and treating each as having the same weight as the others.
In line with the guidance in PPS22, no buffers have been added to designated areas.
For assessment purposes, the typology of wind energy development is as follows: Large: more than 26 turbines, Medium: 6-25 turbines and Small: 1-5 turbines. The study excludes small wind developments of a domestic scale, typically a single turbine of < 0.03MW capacity. (To match REAS2002).
Where two or more wind farms lie in the same area, there can be cumulative impacts over wide areas. There is currently no nationally accepted methodology for undertaking strategic appraisals of the effects of more than one wind farm, and cumulative impacts would have to be assessed on a site specific basis.
This study did not include an appraisal of urban areas.
The visual effect on people of the changes in available view through the introduction of wind energy development was not specifically addressed.

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5 Offshore Wind

The National Context

Offshore wind energy schemes within the UK are currently being brought forward through a highly regulated process. The Crown Estate (responsible for land management issues offshore) have, in collaboration with the DTI and a variety of interested parties, brought forward two tender rounds for prospective developer groups to submit proposals. The 15 proposals now under consideration within the second of these rounds amount to a prospective installed capacity of over 7GW, representing a major proportion of the UK's potential electricity generating capacity.

However the granting of institutional (and a measure of financial) support to these extremely large projects is not in itself a guarantee that all of these projects will proceed. A variety of issues may still present themselves as these projects proceed further.

The Regional Context

To date, two "Round 2" applications have been made for offshore wind energy developments directly off the Yorkshire coast. These form a part of "The Greater Wash", one of three agreed strategic priority areas for development off the UK coast[4]. Although it is possible that further offshore applications within these areas may be sought over the next few years, it is also possible that the Government may view it as important that resources be now applied by developer consortia to procuring schemes rather than working further on outline prospects. There remains a high level of residual uncertainty over the possible number of schemes that could emerge off the Humber coast by 2010 and 2021.

The two current "regional" schemes are as follows:

Total's "Westernmost Rough" 240MW windfarm
Humber Wind Ltd.'s "Humber" 300MW windfarm

Within this context, we define an offshore wind scheme as "regional" if the power that it produces is brought to land within the region.

Regional Potential to 2010 and 2021

We assume that:

Due to the complexity and duration of the developmental process, we assume that only one of these schemes can be procured, developed and become operational before 2010. An indicative regional potential for offshore wind by 2010 can be taken as either 240MW or 300MW.

For 2021, we propose an offshore potential of 600MW to reflect technological development and an increasing focus on offshore wind as a commercially viable technology.

[4] The others being "Thames Estuary" and "North West".

6 Photovoltaics

6.1 Background

Photovoltaic (PV) cells generate electricity from light. The cells are usually mounted into panels which produce direct current. The direct current supply is connected via an inverter to produce alternating current which can be used in place of conventional supply from the grid or fed into the grid. Buildings are convenient structures on which to place PC panels as the structure already exists and the power can be consumed directly within the building[5]. PV panels need to be placed to face a southerly direction in order to maximise absorption of solar energy. PV is a very convenient technology but is expensive even when grant aided. This is the main only barrier to its faster deployment. It is likely that PV contributions to reducing carbon emissions from buildings will in future be recognised within Building Regulations.

The uptake of solar PV has been slow and the majority of the current schemes only exist due to financial assistance from grant schemes such as the EST (Energy Saving Trust) programme. The EST programme is a three year initiative which was announced in the Government's White paper (February 2001) which has the aim of making considerable headway in preparing a secure market platform for long term and sustained growth of the PV industry in the UK. The programme was launched in 2002 and hopes to increase photovoltaic installations by 10 fold by 2005. It is also hoped the programme will result in a reduction in cost of installations for the future. There have been a total of 20 applications for PV schemes in the Yorkshire and Humber region with 11 schemes awarded grants with a total kWp of 226.12 [3].

The targets set in 2002 as the basis for RPG included central generation - large areas of PV panels deliberately linked to generate power in a specific location e.g. PV on edges of motorways. While central generation cannot be ruled out for the future, we now consider that most PV development will be dispersed on buildings which provide a ready mounting surface and have the capability to consume the generated power directly. Existing and planned large-scale PV projects in the Yorkshire and Humber Region are listed below:

Organisation Name	Post Code/Sub-Region	Type of Installation	Domestic/Non Domestic	Total kWp
Pennine Housing 2000 Ltd	Halifax	New Build	Domestic	10.85
Bradford Environmental Industries Centre	West Yorkshire	Offices	Non domestic	101.73
West Lindsey District Council	DN21 2DH Humber	Offices	Non domestic	29.19
The Sheffield College	South Yorkshire	Education Centre	Non domestic	85.6
Ravenscliffe Community Association (RCA)	West Yorkshire	Community Centre	Non domestic	9.282
Park Lane College	LS3 1AA	Education	Non domestic	62.55

5

	West Yorks	Centre		
The Riding's Housing Association	LS7 West Yorks	Group of small systems	Domestic	16.224
Kirklees Metropolitan Council	West Yorkshire		Domestic	?
The Earth Centre		Education Centre	Non domestic	103
				Total 418.4kWp
				Average 52.3kWp

Methodology for Potential Estimation

To estimate the potential for PV within the Yorkshire and Humber region we have assumed that PV installations will mainly be on new buildings as this is the most cost effective application of the technology. We have subdivided the buildings sector into domestic (i.e. housing) and non-domestic (i.e. all other types of building). The rate of new housing development is already published and this data has been used for estimating potential in the domestic sector.[6] The application of PV in the commercial/non-domestic sector has been estimated but a build rate is not available. PV development in the commercial sector has therefore been based upon local population levels as a comparative indicator of future new commercial buildings within a local authority area.

All calculations assume that a well designed 1kWp PV system installed in the Yorkshire and Humber region will yield approximately 750kWh/year.

Domestic 2010

The domestic targets are based on the annual Regional Planning Rate (RPG) rate provided by the Yorkshire Assembly. The annual RPG rate is the number of homes that will be built in a given LA or region per year, in this case between 1998-2016. As the annual RPG rate beyond 2016 is not available it is assumed that it will remain the same up to 2021 for the purpose of this methodology.

Up to April 2002 the take-up of PV on domestic properties has been limited but with the introduction of the EST grant scheme and the reducing cost of the systems the number of installations has been increasing. This increase should be sustainable up to 2010 as it is hoped there will be continued funding for installations and the cost will maintain its gradual reduction.

The business as usual scenario was calculated assuming 4% of all newly built domestic property would take-up PV from now until 2021.

To calculate the green future domestic LA installed potential for 2010 it was assumed that 9% of new built domestic property would incorporate PV systems and would typically have an installed capacity of 1.5$kW_{p.}$ In the event the RPG (Regional Planning Guidance) rate for a given LA was not specified it was apportioned taking its population percentage of the sub-region into account. This assumption was used in the calculation from July 2004 – December 2010 that equated to 6.5 years.

Domestic 2021

[6] Government Office for Yorkshire and the Humber- Population and Housing stock for the Yorkshire and Humber Region

It is anticipated that post 2010 PV will be included in planning regulations prescribing the use of energy efficiency and renewables measures and this will act as the catalyst to a large increase in up-take in all new built and refurbished domestic properties.

To calculate the LA potential from 2011 to 2021 it was assumed that there would be a 50% uptake in PV due to planning regulations and more cost effective hardware. The 50% assumption is made for all LAs apart from the main cities in the area (namely Hull, York, Sheffield, Bradford and Leeds) where it was assumed a 60% uptake to account for the larger number of existing properties that will install PV as part of refurbishment or retrospective installation. The calculations were based on the period January 2011 to December 2021.

Non-domestic buildings

Non-domestic buildings includes all commercial, industrial and public sector buildings. The number of PV installations per local authority area has been based on the current population as follows:

2004 - 2010

LA Population	Non-domestic Buildings to have PV
0-100,000	1
100,001 – 250,000	2
250,001 – 500,000	4
500,001 – 750,000	6

2011 - 2021

LA Population	Non-domestic Buildings to have PV
0-100,000	2
100,001 – 250,000	5
250,001 – 500,000	10
500,001 – 750,000	12

It was assumed that each non-domestic installation would have an average installed capacity of 50kWp based upon the average existing/planned installed capacity listed earlier.

Sub-Regional and Local Authority Target Development

The Humber

Local Authority	Mid Year Popultn. in 2002 (% of County Popultn.)	Annual Regional Planning Guidence Rate	Potential 2010 (kW_P) Domestic	Potential 2010 (KW_P) Commercial	Potential 2021 (KW_P) Domestic / Total Capacity	Potential 2021 (KW_P) Commercial
East Riding	318900 (36%)	1254	489	200	10346	500
Hull	254300	986	384	200	9761	500

	(29%)					
NE Lincs	155200 (18%)	440	172	100	3630	250
North Lincolnshire	152500 (17%)	440	172	100	3630	250
TOTALS	**880900**	**3120**	**1217**	**600**	**27367**	**1500**

North Yorkshire

Local Authority	Mid Year Popultn. in 2002 (% of County Popultn.)	Annual Regional Planning Guidance Rate	Potential 2010 (KW_P) Domestic	Potential 2010 (KW_P) Commercial	Potential 2021 (KW_P) Domestic / Total Capacity	Potential 2021 (KW_P) Commercial
Craven	52300 (7%)	175	68	50	1444	100
Hambleton	87500 (12%)	300	117	50	2475	100
Harrogate	153600 (21%)	525	205	100	4331	250
Richmondshire	51300 (7%)	175	68	50	1444	100
Ryedale	48800 (6%)	150	59	50	1238	100
Scarborough	108300 (14%)	350	137	100	2888	250
Selby	72800 (10%)	250	98	50	2063	100
York	173900 (23%)	575	224	100	5693	250
TOTALS	**748500**	**2500**	**975**	**550**	**21576**	**1250**

South Yorkshire

Local Authority	Mid Year Population In 2002 (%	Annual Regional Planning	Potential 2010 (kW_p) Domestic	Potential 2010 (kW_p) Commercial	Potential 2021 (kW_p)	Potential 2021 (kW_p) Commercl.

	Of County Population)	Guidance Rate			Domestic / Total Capacity	
Barnsley	228100 (18%)	810	316	100	6683	250
Doncaster	290100 (22%)	735	287	200	6064	500
Rotherham	253200 (19%)	800	312	200	6600	500
Sheffield	530100 (41%)	770	300	300	7623	600
TOTALS	**1301500**	**3115**	**1215**	**800**	**26970**	**1850**

West Yorkshire

LA	Mid Year Population In 2002 (% of County Popn.	Annual Regional Planning Guidance Rate	Potential 2010 (kW_p) Domestic	Potential 2010 (kW_p) Commercial	Potential 2021 (kW_p) Domestic / Total Capacity	Potential 2021 (kW_p) Commercial
Bradford	486100 (23%)	1390	542	200	13761	500
Calderdale	193700 (9%)	450	176	100	3713	250
Kirklees	395100 (19%)	1310	511	200	10808	500
Leeds	726100 (34%)	1930	753	300	19107	600
Wakefield	320400 (15%)	950	371	200	7838	500
TOTALS	**2121400**	**6030**	**2352**	**1000**	**55227**	**2350**

Potential per LA in terms of houses with PV installation

Local Authority	2010 PV houses	2021 PV houses
Humber		
East Riding	459	7230
Hull	390	6841
NE Lincs	181	2587
N Lincolnshire	181	2587
North Yorkshire		
Craven	79	1029
Hambleton	111	1717
Harrogate	203	3054
Richmondshire	79	1029
Ryedale	73	892
Scarborough	158	2092
Selby	99	1442
York	216	3962
South Yorkshire		
Barnsley	277	4622
Doncaster	325	4376
Rotherham	341	4733
Sheffield	400	5482
West Yorkshire		
Bradford	497	9507
Calderdale	184	2642
Kirklees	474	7539
Leeds	702	13138
Wakefield	381	5559
Total	**5808**	**92080**

Total PV Potential for Local Authorities in the Yorkshire and Humber Region

Local Authority	Total PV Potential 2010 (kWp)	Total Anticipated Output 2010 (MWh)	Total PV Potential 2021 (kWp)	Total Anticipated Output 2021 (MWh)
Humber				
East Riding	689	517	10846	8134
Hull	585	439	10261	7696
NE Lincs	272	204	3880	2910
N Lincolnshire	272	204	3880	2910
North Yorkshire				
Craven	118	89	1544	1158
Hambleton	167	125	2575	1931
Harrogate	305	229	4581	3436
Richmondshire	118	89	1544	1158
Ryedale	109	818	1338	1004
Scarborough	237	178	3138	2354
Selby	148	111	2163	1622
York	324	243	5943	4457
South Yorkshire				
Barnsley	416	312	6933	5200
Doncaster	487	365	6564	4923
Rotherham	512	384	7100	5325
Sheffield	600	450	8223	6167
West Yorkshire				
Bradford	742	557	14261	10696
Calderdale	276	207	3963	2972
Kirklees	711	533	11308	8481
Leeds	1053	790	19707	14780
Wakefield	571	428	8338	6254
Total	**8712**	**14629**	**138120**	**103590**

7 Non-Generation Technologies

There are some renewable energy technologies that can make a significant contribution to carbon saving in the region but have not been included within the potential estimation process as they do not generate electricity.

7.1 Solar Hot Water

This is a heat transfer technology and does not generate electricity and so has not been considered in this study for potential evaluation purposes. Solar water heating is a well established technology, is reliable and can provide a reasonable return on investment, especially if grant aided. Solar panels absorb heat from the sun to heat hot water for general use. Systems are most commonly fitted to private houses. It is usually possible to provide about half of a household's hot water needs through solar water heating. A combined hot water system using solar and conventional water heating is required in order to ensure adequate hot water at all times. The energy savings contribution from solar water is already recognised within Building Regulations.

7.2 Passive Solar Design

The utilisation of solar energy in buildings to provide light and heat and to drive natural ventilation is known as passive solar design (PSD). This technology is a part of the building design process and is integrated and optimised with energy efficiency measures. PSD displaces the use of conventional energy and its contribution to conventional energy savings is recognised within the Building Regulations. PSD does not generate electricity and so cannot be included in this study for target development purposes.

7.3 Biomass Heating

The simplest utilisation of biomass is for direct heating in boilers. Wood fuelled boilers using wood chips or pellets are now commonplace in some European countries such as Sweden and Austria . There is a significant potential for wood heating boilers in the UK. The UK market is still in its infancy but a gradual growth in the wood fuel market is anticipated as conventional (fossil) fuels become more expensive and the alternative wood fuels infrastructure continues to develop.

Wood fuelled boilers are now both efficient and have sophisticated automatic controls making them as convenient in use as boilers for conventional fossil fuels. However, provision must be made for the wood fuel storage adjacent to the boiler to enable automatic feed. It is hoped that local authorities within the region might consider these boilers in future new buildings or boiler replacement programmes.

8 Biomass

8.1 Biomass General

There are a range of biomass technologies that can be used to exploit the resources within the region. These technologies fall basically into two types:

- Burning the solid biomass and utilising the heat directly or for power generation or both (CHP).
- Extracting a combustible gas and burning this for direct heat, power generation or CHP.

Biomass is a general term that covers a wide range of natural materials from which energy can be extracted e.g. wood from various sources including forest thinnings and energy crops, straw, farm wastes, poultry litter etc. There are a few good examples of established biomass generation plants in the region and elsewhere in England e.g. chicken litter plant at Glanford in North Lincolnshire (13.5MW capacity) and the straw burning plant at Ely in Cambridgeshire (36MW capacity). The ABRE project, a large scale biomass CHP scheme using wood fuel has discontinued operation due to technical difficulties. However, there is likely to be local demand for the wood fuels intended for this project from the Wilton 10 project at Redcar just north of the regional boundary and from co-firing.

Biomass from waste sources is covered in Section 12 of this report.

8.2 Biomass Workshop

The following notes summarise the main points of discussion and views raised at the Biomass Workshop of 21 May 2004, Leeds which was attended by some 20 delegates from a broad spectrum of organisations with interests in biomass. The following points are intended to reflect the various points of view raised at the workshop and not necessarily those of the consultants to this project.

Co-firing

- Co-firing of biomass in coal fired power stations is likely to be the dominant use of biomass in the near future i.e. up to 2010. Trials have been carried out at the power stations and demand is expected to rise dramatically.

- Co-firing is controlled by regulations that should create a biomass market up to 2016.

- Local supplies are unlikely to meet co-firing demands in the near future. Power stations will therefore have to rely on imported materials delivered in bulk by road, rail and by sea.

- Uncertainty whether biomass will increase, reduce or cease beyond 2016. There is a possibility of new dedicated plant for biomass power generation at that time.

Biomass Heating

- There needs to be some form of cost advantage for biomass heating compared to heating from fossil fuels.

- Needs to be some form of major driver to increase the market as has happened in Sweden and Austria for example.

- Transport costs are a significant proportion of biomass heating costs and so transport needs to be limited to about 25 miles from source to point of use.

- The biomass heating sector is quite separate from the co-firing sector. The heating sector is currently very small and can currently therefore be supported on a much smaller scale of infrastructure than co-firing.

- If co-firing is to cease or reduce from 2016 then more material will become available in the market which could support expansion of the heat market.

- Optimistic potential for the region would be 550 wood fired boilers (250kW$_t$) by 2010. This would produce 137.5 MW$_t$ and consume about 55,000 odt wood.

- A lower 2010 potential would be for each local authority (22 total) within the region to achieve a cluster of about ten boilers each i.e. about 220 boilers.

- The concensus was that the 2021 potential could be at least three times greater than the 2010 potential. As infrastructure grows and familiarity with fuel is gained then the market should grow. Achieving 5% of the regions heating potential by 2021 from biomass might be possible but resource for this must be available.

- Market is for conversion of old boiler stock and new boilers for new developments (although heating loads are lower in more energy efficient buildings).

- Biomass boilers for district heating are an option but district heating schemes are still fairly rare in UK. In this system the heat rather than the fuel is sold to the consumer.

- Local authorities could require new developments to incorporate a proportion of biomass heating.

CHP Plants

- The failure of the ARBRE project has lowered confidence in this sector of the market in the short term.

Unless ROCs are introduced for heat then new CHP development is likely to be zero for 2010.

Market

- Market for biomass is generally not yet developed. However there are some exceptions such as the Wilton 10 plant near Redcar which is currently burning tallow derived from cattle carcass processing. This plant is looking to take in other biomass products from the Yorkshire and Humber and elsewhere in future.

- Forest Enterprise supplies about 18,000 tonnes of material for biomass.

Grants and Incentives

- Assistance is available through schemes such as Clear Skies for heating boilers.

Biomass Potential and Targets

- Estimated potential and targets need to serve a useful purpose.
- Estimated potential and targets for one particular technology could be traded with another e.g. wind/biomass.
- Targets should apply to the point of use rather than the location of the resource. This means that forested areas should not necessarily have higher targets unless resource is used there.
- Estimated potential and targets should reflect commercial reality.
- Some products currently designated as 'waste' should be reclassified to encourage their use as biomass.
- All sources of biomass (not just wood based materials) should be encouraged.

Available Material

- Although about 85,000 tonnes (dry weight) of wood based material (virgin sources) are identified as currently available within the region, this material is only available if buyers are willing to pay a commercial price.
- There is currently no real competition for resources between the heat and co-firing markets. However this could grow. This will be alleviated by importation of materials for co-firing.
- There is a growing world market for biomass (e.g. export from Canada to Sweden) so resources must be seen as finite.

Energy Crops

- Co-firing requires an increasing proportion of energy crops in the fuel mix between now and 2016.
- The co-firing regulations will require 150,000 tonnes (dry weight) of energy crops by 2009-10 rising to 450,000 tonnes 2011-16 assuming that the three coal fired power stations in the region maximise their co-firing capability.
- Need to identify how much land is required to support local needs. Willow can yield 10 tonnes per hectare of short rotation coppice plantation or more under ideal conditions. From this it follows that there is a need to plant 15,000 ha rising to 45,000 ha of SRC

within the near future (2005 - 2007). This would have a major impact on local agriculture and the infrastructure to provide and deliver the fuel.

- Energy crop growers need to have 'long term' supply contracts of at least five years to cover the risk of investing in planting.

Local Authorities

- Local authorities are unlikely to play a major role in the power generation sector.
- Biomass is a bulky material and so transport can be an issue that LAs need to consider in planning applications.
- LAs generally have the political will to see biomass and other renewables developments within their area. If they adopted biomass heating targets within a proportion of their own building stock and new developments then this would create the necessary 'critical mass' for biomass heating.
- Biomass heating needs to be a part of LA strategy. Buying 'green electricity' is not sufficient to stimulate markets.
- Short rotation coppice may reduce flood risks.

Workshop Delegates

The following organisations were represented at the workshop:
Bioenergy
Biorenewables
British Pellet Club
Consulting with a Purpose
Coppice Resources
Dragon Energy
Drax powerstation
EDF
Envirogen
Forestry Commission
Future Energy Solutions
North Yorkshire County Council
Renewable Fuels
Sembcorp Utilities
South Yorkshire Forest Partnership
Talbotts
Wood Energy
Yorkshire and Humber Assembly
Yorwoods

8.3 Biomass Wood Availability

Biomass data for Yorkshire and Humber Region[7]

Present annual production of potential operationally available biomass within the Forestry Commission and the private sector area, thinning and felling (oven dried tonnes per year)

Yorkshire and the Humber	213,906
England total	463,382
GB total	5,633,802

Forecast of potentially operationally available biomass as a result of thinning and felling in England:

	2003-2006	**2007-2011**	**2012-2016**	**2017-2021**
Public sector	500,458	504,958	519,346	502,657
Private sector	170,914	159,124	150,305	135,204
Total	671,372	664,982	669,651	637,861

Estimated sawmill conversion products by present use in Yorkshire and Humber (oven dried tonnes per year)

Sawdust	3,347
Slabwood	43
Peeled chips	8,735
Unpeeled chips	3,650
Bark	1,763
Burnt for heat	789
Firewood	171
Disposed	25
Other	446
Total	18,970

Estimated annual disposed arboricultural arisings in Yorkshire and Humber (odt/y)

Arisings	**Produced**	**Non-marketed**
Stemwood	56,305	14,130
Branchwood	4,990	1,170
Wood chips	7,794	7,794
Foliage	3,240	180
Total	72,329	23,814
GB total	472,170	321,495

Production of SRC (based on average yield of 8 odt/ha/y) in Yorkshire and Humber 7,703 odt/y.

Total potentially operational woodfuel resource in GB is 3.1million odt/y in absence of competing markets. If used for electricity generation this equates to 3.6 TWH_e / y based on

[7] Data source: Woodfuel Resource in Britain, FES B/W3/00787/REP/1 published by DTI, December 2003, DTI/Pub URN 03/1436

calorific value of 20GJ/odt and 25% conversion effciency.or 0.44 GW (assuming a generating time of 8000 h/y).

Product	**Yorkshire and Humber** (ktonnes)	**GB** (ktonnes**)**
Stemwood 7-14 cm	31	1032
Poor quality stemwood	8	278
Branches	23	410
Stem tips	1	31
Sawmill conversion products	19	859
Arboricultural arisings	72	492
SRC	8	17
Total	162	3,119

Assumptions on market availability:

Product	Max available (kodt/y)	Assumed market availability %	Available (kodt/y)
Stemwood 7-14 cm	31	10	3
Poor quality stemwood	8	100	8
Branches	23	100	23
Stem tips	1	100	1
Sawmill conversion products	19	10	2
Arboricultural arisings	72	100	72
SRC	8	80	6
Total	162		115

0.44GW (440 MW) equates to 3.1 million odt/y
Thus 115 thousand odt/y equates to about 16 MW electricity generation. This is the maximum electricity generating capacity under current available resource and market conditions.

If used for heating higher conversion efficiency of 85% can be assumed.

8.4 Energy Crops

Energy crops are a fuel source not a technology. Energy crops are plants grown deliberately for energy production. They are 'carbon neutral' i.e. the carbon emitted when they are burned is equal to the carbon absorbed into the growing plants. Energy crops that are harvested are replaced by new growth each year and are therefore a renewable source of energy. As fossil fuel sources are depleted and energy prices rise, energy crops will have an increasingly important role to play in UK energy supply. Co-firing in power stations, biomass fuelled CHP and wood fuelled boilers will create huge demands for energy crops.

The establishment of a supply infrastructure for energy crops is in its infancy. The demand for the fuel will cause the infrastructure to develop. The impact will mainly be on agricultural land but brownfield sites can also be used. To supply the regions co-firing requirements for renewable sources of fuel beyond 2010 will require about 30,000 hectares of energy crop (e.g. willow) to be established. Given that willow is not normally harvested until its fourtb year of growth, there is little time remaining to establish such a large crop.

9 Biomass Co-firing

9.1 Co-firing and Regulations

Co-firing Regulations allow coal fired power stations to burn biomass with coal. The Co-firing Regulations changed in 2004 to allow more time for energy crops to be established. The new regulations are:

- Any biomass can be co-fired until 31st March 2009
- 25% of co-fired biomass must be energy crops from 1 April 2009-31 March 2010.
- 50% of biomass must be energy crops from 1 April 2010-31 March 2011
- 75% of biomass must be energy crops from 1 April 2010-31 March 2016.

There is a cap on the amount of co-firing that can make up the Obligation of an individual supplier, which is 25% at present and will decrease to 10% from 1 April 2006 until 31 March 2011 and then to 5% from 1 April 2011 until 31 March 2016.

The biomass needs to be compatible with the materials handling capability of the power stations. Wood chips are handleable but materials such as straw are probably not. Materials such as olive stones have been trialled successfully. The demand for suitable forms of biomass (i.e. consistent quality, quantity, price, and convenience) is likely to outstrip UK supply in the short -medium term.

9.2 Local Power Stations

There are three coal fired power stations in the region that have a potential for co-firing biomass with coal: Ferrybridge, Drax and Eggborough:

Power station	Capacity (MW)	Generation in 2000 (TWH/y)
Eggborough	1960	6.9 (LF=40%)
Drax	3750	22.1 (LF=76%)
Ferrybridge	1923	7.6 (LF=45.12)

LF=load factor.

It is thought that all three of these power stations will still be in operation in 2010 but high costs for future investment in emissions reductions will need to be considered in future. Together these stations could generate around 325GWh/y from co-fired biomass. This assumes that the stations co-fire at 5% biomass fuel. Currently all three stations have considered co-firing. If all three power stations co-fire biomass by 2010, it is estimated that they will require 600,000 tonnes of biomass per year.

9.3 Target Development

The renewable energy potential for biomass co-firing is large but uncertain and influencing the growth of this technology is beyond the capabilities of the two local authorities concerned. For this reason the local potential for biomass co-firing has been developed at the sub-regional level only.

10 Hydro

Overview

Hydro is currently the single largest renewable energy technology in the UK and contributes about half of the 4% of electricity generated from renewables. Hydro schemes can range in size from small schemes (micro) of about 100kW to major multi megawatt schemes. Some small schemes already exist within the region and there is some limited scope for further small developments.

At present in the Yorkshire and Humber region there is approximately 1MW of small hydro capacity most of which has been developed through the Non Fossil Fuel Obligation (NFFO), and a smaller amount of micro-hydro schemes producing energy for on site consumption. It is estimated that the region has the potential to develop a further 54 considered to be around 9.5MW of capacity. Other sites (up to an additional 10MW) may exist, notably within the utilities' water supply infrastructure across the region; largely from base of reservoir projects

Maturity of the Technology
Yorkshire in particular has a history of utilising waterpower since the onset of the industrial revolution due to its high rainfall, dramatic topography and swift flowing watercourses. As a result, Yorkshire has a rich heritage of hydro schemes, used to power mills before coal. Although many of the original buildings, weirs and mill ponds have fallen into various states of disrepair, what gave the Victorians power could still provide it today. Many derelict mill sites that once captured the energy in water for operating machinery could be revitalised as micro and small-scale electricity generators.

Environmental Impact
Hydroelectric schemes are environmentally attractive because they do not produce pollution during operation. Small-scale schemes, which do not involve collecting water behind dams or in reservoirs, have very little impact on the environment. Another positive feature of hydropower is that the energy factor, produced energy in relation to energy consumed for construction, operation and disposal along the plant life is the best of any electricity production technology.

Visual Impact
Plant is likely to be sited in sensitive riverine areas, often valued for their seclusion and visual amenity. Sites will entail some visual impact from weirs, significant lengths of cabling, piping and the turbine house. However small-scale hydro schemes are usually compact structures often located in the floor of valleys and any associated infrastructure can easily be hidden by vegetation. Some have been built in refurbished structures such as mills. Those hydro power stations that have been built in highly scenic regions (i.e. Cumbria and Snowdonia) have successfully minimised visual intrusion by reusing existing buildings and building any new structures required in local stone, visual intrusion is further minimised if existing weirs can be used. Despite the unobtrusive nature of the technology previous objections have been raised to overhead power cables but it must be remembered that this infrastructure is required whatever form of power generation is used.

Ecology
Hydro schemes may affect underwater ecology due to changes in flow and sedimentation. Strict environmental conditions may be placed on a plant to control its impact on the river and

associated flora and fauna, together with provisions for ongoing monitoring. However, there are some benefits to a watercourse from the operation of a small or micro hydro scheme - such as increased aeration of the watercourse, which is beneficial for aquatic life. Furthermore, a well-designed scheme will actually prevent major fluctuations in water levels, and hence minimise flood risk and will also prevent erosion.

In the Yorkshire and Humber region, the areas identified as potential small-scale hydro sites will not affect the seasonal migration of Salmanoids as the rivers and becks proposed for run of river schemes are not on migration routes. Other sport fishing of riverine fish such as Trout may be affected to a limited extent within the region although most of the rivers in question do not possess sufficient water quality to support large populations.

Water Abstraction

The amount of abstraction has been one of the main reasons for refusing some proposed small-scale hydro schemes. Although it must be stressed that many of the bids made in the past – especially in some of the later tranches of the NFFO (Non Fossil Fuels Obligation) included water abstraction rates that were wholly unrealistic. This was because of the naïve assumption that more water equals more power, which equals more money, when actually a scheme that requires too much water flow is very unlikely to be built within the UK planning and environmental climate. The continuation of existing hydro schemes depends upon the renewal of abstraction licences by the EA.

Noise

There may also be increased noise levels from the weir and turbine house, however this is unlikely to be noticeably higher than the existing noise levels of a weir / rapidly flowing watercourse.

Construction and Decommissioning

There may be short-term impacts during construction from the materials used, and the traffic and dust generated. These impacts are however no greater than for any other similarly sized construction project. When decommissioning plant it is usually possible to return the site to it's original condition in a short period of time, however removing the plant will destroy any new habitat created by changes in water flow during the turbines operation.

National Parks and other designated areas

National Parks and hydropower are not mutually exclusive concepts. For example there are four hydroelectric power schemes within the Lake District National Park none of which have had a deleterious effect on tourism income for the region. One of the schemes is at Ennerdale Youth Hostel. Water is taken from a mountain stream 85m above the hostel. The scheme can produce a maximum of 6kW. It provides all the electrical requirements for the Youth Hostel, staff accommodation and Camping Barn. Any surplus power is used for water and space heating. They have a stand-by diesel generator for use if the system fails or there is insufficient water in the stream to produce any power. Since the scheme became operational in April 2001 the generator has never been needed and HGV deliveries of diesel can now be avoided in this sensitive environment.

Within Yorkshire's parks, there has been a paucity of renewable energy development when compared to other National Parks in the UK, this has largely been seen as a result of the planning communities reactionary attitude to proposals close to the Yorkshire Dales or the North York Moors NPs. Although there is one micro-hydro scheme in operation in the Yorkshire Dales National Park at Malham Moor there is potential for far more

Development timescales

Planning permission has been seen by developers to be a major delay to their plans. Theoretically this can be obtained within 3 months. However, difficulties have been experienced by most developers and experience suggests that it can take up to 1 year to reach the first decision, which if a refusal, can extend to over 2 years to include an appeal and a public enquiry. Before extracting water from any river or stream, a licence has to be obtained from the National Rivers Authority or other relevant authority. It is important to secure leases and wayleaves early on in the planning of the scheme (within the first year of planning) from a negotiating perspective. Otherwise these are relatively straightforward as for other generating plant.

Risks and Constraints

Planning permission is currently very slow across the region with the result that developers are often forced to planning appeal and public enquiry. The planning community needs more guidance so that these problems can be overcome. At present in some cases, the criticism levelled at micro and small-scale hydropower schemes seeking planning permission seems to be emotionally charged. A more professional approach is vital.

Hydropower schemes can cause both positive and negative impacts on riverine ecology. Some of the negative impacts have been greatly reduced by the introduction of new technologies such as fish stairs and intake screens. Additionally small hydro schemes have the unexpected benefit of clearing watercourses of rubbish, as any rubbish that flows along the river to the station, regardless of its source, has to be removed from the water by the operating company and disposed of in a legal manner.

Current capacity

In the UK hydroelectric power accounts for around 2% of the total installed generating capacity in 2004.

In the Yorkshire and Humber region despite relatively low ground rents and a good micro and small- scale hydro resource, very little development has taken place. Under the NFFO agreements there were four hydro schemes with a total contracted capacity of 1.031MW agreed for the region *(capacity not known for one scheme)*. This represents 0.36% of the total NFFO contracted capacity in the region. Of the four NFFO contracted hydro schemes two have been granted planning permission and one did not require express planning consent as it involved the refurbishment of an existing building. Of those that did require consent, one scheme also required listed building consent as the weir is Grade II listed, whilst the other was approved despite objections from local residents, who expressed concerns regarding the effect on public access and the remains of the mill. One scheme is currently operational at Malham Moor in North Yorkshire, the contracted capacity of which is not known. It is understood that the original contractor of the remaining hydro scheme went into receivership and the contract has not therefore been brought forward.

In addition a small hydroelectric plant is up and running at Kilnsey Park, Conistone-with-Kilnsey, near Skipton. The project, which was funded under the Northern Uplands Objective 5b Scheme, is based on producing electricity from excess spring water that feeds a trout farm. The amount of electricity generated is capable of meeting the needs of the Kilnsey Park site requirements, with any surplus being sold as ‘Green’ electricity to Yorkshire Electricity plc. The system is designed to produce in excess of 27kW at full power and operate at 15kW plus on reduced summer water flows.

Future potential

A major study of the regions potential for Renewable Energy by FES and Terence O'Rourke plc for the Government office of Yorkshire and the Humber (July 2002) identified target ranges for new small hydropower schemes in the separate sub-regions of the Yorkshire and Humber area. It felt that it was possible to envisage that Yorkshire and the Humber could significantly increase its current deployment of small hydro schemes. The table below presents possible targets for the region, which assume that small hydro schemes are given greater levels of support and that statutory requirements governing licensing procedures prove to be relatively straightforward for a good proportion of potential schemes possible.

Potential for new small hydropower schemes in Yorkshire and the Humber

SUB-REGION	TARGET RANGE FOR NEW INSTALLED CAPACITY (MW)		IMPLIED ANNUAL ENERGY OUTPUT (GWH/YR)	
	2010	2021	2010	2021
HUMBER	0		0	
NORTH YORKSHIRE	0.6 – 2.2		2 – 7	
WEST YORKSHIRE	0.2 – 0.4		0.5 - 1	
SOUTH YORKSHIRE	0.2 – 0.4		0.5 - 1	
TOTAL	1 – 3	3 – 5	3 - 9	9 – 16

The figure below shows the geographical distribution of "run of river" small hydro sites identified within the University of Salford study 'Small Scale Hydroelectric Generation Potential in the UK' (ETSU SSH – 406 Parts 1-3, 1989). The vast majority of sites identified as suitable for small hydro generation are located in the West of the region where topography is at its most rugged and there are many fast flowing moor land watercourses. North Yorkshire and the West Riding in particular were identified as favourable counties. In the east of the Region, in the East Riding of Yorkshire, and eastern parts of North Yorkshire and the area immediately south of the mouth of the Humber were all found to contain few commercially viable sites simply due to the slow moving nature of the watercourses in these areas and the lack of hydraulic head caused by the relatively flat landscape.

Future potential by Local Authority

Following on from the work of these studies, this report identifies the potential of each local authority area to develop new small and micro scale hydro projects within their boundaries. The results are summarised in tabular form below:

Potential small and micro hydro sites within the local authorities of Yorkshire and the Humber

River	Capacity if Installed (kW)	OS Map Number	Grid Ref	Location	Town	Local Authority
WORTH	31	104	SE054395	GROVE MILLS	KEIGHLEY	**BRADFORD MBC**
CALDER	76	104	SE052240	HOLLINS MILL	SOWERBY BRIDGE	**CALDERDALE MBC**
CALDER	67	104	SE041240	LONGBOTTOM MILL	SOWERBY BRIDGE	**CALDERDALE MBC**
CALDER	101	104	SE413225	SUGDENS MILL	SOWERBY BRIDGE	**CALDERDALE MBC**
WHARFE	463	110	SE167473	GREENHOLME FARM	BURNLEY IN WHARFE	**CRAVEN DC**
WHARFE	121	104	SE241455	WHITELEY MILL	POOL IN WHARFEDALE	**CRAVEN DC**
WHARFE	153	98	SE999635	LINTON MILL	GRASSINGTON	**CRAVEN DC**
WHARFE	170	98	SE002633	LINTON FALLS	GRASSINGTON	**CRAVEN DC**
WENNING	70	97	SD650692	MILL	LOW BENTHAM	**CRAVEN DC**
KINGSDALE BECK	122	98	SD695735	THORNTON FORCE	INGLETON	**CRAVEN DC**
AIRE	47	103	SD942541	AIRE BANK MILLS	GARGRAVE	**CRAVEN DC**
AIRE	44	103	SD904592	AIRTON MILL	AIRTON	**CRAVEN DC**
DON	148	111	SE566037	CRIMPSAL SLUICES	DONCASTER	**DONCASTER MBC**
NIDD	101	104	SE367558	HOUGH FARM	KNARESBOROUGH	**HARROGATE**
NIDD	132	99	SE193629	LOW LAITHE	SUMMERBRIDGE	**HARROGATE**
NIDD	82	99	SE200624	NIDD VALLEY MILL	SUMMER BRIDGE	**HARROGATE**
NIDD	93	104	SE246597	WREEKES MILL	BIRSTWITH	**HARROGATE**
NIDD	125	104	SE346568	CASTLE MILL	KNARESBOROUGH	**HARROGATE**
NIDD	105	104	SE316585	SCOTTON MILL	SCOTTON	**HARROGATE**
NIDD	72	99	SE171644	GLASSHOUSES MILL	GLASSHOUSES	**HARROGATE**
NIDD	98	105	SE428531	HUNSINGORE MILL	HUNSINGORE	**HARROGATE**
URE	54	99	SE277785	WEST TANFIELD	WEST TANFIELD	**HARROGATE**
URE	216	99	SE252772	MICKLEY MILL	MICKLEY	**HARROGATE**
URE	294	99	SE354672	NEWBY LOCK WEIR	ROECLIFFE	**HARROGATE**
URE	292	99	SE395671	BOROUGHBRIDGE WEIR	BOROUGHBRIDGE	**HARROGATE**
OUSE	903	100	SE500602	LINTON-ON-OUSE	LINTON	**HARROGATE**
CALDER	227	104	SE186208	MIRFIELD WEIR 1	MIRFIELD	**KIRKLEES**

CALDER	224	110	SE217198	MIRFIELD WEIR 2	MIRFIELD	**KIRKLEES**
WHARFE	215	105	SE404480	WETHERBY WEIR	WETHERBY	**LEEDS CC**
WHARFE	237	105	SE422473	FLINT MILL GRANGE	WETHERBY	**LEEDS CC**
URE	40	98	SE011887	YORK MILL	AYSGARTH	**RICHMONDSHIRE**
URE	274	98	SE044900	REDMIRE FORCE	CASTLE BOLTON	**RICHMONDSHIRE**
SWALE	234	99	NZ174006	CASTLE FALLS	RICHMOND	**RICHMONDSHIRE**
WALDEN BECK	102	98	SE019869	WEST BURTON	WEST BURTON	**RICHMONDSHIRE**
BAIN	74	98	SD935901	BAIN MILL	BAINBRIDGE	**RICHMONDSHIRE**
DUERLEY BECK	40	98	SD871894	GAYLE MILL	GAYLE	**RICHMONDSHIRE**
SWALE	90	92	NY885015	WAIN WATH FORCE	KELD	**RICHMONDSHIRE**
SWALE	144	92	NY888015	PARK BRIDGE	KELD	**RICHMONDSHIRE**
GUNNERSIDE GILL	99	98	SD950980	GUNNERSIDE	GUNNERSIDE	**RICHMONDSHIRE**
ARKLE BECK	68	98	SE040995	REETH MILL	REETH	**RICHMONDSHIRE**
URE	775	98	SE012888	MIDDLE FALLS	AYSGARTH	**RICHMONDSHIRE**
DON	100	111	SK403921	ROTHERHAM SEWAGE	ROTHERHAM	**ROTHERHAM MBC**
ELLERBECK	67	94	SE828022	THOMASON FOSS	GOATHLAND	**SCARBOROUGH***
SEA CUT	55	101	TA027907	SCALBY, WEIR 1	SCALBY	**SCARBOROUGH**
SEA CUT	56	101	TA014904	SCALBY, WEIR 3	SCALBY	**SCARBOROUGH**
AIRE	274	105	SE494242	KNOTTINGLEY	KNOTTINGLEY	**SELBY**
WHARFE	263	105	SE486437	TADCASTER WEIR	TADCASTER	**SELBY**
LOXLEY	51	111	SK310894	LOXLEY	LOXLEY	**SHEFFIELD CC**
DON	59	110	SK328915	NIAGARA FORGE	SHEFFIELD	**SHEFFIELD CC**
CALDER	82	110	SE304175	DURKAR WEIR	DURKAR	**WAKEFIELD MBC**
CALDER	178	105	SE429259	ALLINSONS MILL	CASTLEFORD	**WAKEFIELD MBC**
DERWENT	253	105	SE704473	ELVINGTON WEIR	ELVINGTON	**YORK**
DERWENT	107	105	SE714556	LOCKGATE	STAMFORD BRIDGE	**YORK**
NABURN(TIDAL)	900	105	SE594446	NABURN LOCKS	NABURN	**YORK**
Total 54 Sites	**9468**					

The local authorities within West Yorkshire

Local Authority	No Of Sites	Total Capacity If Installed (Kw)	% Of Total County Capacity	% Of Total Regional Capacity	% Of Total Region Sites
Bradford	1	31	3	0.4	1.8
Calderdale	3	216	15	2.4	5.5
Kirklees	2	451	32	4.8	3.7
Leeds	2	452	32	4.8	3.7
Wakefield	2	260	19	2.8	3.7
TOTALS	10	1438	100	15.2	18.4

Micro-scale hydropower potential has been identified in all five local authorities of the West Riding of Yorkshire. West Yorkshire contains several large metropolitan areas that in places have formed a conurbation, because of this grid connections in the region are plentiful. Developers should have little problem accessing the grid to an appropriate 11kV distribution cable in this area. All of the potential sites identified are small enough so as to be classified as micro-hydro schemes.

The local authorities of West Yorkshire have a long history of utilising the local waterways for power generation. All of the sites identified utilise existing structures. In Leeds LA an old mill site and a weir on the river Wharfe have been identified as having micro-hydro potential. Both potential sites in Calderdale utilise existing weirs on the river Calder. All 3 of the sites identified for Kirklees could be housed in existing mill structures on the river Calder. The site identified in the Bradford region would utilise an old mill site on the River Worth. In Wakefield an old mill site and an existing weir on the river Calder have been identified as suitable locations. Because of the nature of the sites planning permission should be easily obtained as visual intrusion can be kept to a minimum and none of the locales are situated in National Parks or other national / internationally designated areas. The only issue likely to be raised by developments at these sites involves public access to the towpaths. Fishing interests would not be threatened by developments within these areas as fish stocks are relatively low and no migrating Salmanoids use these waterways. Local sport fishing could be protected by the use of fish screens at the plants. Waterways would still remain navigable for haulage and leisure craft.

The total potential capacity identified for the local authorities of Leeds, Kirklees, Calderdale, Bradford and Wakefield is 1438kW. This represents 15.19% of the total small and micro hydro potential identified for the entire Yorkshire and the Humber region. On a spatial level this potential is represented by the fact that 10 of the 54 sites identified for the whole region lie within the West Yorkshire region. The summaries for each of the local authorities are given above.

The local authorities within South Yorkshire

Local Authority	No of sites	Total Capacity if Installed (kW)	% of Total County Capacity	% of Total Regional Capacity	% OF TOTAL REGION SITES
Barnsley	0	0	0	0	0
Doncaster	1	148	41	1.5	1.8
Rotherham	1	100	28	1.1	1.8
Sheffield	2	110	31	1.2	3.7

TOTALS	4	358	100	3.8	7.4

Micro-scale hydropower potential has been identified in three out of the four authorities in the South Yorkshire region. South Yorkshire contains several large metropolitan areas that in places have formed a conurbation, because of this gird connections in the region are plentiful. Developers should have little problem accessing the grid to an appropriate 11kV distribution cable in this area. All of the potential sites identified are small enough so as to be classified as micro-hydro schemes.

As in the West Riding, the local authorities of the South Yorkshire region also have a long history of utilising the local waterways for power generation and industrial transportation. All of the sites identified utilise existing structures. The two sites identified as having micro hydro potential in the Sheffield LA both lie on industrialised watercourses. One would utilise an existing weir on the Loxley River, and the other would use existing forge buildings on the river Don. Predicted energy yields are low because of the low hydraulic head and water flow rates in the local authority. The site identified in the Rotherham local authority would use existing watercourses at a local sewage farm on the river Don. In Doncaster, the site identified would make use of an existing sluice gate also on the river Don. Because of the nature of the sites planning permission should be easily obtained as visual intrusion can be kept to a minimum and none of the locales are situated in National Parks or other national / internationally designated areas. The only issue likely to be raised by developments at these sites involves public access to the towpaths. Fishing interests would not be threatened by developments within these areas as fish stocks are relatively low due to comparatively poor water quality and no migrating Salmanoids use these waterways. Local sport fishing could be protected by the use of fish screens at the plants. Waterways would still remain navigable for haulage and leisure craft.

The total potential capacity identified for the local authorities of Barnsley, Doncaster, Rotherham and Sheffield is 358kW. This represents 3.8% of the total small and micro hydro potential identified for the entire Yorkshire and the Humber region. On a spatial level this potential is represented by the fact that 4 of the 54 sites identified for the whole region lie within South Yorkshire. The summaries for each of the local authorities are given above. Compared to the total land area and population of the region this represents a relatively poor hydro resource. Unfortunately hydropower can only be harnessed where it occurs and the region contains few headwaters, low water flow rates and relatively low hydraulic head in many areas due to the lower elevations of the area. Most of the rainfall catchment within this region filters off to join watercourses in North and West Yorkshire and ultimately the Humber rather than forming fast flowing rivers within South Yorkshire itself.

The local authorities within North Yorkshire

Local Authority	No Of Sites	Total Capacity If Installed (kW)	% Of Total County Capacity	% Of Total Regional Capacity	% Of Total Region Sites
Craven	8	1190	15.5	12.5	14.8
Hambleton	0	0	0	0	0
Harrogate	13	2567	33.5	27.1	24.1
Richmondshire	11	1940	25.3	20.4	20.3
Ryedale	0	0	0	0	0
Scarborough	3	178	2.4	1.8	5.5
Selby	2	537	6.9	5.8	3.8

York	3	1260	16.4	13.4	5.5
TOTALS	40	7672	100	81.0	74

Micro-scale hydropower potential has been identified in six out of the eight North Yorkshire local authorities. No commercially viable resource has been detected in Hambleton or Ryedale local authority areas due to the lack of fast flowing rivers and existing canal infrastructure. Unlike the previous two sub-regions North Yorkshire contains few metropolitan areas, and much of the landscape is relatively unoccupied as it is upland National Park and moorland. Upland areas away from settlements may lack grid connections entirely. Furthermore large grid connections in the region are likely to be scarce simply due to the low population. However, because of the small and micro scale of the schemes identified access would only be needed to an appropriate 11kV distribution cable, which is one of the smallest distribution cables on the grid and hence is routed through most regions. Most of the schemes lie in the river valleys, which are the most densely populated areas in rural North Yorkshire and hence grid connections should be available where needed. All of the potential sites identified are small enough so as to be classified as micro-hydro schemes.

North Yorkshire has a long history of using the power of its waterways to drive flour and cotton mills and rural equipment in the valley floor settlements. The fast flowing waters of the region have carved out the magnificent scenery of the Dales and have traditionally been the focus of settlement, trade and transportation. A large number of the sites identified for the region are located within the boundaries of the Yorkshire Dales and North York Moors National Parks. This need not preclude development as indeed two micro-hydro sites already exist within the Yorkshire Dales National Park, at Malham Moor and Kilnsey Park, proving that with careful planning hydro schemes and National Parks are not mutually exclusive. Experience from other National Parks such as The Lake District shows that income from tourism is not negatively impacted by the development of hydropower schemes and indeed in some areas has even proved to be a boost to the local tourist industry (Snowdonia). However, because of the nature of the sites planning permission will be more difficult to obtain than in some of the more urban areas of the Yorkshire and Humber region. However visual intrusion can be kept to a minimum by utilising existing structures and building turbine houses from local materials as well as screening sites with appropriate vegetation. All of the sites are located in settlements on the dale floors and hence will not disturb pristine upland scenery.

Another issue likely to be raised by developments at these sites involves public access to the tow-paths, some form of fencing or signposting is desirable to prevent curious by passers getting too close to the powerful machinery but this need not be extreme and would circumvent access around the site rather than banning it from the riverside altogether. Fishing interests would have to be protected by the use of fish stairs and intake screens. Waterways would still remain navigable for haulage and leisure craft.

The total potential capacity identified for the local authorities of Craven, Hambleton, Harrogate, Richmondshire, Ryedale, Scarborough, Selby and York is 7672kW. This represents 81% of the total small and micro hydro potential identified for the entire Yorkshire and the Humber region. On a spatial level this potential is represented by the fact that 40 of the 54 sites identified for the whole region lie within North Yorkshire. The summaries for each of the local authorities are given above.

The hydropower resource in North Yorkshire is very large in comparison to the population that live there. When one considers the large land area of North Yorkshire the reason for the large potential becomes clearer. The large number of sites identified is a reflection of the hydrology of the area. Hydropower can only be harnessed where it occurs and the region contains the major headwaters for most of the rivers that flow through the Yorkshire and

Humber region. Whilst other power stations may be sited closer to end users of energy – hydropower can only be harnessed where there is potential. As North Yorkshire is the start of most of the region's water ways and contains high and undulating scenery, excellent hydraulic head exists and the many becks of the region race down with a tremendous force to join major rivers in the valleys on their way to the Humber Estuary. This region has a large rainfall catchment and also filters rainfall from other regions down through its rivers towards the sea by nature of the terrain. In springtime the potential hydropower capacity is likely to be considerable due to the run off melt waters from the fells.

The upland areas of Craven, Richmondshire and Harrogate contain the majority of sites identified within the study. This is because of their topography. Craven and Richmondshire contain upland head waters and fast flowing tributaries that form the fast flowing Nidd, Ure and Ouse rivers that flow through Harrogate.

Because of the large resource within the region, local authorities may be wise to prioritise the development of hydropower within their boundaries, and ensure that the most commercially viable schemes are developed first. This will mean that sites with a smaller generating capacity could be developed in future years as technology and the economic viability of hydro energy advances. For example in Richmondshire 73% of the total resource for the region could be obtained by utilising only 36% of the identified sites, or put another way three quarters of the maximum yield could be obtained by developing only the 'top' 4 of the 11 sites identified. In the Harrogate region 66% of the maximum yield from hydro could be achieved by developing the most economic 4 of the 13 sites identified.

The local authorities within the Humber sub-region

Because of the low lying and relatively flat topography of the Humber region no potential small or micro scale hydro sites have been identified exclusively within the local authorities of the East Riding, Hull, North East Lincolnshire and North Lincolnshire due to a lack of hydraulic head. One potential site exists in the north of the East Riding close to the boundary with Ryedale, however at present technology is not advanced enough to capture the slow flow of the water course in question. It is likely that other 'weaker' watercourses may have potential for the future, but at present there is little or no hydro resource in the Humber region which could be utilised to meet the 2010 targets and subsequent targets using existing technology and financing routes. Unfortunately as with other Renewable Energy resources, hydropower can only be utilised in the areas where is occurs naturally. Fortunately the Humber region is rich in other sources of Renewable Energy; namely on and off-shore wind power and tidal and wave power resources - all virtue of it's coastal location.

Several sites are however located on the borders of the Humber Region. One is on the boundary between the local authorities of the East Riding and York, at the site of Elvington Weir (where the lock is in York, but the most likely grid connection would be in East Riding), a similar problem occurs at Stamford Bridge a site on the Juncture of York, East Riding and Ryedale authorities and on the border of North Lincolnshire and West Lindsey Local authorities. This is a common problem because rivers and waterways have historically been used as boundaries between countries, administrative areas and even landowners. Solving the problem could perhaps involve joint development of a site by both local authorities involved with any costs and targets split between the boroughs.

Conclusion

Whilst small-scale hydro can make a useful contribution to the region's electricity supply, it is unlikely to be significant in terms of total demand. An additional resource, potentially of 20-40 MW, exists at sites within the region with hydraulic heads of less than 3m, but at present

exploitation of this is not likely to be economic. Small-scale schemes, particularly those involving the renovation of existing sites, are usually less socially and environmentally intrusive than large scale ones. In general arranging for a scheme to be acceptable in environmental and social terms will add to its cost but will not necessarily prevent its development.

Many opportunities do exist in the Yorkshire and Humber region, however they are only likely to be utilised following greater government incentive to developers including the provision of suitable finance tailored to large initial investment, followed by many years of low cost investment and the development of variable speed turbines for use at heads down to 1m. Where developers can prove the economic case for developing a small-scale site in the region it should be looked upon favourably by the planning community.

11 Marine

Marine technology uses the movement of sea water (tides, currents and waves) to generate electricity. A number of devices are at an experimental and demonstration stage. Commercial sized marine power schemes are unlikely to be available by 2010 but should be available by 2021. There should be some opportunities then to deploy some schemes on or off the region's coast.

11.1 Marine Potential

The UK has an excellent wave energy resource (50 TWh/year offshore) due to the length of coastline and the fetch of the wind across the Atlantic and the North Sea. Harnessing the renewable energy present within waves and tidal flows offers a very significant opportunity for generation in the longer term through a variety of technologies currently in development. However the challenge of designing effective, robust, dynamic structures to survive offshore conditions in a highly salinated environment is significant in the short to medium term. Water is 800 times denser than air, and most of the locations identified for marine generation experience energy flow densities (kW/m2) up to 10 times greater than is normal with a wind turbine. This is an asset in the sense that higher energy density leads to a smaller rotor and potentially lower costs, but it also leads to much larger forces than would apply to a wind turbine of the same rated power.

There are two energy opportunities to be harnessed from the sea: tidal stream and wave power. Tidal stream technology extracts energy from the flow of currents using submerged turbines mounted on the seabed; this energy can be magnified when harnessed in straits or estuaries. Rather than trying to capture the energy in the tides via large expensive and environmentally invasive barrages across estuaries, the idea of using tidal currents has a far lower environmental impact. Wave power is generated by the action of the wind blowing over the sea’s surface and can be harnessed both on the shoreline and out at sea via a variety of different technologies. Shoreline and near shore devices offer the benefits of ease of access for deployment, maintenance and retrieval, plus lower grid connection costs but the energy content of waves decreases as one gets closer to the shore. Offshore devices have the potential to generate more energy but their operational lives are likely to be shorter and operating costs higher.

The prospects for wave and tidal stream technology are mainly limited by technology immaturity. Marine technologies are at the same developmental stage that wind was 10 – 15

years ago. Although UK SMEs and research groups are currently developing several designs, these are several years away from commercial exploitation. Consequently, there is only a small chance of grid connected wave energy plant being installed by 2010. Looking to 2021 however, offshore wave could provide several tens of MW capacity if current designs are proven. Tidal stream energy conversion must also be proven at full-scale in real sea conditions, but the current pace of development is arguably greater than that for offshore wave. An installed capacity of several MW could be possible by 2010 were grid and other infrastructure issues solved.

Proof of concept of both tidal stream and wave devices hinges on the availability of government support, testing facilities and private investment. The current climate is very encouraging and advanced testing facilities are now available at NaREC in Northumberland, and EMEC in the Orkneys. In October 2003, the South West Regional Development agency revealed their plans for a 'Wave Hub' off the region's coast. The site would act as a proving ground for devices in the last stages of R&D prior to market entry. Wave Hub is an offshore electrical 'socket' into which a number of wave machine arrays can be plugged. It would be connected to the national grid via a dedicated undersea cable, which would allow export of power. The UK is now fully committed to developing the next generation of commercial renewable energy technologies in the emerging wave and tidal energy market through a variety of programmes.

As with offshore wind farms, remoteness from a high rated grid connection point is likely to be a major constraint in the development of marine embedded generators, as high voltage grid coverage is currently concentrated around demand centres and large generators, as opposed to around the UK's coast line. The ongoing Distribution Pricing Control Review 4 is likely to remove many of the obstacles currently inhibiting further offshore development by placing the majority of the associated connection and grid reinforcement costs with energy distributors as opposed to developers, who instead will have to pay a rental for the use of the new grid link from April 2005.

Tidal power has the advantage of being highly predictable compared with some other forms of renewable energy. The La Rance barrage situated on the estuary to the river Rance near Saint Malo is the only example of a tidal power scheme in Europe and although inaugurated in 1966, at a capacity of 240MW it remains by far the largest such scheme in the world. A scheme for flood control and power development has been muted for the coast in the Hull area but these are believed to ideas rather than plans at this stage. Combining flood defence with power development could be a way on increasing the commercial viability of such a scheme. The technology, including the possibility of the 8,640 Severn Barrage project, has been extensively researched under the UK renewables programme but commercial viability has so far been a problem.

Whilst wave power is intermittent at the small-scale, well-sited wave farms could forseeably provide base load power. Wave power levels around the UK are highest along the exposed northern and western coasts, where it is most likely that developments will proceed. The Yorkshire and Humber region is unlikely to be a focus for wave energy deployment up to the 2010 time horizon as the coastline is protected by the European continent.

Because of the commercial infancy of marine energy generation technologies, no potential have been estimated for 2010, however by 2021 it is expected that the range of wave and tidal technologies in the UK will have developed significantly and that much of the required infrastructure will be in place as a result of steady investment.

11.2 Developing targets for Marine Energy

Marine resources can only be harnessed by the five Local Authorities in the region with a significant coastline / estuary access – namely Scarborough, East Riding, North East Lincolnshire, North Lincolnshire and Kingston Upon Hull. However it was decided to assign these targets at a regional level, using an approach similar to that used for offshore wind resources. As for offshore wind, all developments out to sea will be under the control of the Crown Estate as opposed to local authorities.

Renewable Energy Type / Indicative Size	**Existing Situation**			**Prospective Total by 2021**		
	Schemes	Capacity (MW)	Output (GWh)	Schemes	Capacity (MW)	Output (GWh)
Marine	0	0	0	1	30	90

12 Waste Related Technologies

12.1 Landfill Gas

In the UK most municipal waste goes to landfill. Decomposition of the organic components of the waste produces 'landfill gas' which can be extracted and used an energy source for electricity generation. At the end of 2002 there were 17 landfill gas sites in the Y&H region with an installed capacity of 33.2 MW[8] and generating 180.5 GWh. Other information source[9] indicates a capacity for 2002 of 36.9 MW with an output of 213 GWh. As this latter information is based on capacities and outputs for 27 individual sites then it may be more representative.

The UK is running out of landfill sites and the policy is to reduce landfill significantly. Landfill gas is not emitted from sites indefinitely. The gas is normally depleted within 5-15 years. Despite these factors the exploitation of landfill gas in the region is expected to increase.

Landfill gas is an energy from waste technology and so not strictly a renewable source of energy. However if the gas were not collected and utilised it would eventually escape from the landfill to atmosphere where it would have a much higher 'greenhouse effect' that if it were used as a combustion fuel. Landfill gas is an eligible energy resource under the Renewables Obligation. The exploitation of landfill gas is expected to be in decline by 2020 as alternative means of waste disposal are introduced. For this reason landfill gas has not been included in the renewable energy targets for this study.

12.2 Sewage Gas

Sewage gas is derived from the anaerobic digestion of sewage. The technology currently makes a small contribution to electricity generation in the region.

12.3 Waste Incineration

One solution to reduce landfill and generate electricity and heat is to use a waste incineration CHP plant. The current situation in the sub-regions[10]:
Humber: New energy from waste CHP plant at Stallingborough in North East Lincolnshire is operational and has a capacity of 56,000 tonnes per year.
North Yorkshire: All residual waste goes to landfill.

South Yorkshire: Energy from waste plant at Sheffield has capacity for 135,000 tonnes per year. This is to be replaced by a new plant with capacity for 220,000 tonnes per year. The 2002 capacity has been stated as 12.1MW_e[11].

[8] Energy Trends, DTI, September 2003
[9] Energy Forum Foundation Update, Yorkshire Forward and Ecotec, not dated but assumed 2003
[10] 'Let's take it from the tip' - Yorkshire and Humber Regional Waste Strategy, Yorkshire and Humber Assembly, July 2003.

West Yorkshire: Energy from waste plant has capacity for 135,000 tonnes per year.

Municipal waste produced each year is growing at about 3% for the region. The amount of municipal waste incinerated for energy production is a small proportion of the total and so there is a sufficient supply to significantly increase energy production from this source. The technology uses large centralised plants and consequently it is difficult to allocate power generation form this resource by local authority. However it is reasonable to assume that incinerators should be sited near to the main sources i.e. major urban areas to reduce waste transport.

[11] Yorkshire Forward, Energy Forum Foundation Study Update, Ecotec Research and Consulting Limited.

13 Other Technologies

13.1 Coal Mine Methane

Coal mine methane (CMM) or mine gas can be extracted from both operating and abandoned coal mines. The estimated capacity for the region is 100-150(MW)[12]. Although eligible under the Climate Change Levy scheme the fuel is not eligible for Renewable Obligation Certificates and is therefore be targeted for the purposes of renewable electricity generation. There are currently seven sites within the region with CMM licences. There is significant potential for this fuel source locally if the regulatory climate changes.

13.2 Other

The technologies briefly described above are the main technologies relevant to the region but this doe not mean that others are excluded. Technologies such as CHP, fuel cells, and ground source heat pumps are not strictly renewable energy technologies but all have an important role to play in the future.

Hydrogen is often referred to in the context of renewables. However hydrogen is not a renewable energy source although it can be generated from water using renewable sources of electricity. The hydrogen can then be stored and then burned to release heat, generate electricity from a CHP plant or a fuel cell. Hydrogen is likely to become an important medium (or vector) for storing renewable energy. This is particularly useful for intermittent technologies such as wind and PV. Hydrogen is a clean fuel and may have a role as a transport fuel in the future but will require a new supply infrastructure.

13.3 Energy Efficiency

Renewable energy power generation is only one of several groups of energy technology measures that have a key role in reducing conventional energy derived from fossil fuels and moving to a low carbon economy. The more efficient end use of energy is also an essential component to achieving the national targets for carbon emissions. The increased deployment of renewable energy is therefore part of a combined strategy to meet the objectives of the Energy White Paper.

[12] Energy Forum Foundation Study Update, Yorkshire Forward 2003.

14 Local Authority Views on RE Targets

Local Authority Views on Renewable Energy Targets within the Yorkshire and Humber Region

This document contains a range of views that have been obtained from the local authorities within the Yorkshire and Humber Region through telephone interviews and a few meetings using a questionnaire as the basis for dialogue.[13] These views have not been attributed to any individuals or local authorities.

1. Keywords Summary

- **Targets** for renewable energy at a local level are helpful/desirable.
- **Education** is needed of public, LA staff and members
- **Equity** between rural and urban areas is needed
- Targets need to be **realistic** in terms of grid strength & MOD concerns
- Targets need to be **politically supported**
- Targets need to be locally owned and informed by **local knowledge**
- There is a **lack of resource** in most LPAs to deal with the issue
- Until there is **political will** the lack of resource will continue
- **Independently** estimated potentials and targets are fairest and provide cohesion
- The methodology needs to be **open and transparent**
- Developments need to be of a **suitable scale**
- **Community** initiatives need to be encouraged
- Potentials/Targets need to be achieved **without destroying amenity**
- Potentials/Targets need to be set into a formal & legally binding **policy context**

2. *The principle of LPA RE Targets*

Do you believe that LPA targets are helpful (desirable?) to assist the achievement of national and regional targets for Renewable Energy?

Response	**No.**
Yes	14
No	2
Unsure	4

Yes

Encouraging Action, Responsibility and Ownership of Targets

All authorities consulted recognised the value of sub-regional targets and the clear majority of LPAs felt that a local target was also vital, as, unless there is an objective target to aim for there is likely to be inertia and procrastination at the local government level. All authorities in favour of local targets valued them because of their ability to concentrate the mind. Local targets were hoped to make council members take the issue seriously as one that concerns the local area. For many authorities this is the only way of leading them down a direction they

[13] The word 'target' was used throughout this dialogue and so has been retained in the text of this section to most accurately reflect the feedback. Elsewhere in this report we have reserved the word 'target' for RPG and national targets and have referred to the local indicative RE levels derived in this study as 'potential'.

would be unwilling to take on their own. If set at a wider level – sub-regional for example, then local authorities would tend to ignore them and assume that other authorities would take up the slack. Local targets stand more chance of being met. LPA RE targets are helpful in that they help to drive policy and actions at a local level. Local RE targets are a way of ensuring that each LA plays its part in contributing to the regional and national targets. If LAs can see the other LAs' targets then the burden can be seen to be fairly distributed. Shared responsibility translated via local targets is the key to success, as this forces recalcitrant local authorities in the direction of action.

Risk Management & NIMBYism

Other reasons cited to favour local targets include the opinion that they are a positive risk management strategy and many LPAs predicted that in the short to medium future, LAs not meeting local RE targets will be penalised. The planning system can play a vital role in delivering local, national and regional targets. It can indeed be helpful to deliver measures that are unpalatable due to NIMBYism such as failure to take responsibility for energy use at a local level.

Concerns about translating Targets into Developments

However having targets will not necessarily mean that any more schemes will appear on the ground. Implementation has to come from within the RE industries and they need to develop a coherent strategy. Whilst having targets will mean that many of the barriers hampering the development of RE will be lowered, they can only do so much. There is a real concern from the majority of authorities within the Yorkshire and Humber region that targets may not translate to developments on the ground and that robust formal policy mechanisms are needed to ensure that developers take RE seriously and targets can be met. Developer obligation is a major area that needs to be addressed. Many respondees mentioned the RE policy designed by the London Borough of Merton as something that they would like to see become more commonplace.

Need for a firm Regional & National Legislative Context

Local RE targets were recognised as making an important connection to the national target. It was considered that national targets would be difficult to achieve without targets and commitment at a local level. All authorities expressed concern over the context of the targets currently being developed, and how they would be used in the future. Whilst most recognised that this 'target setting' is a consultative exercise, once the exercise is over Local Authorities stressed that the targets need to be set into a firm context. Clarification is needed from the region once the targets become formal, as to how they fit into RPG and national targets. Around a third of respondees stressed concern that 2010 targets would be difficult to implement because of because of the timetable of Local Plan revisions, and the uncertainty over when LDFs will supercede or complement Local Plans.

Timespan of the Targets

A majority of the respondees felt that predicting as far ahead as 2021 was unreliable as technological progress could not be predicted accurately and hence the 2021 targets need to have an element of flexibility to reflect this. In sum targets for 2010 were felt to be difficult to achieve, and targets for 2021 were felt to be difficult to set. By and large the 2021 targets are considered more important than those for 2010 in planning terms. There is only a limited scope to have significant impact within the 2010 timescale, and many authorities were concerned that these targets will not be able to be met within the conventional planning framework due to public hostility to mainstream technologies such as wind and also due concern that other RE options were unlikely to be market ready or financially viable by 2010.

Robustness of the Methodology

A handful of local authorities were in favour of local targets in principle only and expressed the following reservations: The targets have to be justifiable and robust. Planners need to be able to defend the targets and the methodology at local inquiries, they need to thoroughly understand the methodology they are defending. More information needs to be provided as to how the methodology was constructed.

Targets need to be Aspirational not Prescriptive
Others felt that there is a real need to avoid seeing targets as a maximum threshold, that once reached does not need to be exceeded. Targets could have the effect of constraining action if they are too modest. Aspirational targets would give the LA a challenge to aim for and might be a useful tool with which to solidify political support for actions and policies relating to Renewable Energy.

No
Preference for Sub-regional Targets
Those not in favour of local authority targets tended to prefer sub-regional targets because of their ability to easily gauge cumulative cross-border impact.

Are the targets really targets?
Others against local targets were concerned about the phraseology used and the confusion that this may cause. Many felt that the targets are really an indicator of potential. Although it may be semantics some authorities felt that it would be more useful to use the term 'indicators of potential' or ‘indicators of capacity’ rather than 'targets'. This would give better support from a framework perspective for local planners and the numbers would be more generally acceptable. Use of the word ‘targets’, used so much in local government infers that there could be failure to meet a specified level and that this could be used as a 'stick'. Concerns were raised as to who is responsible if targets are not met given the range of organisations involved in delivering a renewable energy project? And what would happen to them as a result? The term 'indicators of potential' infers a more aspirational approach that would be more politically acceptable and is perhaps more reflective of the project outputs.

Caveats
Additionally, those unsure about targets felt that Targets must come with caveats. If targets are going to be imposed without community engagement, councillors are likely to vote down proposals first and ask questions later. Targets at a local level can only be helpful where the local community is engaged. Furthermore, example citing a zero target for a region is fatal and must be avoided. Targets cannot be seen to promote a foregone conclusion and need to be flexible to economic and technological advances. Potential needs to be indicated for all technologies and the targets must not become a tool that plays into the hands of the negative lobby. Zero targets are bad for members, the general public and planners, as they tie the hands of planners and could cause members to reject them without consideration ‘because we don’t have a target for that technology in the area, so we don’t need it’. Additionally, we do need to consider ‘how’ these targets will be used by local authority staff.

Confusion about Context
Most Local Planning Authorities contacted were concerned about the lack of cohesion between the figures generated by this study, RPG and the REAT. At present the presence of a local target, which is not linked to formal development plans or RPG is a little confusing. And unlike housing figures for example, which are consistent at all levels, the lack of uniformity in RE targets between studies and target-setting bodies could be problematic unless stakeholders realise the inherent flexibility of the RE resource.

3. *A Target for your authority*

In the light of the information that this study has generated so far and any other relevant information, would your authority be able to propose its own RE targets?

Response	No.
Yes	2
No	15
Unsure	4

If not, what further information and assistance would be required to enable you to do so? Over what timescale?

This was a topic that generated a great deal of debate and revolved around not just could LPAs set their own targets, but would and should they.

Can LPAs set their own targets?

In terms of could LPAs set their own targets, the vast majority felt that they simply could not because of a lack of technical staff, time and money. This was an issue that those questioned tended to feel very strongly about. Whilst larger authorities can afford more staff, small rural authorities simply cannot afford to employ technical specialists devoted to RE, and planners are simply not qualified to do the job. As a result of the consultation workshop in January 2004 it was concluded that it was unrealistic to expect all local authorities to be able to develop their own targets. Most felt that access to experts is vital, and continued support of rational, objective, technical advice would be appreciated when dealing with applicants, objectors and developers within the region. Central and Regional Government need to assist LPAs both financially and in training terms before in house target setting will be possible, even in those few authorities lucky enough to have some RE technical staff. Most authorities questioned were happy that the project team is able to fulfil this niche and provide the technical expertise that is needed across the whole range of technologies.

If Local Authorities had the inclination they probably could come up with ‘off the top of their head’ local targets for RE generation by looking at recent development proposals. However this could result in unrealistic targets that missed opportunities and exaggerated other resources wildly. Additionally, to set targets planners need more information from the aviation industry and the MOD as to the local geographical constraints. None of which has been forthcoming in the past - perhaps only a regional study can have enough ‘clout’ to obtain this information.

A handful of local authorities did want to be able to set their own targets, but felt that their lack of technical staff, software, time and financial constraints meant that this was impossible. The majority felt that whilst they could not set targets because of a lack of resource, this was a good thing as LPAs would be unwise to set their own targets anyway.

Should LPAs set their own targets?

In terms of should LPAs be willing to set their own targets, most expressed concern at this approach. It was felt that if all of the local authorities set their own targets there would be no common methodology and they would not have the same rigour and impartiality as when one external body set the targets for everyone. This would be a very difficult and arguably an unproductive exercise. What vetting procedures would there be to ensure that there was

consistency between local authorities? Locally determined targets would create a disparate patchwork of contrasting policies which would be confusing to developers, politicians and the public. Regional and technical guidance is vital regardless of whether individual local authorities have the technical expertise on hand to construct figures themselves. Local authorities will only be able to set their own targets once they have a regional / national policy structure to frame them in. The targets need a context.

Most believe that targets are best co-ordinated at a regional level rather than each trying to develop its own using individual methodologies. A sub-regional approach would be useful and would help to overcome conflicts that could arise over wind farm spacings where these cross LA boundaries and over the issue of cumulative impact. The bigger issue is the need for the local authority to remain impartial and objective. This would be more difficult where local individuals are involved in local target setting. There is therefore a case for an independent body, be it a consultative or regional governmental organisation to do this work

Will LPAs set their own targets?

In terms of would Local Planning Authorities set their own targets, most felt that left to their own devices this would not happen. It seems that most LAs would be reluctant to set their own targets because that would mean facing an often unpalatable issue head on. Politically most would prefer not to face the issue, and by setting their own targets it could be akin to sticking their collective head over the parapet. Most would feel that they would court local and pressure group controversy over wind farms if they did, or else would attract a flood of applications. For the National Parks it would be entirely inappropriate for them to set RE targets for political reasons. This is not to say that schemes won't go ahead and wouldn't be encouraged, but more that a formal target would mean that it would be difficult to justify resisting inappropriate proposals. Similarly formal targets could in reality result in the supporters of National Parks voting with their wallets – by a) not visiting the parks and contributing to the local economies and by b) refusing to donate money to NP authorities as a protest to the RE policy

Political support for RE is weak as local councillors have a suspicion of wind farms, and view RE and wind turbines as synonymous. If the political support were to be obtained, it might be possible to link targets to the RSS process, or else publish a Corporate Approach to RE, outside of the planning process. Planners are very aware of the political climate in which they work and if members are not engaged in the RE debate by Regional Government, planners setting RE targets are unlikely to see them passed by council members.

4. *Factors for and against targets*

What factors (three at most) would make your authority more likely to accept or commit to a RE target?

Factor	**No.**
• Engagement and advocacy from independent bodies providing council members / LA staff with accurate objective information about RE technologies	11

- Engagement and advocacy from independent bodies providing the public with accurate objective information about RE technologies 9
- Official targets set using a common and open methodology for the entire Region 8
- Targets which take into account cumulative impact across LPA, sub-regional and regional boundaries 3
- Robust policies at the national level to integrate RE into new developments / the planning system 6
- Dissemination of Best practice policies and developments 1
- Small scale, community led, local generation and exploiting energy generation in ways which will have a positive impact on the local economy and in terms of sustainable development 8
- Targets should be equitable for all areas regardless of their urban / rural nature 8
- A central government information campaign highlighting climate change and the need for RE and also the grants available is needed 3
- Repowering sites rather than constructing new ones 1
- Agreed restrictions on the sizes of wind turbines able to be used in developments within a local authority 2
- RE developments linked to regeneration (either brownfield or rural) 6
- Targets need to be subject to monitoring and flexible enough to respond to change such as technological advances and over-development within an area 4

- A realistic target which takes technical constraints on the ground into account (i.e. MOD / grid issues) 5
- Targets which fully take into account local knowledge / local landscape character assessments 4
- Targets which are achievable without destroying the amenity of an area 9
- Recognition in the RSS that National Parks have a unique status 1
- The term 'targets' is unhelpful as the study is indicating capacity 1
- Targets should be indicative 2

What factors (three at most) would make your authority less likely to accept or commit to a RE target?

Factor	**No.**
• Uninspiring, low targets	3
• Targets which are not linked to formal national and regional policies, legislation and strategies for deployment	3
• Large scale development imposed from above, unsuited to the local landscape	4
• Lack of consultation / education of public and council members	5
• Pressure groups such as the Country Guardian influencing local opinion and council members	6
• A desk based approach which ignores the realities on the ground causing a lack of technical agreement as to the true capacity	2

- A study which fails to address issues of cumulative impact 3
- The nomenclature is confusing and needs definition. Description of targets as minimum targets, as opposed to targets or capacity 4
- Targets set without a commonly agreed methodology for the region or without explaining the common methodology 3
- Lack of accurate unbiased information 3
- Unfairly distributed targets, especially between urban and rural areas 7
- Targets which are impossible to achieve 3
- Any approach that uses the National Parks' targets to top up under-achieving LPAs in meeting their targets. 1

5. *Technologies at Local Level*

Wind

How concerned are you over the scale and number of wind energy turbines implied for your authority by the study assessment?

Response	No.
Yes	7
No	9
Unsure	3

What – if any – factors would help to reduce this concern?

Factor **No.**

- Incorporate local landscape character assessments into the study 3
- Urban areas and wind are not mutually exclusive concepts – providing 5

the scale of development is appropriate. Link to regeneration of brownfield land.	
• Targets need to be realistic, and take into account the realities on the ground that will affect developers actions. More engagement locally, a thorough local investigation and a move away from the desk based approach of the study is vital.	2
• The public and local politicians need to see examples of the technology in reality, good practice and understand how the technologies benefit the common good. They need to hear facts not scaremongering.	5
• Advocacy is needed from external and independent sources to fully engage the public and politicians, not sales pitches from developers.	3
• Small scale wind applications would be more appropriate.	4
• Allowing planners to develop policies that welcome wind developments that use turbines below an agreed height limit for the area as opposed to a one-size fits all approach.	4
• Targets need to be tied into formal policy mechanisms in the format of the development plan. Whilst there is a strong steer from the region, this is not prescriptive enough in terms of a formal policy framework and the realities of implementation.	3
• Given all the constraints on wind developments arising from landscape and unsuitable built up areas there is a need to allow development on ordinary Green Belt land for smaller scale wind farms.	1
• Local designations such as (Areas of High Landscape Value) may not be appropriate in local plans for the purposes of restricting RE developments.	1
• Need further guidance on criteria based policies.	1

- Cumulative impact needs to be considered. 3

Other technologies

Do any aspects of the other technology assessments give you cause for concern?

Technology	Concerned	Not Concerned	Comments
PV	9	4	Are these technologies market ready? Cost is also a concern. Difficult to persuade builders to use systems. Also difficult to incorporate into listed buildings / national park dwellings.
Biomass	4	6	Don't know the realities of what is involved. Why aren't cofiring targets expressed locally? Would energy crops grown in a region count towards their target even if they were cofired in another?
Hydro	4	7	More information is needed on the realities of this technology – especially at the community scale. The cost is so large few developers will consider it. The National Parks are very positive about micro hydro.
Other	5	4	Waste to energy schemes and RE heat should be considered. More weight should be given to marine technologies by 2021.

6. *Local Authority actions*

Regardless of whether your authority is likely to support a specific local target, what actions would your authority be willing to undertake to assist the deployment of RE more generally[14]?

RE Procurement.

None of the LPAs questioned procured green energy, although a minority were beginning to investigate this. Most authorities are more concerned with energy efficiency than with RE – with regard to their own building stock and energy use strategy.

Corporate Approach

Many of those questioned felt that a Corporate Approach to RE was a vital next step, but there was a lack of political will and financial resources to put this into practice.

Sharing Knowledge

The West Yorkshire authorities have organised a West Yorks / Lancashire Inter Authority Working Group on Renewable Energy, to ensure that authorities with little experience of RE proposals or working schemes, can learn from the experiences of some of the other authorities who have more experience of renewables, and with the wind industry in particular. There has also been the knock on benefit of raised Community led and small-scale schemes seem to present few problems politically. They do however require more officer time and LA investment. This can be a real deterrent for local authorities

The National Parks

The National Parks are keen to integrate sustainable development into all of their activities and are moving away from a reactionary stance to that of a partner. There are the beginnings of 'Clear Skies' projects in the park, such as the farm scale wind turbines at Malhamdale and increasing support for demonstration and community scale projects. The park is ideal for demonstration projects and raising public awareness due to the numbers of visitors it receives, and it is hoped that micro-hydro demonstration projects will be forthcoming in the near future. The policy in the new Yorkshire Dales NPA local plan also looks favourably on

[14] - Development of appropriate land-use policies within the framework provided by the Planning and Compensation Bill (including policies relating to RE within major developments).- Use of Council procurement activities to encourage RE deployment. Development of RE within Council building stock and / or on Council-owned land. Local landscape sensitivity studies

small scale generation. Small scale is defined in this plan as: “Domestic or commercial power schemes within the capacity of the local environment, without causing lasting damage or eroding the special qualities of the area”

Working with Developers

Several authorities are actively looking at the suitability of sites for wind development, most of these are working alongside Powergen’s Community Renewables programme. However most recognise that they are short of resources in house to implement this work as effectively as possible. Many of those authorities who have actively been working with developers have hit upon serious barriers to wind energy development in their area such as grid strength, MOD concerns and proximity of dwellings. One authority now feels as though they have a wind target that even wind developers feel cannot be achieved! Most feel that even where positive policies are in place, there has been no interest from developers so it is difficult to see how renewables could be encouraged any further by LPAs. An authority can have a positive policy in the development plan and still receive no substantial applications.

The idea of a “developers’ forum” to encourage the wind industry to discuss issues informally with the council outside the context of individual schemes could be a beneficial initiative and this is being actively considered by several Local Authorities likely to face increasing applications from wind farm developers. One additional possibility is that developers could be asked to provide input to a local / sub-regional landscape assessment

7. *Other Comments that you wish to make*

- Guidance is needed on the realities of the technologies, however ‘obscure’, so that planners can speak from an informed perspective to council members, developers and any public opposition. Otherwise planners have to merely take the applicants details as gospel.

- It must be remembered that a drafted policy however formal still has to be interpreted by individual planning officers, and this can cause wide discrepancies.

- All technologies need to have targets enshrined in formal policy mechanisms. Even if all formal policy mechanisms are in place there is a worry amongst LPAs about what to do if they receive no applications from developers. Will there be penalties? LPAs can’t be made responsible if no developers are interested in their areas due to a poor resource. There is only so much local authorities can do, the industry and National Government also have responsibilities for meeting targets.

- RPG recommends the encouragement and promotion of the greater use of renewable energy sources. RPG/RSS will be a statutory document and as such will carry a lot of weight in LDF preparation. As such, there would be benefits in promoting a free-standing renewable energy strategy for the region. The RDA is well placed to prepare the strategy. It has an extensive network of contacts in local and regional government and amongst the business community. It is closely involved with bids for national and European funding for projects and has direct contacts in Brussels. It is also committed to the principle of sustainable regional development.

- The study is taken in isolation from the realities on the ground. More engagement and local fact finding is key if it is to be embraced. Local authorities are in the difficult position of not having the technical staff to set their own targets and write their own study, but not being able to contribute sufficient local knowledge to make the study workable and meaningful. Local Authorities are in a unique position to add local knowledge to the study – without which it will be arbitrary and an inaccurate representation of reality.

- An individual local authority RE strategy is needed for all local authorities. Many authorities would like information that enables them to develop this for their area, from an informed standpoint. The information needed would be a mapping of the total potential of their own area, which would enable the authority to pick the best technology mix to achieve this.

- Whilst the broad, criteria based policies of local plans have a place, there is a real need for strategies with corporate commitment from across the whole of a council, whereby real projects come about. Changing the corporate psyche is the only way that sustainability becomes more than a buzzword and projects appear in the real world.

- Local authorities can control the developments within their areas, if they had a consistent policy on design, RE and procurement – all of this could be expressed in built form through planning departments and development control.

- Looking at the attendees at the June meeting, it appears that FES have, to some extent, being preaching to the converted. The West Yorkshire authorities have been sending junior pro-RE staff rather than senior staff opposed to the idea. This contrasts greatly with the Humber experience. hearing the views presented at the June meeting from the West Yorkshire authorities is thus, misleading. The West Yorkshire authorities should be pressed to send their senior staff in addition to those already converted to the idea of RE development if the study is to achieve maximum impact on local policy.

- It would be helpful to reduce the number of different descriptions of the targets from three (MW, GWh, schemes) to just one, preferably MW, to increase clarity.

- Stay away from target trading - too complex.

- More clarity is needed on difference between RE generally and targets for RE electricity generation. The terms have been used interchangeably and have led to some confusion (i.e. “why no mention of energy efficiency or heating?”)

- LAs need to have full details of the methodologies to show how targets are derived.

What further actions in support of RE deployment would you wish to see undertaken at regional level?

- Member and officer briefings on the national / regional policy context, technology attributes and local policy responses would help to accelerate commitment to the idea of targets.

- Would appreciate more guidance on the realities of encouraging developers to actually use RE within developments, and on the practical side of the targets (i.e. implementation strategies, financial impacts etc).

- Both National and Regional Government need to be more positive about RE, and to go out on a limb and set formal, official targets with a penalty if targets are not met. RE needs to be enshrined in national legislation, or else authorities with strict targets may find that they lose out on developments to neighbours who do not stipulate onerous targets for developers to meet. Building Regulations in particular should be used to enshrine PV requirements in law and boost the industry in the UK to bring prices down. It is also all well and good that regional government is helping technical staff to learn more about RE, but council members are the people they really have to persuade if developments that are outside their normal experience are to be approved. Councillors need to be encouraged to become more forward thinking if the planning process is not to be held back by unqualified fears. General RE strategies are needed in an attempt to 'warm up' council members to the idea. This is felt to be likely to be more successful if it comes from in-house staff rather than developers.

- If there is to be an elected regional assembly then this could provide more scope for intervention and guidance on larger developments. This could speed up the process of scheme assessments. Regional assembly should be more objective, appreciative of the broader issues around energy, and less sentimental toward specific geographical areas.

- We believe that the RSS should convert the regional target into agreed targets for each local authority area. It should be explicit about the type of renewable involved, and the 'impact' that has to be accepted. It should make an honest appraisal of the "locational and environmental" criteria that would be used to assess the impact of a wind turbine. It should be frank about the room for manoeuvre at the local level.

- We would like the further work on this matter to deal with the prospect for financial input to local projects to acknowledge the impact of large-scale turbine development. The landfill tax credit scheme whereby in this area, Yorventure have been able to contribute to local community projects is offered as a model for consideration (although it is being superseded). It should be built into regional policy.

- The region needs to be seen to be leading by example.

- There needs to be more emphasis put on solar water heating and PV in the region.

- The region needs to attract manufacturers in the RE technologies into the region. This would improve public opinion on RE deployment.

- Sub-regional co-ordination should be put into regional context.

15 Renewables Innovation Review

The following are selected key conclusions from the Renewables Innovation Review[15] :

1. The 2010 renewable electricity target can still be met if barriers to **wind** deployment can be eliminated. The UK is currently slightly behind target. Wind power, both on- and off-shore , can deliver almost all the required growth in renewable energy to meet the 2010 target and is likely to continue to be the dominant renewable energy technology out to 2020. action is required to meet the 2010 target - timely incentivisation of necessary grid upgrades, addressing other institutional barriers and an appropriate financial framework will be important.
2. Longer term, the UK should develop technology and market options to achieve 2020 and 2050 aspirations and generate UK benefit. Technologies other than wind are required to meet 2050 aspirations. A range of technology and market options should be developed to address the multiple markets for renewables and the inherent high risk of early stage technologies.
3. **Biomass** offers the advantages of non-intermittency and could provide a material contribution to UK heat and electricity supply but may be resource constrained.
4. Current technology solar **PV** installation is expensive under UK conditions. There may be a breakthrough in solar PV technologies which could substantially reduce costs , advancing the point at which solar PV is an economic technology under UK conditions.

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[15] Renewable Innovation Review, DTI and the Carbon Trust, 2004

16 Appendices

Appendix 1

SUB-REGIONAL MAPS RELATED TO DEVELOPMENT OF WIND TARGETS

Maps 1-24 are available on CD.
Note - scales differ between the sub-regions.
Information available is as follows:

Information on Map	**Sub-Region**			
	North Yorkshire	**West Yorkshire**	**South Yorkshire**	**The Humber**
Designated Landscapes	Map 1	Map 2	Map 3	Map 4
Non Designated Landscapes	Map 5	Map 6	Map 7	Map 8
Biodiversity & Earth Sciences - Designated (National Nature Reserve, SSSI, RAMSAR, SAC, SPA)	Map 9	Map 10	Map 11	Map 12
Biodiversity & Earth Sciences - Non Designated (Important Bird Areas)	Map 13	Map 14	Map 15	Map 16
Zones of sensitivity to wind energy development	Map 17	Map 18	Map 19	Map 20
Wind Speed & Development Constraints	Map 21	Map 22	Map 23	Map 24