Supplementary Planning Guidance

For Energy Renewables and Conservation

Adopted October 2003

Peak District Renewable Energy Implementation Review

This Supplementary Planning Guidance is based on a review of the possible opportunities for renewable energy implementation in the Peak District National park. The review was undertaken with financial assistance from the east midlands development agency, and was prepared in partnership by Nottingham University and De Montfort University in Leicester.

Both of these Universities are cited as "Sustainable Energy Champions in the Region" in the latest version of the east Midlands Energy Strategy, prepared by the East Midlands Assembly.

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www.peakdistrict.org

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Foreword

I am pleased to introduce this Supplementary Planning Guidance (SPG) for Renewable Energy Developments and Energy Conservation in the Peak District National Park.

Building on key principles of the National Park Management Plan, this guidance brings together sustainable development and partnership by confidently embracing innovation in ways which can encourage local residents, community services, local business and others to adopt sustainable lifestyles.

With increasing energy demands, the need to save or generate more energy is a challenge to us all. However, the vast majority of our energy is currently derived from fossil fuels despite awareness of the environmental damage caused by burning coal, oil and gas.

These are real concerns for everyone and the benefits of energy efficiency and self-sufficiency are now being promoted strongly by the Government. Nevertheless, to make a positive contribution in somewhere like the National Park is a great challenge since new technologies are often foreign in shape, colour and material to the traditional built or natural character of the National Park that this Authority is charged to conserve.

So in this SPG we explore the wide variety of technologies currently available or being developed that can allow you to contribute to sustainable development in ways that still protect the special features of this treasured area of the country.

We are very excited about the opportunities and hope people will find this guidance a useful basis for discussion with our Planning Officers.

Tony Hams
Chair
Peak District National Park Authority

Preface

1.1 This Supplementary Planning Guidance (SPG) supports the positive role that renewable energy and energy efficiency can play in an area of high environmental quality such as the Peak District and offers guidance on the most appropriate ways for future development. It supplements policies of the adopted Peak District National Park Structure Plan (1994) and Local Plan (2001) by identifying those technologies most likely to be acceptable within the National Park and emphasises that they should all be small-scale serving only local need and achieved in ways, which are sensitive to the special character of the area. It aims:

- To help you submit a high quality of planning application;
- To assist in the discussions you have with the Planning Officers; and
- To ensure that your proposal leads to the best outcome possible.

1.2 The technologies are presented in a way that describes their likely environmental impact within generic areas of the Peak District. This is done so as to highlight areas of opportunity as well as the obvious constraints.

1.3 After the description of renewable energy sources the SPG refers to a range of other technologies, which are not strictly involved with energy generation. However, for completeness and to build on the principles of energy efficiency and better use of natural resources, their inclusion is considered appropriate.

Purpose and Status of Supplementary Planning Guidance (SPG)

1.4 This document is not in itself a statement of policy, but sets out in more detail how the policies can be put into practice. SPG does not carry the special statutory status of the National Park Development Plan. But the Government's national planning guidance indicates that:

- It can provide helpful guidance for those preparing planning applications;
- It may be taken into account as a material consideration in deciding planning applications; and
- The weight accorded to it will increase if it has been prepared in consultation with relevant stakeholders and has been the subject of a Council resolution. Details of the consultation carried out are given in Appendix 3.

Policy Context for SPG

National Context

2.1 The UK has a target under the Kyoto Protocol, adopted in 1997 to reduce emissions of six Greenhouse gases by 12.5% from 1990 levels in the period 2008-2012. In February 2003, the Government published its Energy White Paper: Our energy – creating a low carbon economy. This set a goal of meeting 20% of our energy needs from renewables by 2020.

2.2 Government's planning policy statement on renewable energy (PPS22) explains how local planning authorities should include renewable energy policies in their plans and advises on the contribution their area might make, noting the considerations that should apply in designated areas such as National Parks to protect the landscape and wildlife. It states, "Permission should only be granted where the objectives of designation....will not be compromised....and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits."

Regional Context

2.3 The **East Midlands Regional Energy Strategy** can be viewed at http://www.emra.gov.uk/publications/documents/energy_strategy_complete.pdf.

It builds on the energy hierarchy adopted by the Local Government Association in 1998, setting priorities in the following order:

- Reducing the need for energy
- Using it more efficiently
- Using more renewable sources
- Making clean and efficient use of fossil fuels.

The strategy encourages domestic and small scale community renewable energy schemes. It seeks sensitive design of installations to take full account of the historic and built or natural environment and states that the appropriate location of energy generating installations must be addressed in spatial policy (see reference to RSS 8 below).

The next steps for the regional energy strategy will be to identify specific actions that can be taken forward now and in the near future to achieve its policy aims. This SPG should help in respect of the National Park.

Regional Spatial Strategy for the East Midlands (RSS 8) was developed in 2003/04 and builds on recent regional planning guidance (RPG 8) together with PPG 22 to give spatial meaning to the energy strategy. It points out that at the local level Authorities such as the National Park Authority may identify those technologies on which they wish to place emphasis. For wind energy (most likely to be controversial in the National Park) it emphasise a criteria based policy approach to take particular account of:

- landscape and visual impact and capacity;
- natural and cultural environment including bio-diversity
- built environment including noise intrusion
- the ease of connection to the Grid;
- local wind conditions;
- scale and cumulative impact including intervisibility (where more than one installation can be seen).

National Park Context

2.4 The National Park Management Plan is underpinned by principles of sustainable development and partnership and promotes a positive attitude towards issues of global importance such as climate change. However, National Park legislation requires that where there is a conflict of interests the priority must be with the conservation of the valued characteristics of the area. Within this framework the National Park Development Plan further explains the general approach to renewable energy development that:

2.5 Only small-scale schemes appropriate to local need (including those benefiting the wider community) are likely to be compatible with the overall policy of conserving and enhancing the special characteristics of the Peak District. Schemes judged harmful to these special characteristics are likely to be refused (see Appendix 1). This is the overriding context for the supplementary planning guidance that follows. Advice on conserving and enhancing these features can be obtained from the National Park Authority's (NPA) Development Control, and Cultural Heritage Services. Similarly in terms of other potential environmental impacts you should also seek advice from the Environment Agency, e.g. for water abstraction on hydro schemes (see Para 4.52). **www.environment-agency.gov.uk**

2.6 The broader Development Plan strategy seeks to concentrate development in designated settlements, thus protecting the open landscape, and contributing to sustainable communities. Drawing uses closer together also reduces the need to travel and to reduce the distance of travel. To further its own commitment to sustainable development the NPA is also looking at opportunities to use renewables / green technologies at several of its properties (see Appendix 2).

Do You Need Planning Permission?

2.7 **Unless your idea comes within the criteria below it is likely to require full planning permission.**

2.8 In a few cases, the technologies described in this SPG may not require planning permission. Factors that may affect this include:

- Size;
- Siting;
- Degree of Permanence;
- Attachment

Examples

- A technology may be installed for demonstration purposes and removed after a short period of time (temporary uses are allowed for 28 days in any one year);
- A micro-hydro scheme may simply involve mobile equipment being placed into a flow of water and wired to the intended appliance; or
- Some technologies (by virtue of their size) are capable of being accommodated inside buildings e.g. composting toilets and some smaller Combined Heat and Power (CHP) systems (which can be the size of a domestic fridge). Similarly, hydrogen fuel cells can be adapted for use in cars.

2.9 There are also examples, e.g. with roof based technologies where they may not always constitute development. In such cases, consideration would be given to their size or degree of projection from the roofline to determine whether the shape of the house had been "materially altered". An appeal against Purbeck District Council has provided guidance that a projection of 8cm to 12cm from the roof was appreciably more than the projection of a flat window and was therefore deemed development.

2.10 However, with the exception of internal works in buildings that are not "listed" the examples of this for other technologies are too few to offer clear guidance for each technology so each case will be judged on its own merits. In any case, early discussion with the planning officers will allow such judgements to be made.

Building Regulations and Energy Efficiency

2.11 The use of renewable energies is not the only way to reduce carbon emissions and save energy. A primary concern is energy efficiency. The NPA does not have an energy efficiency remit beyond land use planning. Advice on energy efficiency is therefore best obtained from the constituent local authorities within the National Park (See Appendix 5). Nevertheless, some useful pointers are given here.

2.12 To best ensure a sustainable development, applicants should try to co-ordinate building control and planning applications by discussing them together. Try to arrange joint site meetings with officers of both authorities.

2.13 Businesses are increasingly recognising that greater energy efficiency is required not only for short term financial gain but that it is also important for longer term planning and environmental responsibility. Energy bills can be controlled by cutting down on wasteful energy consumption, reducing not only the costs, but also reducing carbon emissions and hence benefiting the environment. Companies can obtain energy efficiency advice from **www.actionenergy.org.uk**

2.14 In the UK, one quarter of all carbon dioxide emissions come from the energy used to heat and light houses, and power household appliances. Identifying the energy wasted in houses can have a direct effect on the environment as well as saving money. This is the basis of energy efficiency. Householders can obtain energy efficiency advice at: **www.saveenergy.co.uk** Innovative ideas on straw bale construction and sheep wool insulation are also developing. Details of the Straw Bale Building Association can be found in Appendix 4.

2.15 **Double-glazing** can improve insulation and there may be opportunities to accommodate it in the National Park. However, standard double glazing units tend to be designed for the suburban style of house and nearly always look wrong in an old building unless efforts are made to respect the character of the building. It is possible to achieve improved thermal insulation and reduce draughts by overhauling and upgrading existing windows without the expense, disruption and damage to character caused by double glazing (especially uPVC). New, thin sealed vacuum double glazing units are becoming available which are not much more expensive than conventional units and can be applied to traditional timber frames, including sash windows.

2.16 Adding secondary glazing is another option in older buildings as it better maintains the integrity of the building yet provides useful sound and heat insulation due to the wide air gap between the two sheets of glass. In terms of sustainability there are further arguments against the use of uPVC, i.e. that they are essentially oil based (non-renewable) and emit a variety of toxic chemicals either from the plastic itself, or from its additives. Further advice may be sought from the NPA Historic Buildings Team.

2.17 A few simple measures that householders can carry out to save energy are:

- Turn off any lights that aren't being used
- Close windows that could be letting out heat
- Don't leave the TV or computer on standby
- Draught proof windows or doors
- Take a shower instead of a bath
- Only boil the ammount of water you need in your kettle
- Close curtains and blinds at dusk
- Use energy efficient light bulbs
- Only use your washing machine/dishwasher when its full
- Turn down your thermostat
- If you buy a **new boiler** and/or heating system to save energy **make sure** it can also work with additional heat sources such as solar or heat pump. Some cannot. You want the best of both worlds.

Cost, Efficiency and Implementation

2.18 The cost of renewable energy technologies is changing all the time and as such it is not considered appropriate to list costs in this document. However, there is a perception of costs and length of payback being prohibitive and therefore a barrier to implementation. To address this matter the government and other agencies offer grants and incentives. Key grant schemes and contacts are listed at Appendix 4 offering further information and advice on technologies.

2.19 The focus of this guidance is to discuss and highlight the best way to integrate the following technologies into the National Park. Some discussion is offered on the relative efficiency of technologies but this is generally omitted to allow concentration on matters affecting character of the National Park. As with cost further information can be found from the resources list in Appendix 4.

2.20 Assistance from the NPA is available via the Authority's Sustainable Development Officer, who manages the Sustainable Development Fund. This Officer may also be able to bring together project ideas both from the community and within the NPA e.g. from the New Environmental Economy and Environmental Quality Mark projects (note Appendix 4).

2.21 Finding the best solution either as an individual, a community or a business is very important and an approved scheme may not satisfy all your energy needs, however all contributions to sustainable living should be welcomed and encouraged in principle. Nevertheless it must be recognised that the sensitivity of the Natural and Built Environment in the Peak District means that in some areas there may be little scope for incorporation of new technology.

Chapter 3

Appropriate technologies for the National Park

Introduction

3.1 Renewable energy can be produced by a wide range of technologies: small enough to power a wristwatch or potentially rivalling the outputs of modern conventional utility power stations. Technologies such as tidal, wave and geothermal (hot rocks) are immediately discounted, as they do not have a resource in the National Park. The size of renewable energy developments is also a basic limitation wherever they would conflict with the special character of the area. Large-scale wind energy and large hydro power stations are therefore not generally considered acceptable. Technologies more likely to be compatible with policy by virtue of their scale, resource base and appearance are those involving:

Renewable Energy Generation

- Solar photovoltaic
- Solar thermal
- Small scale wind
- Small scale hydro
- Biomass (wood, wastes)
- Groundsource

Greater Energy Efficiency and Use of Natural Resources

- CHP
- Hydrogen fuel cells
- Composting toilets
- Natural ventilation
- Rainwater collection
- Lightpipes

3.2 Future development of technology and the continuing need for innovation and improvement also needs to be considered. Moreover, the need to reduce demand for energy and to use natural resources more effectively should also be considered. This document therefore includes discussion on building design and the use of natural resources in new buildings.

3.3 In considering the appropriateness of renewable energy technologies the environment in which they will be installed has also been considered. Four main environments are analysed to acknowledge the variety of the National Park.

- Open Landscapes
- The Built Environment
- The Farm Environment
- Industrial Environment

Renewable Energy Generation and Environmental Considerations

Solar Photovoltaic

4.1 Solar photovoltaic (PV) panels convert sunlight directly into electricity. PV panels do not require direct sunlight to operate but the amount of electricity generated is proportional to the intensity of the sunlight. The panels consist of a series of solar cells (usually made of silicon), which produce approximately half a volt each when light photons strike them.

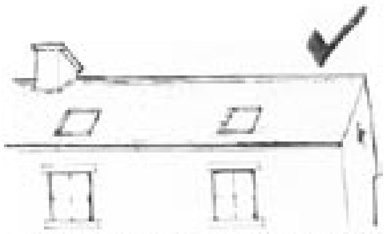
4.2 PV systems can either be stand alone units (particularly useful in remote areas where normal electrical supply would be too expensive or difficult to install) or grid connected to export a surplus of electricity to the national grid as shown below. A suitable building is needed to support the panelling and to maximise the efficiency of the PV panels it should be south facing, and have a roof tilt of ideally between 30-40 degrees. Other buildings or trees shouldn't shade the panelling. PV panels operate continuously in sunlight all year round. It is therefore important to consider how PV might be affected by shadowing in the winter months when the sun is lower.

4.3 There are many PV systems available on the market that can be installed free standing, retrofitted on roofs using a frame, or actually incorporated as part of the original roof as PV tiles. Solar tracking PV panels are also available as shown below. These can be much more effective as they follow the path of the sun. The advantage of solar trackers is that they are much more efficient than stand-alone or roof mounted panels as they are always pointing at the sun. However, they are more expensive and as they have moving parts, maintenance costs can be high.

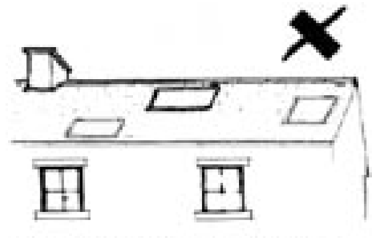
4.4 Visually PV panels are potentially harmful for the built environment. Each panel resembles a skylight and may cause reflections from the sun. In many areas of the country, this may not be a problem. However, due to the special character of many buildings and settlements within the National Park, it can become significant. This is discussed further below.

4.5 Many Peak District settlements have distinctive 'roofscapes' especially when seen from a distance. This character of village roofs is a special feature of the National Park and something worthy of protection. PV installations in these areas should be carefully considered so that the panels do not stand out as shown below.

Poorly sited PV panels.



Smaller units more neatly arranged with a better relationship to what happens below on the elevation.



Variety of rooflights, poorly arranged: too near roof edges.

Extract from Peak District National Park Building Design Guide used to highlight similarity to design considerations for roof lights. Rear, or non-public slopes are preferred. Front slopes or those visible to the public should be avoided. There may be potential for placing solar panels or evacuated tubes (see below) in recessed boxes and, preferably, covering with glass (non-reflective wherever possible) to emulate roof lights. The colour of the containing structures should generally be dark to match roof colours.

4.6 Opportunities for insertion of PV panels may nevertheless be found on non-public faces, or on the inside channel of double-pitched roofs (see Para 4.24). On listed buildings and in Conservation Areas particular care should be taken not to undermine the traditional materials. PV tiles are now becoming available in styles, which simulate traditional materials. The NPA wishes to encourage innovative solutions such as this, provided it can be demonstrated that their integration with traditional materials can be achieved in a way that does not cause unacceptable harm to the valued characteristics of the National Park. The amount of reflection from a panel or tiles can make a critical difference to their acceptability. From a visual and conservation perspective non-reflective surfaces or those that match closely the amount of reflection on existing roofs work best. It is important to note that there is no loss of efficiency by using non-reflective material.

PV tiles simulating traditional materials (Examples from Solar Century).

4.7 Integration of PV into housing in PDNP villages would therefore have to be looked at carefully and individually. For example, the photo opposite shows Thorpe village in the south of the PDNP. We must find solutions, which retain such views for future generations.

Thorpe village in the PDNP.

4.8 The photograph is taken from north of Thorpe, which offers a key view over the village. If PV was to be fitted to any roofs in Thorpe, it is most preferable on the south facing roofs, partly because they would be more likely to collect sunlight from this perspective but also for the added advantage that most of the south facing roofs cannot be seen from the road through the village. This would be to the benefit of not only the built integrity of the village but to all who may enjoy this view of a traditional Peak village. However, if the south facing roof is highly visible, and the materials or technology overly obtrusive, then solar power may not be a viable option mainly due to its visual impact but also due to the reduced efficiency of installing in shaded areas relative to installation cost.

4.9 Large and modern building structures such as bus shelters (as shown below) pay and display machines in car parks, petrol station canopies, leisure facilities (e.g. swimming pools, local shops and health centres) may provide good opportunities for siting such technology as these are less likely to be vernacular buildings and the building form is less sensitive.

PV panels on a bus shelter roof.
Solar powered parking meter.

4.10 PV application for powering parking meters and bus stop information screens is becoming increasingly prevalent by local councils. The examples above are used purely to represent the potential application of PV. Their use in the National Park would need to reflect local character, e.g. by using non-public slopes on stone shelters or toilet blocks. The NPA has already installed solar powered parking meters such as one at Moor Lane near Youlgrave.

4.11 Applications could be sought on remote farms where normal electrical connection would be very expensive or difficult to install. It may be difficult to obtain planning permission if the PV panel was to be very large, or was visible from a long distance, or if it was considered to undermine the local building traditions.

4.12 Farms in the PDNP commonly have a mix of traditional and modern outbuildings, along with larger, utilitarian modern buildings, with most of these being constructed from timber, pre-cast concrete or corrugated materials.

Typical Peak District Farm.

Outhouse roof at a property near Thorpe with permission for PV panels

4.13 Installation of solar panels on these roofs may not cause greater visual impact than roofs constructed from other modern materials, they may even improve the appearance of some buildings as shown here, on a farm in the Yorkshire Dales.

Farm Building in the Yorkshire Dales.

4.14 On larger farms or industrial sites some freestanding PV panels might be used as long as they could be sited so as not to damage to the special characteristics of the Park.

4.15 Industrial sites can have great potential for solar panels without causing visual impact since buildings are rarely built to traditional architectural forms. Industrial buildings often cover a large area and can therefore provide a significant basis for generating the buildings' energy requirements. This could include offices, small engineering units or craft workshops.

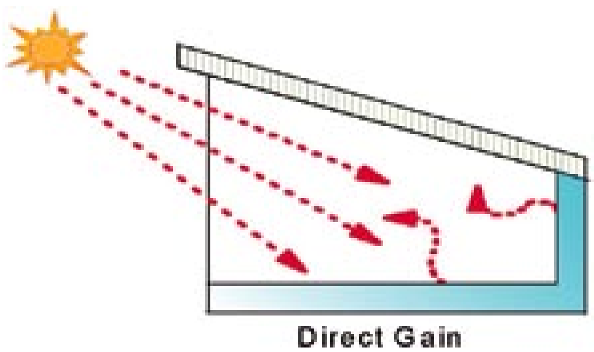
4.16 PV is largely unsuited to the open landscape as large free standing units would conflict starkly with the natural beauty of the area due to the high visual impact this is likely to cause, particularly in view of their reflective properties.

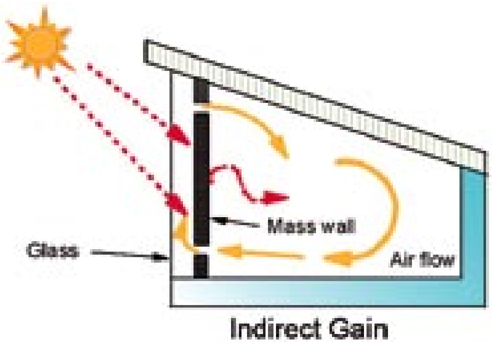
Solar Thermal

4.17 There are other uses of solar energy that are not used to generate electricity, but to heat water or spaces in houses.

Space Heating

4.18 Energy from the sun can be captured and used, reducing heating bills and creating a more comfortable living environment. Large windows on the sunny side of the building or conservatories can capture the sun's radiation. Smaller windows on the non-sunny side and well-insulated walls and roofs will then keep the heat in. Walls made of concrete or stone absorb heat that can be released in the evening. This is called **Passive Solar Heating**. There are two types as shown below.





4.19 1. **Direct solar gain** captures the sun's energy through large areas of south facing windows. When sunlight strike the interior, it is converted into heat, which is not as readily transmitted back through the glass, providing a heat gain inside the house.
2. With **indirect gain**, a large glazed collector warms a storage mass directly behind it. Distribution of air by natural convection occurs with the mass wall system since the air in the space between glazing and storage mass is heated to high temperatures and seeks constant means of escape.

Water Heating

4.20 The sun can also heat water. There are several types of solar water heater, but most consist of metal pipes (usually copper) painted black and connected to an absorbing surface. A heating fluid is warmed by the sun's rays, and then pumped through a heat exchange coil in the hot water tank. Solar-based systems need a conventional water heater - powered by gas or electricity - to provide back up. However, in hot weather they should be sufficient to provide all the hot water needed. Even on cool days it will raise the temperature of the water a little.

4.21 There are two main types of commercial collectors: flat-plate and evacuated-tube. They have similar collection principles to PV, i.e. a system would often be roof mounted, inclined towards the sun in a south facing direction with the heat output proportional to the amount of direct sunlight striking the collector. Environmental considerations of location are essentially the same as for surface mounted PV systems. Again darker, matt finishes are best.

The Flat-Plate

4.22 An insulated, weatherproofed box covered with glass or clear plastic on the front, contains a dark absorber plate as shown below. To be heated, water or conducting fluid passes through pipes located below the absorber plate.

A typical flat plate collector.

Evacuated-tube

4.23 Evacuated-tube (vacuum) collectors are made of rows of parallel, transparent glass tubes as shown below. Inside each tube is a flat or curved copper plate, attached to a copper heat pipe. They are more efficient because heat loss by convection is negligible compared to the flat plate collector system. They therefore tend to need less area, but can be more expensive.

Evacuated tubes

4.24 Similar principles apply as for PV in the built environment (see para 4.4). However, if the solar array were carefully positioned as shown over in Winster, then planning permission would be more likely. These solar arrays were positioned on a south facing roof to maximise their performance while ensuring that they could hardly be seen from the rest of the village as shown in the second photograph.


Solar thermal collectors on a house in Winster village.

4.25 Again, large and modern building structures may provide the most adequate locations where the technology would not harm character or appearance or even be visible. Community buildings such as Village Halls or Scout Huts may offer potential to supply either the building or even provide a wider community benefit.

4.26 Peak District farms commonly have a mix of traditional and modern outbuildings, with most of the newer buildings constructed from timber, pre-cast concrete or corrugated materials. These could be used to attach solar collectors as shown. This farm is near Kniveton just outside the National Park. The photo on the right shows that in distant views the collectors appear as a large roof light, but in the National Park the acceptability of this technology would need to be judged very carefully in terms of its impact on a traditional building such as this. Once again, in visual terms better attention to detail, using materials that reflect less light, would be beneficial.


Solar collectors on a converted barn near the National Park.

4.27 As mentioned also in the PV section (para 4.15), industrial sites probably have the greatest potential for solar thermal collectors without causing visual impacts.

4.28 Large solar thermal collectors would not be suited to the open landscape of the park as it would have to be free standing and would therefore not blend into the background due to its high visual impact.

Wind Power

4.29 Given the fine landscapes of the PDNP, development of wind farms on a large scale is not acceptable. Local plan policy LU4 states that windfarms will not be permitted. A more feasible option is likely to be the construction of isolated wind turbines supplying just one or two dwellings. Such small-scale projects still need to be well designed to make use of natural cover and local topography. Experience to date suggests that this is not easy but is possible in some cases. Small wind turbines are also very effective when used in conjunction with PV arrays. This is especially true in the UK, because if it's not sunny enough, the wind will probably be blowing and vice versa.

4.30 Turbines are available in various sizes and with a variety of outputs from a few hundred watts, to thousands of kilowatts as in large wind farms. The amount of electricity generated depends on the strength of the wind, the area swept by the rotor, the height of the tower and the efficiency of the rotor and generator. Smaller wind turbines can be connected to poles, which in turn can be fitted on sites such as rooftops and walls.

4.31 There are two types of wind turbines available, with either a horizontal or vertical axis.

Horizontal Axis Wind Turbines – HAWTs

4.32 Most turbines in use today are horizontal axis machines. Typically, the visible components are a tower (lattice structure or solid) with a nacelle on top housing the electric generator and a device to let the machine turn into the wind. They typically have 2 or 3 blades and these rotate a horizontal shaft connected to a generator. In order to work effectively they need to be turned into the wind. The two most common methods are:

- To provide the turbine with a tail – commonly used on smaller machines
- To use an anemometer to detect both wind speed and direction and then a control system and motor to rotate the turbine. This is most commonly used on the larger machines, inappropriate to the National Park.

Small wind turbine.

Vertical Axis Wind Turbines – VAWTs

4.33 Vertical axis turbines are not sensitive to wind direction and do not require a means of orientating themselves. There are several types but the main advantages of the style shown below are that they are virtually silent and often thought to be more aesthetically pleasing. However this example is less efficient at harnessing wind energy and take a fairly high wind speed to start rotation. Other types of vertical axis turbine are more efficient but are commonly bigger and less suitable for adaptation at a domestic scale. Most modern turbine developments have concentrated on the horizontal axis machines, which turn and generate electricity in very low wind speeds.

A vertical axis wind turbine.

4.34 Wind energy within built areas is feasible, but often settlements are not located in exposed (windy) locations. The larger population of villages and towns also means that wind turbines are more visible by a large number of people and this may prove unsatisfactory. Despite these problems there can still be potential for small wind turbines to be constructed in some built areas. For example where there is an industrial presence that provides a useful backdrop against which to site a turbine or where there is no harm to the traditional features of the settlement.

4.35 Wind energy is more suited to windier, exposed landscapes and provides a useful power generation option to remote sites such as farms and dwellings, particularly when they are not grid connected and would incur large costs for connection.

4.36 Isolated turbines to supply farm buildings can be environmentally feasible in some situations, depending on the local geography. If there are clumps of trees present in the area, then a turbine may be located to blend in with them. Colouring in green or black can help to camouflage against background colours. The turbine should ideally be located so as to avoid standing out on the skyline. A careful visual assessment would be required from all visibility points before planning permission might be granted. An approved wind turbine site near Wincle in the PDNP for a latticed tower, painted dark green, and situated among trees is shown here.

4.37 The towers are fixed to a concrete foundation whose surface is usually flush with the surrounding ground. As a result the land area used by turbines is very small, and so agricultural use can continue right up to the edge of the foundations as shown on a farm in Kniveton on the edge of the PDNP.

4.38 Industrial sites may present an opportunity to use larger-scale wind turbines without increasing the overall visual impact. Sites such as quarries generally have a high visual impact on the landscape anyway, however they may not often have suitable wind profiles. Indeed most quarrying companies are more concerned with heat recovery technologies, or alternative fuel sources rather than renewable energy as a whole. Acceptability would, nevertheless need careful assessment on a case-by-case basis. Other Brownfield sites may also present opportunities.

4.39 The construction of even a single wind turbine in the open landscape is likely to have significant visual impacts in many areas of the PDNP. The photo below shows a typical open landscape site where any wind turbine development would be very prominent and spoil the character of the National Park.

A typical open landscape in the National Park.

4.40 In some areas, topography of the land may allow visual impacts to be minimised. A careful visual impact assessment will be carried out in each case with reference to local landscape character.

4.41 There is no technical reason why smaller wind turbines cannot be painted (e.g. black or green) to blend in more with a particular background. It is also possible to 'strategically' locate wind turbines close to other built or natural structures such as power lines and trees, where turbine development appears much less conspicuous. The open landscape shown opposite is largely inappropriate for isolated wind turbines. In the event that a wind turbine is considered, use could be made of tree cover, which creates an effective backdrop against which development on the landscape can be disguised.

Typical open landscape.

Small-Scale Hydro

4.42 Hydropower is a well-established technology. Water is used to drive a wheel or turbine, producing electrical or mechanical energy. Simply put, the mechanical or electrical output is related to the volume of water available. Until recently, most developments utilising hydroelectricity have been on a large scale, but due to the associated impact on areas of great natural beauty, proposals have begun to focus on Small Hydropower Plants (SHPs) with outputs ranging from a few kilowatts (kW) to several megawatts (MW). Hydroelectricity generation on this smaller scale generally has a much lower impact on the environment.

4.43 The term 'small-scale hydro' is used to describe a wide range of different schemes, based around similar technologies. The Department of Trade and Industry (DTI) defines small-scale as schemes up to 5 MW. In most cases, small hydro is 'run of river' – any dam or barrage is quite small, usually just a weir, and little or no water is stored. There are also smaller systems such as micro-hydro that can supply power up to 100 kW of electrical energy.

4.44 The essential elements in a typical hydro scheme are:

- A suitable water catchment area;
- A hydraulic head;
- A method of transporting the water from the intake to a turbine, such as a penstock or leat;
- A turbine, a generator, valve equipment (for regulation of the water supply), and associated buildings;
- A tailrace (or outflow), returning the water to its natural course;
- A link to local users of the power generated or to the local electricity distribution network.

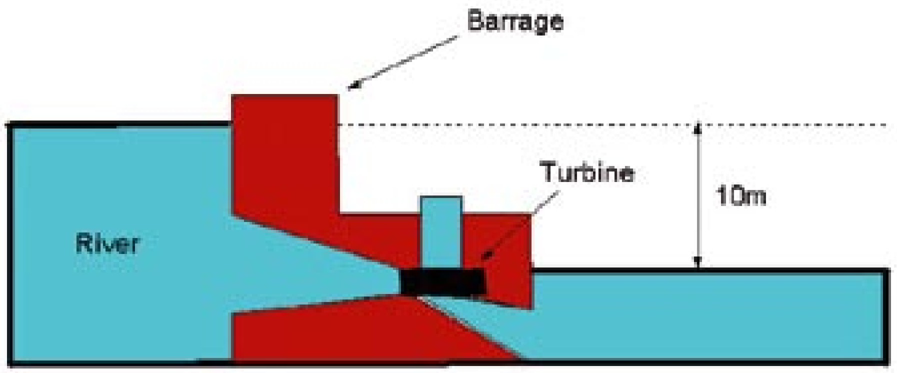
4.45 Similar power levels can be drawn from large quantities of water falling a short distance (low head), or smaller quantities of water falling a large distance (high head).

Low Head Systems

4.46 Low-head systems are typically installed at lowland sites where a large volume of flow is diverted at a weir, through a turbine (shown below). They either use water running from a small reservoir (or millpond) or are 'run of river'. Water from the intake above the weir or reservoir is usually fed directly into the turbine (so no penstock is needed) being abstracted immediately upstream of the structure and discharged immediately downstream. The main impact of these schemes is therefore from the physical barrier produced by the weir, which may affect recreational uses of the river (e.g. navigation) or wildlife movement such as fish migration.

Low head hydro system at Bottoms Reservoir, Longdendale.

4.47 A similar impact occurs at some lowland sites when flows are diverted from the main watercourse into side channels to feed hydropower turbines. For example, old mill leats with a gentle gradient over significant lengths of channel may be used to obtain the necessary generating head.

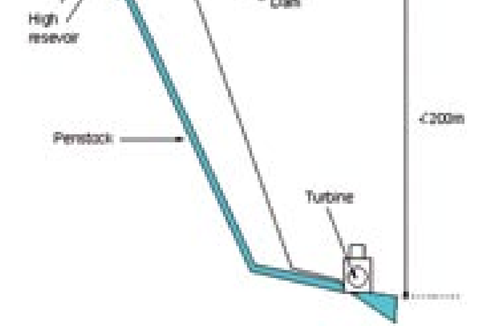


Low head – Typically less than 10m.

High Head Systems

4.48 High-head schemes use smaller flows than low-head sites, diverting water over several hundred metres or more and taking advantage of the difference in height over that distance (as shown below). They are typically installed on mountain streams. The main features are a small dam to provide an intake pool; a pressure pipe or penstock (often several hundred metres long) and the powerhouse itself. They usually redirect only part of the water flow from the channel through the turbine before returning it to the river.

4.49 Chatsworth House makes use of a high head hydro system which has been operating on and off for over a hundred years. The generator was replaced in the 1980s after the system had been standing idle for many years and now produces up to 5kW peak at 12m/s flow rate. This provides electricity for the lighting at Chatsworth House during the winter months. The hydro system at Chatsworth works from a series of inter-connected lakes that power all of the hydro systems such as the Emperor Fountain and the cascade by gravity. As a result the lakes are only full enough for the excess water to be fed into the hydro system during the winter.



High head – Typically more than 200m

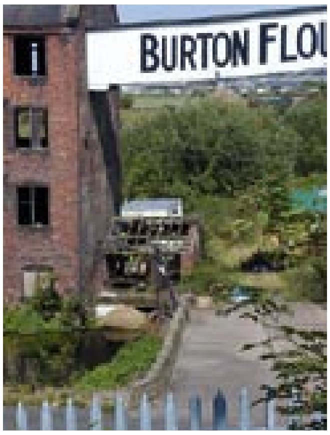
Micro Hydro

4.50 These systems, as their name suggests, are very small simple devices that provide only low levels of electrical power. An example of a micro-hydro machine by a UK company is shown below. It provides 1kW continuous power output, low requirement 130 litres/sec).

A micro-hydro machine

4.51 The use of hydropower is limited to the location of suitable rivers. Potential schemes are most likely to be "low-head", situated in the built environment, such as those at old mill sites. The terrain does not really favour the use of high-head schemes, although there may be some exceptions within the Dark Peak area. In sensitive areas it may be necessary to house the turbine equipment in a low impact building, e.g. the cabin used at Bottoms Reservoir (note photo opposite). Furthermore power lines should be under grounded.

4.52 If existing infrastructure can be used at low-head schemes environmental impacts are often minimal. In some cases they may even be considered positive, with construction of a weir or the re-development of an old mill house as shown below in Burton-on-Trent. Rivers in the built environment can be less 'ecologically important' and given the surrounding development; water abstraction and diversion can have less of an impact on wildlife. However, there may be protected species to consider and it is best to seek advice from the NPA's Ecology Team. Importantly any hydropower scheme that abstracts water would require an abstraction licence from the Environment Agency (EA) under the Water Resources Act 1991. The EA supports hydro schemes and welcomes discussion about such implications. English Nature can also offer important advice on the impact of new development on wildlife.



Old weir and mill in Burton-on-Trent.

4.53 Old water wheel sites can also be refurbished with new, more efficient waterwheels as shown here. This is a 10ft diameter power wheel.

4.54 To demonstrate the concept the National Park Authority study centre at Losehill Hall is installing a waterwheel in its grounds. Powered by Losehill Brook it will trickle charge a series of batteries. The oak wheel is very small at only 0.4m diameter and it is intended that the stored power from the batteries will be used to power items such as a light bulb, laptop, electronic microscope or a cd player; principally for educational purposes. More examples of technology in NPA buildings are listed in Appendix 2.

4.55 Existing infrastructure is less likely to be present around farms and the construction of weirs and turbine house is not usually economically feasible. However, if a scheme were pursued there is no reason why impacts should be environmentally harmful if best practice is adhered to. In practice though, if a farmer has a watercourse that runs through the land, then micro hydro systems are probably more easily used.

4.56 It is very unlikely that industrial sites within the PDNP have the potential for new hydropower development, but if previous hydro sites were to exist (e.g. in the form of old mills) there is no reason why schemes to refurbish them would prove unacceptable. The photos below show a scheme supported by the National Park Authority's New Environmental Economy project. A millrace and mill wheel has been restored to provide power for holiday accommodation near Longnor.

The Old Mill near Longnor

The mill wheel

4.57 Hydro development in the open landscape is more likely to have a significant impact on the environment. Rivers are likely to be in a more pristine condition and ecologically important so that weirs and pipelines have a higher impact. The visual impact of infrastructure is also more noticeable. Nevertheless there may be instances where impacts can be kept to acceptable levels and hydropower may therefore still be considered an option in open areas.

Biomass

4.58 All the earth's living matter, (its "biomass") is an energy store, which is being replenished continually by the sun. This energy is stored in plants and usually recycled naturally through chemical and physical processes in the plant, the soil, the surrounding atmosphere and other living matter. When biomass is used as a fuel (rather than stored carbon in coal, oil and natural gas), as long as consumption does not exceed the level of recycling (e.g. growing new crops), excess heat and carbon dioxide will not be produced. The process uses waste that would otherwise have been difficult to dispose of in an environmentally favourable way producing solids that can be burned or used as fertilizer.

4.59 Biomass fuels can be derived from:

- Wet agricultural waste (anaerobic digestion of slurry from cattle, pigs and laying hens);
- Poultry litter (use of litter from poultry as a fuel);
- Energy crops (e.g. straw, forestry residues and short rotation coppice as a fuel); and
- Human waste, (i.e. municipal and industrial wastes).

Anaerobic digestion

4.60 There are several different methods of producing gas from biomass, but because of the size of buildings or equipment needed or associated impacts on the character of the landscape (e.g. by introducing non-indigenous species), the form with the greatest potential for the Peak District is anaerobic digestion (decomposition caused by bacterial action in the absence of air – usually in a purpose built container). This accords with the emerging Regional Strategy, which only proposes a biomass target for the Peak District based on wet agricultural waste.

4.61 Dairy and intensive pig farms produce large amounts of animal slurry. Due to concerns about environmental damage, (particularly the odours and pollution of watercourses) legislation has been introduced to control discharges. As a result control systems have become more popular to gather the slurry and use it to spread on farmland. Anaerobic digestion is simply another form of slurry treatment and produces biogas that can fuel a standard gas boiler or power an internal combustion engine. An added benefit is that the solid waste residue can be used for fertiliser. It is very important to consult the Environment Agency regarding discharge control.

4.62 To produce biogas, dung or sewage is put into a purpose-built digester (typically a cylindrical tank made of reinforced concrete, fibreglass or vitreous enamelled steel built either above or partly below ground) as slurry with up to 95% water. Digesters range in size from perhaps one cubic metre for a small 'household' unit (roughly 200 gallons) to some ten times this for a typical farm plant and as much as 2000 m^3 for a large commercial installation as shown below.

4.63 Large scale applications of this technology requires significant infrastructure, which is likely to create a significant visual impact. Furthermore transport of manure to any collective site of energy production will result in increased traffic and therefore further pollution from vehicular emissions.

4.64 As it would be difficult to collect waste from all farms in a region and deliver it to a large centralised digester, it would be more probable for either single large farms (at least 1,000 pigs or approximately 100 cows), or several localised farms to provide adequate supplies of slurry. The slurry needs to be free of rainwater and bedding, so only pigs kept inside or large dairy farms would be suitable.

4.65 The PDNP has approximately 25,000 dairy cattle and 16,000 pigs and so has the potential for anaerobic digesters to be used either cooperatively or singly for the larger farms. Similarly the biomass-derived fuel could be used in larger scale cooperative CHP units, or for directly heating a single farm. The most appropriate schemes for the National Park will be less obtrusive horizontal rather than vertical units. Slowly revolving digesters (2-3 metres in diameter) are available which can even be housed in a traditional or non-traditional farm building.

4.66 The benefits of farm based energy production are numerous:

1. Most obvious is the production of biogas, to be burned for heat or used to fuel combustion engines to produce power and heat. The energy yield from digestion can be significant (from 44 – 255 kW/tonne plus heat). On-farm energy can displace non-renewable energy for power and heat, reducing greenhouse gas emissions.

2. There are significant environmental benefits in addition to an energy source. Under usual conditions, methane would escape into the atmosphere from uncontrolled manure digestion (methane is much more potent than carbon dioxide in causing global warming). Digestion and use of the methane vastly reduces greenhouse gas emissions.

3. The digestion process is completely contained, dramatically reducing odours from manure storage. In addition, the digested manure is odourless and can be stored or applied to crops with no concern about smells.

4. It conserves nitrogen, and replaces fossil fuel based fertilizers. The nutrients in digested manure are more stable and available than in raw manure. It can be applied during the growing season making it easier to match nutrient application to plant demand.

5. Fibre from digested manure can be used as a peat moss replacement.

6. Digestion eliminates pathogenic organisms, e.g. Esherichia coli O157:H7, Pfiesteria.

7. Reduced land and water pollution.

Other Farm Energy Sources

4.67 There are no significant environmental issues related to the use of straw as a fuel. Chicken litter has few environmental issues. The gaseous emissions can be dealt with to meet statutory requirements, and any residue ash from the process can be recovered and used as a fertiliser.

4.68 In the built environment Biomass was the main domestic source of fuel before the industrial revolution and has wide potential application as a fuel for household heating, either being directly burned or used as a fuel to power a combined heat and power (CHP) system. The National Park study centre at Losehill Hall has recently had agreement to fit a biomass boiler.

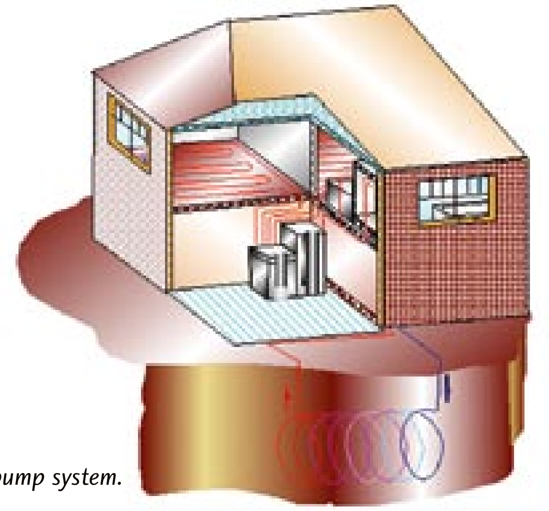
4.69 In terms of industrial sites small to large businesses could use biomass as a fuel for CHP units, or simply for their heating purposes. The very large quarries in the National Park already use, (and are looking for alternatives sources) biomass to provide the fuel for their large heating loads.

4.70 However in the open landscape the large areas that would need to be given over to short rotation coppicing would not be acceptable in the National Park. Neither would large centralised power stations using biomass-derived fuels or large anaerobic digester units.

Closed Loop Ground Source Heat Pumps

4.71 In basic terms if the ambient air within a building is warmer because of a heat exchanger, less energy is expended on further heating. A heat pump (when used for heating) extracts energy from a heat source and upgrades it to a higher temperature. Air is the most commonly used heat source for heat pumps but is not appropriate for cold climates since efficiency drops considerably when temperatures are very low. In such cases, heat pumps that use the ground as the heat source can be used (as shown below). Ground Source Heat Pumps (GSHPs) are more expensive to install, but they are also more efficient. The coefficient of performance (COP) of a GSHP can be 4.0, i.e. it can deliver four times more energy than it consumes. The term 'ground' includes soil, ground water and ground surface water, e.g. rivers, ponds and lakes

4.72 Most GSHPs are coupled to the ground by closed loop pipes. The closed loop ground source heat pump (CLGSHP) extracts heat from the ground via a closed loop of high-density polyethylene pipe that is filled with a mixture of water and antifreeze (e.g. glycol) and buried into the ground. In other words, the closed loop acts as a heat exchanger between the ground and the heat pump. Closed loops may be buried in the ground horizontally or vertically, or laid in the bottom of a pond/lake. The heat extracted from the ground is delivered in a concentrated form via the heat pump. In buildings, for example, this heat can be used in space or water heating.



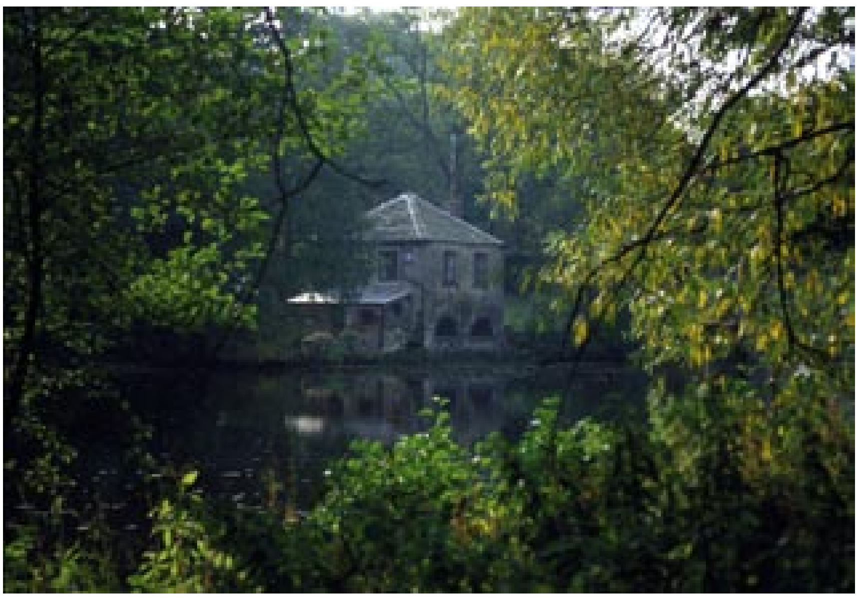
A ground source heat-pump system.

4.73 GSHP could in principle be fitted anywhere in the built environment subject to archaeological concerns. Vertical systems are best for retrofitting because large areas of garden or land would need to be removed to fit a horizontal system. However, large plant still needs to be able to gain access to carry the work out.

4.74 GSHP can be very easily installed on farms. Farmers not only have the space for large plant to arrive to install the systems, but having more space they could easily fit both horizontal and vertical units subject to ecological and archaeological concerns.

4.75 Again GSHP would be very useful to provide heating, (or cooling) to industrial developments. Many councils are looking at the use of GSHP as well as large organisations such as the Metropolitan Offices in Nottingham.

4.76 GSHP could be fitted in the open landscape of the PDNP subject to ecological and archaeological concerns as long as any sites were returned to their original state after the installation. Reservoirs in the National Park could also be fitted with GSHP.



Technologies Involving Greater Energy Efficiency and Use of Natural Resources

Combined Heat & Power (CHP)

5.1 Combined Heat and Power (CHP) is also examined because even though it is not necessarily a renewable energy source (unless fuelled by, e.g. biomass fuel) it can still reduce carbon emissions. Conventional power generators typically convert only 30-50% of the input fuel into useful power (electricity), with most of the remaining proportion lost as waste heat. In contrast, Combined Heat and Power (CHP) is a highly fuel-efficient energy technology, in which the heat produced by the power generation process is 'captured' and made available for use. Although not a true renewable energy (unless bio-fuels are being used), efficiencies of 70-90% can be achieved. Consequently, CHP can bring considerable economic and environmental benefits in the form of energy cost and carbon savings.

5.2 The CHP process can use steam or gas turbines, or combustion engines. The primary energy source can be a wide range of fuels, including biomass and fossil fuels, as well as geothermal or solar energy. The best time to consider CHP in existing buildings is when the heating plant is to be replaced, so that the CHP unit can be integrated with the heating system.

5.3 CHP offers energy and environmental benefits over electric-only systems, whether in central power generation or smaller scale local generation. It provides increased efficiency in fuel use, reduced emissions of air pollutants and greenhouse gases, and enhanced reliability of the electrical grid. CHP can be used with a variety of technologies available today and more are under development for industrial, commercial, and even residential applications. The main impact is the actual infrastructure of the CHP system. However, for individual buildings, the generator is small, (about the size of a small fridge), and should easily be accommodated without additional external visual impact. Where the need for construction of power lines to supply isolated buildings is avoided by using CHP there is an additional visual benefit.

Small-scale CHP system

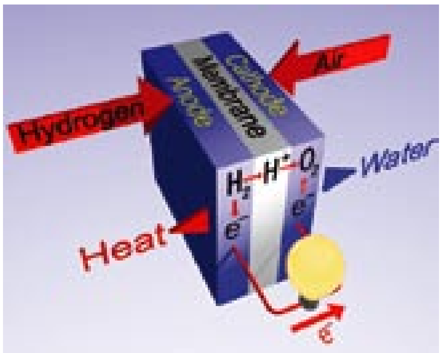
5.4 Given that CHP is designed for indoor use, there should be no problems in siting units. They would be very effective in remote areas where people have relied on diesel generators and oil-fired boilers in the past, and where mains connection would be very expensive. They are also very effective for small-scale businesses.

5.5 Industry, commerce and public services are all prospective users of CHP. The largest, most economic opportunities are usually found in the industrial sectors where there are often large heat processing requirements. However, there are significant opportunities in commerce such as leisure centres, corporate buildings and public services such as hospitals, administrative offices and schools or colleges. The possibility of linking heat users together, including community heating to link up domestic users may provide additional opportunities its use.

Hydrogen fuel cells

5.6 A fuel cell operates like a battery but does not run down or require recharging. It consists of two electrodes sandwiched around an electrolyte with oxygen passing over the cathode (negative) and hydrogen over the anode (positive) as shown below (Sometimes methane or methanol are used instead of hydrogen). Encouraged by a catalyst, the hydrogen atom splits into a proton and an electron, which take different paths to the cathode. The proton passes through the electrolyte. The electrons create a separate current that can be utilized before they return to the cathode, to be reunited with the hydrogen and oxygen in a molecule of water. This produces water and energy in the form of electricity and heat as long as fuel is supplied.

5.7 Fuel cells come in a huge range of sizes. They can be used to produce quite small amounts of electric power, for devices such as portable computers or radio transmitters, right up to very high powers for electric power stations. Although costs are currently quite high, technological improvements and economies of scale are reducing prices every year. Also, hydrogen fuel cells are up to 2 times more efficient than internal combustion engines.



Operation of a typical fuel cell.

Fuel cell powered Honda.

5.8 The oxygen needed by a fuel cell is usually obtained from air. The hydrogen can be obtained by electrolysis (splitting water into hydrogen and oxygen). If renewable energy provides electricity for the electrolysis then the whole system is carbon free.

5.9 One general disadvantage of many renewables is the problem of continuous power supply. If the wind isn't blowing, the sun shining or water flowing, no electricity is produced. The electricity produced by renewables can be stored in batteries, but this can be costly (as they have a limited life) and if carelessly disposed of they can be environmentally damaging. However, if some of the electricity is used to electrolyse hydrogen from water this can act as the storage medium and be used later when the renewable power source is not available.

Composting toilets

5.10 The process works on the same principle as an ordinary garden compost bin, by providing an enclosed environment for the natural process of aerobic decomposition (the same type of environment on forest floors decomposes wildlife droppings and converts them into valuable nutrients for the vegetation to use).

5.11 The systems are designed to treat the "deposits" by composting, worm processing, micro and macro - organism breakdown, and by dehydration and evaporation of moisture and can be broadly divided into two different types:

- Batch Systems - a container is filled and then replaced with an empty container. The composting process is completed inside the sealed container, which can be on a carousel with 3 or 4 others; a new container being spun into the toilet area when the other is full. After a full cycle, the first container is fully composted and ready for emptying.
- Continual Process Systems - these are in a constant state of composting, reducing the volume of waste and moving it downward to be harvested after 6-12 months as fully composted material.

5.12 Usually small electric fans ensure that any toilet room smells are drawn away - leaving fewer odours than even a flush toilet. Chemicals are not used, as they would only harm the various composting organisms. The toilet bowl is easily cleaned with biodegradable cleaner and a toilet brush. Because of its straight-through design, it actually needs less cleaning than a regular toilet bowl. The seat and the outside of the toilet can be treated as in any other toilet.

Rainwater collection

5.13 Rainwater can be collected from the roof of a house and stored in tanks to be used as drinking water (using fine micron and UV filters) or directly to flush toilets. The used water can also be recycled using reed bed or other water cleaning systems. The placement and appearance of tanks will need particular care on listed buildings, other buildings of historic or vernacular merit and more broadly in the built environment.

Natural ventilation

5.14 Most buildings in the past had some form of natural ventilation, for example chimneys and open windows. However, with concerns about excessive energy consumption or waste, buildings became increasingly airtight. Chimneys were no longer used, and modern houses were built to eliminate draughts. Problems appeared as a result of the decrease in natural ventilation: increased humidity and condensation, overheating in summer and poor indoor air quality. There was also an increase in building related illnesses such as Sick Building Syndrome.

5.15 Natural ventilation can provide a comfortable and healthy environment and reduce the requirement for mechanical ventilation. Careful design of the internal spaces and openings allows air to be driven by the buoyancy of warmer air or by pressure differences caused by the wind to draw cooler fresh air into a building. Removing the need for mechanical ventilation equipment saves space and money and reduces the health risks of highly serviced 'sick' buildings. Passive stack vents are mentioned in Approved Document F of the Building Regulations as a good way of achieving natural ventilation. However the Regulations also state the need for ventilation to be controllable so as not to create excessive draught thus generating additional need for warmth. Clearly a controlled balance should be sought. It is always best to check the compliance of any scheme against the Building Regulations prior to commencing work. Note Appendix 5 for details of Building Control teams in the Park.

Lightpipes

5.16 Lightpipes reduce the use of electrical lighting (in rooms where lights may be needed even in daylight due to poor window lighting) and hence conserve energy. Traditional daylight systems such as windows and skylights are generally beneficial, but there can be problems such as glare and possible thermal discomfort caused by direct solar gain or heat loss in winter. Lightpipe systems can eliminate these problems controlling direct sunlight to provide an effective working illuminant (like a lamp at the internal end of the pipe) as well as meet the following aims:

1. increase daylight levels towards the rear of deep rooms;
2. improve daylight uniformity within a space, and hence its appearance;
3. reduce glare and discomfort for occupants.

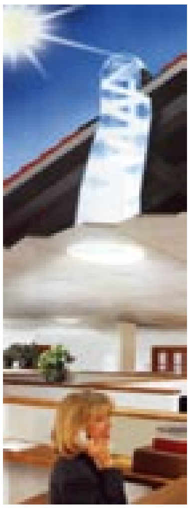
5.17 The majority of commercially available lightpipes are simply tubes, lined with a highly reflective internal finish, along which light can travel by internal reflections into the interior of a building or other dark spaces with minimum loss as shown below.

5.18 Lightpipes are available from a number of manufacturers and can be installed either straight down from the roof, horizontally or even angled using adjustable bend assemblies, enabling them to bring daylight into otherwise inaccessible rooms as shown below. However, straight lightpipes perform better than ones with bends. Much of the sun's heat is removed as the light travels down the pipe.

5.19 The visual impact is often minor since the external domes can be quite small as shown below. If the dome is situated on north facing roofs or in partial shade a lightpipe will still work, but with reduced efficiency.

5.20 There are also collectors available that look like a skylight as shown below. These can be particularly useful in protected areas such as the PDNP.

Lightpipes can be angled



Working principle of a lightpipe.

Lightpipe skylight collectors.

5.21 Lightpipes are already widely used in housing, industry, commerce and public services offering not only the advantage of reduced lighting bills, but also increased internal environmental benefits associated with natural daylight There is also a significant number of opportunities in commerce such as leisure centres and large corporate buildings and public services such as hospitals, administrative offices and colleges within the PDNP.

Future Developments

6.1 The technologies shown throughout this report are indicative of the range of renewable energy sources currently available. However, future technological developments and advances may improve their availability and range and ease their application within traditional and natural environments. As costs fall, more businesses, institutions and families will then be able to benefit.

6.2 In particular the NPA is concerned that manufacturers should give attention to production, design and materials in a way that would help make renewable technologies less obvious in visual impact. The need to use non-reflective glass has been pointed out in workshops held to consult on this report. The good work in PV tiles points the way (see 4.6). The NPA will be making this point to Government, industry and trade associations.

6.3 While the focus of this SPG is on small-scale technology compatible with the NPA's conservation policies it is hoped that the range of options displayed will make it easier to bring forward innovation in one or a package of small-scale solutions. It is important to stress that the sensitivity of the Natural and Built Environment in the Peak District means that in some areas there is non or very little scope for incorporation of new technology. Finding the best solution in a way that conserves and enhances the National Park is crucial in fostering long-term sustainable development.

PDNP Management Plan (PDNPMP)

Sustainable development is at the heart of the PDNPMP and is defined as "meeting today's needs without damaging the National Park, or preventing future generations from using and enjoying it. Sustainability focuses on the overall quality of life, valuing both the local and global environment and our social-well being as much as economic prosperity."

2.11 Peak National Park Structure Plan (adopted 1994)

General Strategic Policy 1 - Development in the PDNP.

GS1
(a) All development will be controlled so that the valued characteristics of the Peak National Park can be conserved and enhanced, now and for future generations.

C17
(a) Major development to generate or store energy will not be permitted other than in exceptional circumstances.
(b) Small-scale development to generate or store energy to meet a local need will normally be permitted provided that it does not detract from the appearance of the landscape or the buildings it serves.

PDNP Local Plan (Adopted 2001)

2.14 The Local Plan offers further guidance on the allowance set out in the Structure Plan for "small-scale development".

2.15 Renewable energy schemes need to be acceptable in the landscape, and of a scale and output consistent with local demand for power. Size, design, siting, noise generation, impact on wildlife and associated landscaping will all are relevant. Windfarms and large individual aerogenerators would clearly be of a scale that would be damaging to the National Park's valued characteristics. Whilst it is not possible to define at what point an individual aerogenerator becomes 'large', freestanding structures of more than a few metres in height or in the open countryside could have a significant and harmful visual impact and are likely to be unacceptable."

2.16 Some small scale, power generation may constitute "permitted development". The National Park Authority will liase with the developer wherever possible to encourage the siting of the equipment so as to minimise its impact on the immediate locality.

LU4: Renewable Energy Generation

(a) The development of a renewable energy source will be permitted provided that the development and all ancillary works including transmission lines can be accommodated without harm to the valued characteristics or other established uses of the area.;

(b) Transmission lines should always be placed underground;

c) Windfarms will not be permitted

APPENDIX
2

Examples of the National Park Authority's Commitment to Renewable Energy and Energy Efficiency in its own Buildings

Aldern House – The NPA is intending to commission an energy audit.

Losehill Hall – Has already had an energy audit carried out and now holds Eco-Centre Status. Is developing a number of initiatives on the back of this including:

- A small water wheel, which charges batteries then used to power educational equipment;
- A small solar panel, again used for educational purposes
- Agreement and funding in place for a Biomass boiler, to heat the Study Centre

Toilet blocks - Two sites have composting toilets, namely White Lodge (nr Taddington) and Binn Green (nr Greenfield). We are also experimenting with waterless urinals at Ashbourne, Hollin Bank and Hartington.

Car parks – use of solar panels in pay and display machine, e.g. Moor Lane, Youlgreave

Visitor Centres - The new visitor centre in Castleton has an underfloor heating system powered by a highly efficient gas boiler. The building also has high levels of thermal insulation. The stone came from a local source and reclaimed roof tiles were used.

We intend to look for opportunities to use renewables / green technologies at several other properties and make a funding bid (possibly next year) to implement any desired schemes.

Summary of Consultation Process, Responses and Research Findings

Consultation was an integral part of the partnership research exercise upon which this SPG is based and was achieved by:

- Telephone interviews with villagers, Village Agents and other contacts sourced via the Peak District Community Planning project.
- Surveys at the following Village Action Group meetings:
  - Warslow, 8th April 2003
  - Parwich, 29th April 2003
  - Bradwell, 29th April 2003
- Formal Consultation Workshops at the following locations to present the findings of the research:
  - Parwich, 3rd June 2003
  - Losehill Hall, 4th June 2003
  - Aldern House, 12th June 2003

  This attracted interest from various village and business representatives from across the National Park as well as the CPRE, South Yorkshire and Peak District Branch.
- Postal survey of all Parish Councils and Parish Meetings, seeking local perceptions of renewable energy and its potential application in the National Park.

Responses

Levels of awareness about Renewable Energy (RE) generally, in terms of that currently in place in the Park, and currently available grant aid for RE, is low. For example, no village environment group contacted in the research had made reference to energy as a specific environmental issue in their plans. Secondly, when asked, public attitudes to RE are typically positive, with individuals stating that, as long as development is sensitive to local character, increased development of RE is appropriate and positively supported, particularly if it is small scale, based in farm, village or industrial locations, and involving solar panels and mini-hydro RE technologies. Alongside this support, there is a smaller body of opinion that is quite concerned about any RE development in the park, as evidenced by emotive reactions to its potential development. Thirdly, it is widely perceived that the most significant barriers to RE implementation in the Park are not public attitudes per se but the existing planning regime, which is perceived to rule out RE development completely, and the high cost of these technologies. Collectively, the results suggest that there is a need for greater awareness about RE technology, grant aid and opportunities for communities as well as individuals. Secondly, there is a need to address current perceptions of planning policy towards RE, so as to ensure that these perceptions do not deter future RE development in the Park.

Research Findings

There is a considerable lack of awareness about Renewable Energy (RE), and lack of importance attributed to RE. Despite this, the research suggested that there is a latent pool of positive support for greater RE development. It is unlikely that this will lead to action unless residents are actively approached about RE (e.g. outlining the potential for development on local buildings like the Village Hall alongside information about lower running costs and local self-sufficiency) and until the National Park Authority is more visibly supportive, both in its own buildings and facilities, and in Planning decisions. There is a clear need to more widely communicate the potential for RE exists that exists in the Park, in which types of locations, at what scale and cost (including what grants are available), together with better knowledge of what has already been achieved nationally and locally, particularly in terms of solar energy and mini-hydro technology. This could involve opportunities for locals to see for themselves, for example at visitor centres. As one participant remarked, "it has to be sold to people".

There are many steps that could be taken to improve the social acceptability of increased RE development in the Peak Park. These include Targeting the public:

- At village and area shows to heighten awareness of RE technologies and address potential fears about their impacts. There is no better way to learn about RE than to 'see for yourself', as the village meetings held over the course of the project demonstrated.
- Including articles in the annual newspaper sent out to all Peak households, with features on different RE technologies, grants, planning policy etc. in a user friendly and exciting manner.

- By a promotion to the many residents and communities located off the gas-grid and currently using oil or solid fuels for heating. For example, in Monyash, it was asserted that the oil bill has gone up from £140 to £230 in past 5 years.

Targeting existing institutions and programmes by:

- Installing of more visible low key RE technology by the National Park Authority and local authorities in the Peak District, for example to power pay and display machines and parking meters as in Nottingham city centre. These provide examples to the public that RE is a valuable, everyday part of the environment that is not threatening the quality of life.
- Adopting a 'confident' approach towards RE in planning policy and practice, affirming that RE is of benefit to all when carefully developed, so that it does not harm its valued characteristics.
- Public sector buildings, including those owned and managed by the National Park Authority, incorporating as many sustainable energy measures as possible, sending a powerful message to the public and other stakeholders about the potential.
- Presenting to Village Hall committees the case for RE, including self-sufficiency, grants available, potential savings and planning policy. In this scenario, "people might think there was a positive stand on this". Mailing of such information could be complemented by an awareness-raising day.
- Contacting owners of historic water mill buildings, informing them of the potential for mini-hydro development using current RE technology. Work by Dulas (2003) in Wales has demonstrated the value of small-scale hydro projects with extensive local community participation.
- Encouraging links between Rural Community Councils and the Community Renewables Initiative programme. This might include training for Village Agents about RE development at both individual and community levels.
- Contacting representatives from local schools, particularly those charged with building maintenance and energy issues. Refurbishment of school buildings or replacement of boilers could provide an ideal opportunity to apply for community renewable energy grant aid.

Currently available grant aid for RE development targeting individuals and communities, and other sources of information

Peak District National Park Authority
www.peakdistrict.org

The following initiatives are currently operating through the National Park Authority:

Sustainable Development Fund.
We are looking to help projects that comply with the principle of sustainable development and demonstrate some of the following characteristics:

- Take care of the environment;
- Encourage the careful use of natural resources;
- Involve communities and partnerships;
- Strengthen links with our neighbouring urban communities;
- Promote the involvement of young people;
- Celebrate cultures and traditions; and
- Tackle problems in new and innovative ways

New Environmental Economy (NEE)

The NEE programme can:

- Enable you to develop new products and services based on using the high quality environment of the Peak District as a business asset
- Create a distinctive marketing edge for your business

Environmental Quality Mark A certification mark. It can only be achieved by businesses that actively support the best environmental practices in the Peak District National Park. When you buy a product or service that has been awarded the Mark you can be confident that your purchase directly supports the high quality management of the special environment of the Peak District National Park.

Clear Skies: This is a government-funding programme that has £10 million available for individual and community level RE projects. Further information can be found at the following website:
www.clear-skies.org

Solar PV Major Demonstration Programme: This is a £20m major demonstration programme approved in 2002. Grants will be offered to the private and public sector to install solar electric systems on new or existing buildings. More information about grants for Solar PV as well as other RE technologies can be found at the following website:
www.dti.gov.uk/energy/renewables/support/capital_grants.shtml

Community Renewables Initiative: This is a support programme for communities who wish to develop renewable energy projects in their localities. It is coordinated by the Countryside Agency and further information can be found at the following website:
www.countryside.gov.uk/NewEnterprise/Economies/CRI.asp email: cri@countryside.org.uk Tel: 01242 533260

CAFÉ: Community Action for Energy. This is a community level energy conservation programme coordinated by the Energy Saving Trust. More information can be found at the following website:
www.est.co.uk/cafe/index.cfm?FuseAction=hom.Home

Energy Efficiency Advice Centres: These are local centres of knowledge and experience about energy efficiency. EEACs give free, impartial and locally relevant energy efficiency advice to householders. Further information can be found at the following website:
www.est.org.uk/est/est.html?est-energy-efficiency-advice-centres.html

Renewable Energy Investment Club: This is a finance initiative designed to help local communities get renewable energy projects off the ground. Further information can be found at the following website:
www.reic.co.uk/menu.htm

Some practical examples:

Sherwood Energy Village: This is a project to transform a derelict colliery site in Nottinghamshire into a sustainable mix of industry, housing and commercial, leisure and educational uses. The development is owned by an industrial and provident society set up by members of the local community. Further information can be found at: **www.sherwoodenergyvillage.co.uk/** and **www.sbbc.co.uk/resources/pp/pp_53.htm**

Baywind Cooperative: This was the UK's first cooperatively owned renewable energy development, in Cumbria. Further information can be found at: **www.baywind.co.uk**

Awelamantawe Community Wind Farm: This is a community renewable energy project involving both energy efficiency and renewable energy actions.
Further information can be found at: www.awelamantawe.co.uk/

Centre for Alternative Technology: An environmental charity aiming to 'inspire, inform, and enable' people to live more sustainably. Offers practical solutions to environmental problems, key areas of work are renewable energy, environmental building, energy efficiency, organic growing and alternative sewage systems.
Further information can be found at: **www.cat.org.uk**
Machynileth, Powys, SY20 9AZ
Tel: 01654 702400 **E-mail: consultancy@catinfo.demon.co.uk**

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