Directorate of Environment and Regeneration • Planning Services

LOCAL PLANNING GUIDANCE NOTE NO.20: ENERGY CONSERVATION AND RENEWABLE ENERGY FOR HOUSEHOLDERS AND SMALL BUSINESSES

Background

Recent years have seen a growing awareness that **climate change is occurring** and that the burning of fossil fuels - that is, carbon based fuels such as coal, oil and natural gas which generate greenhouse gas emissions - is a major contributor. At the international and national levels, the **need for governments and major businesses to use energy more wisely and utilise to a much greater extent those sources of energy which are renewable**, as opposed to continuing to rely heavily on non renewable fossil fuels, has been increasingly (although not universally) recognised. The Kyoto Protocol called for a 12.5 % reduction worldwide below 1990 levels by 2008-2012. Arising from it, the UK government has set a domestic goal of 20% reduction by 2010, and a 15% renewables target by 2015.

At the micro level, many individuals, householders and people running small businesses wish to use less energy from fossil fuels, by means of energy conservation measures, or greater use of renewable energy, or both, for ideological and/or financial reasons.

This Local Planning Guidance Note (LPG) is intended to assist householders, businesses and communities with an interest in developing small scale renewable energy schemes (microgeneration technologies) to understand better these matters in the context of the town and country planning system. It is acknowledged that small scale projects can make a valuable contribution in total, and therefore planning applications will not be rejected purely because their level of output is small. For further advice concerning the **larger scale technologies** not dealt with in this Note, reference should be made in the first instance to Technical Advice Note 8: Planning for Renewable Energy, published by the Welsh Assembly Government in July 2005.

The Note deals with energy efficiency first, then looks at a number of renewable energy technologies individually. It has been produced by Planning Services, and is **supplemented by detailed notes on the non-planning aspects of the various technologies contributed by the Council's Home Energy Conservation Officer, which form Appendix 3.**

Policy

According to **"Planning Policy Wales" (PPW)**, published by the Welsh Assembly Government in March 2002 "The objective of the UK Government's energy policy is to ensure a secure, diverse and sustainable supply of energy at competitive prices consistent with wider economic policies, the promotion of energy efficiency and health and safety, and the full and proper protection of the local and global environment." Whilst energy policy as such has not been devolved to the Welsh Assembly Government (WAG), under Section 121 of the Government of Wales Act 1998 **the Assembly has a duty to promote sustainable development in the exercise of its functions**, part of which includes working with local government (and other partners) to further this end. The planning system has a fundamental role in delivering sustainable development. PPW states that renewable energy accounts for 3% of Wales's electricity generation, which the Assembly Government wishes to increase, therefore local authorities like **the County Council should "facilitate the development of all forms of renewable energy and energy efficiency and conservation measures where they are environmentally and socially acceptable"** and yet **"Where a development is likely to cause demonstrable harm to a designated area by virtue of having a significant adverse impact on the qualities for which the site was designated, consideration should be given to refusing the development if such effects cannot be overcome by planning conditions or agreements."** Listed buildings and other important buildings within conservation areas must be considered in this context. Also, the Council "should ensure that any environmental effects on local communities are minimised, to safeguard quality of life for existing and future generations" and "encourage developers to integrate energy efficiency and conservation measures as part of the design of new development."

By way of commentary, excessive carbon emissions affect buildings as well as people, and therefore it is important to protect the built heritage from harmful emissions which might damage their fabric. It is also important to try and reduce the running costs of buildings. At the same time the planning system seeks to protect those visual features which make our built heritage important, and there may be situations where the addition of structures to buildings would detract from the appearance of visually important buildings. Clearly, **a balancing act between energy efficiency/environmental protection and visual/heritage considerations is involved**. Much will depend on the individual circumstances of the proposal.

Flintshire, in its **Unitary Development Plan (UDP),** recognises the need to stabilise and ultimately reduce non renewable energy consumption and encourage appropriate renewable energy. **Policy STR 10 Resources states that "Development will be required to make the best use of resources through:**

(extract only)

e. utilising clean, renewable and sustainable energy generation where environmentally acceptable in preference to non renewable energy generation and incorporating energy efficiency and conservation measures in new development."

More specifically, **other policies deal with Sustainable Energy Generation (EWP1), Energy Efficiency in New Development (EWP2), Renewable Energy in New Development (EWP3), Wind Turbine Development (EWP4), Other Forms of Renewable Energy Generation (EWP5).** These policies are reproduced in **Appendix1.**

What is meant by sustainable development, renewable energy and microgeneration?

Sustainable development is commonly defined as that which meets the needs of the present without compromising the needs of future generations to meet their own needs, in terms of environmental, social and economic well-being.

Renewable energy is the term used to cover those sources of energy, other than fossil fuel or nuclear fuel, which are continuously and sustainably available in our environment. This includes wind, water, solar, geothermal energy and plant material, the latter often being referred to as biomass.

Microrenewables and microgeneration are alternative names to describe a non-commercial renewable energy development which provides heat and/or electricity to a single end user, such as a house, an office or a community facility. Although electricity can be sold back to the national grid, this is only ancillary to its main purpose, so it is not seen as commercial.

The energy hierarchy

In 1999 the Local Government Association adopted an energy hierarchy which set **priorities** in the following order:

- **Reducing the need for energy**
- **Using energy more efficiently**
- **Using renewable energy**
- **Ensuring that any continuing use of fossil fuels be clean and efficient**

It makes much sense to address energy efficiency issues prior to considering microgeneration/microrenewable technology as this will lead to a more effective system. More efficient property and appliances will mean a higher proportion of heat or electricity will be supplied, and thus improve the financial viability of the system. The following notes start with the energy efficiency aspects.

The Carbon Trust helps businesses and the public sector to cut carbon emissions and supports the development of low carbon technologies. For details of how to contact the Trust for advice, see **Appendix 3.**

In line with the first of the above priorities, some simple tips for domestic users and small businesses to save energy are given in **Appendix 2.**

Energy efficiency

This section covers both siting matters relevant to small scale developments and measures which could be applied to the building.

The construction costs of new development can be offset against the revenue savings on energy bills and maintenance over the entire life of the building, the **whole life costing**. The Building Research Establishment Environmental Assessment Method **(BREEAM)** gives a number of **benefits from designing energy efficient buildings, including:**

- creating a highly **marketable and saleable** product
- **reduced running costs** over the life of the building, and
- **a better environment** for building users in terms of light, ventilation and warmth.

The Welsh Assembly Government's **"Technical Advice Note 8"** states that "The Assembly Government considers that the standards established under the **EcoHomes scheme for residential development and BREEAM scheme for non-residential development** form a useful framework for energy efficiency consideration. These include the use of **whole lifetime costs** (i.e. initial capital costs, maintenance and running costs and, in particular, energy costs) in evaluating schemes." It adds that "local planning authorities are expected to consider matters of energy efficiency when considering planning policy and applications." It would be reasonable to take into account the materials to be used; clearly it is far better to make use of locally obtained materials which are not depleting than those from a depleting resource.

"Technical Advice Note 12 Design" or TAN12 (WAG, 2002) points out that "Changes in site layout such as building orientation, location on slope and planting can reduce significantly the energy requirements of a typical dwelling through the free ambient sources created by passive solar gain and microclimate improvements". The clear guidance is that energy issues should form a part of the design thinking from the outset. Thus, in evaluating planning applications **the Council must be satisfied that new buildings or conversions are energy efficient, in accordance with Policy EWP2**, and be seeking both layouts and buildings which are resource efficient. It will

consider site layout and building design in terms of the following, which all aim to reduce the need for energy, consistent with the first priority in the energy hierarchy:

- **Microclimate** - avoiding exposed hill crests and frost pockets, and making the most of south facing slopes. If a house is overexposed to the elements, it can suffer high heat losses, therefore sheltering it can reduce heat loss and minimise the effects of driving rain, which can lead to damp penetration.
- **Orientation** - housing should face within 45 degrees of south to maximise solar gain.
- **Limiting overshadowing** - reducing the loss of solar gain by spacing and location of buildings (and not by felling trees). North facing slopes require greater separation distances than south facing slopes to reduce overshadowing.
- **Shelter** - the use of landform and planting to provide shelterbelts and improve energy conservation, and the use of building form to minimise wind tunnelling.

Passive solar design (PSD) means designing buildings to make best use of free energy from the sun, thereby reducing the need to artificially light, heat and ventilate a building. There is of course nothing new in this concept. The housing sector probably has the greatest potential for energy capture. Possible measures include:

- Buildings located on an east-west axis, within 30 degrees of south such that their south face receives sunlight between 9 a.m. and 3 p.m. in the summer half of the year.
- Interior spaces needing the most heat and light, such as living rooms, located on the south side.
- The main glazing areas on the south side.
- Reduced glazing on the north side.
- The provision of cellular spaces to differentially control temperatures.
- The use of shading to prevent summer sun making interiors too hot.
- Natural ventilation utilised in the design so that air conditioning is needed less. This is especially significant in commercial buildings.
- Landscaping using shelter planting and bunds to protect from wind and rain.

The **Building Regulations**, which are not a part of planning legislation, require developers to meet a minimum of energy efficiency in new developments. These standards will be amended in 2006. Several **energy rating schemes** are available. New domestic properties must be given a Standard Assessment Procedure (SAP) rating but may also be rated using the National Home Energy Rating Scheme (NHER). The Building Regulations Section may be contacted on telephone 01352 703631.

It is advisable to consider all aspects of design at an early stage and liaise then with both the planning and building control officers.

Whilst **double glazing** can improve insulation, standard units are often designed for a suburban style of housing and may be unsuitable in listed buildings and other older properties. However, thermal insulation can be improved and draughts reduced without the expense, disruption and damage to character caused by standard double glazing (especially uPVC), through the use of thin, sealed vacuum units which can be applied to traditional timber frames, and are not much more expensive than conventional units. **Secondary glazing** is also an option in older buildings; it better keeps the character of the building and gives useful sound and heat insulation.

Renewable energy for houses and other buildings

Firstly, all installations are subject to and require approval under Part L of the Building Regulations; see Energy Efficiency above for contact details.

Appendix 3, prepared by the Council's Home Energy Conservation Officer, provides a full technical explanation of each of the technologies available and whether or not it is likely to be suitable for your property. It also tells you where to obtain further technical advice and how to ascertain whether any grants are available currently.

This section concentrates on the aspects associated with planning. If, after reading it, you are still uncertain **whether planning permission is needed or you want pre-application advice, you should contact the Planning Support Officer in the Development Control section of Planning Services (telephone 01352 703234) at County Hall, Mold, Flintshire CH7 6NF.** For the officers to advise you they are likely to need an image showing the desired equipment; any reputable installer should be willing to supply this information.

Broadly, for any new development, Flintshire County Council (the local planning authority) will have to evaluate how the neighbours are affected from noise, visual impact, overshadowing, whether or not the property is a listed building or in a conservation area and how the proposal impacts on its visual character, and whether the surrounding environment is affected by such as the removal of any trees, under Policies EWP 1 and 3. Each of the technologies is now considered in turn.

Solar

Solar energy collection is normally undertaken at the domestic scale. Whilst the inclusion of it in the design will increase the initial costs, it will bring long term benefits. Solar power is well suited to an urban environment in that it is clean and silent. Two types are in use: thermal and photovoltaic.

Solar thermal

Solar thermal is a proven technology, many buildings are suitable for it, and such installations can make a worthwhile contribution to the hot water demands of homes, hospitals and other buildings. Industrial sites may be well suited to use these systems without a detrimental impact. A typical domestic system will utilise a solar collector - either a flat plate or an array of tubes - mounted on a south facing roof of the house or an ancillary building in order to preheat water for use in the home, requiring 2-4 square metres for domestic use. The roof must be strong enough to take their weight. Alternatively, they can be mounted on the sides of buildings or on freestanding structures on the ground. The connecting pipework is not normally visible from the exterior of the building.

Solar photovoltaic systems

Photovoltaic (PV) cells, in panels, convert daylight into electricity. They are expensive to install; to maximise the cells' efficiency they need direct sunlight and no shading. The systems are usually sited on a roof, either on a low support structure above the existing roof or integrated into it by replacing the conventional roofing material. On a domestic property a typical array producing 1-2 kw at peak might have an area of 9-18 square metres. Again, the strength of the roof must be adequate. In the visual sense, these panels can impact adversely on the building and its surroundings by their prominence on roofs but their impact can be ameliorated, as noted below.

Planning considerations for solar panels

This section applies to both thermal and PV panels. Policy EWP 5 covers the subject. TAN 8 instructs that "Local planning authorities should interpret the provisions of the General Permitted Development Order as constructively as possible when these systems are proposed", insofar as "Other than in circumstances where visual impact is critically damaging to a listed building, ancient monument or a conservation area vista, proposals for appropriately designed solar thermal and PV systems should be supported." It should also be kept in mind that solar gain can be maximised through design.

The situation regarding **whether planning permission is needed** is:

- Generally solar panels can be installed to walls without the need for planning permission provided that the highest part of the panel is not higher than the highest part of the original roof, that it does not exceed 4 metres in height within 2 metres of a boundary of the curtilage of the house, and the panel does not project closer to the highway than the original house unless there would be at least 20 metres between it and the highway.
- Solar panels permanently fixed and parallel to exterior walls and protruding less than100mm are normally permitted development. In steel framed commercial buildings, solar PV panels incorporated as part of the external walls are encouraged as an alternative to decorative cladding.
- Thermal cladding on a listed building or in a conservation area will almost certainly require planning permission as well as listed building consent.
- On pitched roofs of permanent buildings, solar panels are normally permitted development, (that is they do not require planning permission) when they are permanently fixed to a roof and do not exceed the highest part of the roof of the original house and that, where on a roof slope fronting a highway, they do not materially extend beyond the plane of the roof.
- On flat roofs, solar panels are normally permitted development when they are fixed permanently to a roof and are not visible from street level.
- Solar panels permanently fixed and parallel to exterior walls and protruding less than 100mm are normally permitted development. In steel framed commercial buildings, solar PV panels incorporated as part of the external walls are encouraged as an alternative to decorative cladding.
- Planning permission is not required for solar panels on temporary buildings in car parks, gardens or in parks.
- In conservation areas and the Clwydian Range Area of Outstanding Natural Beauty, planning permission will be needed to install solar panels which extend materially beyond the existing plane of the roof or to site a panel on an outbuilding within the curtilage.
- However, if the installation would result in "a material alteration to the shape of the dwellinghouse", it would not be permitted development.
- Solar panels fixed to listed buildings require listed building consent because they may alter the character or appearance which caused the building to be listed. Indeed, listed building consent is required for any significant works, external or internal. The Council will only grant it when they are satisfied that the panel would not be detrimental to the character or appearance of the listed building.

It may be possible to **lessen the adverse visual impact of solar panels** by such measures as:

- Siting on non-public elevations, avoidance of protrusion from the roof, locating on the inside where the roof is double-pitched, and taking care to ensure that they do not create an unbalanced elevation.
- Standard panels are unlikely to be acceptable on listed buildings, where it is particularly important to blend with the traditional materials, but technology in the form of PV roof tiles/slates may be acceptable. They are designed to be similar in appearance to conventional tiles and slates and undertake the same water-proofing function as well as generating electricity, and can be used in new buildings or refurbishments.

- Modules of panels can also be mounted on the sides of buildings or on free-standing support structures on the ground. Sometimes, particularly on institutional or commercial buildings, PV wall cladding can be an architectural feature, waterproof skin and electricity supplier. Other building integrated uses include sun shading for office windows (bris-solaires) and atrium roofs.
- Reflections from panels can affect neighbours, but it may be possible to use panel material which is no more reflective than the existing building materials. There is a considerable variation in appearance; some panels are dark and have low reflective properties.

The Council will also need to consider the effect of PV panels on important views and townscapes, especially in conservation areas. Large stand alone panels are unlikely to be appropriate in the open countryside.

Micro-wind energy

The Assembly Government envisage onshore wind power as the main large-scale technology capable of achieving their 2010 renewable energy target. Larger scale developments, namely wind farms, involve numerous and complex issues. TAN 8 shows those Strategic Search Areas in Wales considered by the Assembly to be most suitable for large scale developments, none of which are in Flintshire, although the highlighting of those areas does not preclude proposals from arising elsewhere. It adds that the potential for development of schemes within urban, industrial and brownfield sites is so far largely untapped, and expects smaller community based wind farm schemes (that is, below 5 MW) to be encouraged.

This section is concerned only with small scale wind technology, such as might be suitable in residential, industrial and retail areas or in the countryside. Wind power is more difficult to utilise than solar power without causing visual intrusion. Clearly, to be effective, the turbines must be sited where they will benefit from adequate supplies of wind, free from turbulence and obstructions. These are generally prominent locations, and the turbines will be roof or pole mounted. Wind turbines use rotor blades; when the rotor's diameter is doubled, the output will be quadrupled. Noise from the turbine gearbox and the rotor blade is minimised by design; recent models have improved and may not be noticeable above ambient wind noise. Roof turbines should have a mounting which is designed to stop vibration passing into the building.

Planning considerations for micro-wind

PPW advises that small scale or domestic scale schemes may be appropriate in most locations provided that they are sensitively sited and designed. Under the Environmental Impact Assessment (EIA) Regulations of 1999 authorities are required to screen applications for the need for EIA where the development involves the installation of more than 2 turbines or the hub height of any turbine or height of any other structure exceeds 15 metres. (LPG Note 21 in this series gives more detailed advice about EIAs.) Less than this might be taken as a convenient definition of small scale. Policy EWP4 of the UDP sets out the Flintshire context, with supporting text noting that proposals should be sensitive to the needs of local communities, that local communities should benefit from them (for example, by commuted sum payments to support community schemes), and that an environmental statement is likely to be required. Installation is likely to require planning permission. Where there are no significant effects, the presumption should be in favour of approval.

Wind turbines, particularly in conservation areas or fixed to listed buildings, would be evaluated by the Council in terms of their visual impact on the character and appearance of the area. In general, proposals will be assessed for adverse effects on the landscape or cultural heritage, flora, fauna and habitats, hydrology, on neighbouring properties through noise, shadow flicker, loss of amenity, and no electro magnetic interference to transmitting or receiving systems.

It is open to the Council to include with any permission for wind farms or individual turbines conditions requiring their removal and the reinstatement of the site when they reach the end of their design life (e.g. 25 years) or following a lengthy period of non-use, and the Council may require financial guarantees by way of a Section 106 Planning Obligation/Agreement as part of the approval.

Biomass

Biomass is generally regarded as fuel (other than fossil fuel) when at least 98% of the energy content of which is derived from plant or animal matter or substances derived directly or indirectly therefrom, whether or not it is waste. This includes agricultural, forestry, or wood wastes or residues, sewage and energy crops. For biomass to be a sustainable approach, consumption of the energy should not exceed the rate of recycling, thus for example, replanting must keep pace with use.

Biomass is diverse: there are different ways of producing fuel from biomass. One is through the use of **methane gas from landfill sites**. Whilst methane is a greenhouse gas, it is also an excellent fuel. The scale involved, and the likely relationship with waste management, is beyond this Note.

Energy can be extracted from agricultural waste by **anaerobic digestion** and it may be viable for a large farm, or a group of farms where they put their waste into a digestor, to use biomass in this way.

The most likely way of producing specifically grown **woodfuel** is willow and poplar grown and harvested under a short rotation coppice regime. The combustion process can be very inefficient. Modern wood burning stoves and boilers can achieve efficiencies of 80-90%, whereas burning logs on open fires loses up to 85% of the heat to the atmosphere. Biomass energy can be used to heat a room from a stove or by incorporating boilers connected to a

central heating and hot water system, but will have to be at ground floor for domestic hot water unless part of a communal heating system.
The most common biomass technologies to be found in urban areas are heating schemes for individual properties or combined heat and power schemes serving larger developments, but individual schemes are better suited to rural areas.

Planning considerations for biomass

Policy EWP5 of the UDP is pertinent here. For the more significant proposals planning permission will be needed and an EIA may be required (see LPG 21) , or for smaller schemes a detailed study of issues such as noise and visual impact, which should be submitted with the application. Amongst **planning considerations** are: the visual impact of the scheme, the risk of detrimental effect on residential amenity through smell, and the increased traffic movements which might be necessary. It is important to ensure that developments do not cause leaching or run off. Properly operated and controlled, biomass will result in reduced land and water pollution. For biogas, that is anaerobic digestion, the planning implications will vary greatly, depending upon the scale of operations and the type and sources of feedstock. Locational requirements will also be varied except that those associated with sewage treatment plants will be tied to their sites.
Planning permission for small scale biomass energy installations located within an existing building is not normally required. To meet Building Regulations an adequate flue must be installed or chimney adapted, and an external flue may require planning permission. Smell, noise and air pollution are valid planning considerations. Storage space for wood fuel can be an issue; it will need to combine adequacy of size and access, without adversely affecting the surroundings, and for automated systems the store (the hopper) must be next to the boiler. Fuel bunkers can be in small extensions or in outbuildings, which may be permitted development.

Hydro-electric

Flowing water is used to drive a turbine, producing mechanical energy which is then turned into electrical energy.

Planning considerations for hydro electric

Policy EWP5 of the UDP is relevant. Small scale hydro-electric power plants will need planning permission but are normally encouraged, subject to there being no adverse effects upon the ecology and the immediate environment. The built elements should be integrated into the landscape as much as possible. The turbine noise should generally be contained within the turbine house. Permission will be needed from Environment Agency Wales for a water abstraction licence.

Ground source heat pumps

Ground source heat pumps are able to transfer heat from the ground into a building to provide space heating and, in some cases, pre-heat domestic hot water. They work best where heat can be applied evenly and consistently such as underfloor heating systems. Air and water source heat pumps are also available with air pumps becoming increasingly popular.

Planning considerations for ground source heat pumps

Policy EWP5 is again relevant. There are unlikely to be significant implications in the planning context. Air pumps require a unit to be installed on the outside wall of a property.

Combined heat and power schemes (CHP) and community heating

A CHP plant simultaneously generates usable heat and power in a single process, which can give very significant savings in carbon emissions because it uses “waste” heat which would otherwise be lost to the atmosphere or water. It is then used for a variety of purposes including industrial processes, community heating and space heating. The most efficient way of utilising renewable heating fuels is through one or more central boiler and a heat distribution network, perhaps for a hospital, a block of flats, a housing estate or a small community, a community heating system. Efficiency is maximised where different uses require when supplying a mix of uses such that requirements are spread during the day, but residential only schemes are feasible. Micro CHP is designed to provide for individual houses.

Planning considerations of CHP

TAN 8 advises planning authorities to actively facilitate CHP systems, and seeks to encourage community heating. It is likely that planning permission will be required.

Summary of the planning position

TAN 8 urges that the **use of renewable energy sources and energy efficiency conservation measures are considered from the outset of the design process,** and that **pre-application discussions** are crucial. Furthermore, “if local planning authorities feel that insufficient consideration has been given to energy issues in project design, they should consider refusing development.” Any uncertainties about whether planning permission is needed should be resolved by checking with the planning authority.

It will facilitate the processing of (and therefore speed up) any planning application for renewable energy projects if it is accompanied by drawings or photographs illustrating its setting and how the project would impact upon it, particularly for larger schemes and those affecting listed buildings and conservation areas.

Works on **listed buildings** may require listed building consent even when planning permission is not needed.

The **first contact** should be the Planning Support Officer of the Development Control Section (011352 703234) and the Building Control Section (01352 703631).

It is unlikely that proposals for micro renewable energy will require a formal **Environmental Impact Assessment** (**EIA)**, but again advice can be obtained from the Planning Support Officer or from LPG Note 21 in this series.

TAN 8 advises that planning authorities can request an **Energy Design Advice Report** for proposals for new non-residential buildings over 1,000 square metres or more.

Appendix 1: Unitary Development Plan Policies

EWP1 Sustainable Energy Generation
There will be a presumption in favour of renewable energy schemes subject to them meeting the other relevant requirements of the Plan.

EWP2 Energy Efficiency in New Development
In all new development the Council must be satisfied that sufficient steps have been taken in the siting, aspect, form and design of new buildings to minimise the wasteful consumption of energy and resources both in the construction and use of buildings.

EWP3 Renewable Energy in New Development
Where appropriate proposals for non-residential use which are large scale and seek to accommodate significant energy users, will be required to include renewable energy technologies within the schemes design.

EWP4 Wind Turbine Development
Proposals for individual wind turbines or for wind clusters or for wind farms will be required to meet the following criteria:

a. the development is not sited within, nor would have a significant adverse impact on, a sensitive area of national, or regional environmental, landscape or heritage importance;
b. the development in conjunction with other wind turbine developments will not have a detrimental cumulative impact upon the landscape;
c. the impact of the development upon agricultural, forestry recreation and other land uses is minimised to permit existing uses to continue unhindered;
d. the turbines will be appropriately designed so as to avoid, or mitigate against, unacceptable environmental impacts of the development, including noise, light reflection, shadow flicker and impact on wildlife;
e. sufficient steps are taken to avoid or, where possible, to mitigate electro-magnetic interference to any existing transmitting or receiving systems;
f. where the development of associated ancillary buildings is required the structures are sensitively designed to enhance the character and quality of the locality and;
g. adequate provision has been made in the scheme for the restoration and aftercare of the site on the cessation of the use.

EWP5 Other Forms of Renewable Energy Generation
Proposals for renewable energy generation by means other than wind turbines will be required to meet the following criteria:

a. the proposed development should have not significant adverse impact on its surroundings in terms of landscape, nature conservation and heritage importance;
b. the development including scale, siting, design and materials will not have an unacceptable effect on the visual amenity or nature conservation of an area;
c. the impact of the development upon agricultural land will be minimised with appropriate installations sited within existing complexes and on existing hard surfacing;
d. in sensitive areas where above ground connections have an unacceptable adverse effect on the landscape, connection lines and pipes are located underground and;
e. the development will utilise the existing transport network and will not have an adverse impact on the local road network, traffic will be restricted to operating to appropriate hours of the day.

Appendix 2: Measures to save energy in your property

Under the Home Energy Conservation Act 1995 the Council is committed to promoting the improvement of energy efficiency in the area. This includes giving advice, obtainable from the Home Energy Conservation Officer on 01352 703766 or via Nia_Prys-Williams@Flintshire.gov.uk

These are not planning matters but in order to give a more complete picture here the following simple advice is suggested:

- Turn off lights which are not in use
- Avoid leaving the television or computer on standby
- Boil only the amount of water needed in your kettle
- Use your dishwasher or washing machine only when full
- Use energy efficient light bulbs
- Turn down the thermostat a little; a few degrees will make a significant reduction in energy use
- Take a shower rather than a bath
- Increase insulation – cavity wall and loft insulation will achieve energy savings, and buildings with solid walls can be improved by installing internal or external thermal cladding
- Close windows which could be letting heat escape if there is no good reason for them to be open
- Draught proof doors and windows
- Close curtains and blinds at dusk to retain more heat
- Buy A Rated (the most energy efficient) white goods, i.e. fridges, fridge freezers, washing machines, tumble dryers, dishwashers. Keep an eye open for the European Energy Label which, by law, must be shown.
- Upgrade your heating controls. A programmer or time switch enables you to automatically heat your property and hot water at specific times when you need it, thus minimising waste. Room thermostats switch the heating off once a room has reached a desirable temperature, thereby avoiding overheating. Individual thermostatic radiator valves can be fitted to give added control of the temperature of each room.

Appendix 3: Renewable energy technologies

This section explains the technologies individually, together with information on where to obtain further advice and check on the availability of grants. This series of notes is being produced by the Home Energy Conservation Officer of Flintshire County Council, and thus far covers the following:

Solar thermal

1.0 Introduction

A solar thermal system consists of a solar collector, usually roof mounted, through which liquid circulates and is naturally heated by radiation from the sun. This heated water is transferred to a hot water cylinder where the water is stored usually for use later on in the day.

As we shall see, there are a variety of systems available, each appropriate for differing domestic situations but the above principle applies to all. Today's systems offer efficiency and reliability and with relatively simple installation and low maintenance, solar thermal systems are set to play a huge role in the future of hot water generation in the UK.

2.0 The Solar Collectors

Solar collectors are fitted to a roof or façade and absorb radiation from sunlight. This radiation is absorbed as heat which is then transferred into the water circulating through the panels. There are two main types of solar collector:-

a) FLAT PLATE COLLECTOR

This type of collector is a shallow box with a heavily insulated base above which is a black metallic absorber plate with an embedded series of copper pipes. A sheet of transparent plastic or glass covers the panel making the whole collector 3 or 4 inches deep. The collector is so efficient and insulated that in the summer the water can, if it were left within the pipes, reach 100^0C. Safety features ensure the system never over heats however.

b) EVACUATED TUBE COLLECTOR

Evacuated tube systems are more efficient systems. They perform better at high temperatures, are more responsive and therefore operate even in diffuse light. These collectors are a series of glass tubes which contain an absorber with a selective coating to maximise the heat transferred to the water which runs through the tubes in copper pipes. These systems are more efficient as air is evacuated from the tubes and reduces convective and conductive heat losses. Reflectors are often placed underneath the tubes to maximise absorption.

3.0 The Water Circulatory System

An effective and efficient circulatory system is a vital component of a functioning solar thermal system. Again, there are different options with their own advantages and disadvantages.

a) ACTIVE VS PASSIVE

Active or passive systems refer to whether the system utilises a pump (active) to circulate the water or whether the system relies on thermodynamics (passive). In areas where the temperature can fluctuate around freezing the former is more commonly used. Electricity from the mains can be used for the pump or in some systems a small photo-voltaic panel (a silicon panel which generates electricity when sunlight falls on it) is fitted to make the system 100% renewable.

Passive systems are designed so the tank receiving the heated water is situated in the roof of the property but at an elevated height to the solar collectors to take advantage of thermosyphoning. Heated water is less dense than cold and as heated water is fed into the head of the tank, colder, more dense water at the bottom of the tank is forced out and into the circulatory system to the collectors.

b) INDIRECT VS DIRECT

An important design question is whether the system is to be a direct or indirect one. In a direct system, the water circulating the solar thermal system is that used directly by residents for washing, bathing etc. In an indirect system, or 'closed loop' system, the solution circulating the system is a mix of water and antifreeze. This heated liquid flows into a heat transfer unit in which the cold water, flowing towards the property's hot water tank, is heated.

4.0 Is my house suitable?

There are a number of things you will need to investigate to find out whether your property is suitable for a solar thermal system.

THE ROOF

- Ideally, you will have a south facing roof to maximise solar gain. Collectors can face anywhere between south west and south east but the more the roof deviates from due south the less hot water will be generated.
- A typical system for a UK property will need 3-4m2 of roof space to accommodate the collectors.

- The pitch of your roof is also important and anywhere between 20-50 degrees from the horizontal will produce an efficient system.
- To ensure your system gives maximum output, shading of the collectors must be minimised or ideally, eliminated altogether during the sunniest part of the day.
- If an additional how water tank is required, then adequate space will be required.

COMBI BOILER COMPATIBILITY

- Combination boilers provide hot water directly and as such, properties with this type of system do not have hot water tanks. This can cause problems as one of the main features of a solar thermal system is a hot water storage tank or cylinder. If you are interested in a solar thermal system and have a combi, it is imperative to notify the installers during the first survey or home visit. Some combi boilers are wholly inappropriate to combine with a solar thermal system however some fully modulating combi boilers can receive a heated feed of water and therefore would be compatible.

PLANNING

- If your property lies in a conservation area or is a listed building, planning guidance should be sought.

5.0 Sizing

An average dwelling in the UK uses approximately 2-3000kwh for domestic hot water heating. An averaged sized system can be expected to provide at least 50% of the annual demand i.e.1-1500kwh worth of hot water. In the summer, a system can deliver 100% of demand and in the winter this figure falls to below 10%. A system can be sized to provide 100% of annual demand but the cost benefit is drastically reduced. An auxiliary back up water heating system e.g. immersion heater or boiler is therefore required for the winter months.

More specifically, a $1m^2$ flat plate collector can provide around 45 litres of hot water at $60^{O}c$ per day. A typical household with 2.4 children will therefore need approximately:-

- 3m2 of evacuated tubes (or 20-30 tubes)
- 4m2 of flat plate collector
- 5m2 of DIY panels

Taking into account frequency, the following figures can be used as a rough guide to estimating how much hot water you use per day:-

- Bath 45 litres
- Shower 15-20 litres
- Washing machine 50 litres
- Washing up 5-6 litres

6.0 DIY Installations

DIY installations of solar panels are increasing in popularity for the technically minded amongst us. This installation method can significantly reduce the cost and hence improve the payback period of your investment. Many companies can provide the main components for your system and there are organisations that provide DIY installation courses (see *Centre for Alternative Technology* in further information section). One draw back for opting for the DIY route is the lack of grants but this value can be recouped from eliminating the installation costs. DIY systems are predominantly based on the flat plate collector design and sometimes are slightly larger than those installed by a professional.

7.0 Maintenance

The beauty of solar thermal systems is that they are virtually maintenance free. Modern systems have relatively few parts and are considerably robust. Ensure your installer is registered with the Solar Trade Association.

8.0 Cost

A solar thermal system can vary a great deal in price and is dependant on a number of factors:-

- **TYPE OF SOLAR COLLECTOR –** Flat plate collectors are less efficient but cheaper than evacuated tube systems.
- **COLLECTOR SIZE** – The larger the collector array, the more expensive the system will be, however, up to a certain threshold, the system will also provide more hot water, thus reducing your bills.
- **CYLINDER –** overall cost will increase should you need a hot water cylinder and how much is dependant on the size and type.
- **Other** – such as warranties, roof access, mixing valves for temperature protection, photovoltaic panel for the pump.

However as a guide, $3\text{-}4m^2$ of Flat Plate Collector should cost between £2-3000 and a $2\text{-}3m^2$ of evacuated tubes should cost between £3,500 and £4,500. The Energy Savings Trust may also be able to provide a grant towards your system (see further information section). It is worth noting however that grants can only be claimed when using a grant registered installer and that they cannot be claimed retrospectively.

9.0 Payback & the Environment

Payback and profit from your system is dependant on the fuel type you are displacing, whether your system is a DIY effort, a flat plate collector or an evacuated tube system and whether you receive a grant. Life expectancy of modern solar thermal systems is around 20 years and with the purchase of a flat plate collector and displacing electricity as your water heating fuel, payback is in the region of 20-25 years. This figure is slowly decreasing with the current trend in fuel prices.

One can opt to look at the solar thermal system in terms of carbon savings as opposed to financial savings. Again, depending on the fuel you are displacing (each fuel has different carbon intensity values), a household can expect to displace approximately 0.2 – 0.6 tonnes or carbon per annum, or, over a system lifetime, 7 – 15 tonnes of carbon which is significant.

Further Information

Clear Skies Website www.clear-skies.org.uk
Solar Trade Association www.solartradeassocation.org.uk
Calculate your Carbon Footprint i.e. your contribution to Anthropogenic Climate Change @:-
www.carbonfootprint.com

Other Domestic Scale Renewable Energy Technologies are:-

- **PHOTO-VOLTAICS (SOLAR PANELS THAT GENERATE ELECTRICITY)**
- **MICRO WIND TURBINES**
- **GROUND SOURCE HEAT PUMPS**
- **GREEN ELECTRICITY TARIFFS**
- **BIOMASS**

For further information on any of these, please see the following websites:-

Energy Savings Trust www.est.org.uk/housingbuildings/renewables
Clear Skies Website www.clear-skies.org.uk
The Renewable Power Association www.r-p-a.org.uk
Green Energy Website www.greenenergy.org.uk

Flintshire County Council would like to hear about any renewable energy technology installation. Please contact the Home Energy Conservation Officer 01352 703766 Nia_Prys-Williams@flintshire.gov.uk

Remember *Energy Efficiency* should be addressed before Renewable Energy is incorporated into your property! Contact the Energy Efficiency Advice Centre to find out how 0800 512 012

Solar photovoltaic

1.0 Introduction

A photo-voltaic (PV) system utilises the suns radiation to generate electricity. Direct sunlight is not essential, only daylight, however the greater the intensity of light the greater the flow of electricity. PV systems usually consist of either solar panels or modules mounted to the roof or small tiles which replace normal roof tiles i.e. an integrated system.

2.0 PV Technology

A PV cell consists of 2 or more layers of semi conducting material, most commonly silicon. When the cell is exposed to sunlight, a small electrical charge is generated. This charge is drawn out of the system via metal contacts as Direct Current (DC).

Each cell generates a very small amount of electricity and hence multiple cells are connected to form a panel or module. Depending on the demand of the system i.e. how many kw the system is designed to generate, multiple panels are mounted and connected.

There are three main types of silicon cells:-

2.1 MONOCRYSTALLINE - These cells consist of thin slices cut from a single crystal of silicon. They can achieve an efficiency of around 15% but due to a more complex manufacturing process, they are the most expensive option.

2.2 POLYCRYSTALLINE - These cells are more granular in texture due to being sliced from a clock of silicon crystals. They are slightly less efficient, 12% and less expensive than the Monocrystalline type.

2.3 AMORPHOUS THIN FILM – These are the cheapest but least efficient cells, at approximately 7%. The cell consists of a very thin layer of semiconductor atoms set down on a glass or metal base.

3.0 Installation Options

There are 2 main types:-

3.1 MOUNTED SYSTEM – One of the most common types of installation is the mounted system. Panels are 'bolted on' to the roof using an aluminium framing structure. PV panels are not light and it is imperative to ensure the strength of the roof prior to installation.

3.2 BUILDING INTEGRATED PV (BIPV) SYSTEM – There are many different options for an integrated system. These systems result in a more aesthetically pleasing and modern finish. If a BIPV system is considered at the planning stages of a new build, then the PV tiles can replace the conventional roofing tiles and their cost thus resulting in a more cost effective renewable energy investment.

3.2.1 PV TILES are now available in many forms e.g. solar shingles, sun slates, solar seams, tiles. The option is available to produce a finish which is not too dissimilar to surrounding conventional roofing. Should you wish to have a prominent finish, such tiles are also available.

3.2.2 TRANSPARENT PV TILES are a relatively new technology which can produce a very modern and aesthetically pleasing finish to a conservative or roof.

3.2.3 Some buildings, mainly commercial buildings, are opting for a **PV FAÇADE** where by a south facing wall, instead of a roof is covered in a PV array.

The PV industry is a dynamic one and research and development is continuously producing cells with improved efficiency and innovative applications of the cells are being created. This is not an exhausted list of PV applications and the websites given at the end of this technical sheet provide the most up to date information on developments.

4.0 Grid Connected vs Stand Alone

The electricity generated through the PV system is of course generated during daylight hours and the average home requires most of its electricity during the evening which is a conflict. There are two options for your system:-

4.1 STAND ALONE PV systems are highly appropriate for properties which are located far from an electricity grid connection. The system is fitted with a battery to store the electricity generated during the day for use later on in the evening.

4.2 In a **GRID CONNECTED** system, the grid functions essentially as an energy storage system. During the day, any excess electricity generated by the PV system is fed into the grid and in the evening, when domestic consumption is usually higher, electricity is then supplied back in the conventional way by your local energy supplier. A prerequisite for this type of system is approval from your local electricity company and appropriate import / export metering.

In both systems, an inverter is required to convert the low voltage Direct Current (DC) from the panels into the higher voltage Alternating Current (AC) which is compatible with household appliances and exporting to the grid.

For grid connected systems, an appropriate metering system will also need to be installed to record all exported and imported electricity units.

5.0 Is my House Suitable?

There are a number of issues that need clarification before proceeding with a PV installation:-

5.1 Is there a south facing roof? Systems can face anywhere between south east and south west but the closer you are to south the more radiation the system will receive. It is also preferable to have a roof tilt between 30-40^{o}.

5.2 Is there shading to the roof? Shading will drastically reduce the output of your system and hence all efforts should be made to eliminate any shading.

5.3 Is the roof strong enough to hold a mounted system?

5.4 Do I want a stand alone or a grid connected system? If it is grid connected, you need to concult the local electricity supplier to arrange the importing and exporting of electricity and find out about the possibility of net metering.

5.5 If you are involved with a new build or roof refurbishment, can an integrated system be considered?

Properties differ greatly in orientation, roof type, location etc. and the best way to find out about the feasibility of a system is to contact an installer. Once the physical viability of the system has been discussed, it then important to get a number of quotes for your chosen system. As mentioned, systems vary greatly and you may be surprised if you shop around but do make sure, a fully qualified, registered installer is chosen.

6.0 Sizing

The table below give some indication of the outputs from panels of different sizes:-

SYSTEM SIZE	ANNUAL OUTPUT	PANEL SIZE
1kWp	700 - 800 kWh	8 m^2
5kWp	3500 - 4000 kWh	40 m^2

Although the UK average household annual electricity consumption is approximately 3300 kWh, it is unusual to size a system to accommodate all of this demand. Typical domestic systems are around 1.5 to 2 kW, which, depending on your electricity consumption can provide around one third of your annual demand.

7.0 Maintenance

Photovoltaic systems are almost a '*fit & forget'* technology. They have no moving parts and are hence very quiet, reliable and virtually maintenance free. It is important to ensure the panels are kept clean as any dirt build up will affect their efficiency. Most roof mounted systems will not develop a significant dirt build up but it is worth keeping an eye out.

Stand alone systems require a little more maintenance in terms of checking the batteries.

Most PV systems now come with a thick Perspex covering to protect the system at sites where vandalism is likely.

8.0 Cost

PV systems vary greatly in price as there are so many variations of the technology. If we consider a typical, roof mounted system then one can expect to pay around £4-9 per Watt installed hence an average sized 1.5-2kWp system can cost anything between £6000-£18,000 which includes all additional components to the panels.

Grants are available but these go through cycles of availability and the websites given at the end of this technical sheet will provide details of currently available grant schemes. Grants can provide anything up to 50% of the installed cost and hence can significantly improve your investment.

Additional costs for a stand alone system are of course for the batteries which store your electricity until needed. These batteries are expensive as they need to be compatible with the continuous cycle of charging and supplying. With regards to the grid connected systems, there are of course the financial issues of importing and exporting electricity to and from the grid. Rarely do electricity companies buy the electricity supplied from your property at the same cost as you purchase from them thus leaving you slightly out of pocket. However, there are some examples of electricity companies agreeing on a net-metering system. In this agreement, your external electricity supplier will purchase your renewable energy for the same cost as you purchase from them. Put simply, when you are providing the grid with your surplus electricity, your meter will effectively run backwards.

9.0 Environment

A PV array generates electricity in a clean and renewable way. For each unit of electricity generated via this technology, it is one less unit generated in the conventional and more polluting way of burning fossil fuels. A domestic system would thus significantly reduce the owner's contribution to anthropogenic Climate Change and drastically reduce their Carbon Footprint (see further information on *Calculating your Carbon Footprint*).

A typical CO2 reduction however would be in the vicinity of 450kg per annum for each kW installed.

By reducing your domestic electricity consumption, you will increase the portion of electricity from your PV array and thus improve your investment. It is strongly recommended that when you replace any white goods in the home i.e. light-bulbs, washing machines, fridges, freezers, tumble dryers and cookers that you opt for highest energy efficiency rating possible. By law all of these goods must display an EU Energy Label which rates an appliances

efficiency from G (being the least efficient) to A++ (super efficient). Ensuring all appliances are low consumption and modifying your own behaviour e.g. using economy wash, boiling only the amount of water you really need in a kettle etc. you can significantly improve the contribution of your PV array to your annual consumption.

Further Information

The Energy Savings Trust Website http://www.est.org.uk/housingbuildings/funding/solarpv/
The Department of Trade and Industry Website www.dti.gov.uk/renewable
The British Photovoltaic Association www.pv-uk.org.uk
The Solar Energy Society www.uk-ises.org
Calculate your Carbon Footprint i.e. your contribution to Anthropogenic Climate Change @:-
www.carbonfootprint.com

Other Domestic Scale Renewable Energy Technologies are:-

- **SOLAR THERMAL (FOR HOT WATER GENERATION)**
- **MICRO WIND TURBINES**
- **GROUND SOURCE HEAT PUMPS**
- **GREEN ELECTRICITY TARIFFS**
- **BIOMASS**

For further information on any of these, please see the following websites:-
Energy Savings Trust www.est.org.uk/housingbuildings/renewables
Clear Skies Website www.clear-skies.org.uk
The Renewable Power Association www.r-p-a.org.uk
Green Energy Website www.greenenergy.org.uk

Flintshire County Council would like to hear about any renewable energy technology installation. Please contact the Home Energy Conservation Officer 01352 703766 Nia_Prys-Williams@flintshire.gov.uk

Remember Energy Efficiency should be addressed before Renewable Energy is incorporated into your property! Contact the Energy Efficiency Advice Centre to find out how 0800 512 012

Micro wind

1.0 Introduction

0.5% of UK electricity is generated by the large scale multi megawatt wind turbines we see in the countryside and in some cases off-shore. More recently, research and development has started to expand the *micro* wind energy industry. Micro domestic scale wind turbines are becoming a more common site and are set to contribute significantly to UK renewable energy targets.

In principal, these micro domestic turbines function identically to the giant wind turbines i.e. wind energy is captured via the turbine blades, which rotate and drive a connected gearbox and generator. They vary in size from 0.5Kw to 6Kw and larger systems e.g. 25kw are ideal for off-grid situations.

There are two types of domestic wind turbine available on the market:-

- **Roof Mounted** e.g. Swift and Windsave turbines
- **Pole Mounted** e.g. Proven and Gazelle.

2.0 Roof Mounted Wind Turbines

Micro wind turbines are mounted to the roof or gable end of a domestic property or small business in a good clear site to capture the wind. Clearly, a turbine's output will be determined on the wind profile of the chosen spot with output improving in areas of moderately strong winds with negligible sheltering and minimal turbulent air.

Two examples of the current technologies available for roof mounting are the ***Windsave Turbine*** and the ***Swift Turbine***. The Windsave turbine is the more traditional looking turbine consisting of a 3 bladed generator. The Swift turbine is more unusual with 5 blades and a surrounding ring which is said to significantly reduce noise and vibration eliminates.

Windsave Turbine

Swift Turbine

2.1 Windsave – Technical Information

The Windsave turbine hooks straight into the main supply of your house via the 'Plug& Save' system and thus does not have batteries. Spillage electricity is fed back into the grid. The Windsave turbine cannot be connected to a property that is not grid connected as the inverter requires referencing the main supply against which to condition the generated electricity to parallel with the main supply. Thus the Plug'n'Save does require to consume a small amount of mains electricity to remain in "stand-by" mode to allow this referencing procedure to happen. The turbine must be installed by registered Windsave installers for Health and Safety reasons and the system comes with a 2 year warranty. The systems are designed as *'Fit and Forget'* and require minimal maintenance.

2.2 Swift Technical Information

The Swift system can be grid connected thus any electricity generated on site and not consumed by the property is fed back into the grid. Alternatively, it is possible to purchase a system which connects to the immersion heater. In this latter system, electricity is used to heat the domestic hot water supply. This system must be mounted with a blade roof clearance of 0.5m and facing the prevailing winds. The unusual ring design minimises noise and vibration thus giving added protection to the dwellers walls and ears. Due to the moving parts, an annual check up is required and the system comes with a 1 year warranty. Installation will take between 1 and 2 days depending on site characteristics.

The table below summarises the main features:-

	WINDSAVE	SWIFT
RATED OUTPUT (KW)	1.0	1.5
BLADE DIAMETER (M)	1.75	2.0
SYSTEM WEIGHT (KG)	25	50
CLAIMED ANNUAL YIELD (KWH)	1,125	4,000
LIFE EXPECTANCY (YRS)	10	20
PAYBACK TIME (YRS)	5	8
SYSTEM OPTIONS	PLUG IN DIRECT FEED (PLUG'N SAVE)	GRID CONNECTION OR ELECTRIC IMMERSION CONNECTION
CO_2 DISPLACEMENT (ANNUAL TONNES)	0.5* APPROX	1.6*
NOISE	APPROX 50 DBA	VIRTUALLY SILENT
MINIMUM WIND SPEED	3-4 M/S	4 M/S
MAXIMUM WIND SPEED I.E. CUT-OUT SPEED	15 M/S	Not available

(Calculated – based on an average property, using 3300kwh annually of electricity and the Windsave Turbine saving approximately a third of this supply. Conversion to kg CO2/kwh = 0.43)*
All other information supplied by Windsave Ltd & Renewable Energy *Devices)*

(The micro-wind industry is rapidly changing and new technologies are set to emerge. Windsave and Swift may not be the only roof mountable turbine available. Please see further information for sources of information which will have the very latest products available and information on their grant status.)

3.0 Pole Erected Turbines

Pole Mounted systems tend to be at the more expensive end of the spectrum and thus careful consideration should be given to its chosen site as to maximise performance and output. Pole mounted turbines come with the option of either being grid connected or battery operated. In remote areas where gird connection would be expensive / complex, the battery systems become a financially viable option.

5.3 kW Iskra Wind Turbine

Siting pole mounted turbines is more complex and requires careful planning to maximise output and improve the financial viability of the system.

4.0 Is my House Suitable?

Property features vary a great deal so if you are interested in a wind turbine you must ask yourself a number of key questions.

- **The Wind Resource** – If your property is situated in a sheltered valley or is surrounded by tall buildings, trees or other objects, then you are unlikely to reap the rewards from a micro wind installation. Tall adjacent buildings or trees will cause the surrounding flow of wind to be turbulent and this will reduce the output from your turbine. The Department of Trade and Industry's NOABL database can give you indicative wind speeds i.e. the average modelled wind speed for each km^2 of the UK but local topographic factors will affect this. It is advisable that your property has an average wind speed of at least 4.5m/s to produce an adequately performing roof mounted turbine. For pole mounted turbines it is advisable to carry out a wind assessment before committing to a development to ensure local wind speeds are high enough to justify your investment. Wind speeds can be measured on site by using an anemometer with which you will need to hire a mast and monitoring equipment. Alternatively, consultants can be hired to do this. To achieve and accurate figure of average wind speeds, data should be recorded for at least several months.
- **Installation Site** – It is important to site your turbine correctly i.e. into the prevailing wind. Remember, wind speed increases with height and the prevailing winds in the UK are from the south west.
- **Planning Permission** – Of all renewable energy technologies, wind turbines have the greatest visual impact. If you have a neighbour close by or your proposed site is near a main road or public area, planning permission

from the authority would be necessary (see FCC PPG on Micro Wind). It is therefore important to find out whether planning permission is needed from the onset of the project and talk to your community about your proposal. Mentioning a wind turbine may shock some individuals into thinking of the giant megawatt turbines. Introduce your project to neighbours with pictures and noise data if obtainable so they can judge accordingly.

5.0 Maintenance

These micro wind turbines are generally designed to be relatively low maintenance but as with all technologies with moving parts & due to health and safety, maintenance assessments are sometimes required. It is imperative that a qualified registered installer carries out the installation of your micro wind turbine. The fast spinning blades can pose a health and safety risk if not installed strictly to the models guidelines. Micro wind systems are designed with safety being top of the agenda due to the nature of their installation sites i.e. homes, schools, community centres etc. All manufacturers and installers should give you a product guarantee, warranty and will outline all maintenance requirements.

6.0 Renewable Obligation Certificates

In April 2002, the Renewables Obligation became law stipulating that energy suppliers must source a certain percentage of their electricity from renewable sources. The initial target was 3% during 2003 with this gradually increasing annually to 10% by 2010.

Renewable Energy generators receive Renewable Obligation Certificates or (ROC's) for each Megawatt (1000 kwh) energy produced. These certificates can then be sold to large electricity suppliers to represent their Renewables Obligation portion of renewable electricity generation.

Renewable energy generators are predominantly large multi megawatt suppliers however smaller generating systems are still eligible to receive ROC's.

The Swift Wind turbine is eligible to receive ROC's however, the Windsave turbine is currently not due to lack of precision metering. Initially ROC's started trading at £30/megawatt but this cost fluctuates. Should your system annually generate 4000 kwh of electricity as expected from the average system, you could generate an additional revenue of over £100 per annum, which would improve the systems financial viability.

(Please note, you could hold on to your Renewable Obligation Certificates to stimulate the market for clean green carbon free technology i.e. if you don't sell your ROC's, more renewable energy will have to be developed to deliver the Renewables Obligation objective thus further reducing the UK's carbon dioxide emissions).

7.0 Cost

The cost of domestic wind turbines varies a great deal depending on model, capacity and site characteristics. The smaller roof mounted turbines can be installed for as little as £3,000 with the larger pole mounted systems costing anything up to £18,000.

The roof mounted Swift and Windsave turbines are very recent technologies to reach the market. They are currently in the region of £3,000 - £8,000 excluding grant. This figure is expected to fall over the next 2 years as uptake increases and mass production starts. Target costs are between £1,000 - £2,000 excluding VAT and installation.

Pole mounted systems are more expensive due to the additional components required and the cabling necessary to connect the turbine to the property. Grid connection and battery equipment also contribute to the higher costs.

Grant schemes for renewable energy technology are dynamic. Turbine installers will know the present state of affairs but you can always contact the Energy Savings Trust (see further information) who can give you the most up to date information.

Further Information

UK Based Wind Manufacturers

Iskra	www.iskrawind.com
Proven Wind Turbines	www.provenenergy.com
Windsave Turbines	www.windsave.com
Swift Wind Turbines	www.renewabledevices.com/swift
Ampair	www.ampair.com
Eclectic Energy	www.eclectic-energy.co.uk
Eurowind	www.eurowind-uk.net
Gazelle	www.northenergy.co.uk/gaze.html
Marlec	www.marlec.co.uk
Quietrevolution	www.xco2.com

British Wind Energy Association (BWEA) **www.bwea.com**
Clear Skies Website **www.clear-skies.org**
Department of Trade & Industry NOABL Database
(wind speed database) **www.dti.gov.uk/renewables/technologies/windspeed**

Other Domestic Scale Renewable Energy Technologies are:-

Solar Thermal (for hot water generation)
Photo-voltaics (Solar panels that generate electricity)
Ground Source Heat Pumps
Green Electricity Tariffs
Biomass

For further information on any of these, please see the following websites:-

Energy Savings Trust **www.est.org.uk/housingbuildings/renewables**
Clear Skies Website **www.clear-skies.org.uk**
The Renewable Power Association **www.r-p-a.org.uk**
Green Energy Website **www.greenenergy.org.uk** **www.res-e-cymru.org.uk/**
Wealth of information on renewable energy and details how to overcome some of the main barriers of renewable energy implementation.

Flintshire County Council would like to hear about any renewable energy technology installation. Please contact the Home Energy Conservation Officer 01352 703766 Nia_Prys-Williams@flintshire.gov.uk

Remember *Energy Efficiency* should be addressed before Renewable Energy is incorporated into your property! Contact the Energy Efficiency Advice Centre to find out how 0800 512 012

Ground source heat pumps.