Snowdonia National Park Supplementary Planning Guidance: Renewable and Low Carbon Energy

November 2013

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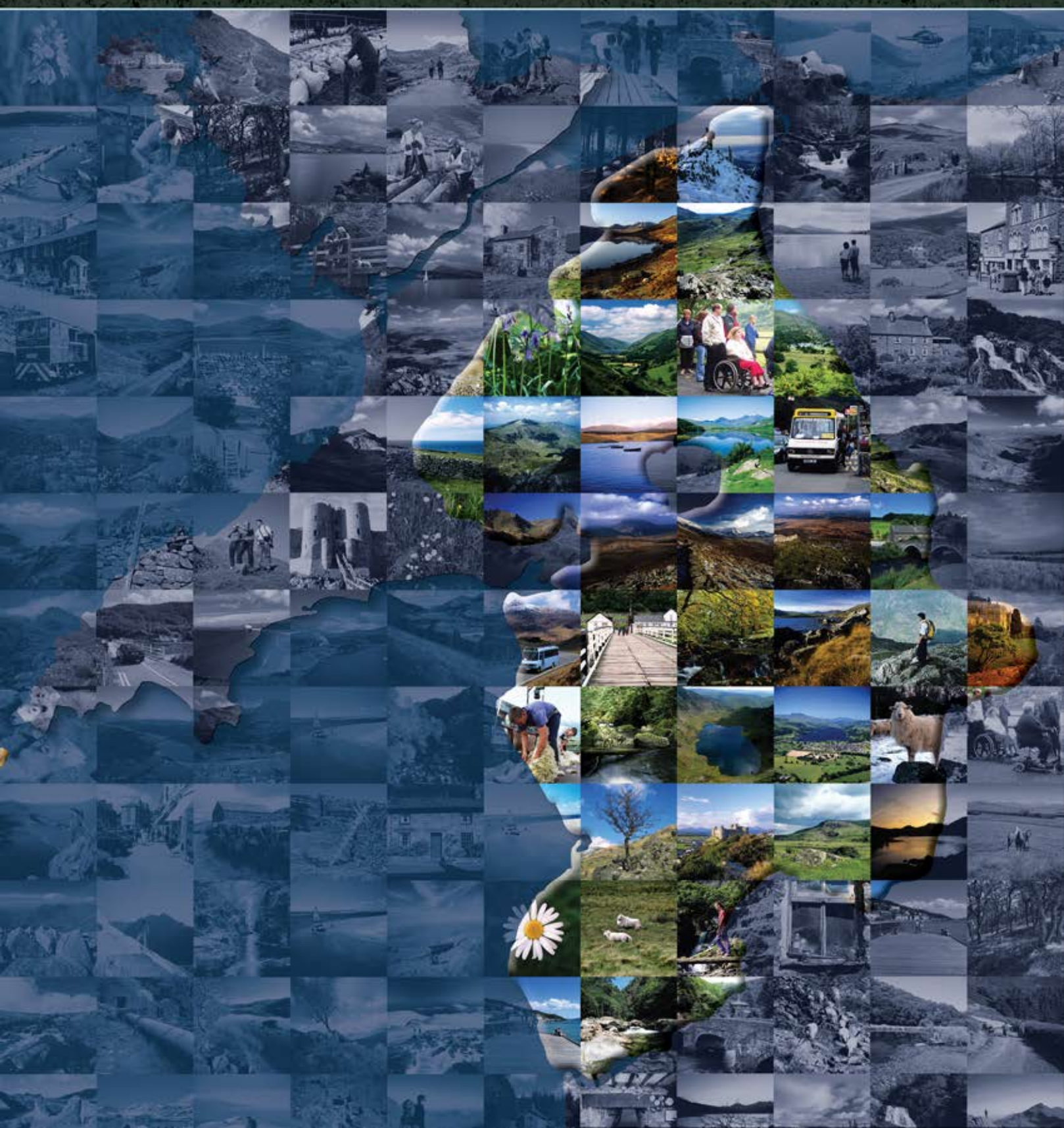


SNOWDONIA NATIONAL PARK AUTHORITY

ERYRI LOCAL DEVELOPMENT PLAN

SUPPLEMENTARY PLANNING GUIDANCE 10 – RENEWABLE AND LOW CARBON ENERGY

CONTENTS

1.0 INTRODUCTION

1.1 This document is one of a series of Supplementary Planning Guidance (SPGs) produced by the Snowdonia National Park Authority with the intention of providing detailed information in support of the policies contained in the Eryri Local Development Plan 2007 - 2022 and those contained in national planning guidance..

1.2 This Supplementary Planning Guidance (SPG), which was formally adopted by the Snowdonia National Park Authority after a period of public consultation, will be a material planning consideration when decisions are made on planning applications. I

1.3 In keeping with good practice developers are encouraged to discuss applications for new developments, or change of use of existing land or buildings, beforehand with planning officers in order to decide, amongst other things, whether the proposals are acceptable in policy terms, where new development could be located along with issues relating to design such as scale and appearance. The scope for identifying and mitigating any potential adverse effects of the proposals on the environment will be an important consideration at this early stage.

2.0 BACKGROUND

2.1 National Policy Context

2.2 It is the Welsh Government's aim to enhance the economic, social and environmental wellbeing of the people and communities of Wales and its ambition is to *"create a sustainable, low carbon economy for Wales*".

2.3 In doing so, the Government wants to ensure that full advantage is taken of the transition to a low carbon economy to secure a wealthier, more resilient and sustainable future for Wales.(**Energy Wales: A Low Carbon Transition)**

Further context is provided by the following:

- **Programme for Government 2011-2016** www.wales.gov.uk.
- **First Minister's Written Statement on Energy** www.wales.gov.uk/firstminister.
- **National Energy Efficiency and Savings Plan – March 2011** www.wales.gov.uk/energy.wales.gov.uk/energy
- **Climate Change Strategy for Wales – October 2010** www.wales.gov.uk/climatechange
- **Sustaining a Living Wales** www.wales.gov.uk/livingwales
- **One Wales: One Planet – The Sustainable Development Scheme of the Welsh Government – May 2009** www.wales.gov.uk/sustainabledevelopment

- **Practice Guidance: Planning for Renewable and Low Carbon Energy – A Toolkit for Planners** www.wales.gov.uk/planning

- **A Low Carbon Revolution– The Welsh Assembly Government Energy Policy Statement – March 2010** http://wales.gov.uk/docs/desh/policy/100331energystatementen.pdf

- **Energy Wales: A Low Carbon Transition – Welsh Government March 2012** http://wales.gov.uk/docs/desh/publications/120314energywalesen.pdf

2.4 The UK Government is committed to delivering its share of the EU target for 15% of energy from renewable sources by 2020.It is estimated that reaching these targets could result in £100 billion worth of investment opportunities and up to half a million jobs in the renewable energy sector by 2020. At present 50% of all energy is used for heating and hot water and 75% of domestic households' energy consumption is for heating and hot water.

2.5 The UK's renewable energy strategy aims for 12% of heat to come from renewable sources. Currently less than 5% of UK electricity comes from renewable sources. It is estimated that 30% of our electricity may be delivered from renewables with 2% from small-scale electricity generation.[1]

2.6 The Welsh Government's Energy Policy Statement (2010) identifies the sustainable renewable energy potential for a variety of the different technologies in Wales as well as its commitment to energy efficiency. It aims by 2050, at the latest, to be in a position where almost all energy needs can be met by low carbon electricity production. The Welsh Government's approach is to reduce energy consumption and improve energy efficiency first and maximise renewable and low carbon energy generation at every scale across Wales. This is part of a concerted effort to tackle climate change in Wales

2.7 The Welsh Government's policy on planning for renewable energy is set out in **Planning Policy Wales (PPW)** and **Technical Advice Note (TAN) 8**.

2.8 PPW considers that in order to meet the Government's renewable energy target of 4TWH per annum, local planning authorities should support proposals for renewable energy projects provided environmental impacts are avoided or minimised, and the integrity of nationally and internationally designated areas are not compromised.

2.9 LPAs should, it is stated, "facilitate the development of all forms of renewable energy and energy efficiency and conservation measures which fit within a sustainable development framework". LPAs should seek to make positive provision for such developments in order to meet society's needs now and in the future. This may be done by:

[1] Department of Energy and Climate Change

- *considering the contribution that their authority area can make towards developing and facilitating renewable energy and energy efficiency and conservation, and ensuring that development plan policies enable this contribution to be delivered;*

- *ensuring that development control decisions are consistent with national and international climate change obligations, including contribution to renewable energy targets, having regard to emerging national and international policy on the levels of renewable energy required and on appropriate technologies; and*

- *recognising the environmental, economic and social opportunities that the use of renewable energy resources can make to wider planning goals and objectives and the delivery of renewable energy targets.*

2.10 PPW further considers LPAs should undertake an assessment of the potential of all renewable energy resources, renewable energy technologies, energy efficiency and conservation measures within their areas and include appropriate policies in local development plans.

2.11 In undertaking such assessments local planning authorities should:

- *take into account the contribution that can be made by the area towards carbon emission reduction and renewable energy production targets; and*

- *recognise that different approaches will be appropriate for the deployment of the different renewable technologies and energy efficiency and conservation measures*.

2.12 Technical Advice Note 8 established a target of 800MW of installed onshore capacity for wind energy developments. TAN8 sets out Welsh Government's view that large-scale (defined as being over 25MW installed capacity) onshore wind energy developments should be concentrated into particular areas defined as Strategic Search Areas (SSAs) which are all located outside National Park boundaries.

2.13 Welsh Government Policy however does not specifically exclude the National Parks as areas for the location of small-scale wind energy developments of less than 5MW. However Paragraph 8.4 of TAN8 Renewable Energy has the objective *"to maintain the integrity and quality of the landscape within the National Parks/AONDs of Wales i.e. no change in landscape character from wind turbine development."*

2.14 **Renewable Energy Capacity Assessment for Snowdonia**

In 2012 the Snowdonia National Park Authority (SNPA) commissioned Arup to undertake a renewable energy generation capacity assessment for Snowdonia. The purpose of this study is to provide information on the potential and capacity for

renewable and low carbon energy generation, as such it will form part of an updated evidence base for the first review of Eryri Local Development Plan (LDP).

2.15 The methodology is based on the Welsh Government Practice Guidance: Planning for Renewable and Low Carbon Energy - A Toolkit for Planners (June 2010, referred to as the "Welsh Government Toolkit").

2.16 The Welsh Government Toolkit was commissioned by the Welsh Government in November 2008. The use of the toolkit was aimed at assisting planning policy officers from Local Planning Authorities to deliver two national planning policy expectations as set out in Planning Policy Wales, namely, Planning for Renewable Energy, and Planning for Sustainable Buildings.

The assumptions and steps required vary between each resource and further details can be found within the respective 'Project Sheets' accompanying the toolkit. In principle the methodology involves the following steps:

- *Establishing the quantity of the available resource;*
- *Establishing the constraints on this available resource (e.g. environmental or regulatory constraints);*
- *Establishing the amount of this resource that can viably be collected or used;*
- *Establishing the energy content of the resource; and*
- *Establishing the overall potential energy by multiplying the above factors*.

2.17 Appendix 1 sets out the findings of the capacity assessment for the National Park and is repeated under each type of renewable energy technology discussed in this Guidance. It provides an estimation of the theoretical renewable energy capacity available within the National Park.

2.18 Out of a potential capacity 47.2MW (electricity) nearly 40% may be provided by micro-wind and 35% by photovoltaics with only energy crops (12%) and biomass (8.5%) out of the other technologies making a meaningful contribution. The estimate for hydro is based on low-head schemes and it is considered that if small-scale high head schemes are included, the potential may actually be greater than the 4% (1.9MW) estimated.

2.19 Whether this theoretical capacity of 47.2MW will be achieved will be very greatly dependent on environmental, technical and economic considerations. Certain small domestic scale technologies will benefit from permitted development rights

2.20 **Landscape Sensitivity and Capacity Study**

The SNPA has jointly commissioned (with Gwynedd and Isle of Anglesey Councils) a study of the sensitivity and capacity of defined landscape character areas (LCAs) to a range of developments that could potentially have impacts on the landscape and visual

amenity. These development types include National Grid pylons, static caravan sites, wind turbines, field scale photovoltaic arrays and telecommunications masts.

It is intended that one of the outcomes of this study will be Supplementary Planning Guidance on the sensitivity and capacity of Snowdonia's landscapes. In future revisions of this Guidance it is proposed to include more specific cross references to the capacity of the individual LCAs to host wind energy developments.

2.21 **Local Policy Context**

2.22 Eryri Local Development Plan

2.23 Whilst large-scale energy generation projects are likely to be incompatible with National Park status, an earlier assessment of renewable energy production and potential in Snowdonia (carried out as a part of the LDP preparation process) considered that scope might exist to contribute to reduce demand for electricity derived from fossil fuels through efficiency savings and through small-scale renewable energy developments to meet domestic or community needs. These included small-scale hydro, domestic wind turbines, photovoltaics, biomass and landfill gas.

2.24 The ELDP (para.3.18) went on to say that, given the very large size of modern wind turbines, often in excess of 100m to blade tip, it was highly likely that even a single turbine would have a significant detrimental visual impact on the surrounding landscape. Such a proposal would be an inappropriate development within the National Park where landscape protection is paramount.

2.25 Consideration will also be given to individual and cumulative impact of wind turbine and windfarm proposals close to the National Park boundary, especially with regard to landscape and visual effect on the overall landscape setting of the Park. The Supplementary Planning Guidance on Landscape Sensitivity and Capacity and will provide further detail on landscape sensitivity to renewable energy developments and will support Development Policy 2: Development and the Landscape.

2.26 **Development Policy 2: Development and the Landscape**

2.27 ***The scale and design of new development, including its setting and landscaping should respect and conserve the character of the landscape. Unacceptable impacts on the landscape will be resisted and particular regard will be had to the protection of:***

i. Section 3 Areas of Natural Beauty

ii. Undeveloped Coast

iii. Panoramas visible from significant viewpoints

iv. Landscape Character Areas based on LANDMAP and as defined in the Landscapes of Eryri Supplementary Planning Guidance

2.28 The Authority has also adopted Guidance for Sustainable Design which provides guidance on siting and building orientation and includes details about the requirement for Energy Statements.

2.29 Small localised renewable energy projects can have the added benefit of taking advantage of local conditions and at the same time improving the quality of life in smaller communities, for example by reducing the dependency on fossil fuels of properties not connected to the local electricity distribution grid. Community led and owned schemes, such as small-scale biomass and district heating and photo-voltaics on community/village halls, may generate valuable income for local projects.

2.30 Such proposals will be supported through Development Policy 3: Energy of the ELDP.

2.31 **Development Policy 3: Energy**

2.32 ***All planning applications should be accompanied by an energy statement as part of the Design and Access Statement and should take into account the Supplementary Planning Guidance for Sustainable Design.***

- ***Wherever possible, developments should be sited and orientated to take advantage of solar gain and shelter.***

- ***Wherever possible all new buildings, including extensions, should consider the potential for maximising renewable energy technologies***

Microgeneration and small-scale community renewable energy plant will be supported especially where they make a contribution to improving the quality of life in smaller communities.

2.33 Although in legislation microgeneration is defined as less than 45kW (heat) and 50kW (electricity) the special landscape qualities of the National Park and the Authority's responsibility to conserve and enhance natural beauty dictate that, in most cases, the output may be significantly less as it will be difficult to assimilate wind turbines in excess of 15m to blade tip, large free-standing photo-voltaic arrays and large turbine houses without incurring adverse impacts on the landscape and local amenity.

2.34 It will be important for the ELDP to be read as a whole and any small scale renewable energy project must conform to Development Policy 1: General Development Principles. Generally however small-scale projects, properly sited and designed and complying with policies in the Plan will be supported.

2.35 **The Benefits of Microgeneration**

Microgeneration can help to helping to combat climate change through the reduction of carbon emissions by reducing reliance electricity generated in conventional fossil-fuel power stations, it can also benefit householders and businesses more directly. Generating electricity on-site can lead to reduced energy bills, for example when

replacing heating oil in those more isolated properties not currently on the gas grid. It can buffer consumers from future energy price rises and in doing so can help make a small but significant contribution to UK energy security. Other broad benefits of locally embedded electricity generation is the reduction of transmission losses through the national grid associated with centralised electricity generation.

2.36 Consumers may be able to achieve returns on their investment in the order of 6%-8% (depending on outputs) through financial incentive schemes, such as Feed-in-Tariffs and the Renewable Heat Initiative (see below). These incentives may enhance the value of a property since the income will continue for a fixed number of years. This beneficial effect would be enhanced by any future energy price rises.

2.37 Recent changes in the General Permitted Development Order does away with the need to obtain planning permission for a range of microgeneration technologies for domestic and commercial properties. This means that, provided the proposed development conforms to certain limits, it is not necessary to apply to the local planning authority for permission. Further details on permitted rights are provided in Appendix 3.

2.38 **Feed-In Tariffs Scheme (FITs)**

2.39 Feed-In Tariffs were introduced on 1 April 2010 and replaced UK government grants as the main financial incentive to encourage uptake of domestic and small-scale renewable electricity-generating technologies.

2.40 The Department for Energy and Climate Change (DECC) makes the key decisions on FITs in terms of government policy. The energy regulator Ofgem (https://www.ofgem.gov.uk) administers the scheme on behalf of the Government.

2.41 If householders install electricity-generating technology from a renewable or low-carbon source such as solar PV or a wind turbine, the FIT scheme could mean that they will be eligible for payments from their energy supplier.

2.42 Householders can be paid for the electricity they generate, even if they make use of some of it themselves. Any surplus electricity can be exported to the grid.

2.43 Most domestic technologies (and larger systems up to 5 megawatts) qualify for the scheme, including:

- *solar electricity (PV) (roof mounted or stand alone)*
- *wind turbines (building mounted or free standing)*
- *hydroelectricity*
- *anaerobic digesters*
- *micro combined heat and power (CHP).*

2.44 It is energy suppliers who will pay the FITs payments with the 'big six' energy suppliers required by law to provide these payments. Some smaller electricity suppliers may

not offer FITs payments as it is not compulsory for them though many have opted to offer the payments.

2.45 The tariffs available and the process for getting them depend on when the technology was installed, and whether the system and the installer were certificated under the Microgeneration Certification Scheme.

http://www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Feed-In-Tariffs-scheme-FITs

2.46 **Renewable Heat Incentive (RHI)**

The Renewable Heat Incentive (RHI) is the world's first long-term financial support programme for renewable heat. The UK Government launched the RHI scheme in November 2011 with a scheme for the non-domestic sector that provided payments to industry, businesses and public sector organisations. The Government plans to open the household scheme in spring 2014

2.47 The RHI is payable to eligible participants that generate and use renewable energy to heat their buildings. Increasing the generation of heat from renewable energy sources the RHI can help the UK reduce greenhouse gas emissions and meet targets for reducing the effects of climate change.

2.48 **Microgeneration Certification Scheme**

The Microgeneration Certification Scheme (MCS) is an internationally recognised quality assurance scheme which demonstrates to customers that a company is committed to meeting rigorous and tested standards. It was designed with input from installer and product representatives. The MCS gives a mark of competency and demonstrates to customers that the company can install microgeneration technologies to the highest quality. Installer certification entails assessing the supply, design, installation, set-to-work and commissioning of renewable microgeneration technologies. The following technologies are covered by the MCS scheme:

- Solar Thermal Hot Water
- Solar Photovoltaic
- Ground Source Heat Pumps
- Air Source Heat Pumps
- Biomass
- Small Scale Hydro
- Wind Energy
- Micro-CHP (Micro Combined Heat and Power)

3.0 RENEWABLE ENERGY TECHNOLOGIES WHICH MAY BE APPROPRIATE IN SNOWDONIA

3.1 SOLAR PANEL, PHOTOVOLTAICS

3.2 Potential for Deployment of the Technology in Snowdonia

The Renewable Energy Capacity Assessment for Snowdonia has estimated the number of suitably oriented properties and potential electricity/heat outputs if these technologies were adopted.

3.3 The resulting figures are shown in the table below. A capacity factor of 10% has been assumed to calculate annual output. It should be noted that, depending on the type of panel used, ***either*** the electricity ***or*** the heat output is achievable, but not both. In reality a mixture of panel types will be deployed.

Type of Property	Number of Properties with Suitable roofs for Solar	Estimated Resource (MW)		Potential Annual Generation (GWh)	
		Electricity	Heat	Electricity	Heat
Domestic Properties by 2020 (2kW)	4,462	8.9	8.9	7.8	7.8
Non-residential Properties (5kW)	1,555	7.8	7.8	6.8	6.8
Total		**16.7**	**16.7**	**14.6**	**14.6**

Table 1: Potential Solar Resource Available

3.4 Planning Considerations

Appendix 3 sets out the Permitted Development Rights for solar thermal and photovoltaic panels (pv) provided certain limits are not exceeded. The SNPA has granted planning permission for a small number of free-standing pv arrays. Generally they have been modest in nature, being located in the private gardens of residential properties which benefit from a certain degree of natural screening and therefore do not appear overly prominent when viewed from the public realm. Given their domestic context small arrays are considered more acceptable than larger field-scale arrays which would be more difficult to accommodate and screen given their locational requirements. They would introduce a jarring, man-made element into the open-countryside which would be incompatible with the conservation of the landscape and the visual amenity of the National Park.

3.5 HEAT PUMPS/HEAT EXCHANGERS

3.6 Potential for Deployment of the Technology in Snowdonia

The Renewable Energy Capacity Assessment for Snowdonia has estimated the `number of suitable properties and potential heat outputs if these technologies were widely adopted.

Type of Property	Overall No. of Properties suitable for Heat Pumps	Capacity (MWt)	Renewable energy element (mW) (CoP assumed is 4 to 1)
Existing Residential On-Grid Properties	5,368	27	20
Existing Residential Off-Grid Properties	7,688	38	29
Future Residential on-Grid Properties	472	2	2
Total		**67**	**51**

Table 2: Potential capacity of heat pumps.

3.7 BIOMASS

Biomass systems are considered to be low carbon because the CO_2 released on combustion is equal to that absorbed during the lifetime of the plant, and provided that the plants are replaced the process can be considered to be broadly sustainable. There will be some carbon emissions from cultivation, harvesting and transport of the wood fuel, however if locally sourced material is used then these are much lower than the emissions from fossil fuels.

3.8 In North Wales small diameter timber, largely from conifer plantations, is a fuel source that is readily available. Thinning and felling produces some timber that is too small in diameter for construction purposes but suitable for paper manufacture, fencing stakes/posts, raw product for fibreboard or woodfuel. In the past studies[2] have indicates that the 67,000 ha of forests in north Wales could supply a biomass plant with forest waste capable of producing some 7MW of electricity.

[2] *Prospects for Renewable Energy*, MANWEB/ETSU 1994

3.9 Renewable Energy Capacity Assessment

The Renewable Energy Capacity Assessment has estimated the potential wood fuel resource available in Snowdonia to supply these technologies if they were widely adopted.

Available Resource	Area of available woodland (ha)	Available wood (odt) per ha. of woodland per annum	Potential woodfuel resource (odt/annum)
FC owned/managed land	19,035.18	0.6	11,421.11
Privately owned/managed land	20,988.57	0.6	12,693.14

Table 3: Potential wood fuel yield in Snowdonia.

Available Resource	Potential woodfuel resource (odt/annum)	Estimated Resource		Potential Annual Generation	
		Electricity (MWe)	Heat (MWt)	Electricity (GWe)	Heat (GWt)
FC owned/managed land	11,421.11	1.9	3.8	15.01	30.01
Privately owned/managed land	12,593.14	2.1	4.2	15.55	0.09
Total	24,014.25	4	8	31.56	63.10

Table 4: Potential managed wood fuel resource.

3.10 Planning Considerations

Biomass plants would require planning permission and would need to satisfy the relevant policies set out in the ELDP. The plant could be contained in a shed like building with, depending on which process was used, storage buildings/yards feed hoppers etc. They would have to be well connected to a regular and dependable supply of feedstock, ideally locally sourced, in order reduce transport impacts and costs. Similarly, good connections to the existing local electricity network would be a prerequisite. This type of development may be appropriate on existing industrial

estates or Brownfield sites. Natural Resources Wales would need to be satisfied that any emissions to air and water were not harmful to people and the environment.

3.11 Anaerobic Digestion

Anaerobic Digestors make use of the natural process of anaerobic digestion of organic materials (animal wastes and/or vegetable matter) in a closed vessel to produce biogas (a mixture of carbon dioxide and methane) and digestate (a nitrogen-rich fertiliser). The biogas can be used directly in engines generate electricity, burned to produce heat, or can be cleaned and used in the same way as natural gas or as a vehicle fuel.

3.12 Renewable Energy Capacity Assessment

The Renewable Energy Capacity Assessment has estimated the potential resource available in Snowdonia to supply these technologies if they were widely adopted.

Available Resource	Calculated tonnes of poultry litter/annum	Accessible Resource		Potential Annual Generation	
		Electricity (MWe)	Electricity (MWe)	Electricity (MWe)	Electricity (MWe)
Poultry	259	0.03	0.05	0.19	0.21

Table 5: Poultry litter resource potential.

Available Resource	Calculated tonnes of wet slurry	Estimated Resource		Potential Annual Generation	
		Electricity (MWe)	Electricity (MWe)	Electricity (GWh)	Electricity (GWh)
Cattle	42,912	0.19	0.29	1.5	1.3
Pigs	12	0.00	0.00	0.0	0.0

Table 6: Animal manure resource potential.

Source	Food Waste (Tonnes)	Estimated Resource		Potential Annual Generation	
		Electricity (MWe)	Electricity (MWe)	Electricity (GWh)	Electricity (GWh)
Domestic Food Waste (09 – 10)	64	0.00	0.00	0.02	0.01
Commercial Food	5,535	0.17	0.26	1.36	1.14

Waste (2007)					
Total		**0.17**	**0.26**	**1.38**	**1.15**

Table 7: Potential waste food resource.

3.13 Planning Considerations

On agricultural or forestry land permitted development rights apply to buildings to house microgeneration equipment, and in particular to house biomass boilers and anaerobic digestion systems, and to store associated fuel and waste as long as the fuel or waste is produced on the agricultural or forestry land or by the boiler or system.

3.14 More generally the siting of AD plant is greatly dependent upon the source of the digestate. That material might be biodegradable domestic waste kitchen/food waste or sewage, in which case the preferred location of the plant would be within existing waste management sites and sewage treatment works respectively.

3.15 Animal wastes are more likely to be transported to a central site from the surrounding area and food processing and catering wastes could come from further afield again. In these cases transportation issues will be critical to the viability of schemes and efforts should be made to reduce the need for road transport by siting plant close to the source of feedstock. This type of development may be appropriate on existing industrial estates or Brownfield sites. Natural Resources Wales (NRW) would need to be satisfied that any emissions to air and water were not harmful to people and the environment.

3.16 The North Wales Regional Waste Plan does not require the SNPA to allocate land for, or host, regional or sub-regional scale waste management sites. Any scheme which would be dependent on the import of such wastes would be unlikely to be approved in Snowdonia.

3.17 The installation of generating plant at a landfill site will require planning permission and satisfy the policies set out in the ELDP. However the gas engines, generators and ancillary equipment (such as the gas pre-treatment system and heat recovery system), need not be housed in large structures, often, depending on the size of the landfill site, they may be housed in standard, sound-proofed, shipping containers.

3.18 In reality the use will only be temporary as the capability of the landfill sites to produce landfill gas is finite. Biodegradable wastes are no longer being disposed of at landfill sites, rather they are being composted or fed directly into anaerobic digestors where the biogas they produce can be used to generate electricity in the same way as landfill gas.

3.19 HYDRO AND MICRO HYDRO

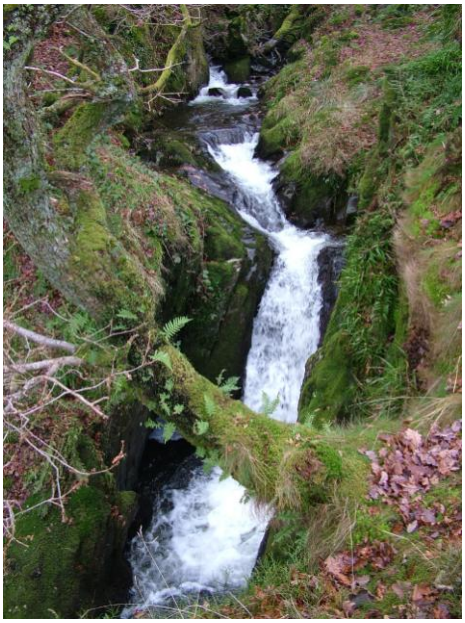
The topography and climate of Snowdonia has meant that there is a long history of utilising water to produce power, from early waterwheels to grind corn to at riverside

mills through to complex systems of reservoirs, leats and waterwheels to power crushers and other ore processing plant at metal mines.

3.20 The area saw the early development of hydro-electric power stations with local entrepreneurs installing small generating stations driven by Pelton wheels. Although many fell into disuse after the establishment of the National Grid some generating stations established in the early years of the 20th Century are still operating today.

3.21 The 40 or so existing hydro power stations which are located in, or use water from, Snowdonia have a combined total installed capacity of some 82MW This is in excess of local electricity demand by an estimated factor of 3 and results in the area being a net exporter of electricity.

3.22 The Environment Agency (Environment Agency Wales was incorporated into Natural Resources Wales in April 2013) has undertaken a project to assess and map opportunities for hydropower in England and Wales. The results indicate that there may well be limited potential for further run-of river and micro-hydro schemes on Snowdonia's rivers, however each must be assessed on its own merits with safeguards to protect the ecological value of the particular watercourse and surrounding habitats, trees and archaeology. The table below shows the Local Authority areas within Snowdonia with the most opportunities for hydro generation. Almost all of these opportunities are in areas of high environmental sensitivity.



A typical small upland stream in Snowdonia

3.23 It is noted that the methodology used in the report is based mainly on identifying low head barriers as potential sites, and therefore underestimates the resource in Snowdonia,

Local Authority	Number of barriers	Total power potential/MW	% of power potential classified as high sensitivity	% of power potential classified as potential win-win
Gwynedd	735	47	98%	24%
Conwy	283	38	96%	3%

Table 8: Hydro opportunities in Gwynedd and Conwy

3.24 Renewable Energy Capacity Assessment

Based on the Environment Agency's study the Renewable Energy Capacity Assessment has estimated the potential low head hydro resource available in Snowdonia. It is acknowledged that this a an underestimate of the total hydro resource as it does not account for small high head schemes

Resource	Estimated Resource (MWe)	Potential Annual Generation (GWh)
Small-scale hydro	1.9	6.1

Table 9: Potential small-scale low head hydro capacity in Snowdonia.

3.25 Hydro - Planning Considerations

Permitted development rights apply to the construction of buildings on agricultural or forestry land to house hydro-turbines although the construction of weirs, channels, leats, pipelines (whether on the surface or buried) will need planning permission.

3.26 Environmental Impact Assessment regulations[3] specify that in certain areas, such as national parks, a hydro-electric development that is considered likely to have a significant effect on the environment by virtue of its nature, size or location will require Environmental Impact Assessment (EIA). It is therefore advisable, in all cases, for developers to request a Screening Opinion for EIA. Such applications may fall to be considered against Eryri Local Development Plan ***Strategic Policy B: Major Development***.

3.27 The National Park Authority is then obliged to publish a Screening Opinion within 3 weeks from the date of receipt of the request. Requests for Screening Opinions should include sufficient information in order to conclude the likely environmental impact of the proposals and the total nature of development involved including grid connection and highways and construction requirements.

[3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999.

3.28 It is therefore advisable to contact the National Park Authority before submitting a planning application for a hydro scheme as this will usually be necessary to support the application with ecological and other surveys within an Environmental Statement. The Authority can advise on the form and content of the surveys. Furthermore, in addition to the need for planning, Natural Resources Wales must be satisfied that the scheme does not harm the water environment. NRW has responsibility for most matters relating to water courses, including abstraction, obstruction, impoundment along with the effects on fisheries wildlife and geomorphology, and the necessary consents and/or licences will have to be issued by them before the scheme can be implemented. It is essential therefore that they are contacted before any planning application is submitted. The relevant information regarding hydropower and details of the licencing and consenting are set out on the NRW website: http://naturalresourceswales.gov.uk/apply-buy-report/apply-buy-grid/water/abstrations-impoundment/hydropower-scheme/?lang=en.

3.29 The National Park Authority will generally be supportive of small-scale schemes which do not give rise to environmental concerns and are considered suitable by Natural Resources Wales. Further information can be found in the document entitled *"Planning and Implementation Workbook for the Installation of a Micro Hydro Electricity Generation Facility" prepared for the Gwynedd Economic Partnership*.[4]

3.30 If it is determined that a full EIA is not required the planning application should be accompanied by a Design and Access Statement. This should give a full and detailed description of the development's likely impacts. This should include a detailed analysis of the headings set out below along with a justification of the proposed development in terms of both national and local planning policy.

1. Landscape and Visual

- *Landscape and visual impacts including an assessment of impact on LANDMAP*
- *Cumulative impacts, consideration of other existing and proposed nearby hydro developments/abstractors on the water course.*

The SNPA considers that in most circumstances pipelines should be undergrounded provided this can be achieved without significant damage to trees, ecology and archaeology interests.

The Supplementary Planning Guidance on Landscape and Seascape Character Areas in Snowdonia and the Landscape Sensitivity and Capacity Study (in preparation) will provide greater details on landscape matters.

Any Landscape and Visual Impact Assessments should be in conformity with recent guidance from the Landscape Institute in the form of "Guidelines for Landscape and Visual impact Assessment" 3rd Edition 2013.

[4] http://www.eryri-npa.gov.uk/__data/assets/pdf_file/0003/133590/Appendix-I-MHWorkbookEng.pdf

2. Ecology

- *Impacts on riverine habitats, protected species and fisheries*
- *Impacts of protected areas such as SSSIs, and internationally designated sites SACs, SPAs and Ramsar sites and NERC Act Section 42[5] and Biodiversity Action Plan habitats and species.*

The Supplementary Planning Guidance on Nature Conservation and Biodiversity will provide greater detail on the ecological information required as regards surveys etc. Information is also available on the Authority's website: http://www.eryri-npa.gov.uk/planning/development-and-biodiversity.

3. Impact on Amenity

- *Impacts on public rights of way*
- *Impacts on recreational uses of the watercourse, especially at minimum flow*
- *Impacts on "scenic qualities" of waterfalls*
- *Impact of mechanical noise of nearby receptors*
- *Cumulative impact of noise*

4. Impact on Heritage

- *Visual impact upon Listed Buildings, Conservation Areas and Sites of National Historic Importance such as National Trust Properties; Scheduled Ancient Monuments*
- *Impact on Non Scheduled Archaeological Sites*
- *Impact on Registered Parks and Gardens*
- *Impact on Registered Historic Landscapes*

5. Hydrology

- *Impact on water quantity and quality of the watercourse and the wider catchment*
- *Impact on soil drainage of the penstock*

6. Operational and Ancillary Development within the Site.

- *Access tracks*
- *Ancillary buildings such as turbine houses transformer buildings*
- *Hard standing areas and temporary working areas. (Construction Method Statements are crucial in this respect)*

7. Connection to the electricity network

- *A plan indicating the proposed grid connection, which will also be assessed by the above criteria.*

[5] Natural Environment and Rural Communities Act 2006. The Section 42 list of habitats and species of principal importance in Wales is the definitive list and is a key requirement of the NERC Biodiversity Duty. The list is a key reference for all statutory and non-statutory bodies involved in operations that affect biodiversity in Wales. The S42 list will be used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006 "to have regard" to the conservation of biodiversity in all their activities.

The SNPA will expect most connections to the grid to be by underground cables. However should this be difficult to achieve without significantly damaging ecological or archaeological interests the least visually intrusive overhead route should be considered

3.31 **WIND TURBINES**

Several domestic scale turbines have already been granted planning permission in Snowdonia. A recent development is that small-scale wind turbines for domestic use may benefit from permitted development rights and be acceptable in Snowdonia provided they can be assimilated unobtrusively into the landscape/townscape and do not harm the amenity of neighbours and vistors. Details of Permitted Development Rights are set out in Appendix 1

3.32 Wind turbines are also eligible for Feed-in-Tariffs. To be eligible, the installer and wind turbine product must be certified under the Microgeneration Certification Scheme (MCS).

3.33 In remote areas not connected to an electricity supply, known as off grid, surplus electricity generated by domestic turbines can be used to charge batteries for use when there is no wind.

3.34 Domestic wind turbines may be free standing, pole mounted or mounted on buildings

i) Pole mounted - these are free standing and are erected in a suitably exposed position, and in domestic situations can generate around 5kW to 6kW

ii) Building-mounted are usually smaller than free standing systems and can be installed on the roofs of houses where the wind resources are suitable. These are generally around 1kW to 2kW in size.

3.35 **Renewable Energy Capacity Assessment**

Based on the use of 6kW turbines the estimated resource available for micro scale wind in Snowdonia is shown in the table below. It should be noted that this analysis does not take into account the location of any existing micro-wind developments

	Number of properties	**Estimated resource (MWe)**	**Potential Annual Generation (GWh)**
Residential	2,577	15.5	13.5
Non- residential	485	2.9	2.5
Total		**18.4**	**16.1**

Table 10: Potential micro-wind resource.

3.36 **Planning Considerations**

National parks are the premier landscape designation in the UK and as such it is incumbent on the National Park Authority to provide the highest levels of protection to the landscape. It is considered that most wind turbines, because of their man-made, vertical nature combined with the element of movement have the potential to be significant visual detractors and as a consequence impact adversely on the landscapes of Snowdonia.

3.37 Paragraph 8.4 of TAN8 Renewable Energy has the objective *"to maintain the integrity and quality of the landscape within the National Parks/AONBs of Wales i.e. no change in landscape character from wind turbine development."*

3.38 Policy 3 Energy of the ELDP is intended to support micro generation which is regarded as small scale domestic or community wind generating projects. Currently the permitted development limits would allow the erection of a single wind turbine of 11.1 meters to blade height within a domestic curtilage i.e. there is no need, subject to siting within the curtilage, to obtain planning permission. This scale of development is regarded as small scale and appropriate within a domestic curtilage. Above the permitted development height the National Park would regard wind turbines as being more commercial in nature and not to a domestic scale.

3.39 The Authority has already granted planning permission for small scale wind turbines. Most of these have been below 15 meters in height to blade tip and associated with proposals on working farms. The experience to date indicates that turbines above this height have a more adverse visual impact on the landscape and are more likely to be visible from a wider area. Apart from TV relay transmitters and National Grid pylons there are no other man-made structures exceeding this height to be found in the open countryside. Telephone and electricity poles tend to be in the range of 8 – 10 m. Furthermore an important consideration is the fact that wind turbines possess moving elements which will always draw the eye of the observer. As a general rule of thumb therefore the Authority will not support single wind turbines of over 15m to blade tip unless it can be demonstrated that the siting accords with the criteria below and there is no landscape or visual impact.

3.40 Individual wind turbines will need to be carefully sited and should avoid the following locations:

- Exposed hilltops which are visible from public viewpoints where the turbine would result in an intrusive and significantly adverse landscape and visual impact for nearby residents and members of the public*".*

- Sites that break the skyline and have no background landform to provide "backcloth" screening.

- Isolated locations which are more than 100m from the nearest building in the same ownership or in the control of the proposer.

- Sites that require the erection of new electricity pole connections to the existing network.

- Sites of ecological interest e.g. bird and bat flight lines

- Sites that, in cumulation with existing or proposed similar wind turbine proposals, will have an adverse visual impact in a relatively small geographical area, for example a coherent landscape, such as a valley, unit within a larger landscape character area

- Sites that will impact adversely on iconic panoramas and impair the opportunity for people to understand and enjoy the National Park actively

3.41 The tendency of manufacturers to supply turbine components in a limited colour palette means that they can appear unduly prominent when "backclothed", that is seen against a darker variegated background from elevated viewpoints – this again compromises their acceptability. Within most locations in the National Park, darker colours are more suitable for turbine towers and blades, and where appropriate, the Authority will stipulate the most appropriate colour for a particular location. Very often this will be a matt finish mid to dark grey.

3.42 Proposals which are community based should clearly indicate how they will improve the quality of life of smaller communities for the longer term and not be solely for the benefit of a smaller group of people.

3.43 Environmental Impact Assessment (EIA) regulations[6] specify that in certain areas, such as national parks, a wind turbine development that is considered likely to have a significant effect on the environment by virtue of its nature, size or location will require EIA. It is therefore advisable, in all cases, for developers to request a Screening Opinion for EIA from the NPA.

3.44 The NPA is then obliged to publish a Screening Opinion within 3 weeks from the date of receipt of the request. Requests for Screening Opinions should require sufficient information in order to conclude the likely environmental impact of the proposals and the total nature of development involved including grid connection and highways and construction requirements.

3.45 If it is determined that a full EIA is not required the planning application should be accompanied by a Design and Access Statement. This should give a full and detailed description of the development likely impacts. This should include a detailed analysis of the headings set out below along with a justification of the proposed development in terms of both National and Local Policy.

[6] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999

1. Landscape and Visual

- *Landscape and visual impacts including an assessment of impact on LANDMAP*
- *Cumulative impacts, consideration of other existing and proposed nearby turbines.*

3.46 The Supplementary Planning Guidance on Landscape Character Areas in Snowdonia and the Landscape Sensitivity and Capacity Study (in preparation) will provide greater details on landscape matters.

3.47 Any Landscape and Visual Impact Assessments should be in conformity with recent guidance from the Landscape Institute in the form of "Guidelines for Landscape and Visual impact Assessment" 3rd Edition 2013.

2. Ecology

- *Impacts on wildlife and biodiversity, especially protected species and habitats*
- *Impacts of protected areas such as SSSIs, and internationally designated sites SACs, SPAs and Ramsar sites and NERC Act Section 42 and Biodiversity Action Plan habitats and species.*

3.48 The Supplementary Planning Guidance on Nature Conservation and Biodiversity will provide greater detail on the ecological information required as regards surveys etc. Information is also available on the Authority's website: http://www.eryri-npa.gov.uk/planning/development-and-biodiversity

3. Impact on Amenity

- *Visual impact upon nearby properties*
- *Impacts on public rights of way*
- *Impacts on recreational of the land*
- *Impact of mechanical noise of nearby receptors*
- *Cumulative impact of noise*

4. Impact on Heritage

- *Visual impact upon Listed Buildings, Conservation Areas and Sites of National Historic Importance such as National Trust Properties; Scheduled Ancient Monuments*
- *Impact on Non Scheduled Archaeological Sites*
- *Impact on Registered Parks and Gardens*
- *Impact on Registered Historic Landscapes*

3.49 Supplementary Planning Guidance on the Historic Environment (in preparation) will provide greater detail on these issues.

5. Hydrology

- *Impact on the hydrology of the site and the wider catchment during construction and operation and decommissioning*

6. Operational and Ancillary Development within the Site.

- *Access tracks*
- *Ancillary buildings such as transformer buildings*
- *Hard standing areas and temporary working areas*

7. Connection to the electricity network

- *A plan indicating the proposed grid connection, which will also be assessed by the above criteria.*

3.50 The SNPA will expect most connections to the grid to be by underground cables. However should this be difficult to achieve without significantly damaging ecological or archaeological interests the least visually intrusive overhead route should be considered.

APPENDIX 1

Technology descriptions

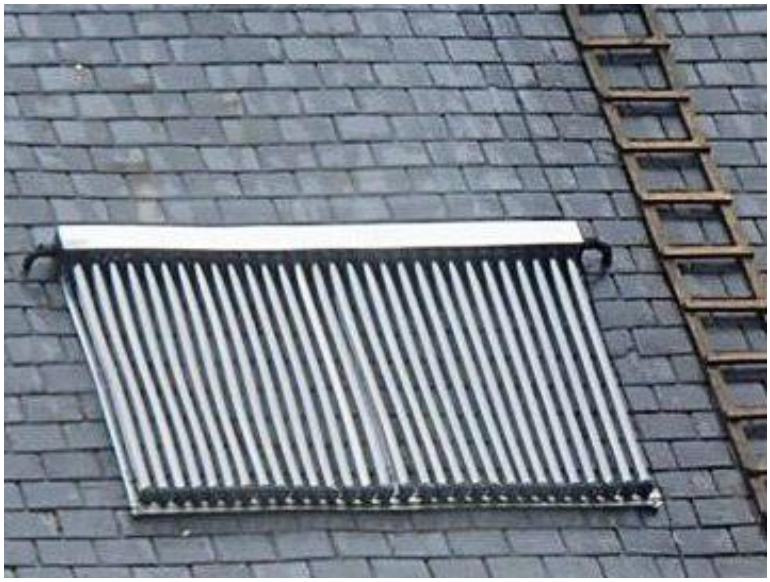
Solar Thermal Panels (water heating)

Solar water heating systems use solar panels, sometimes called collectors, most commonly fitted to the roofs of buildings. The collectors absorb heat from the sun and use it to heat water which is then stored in a well insulated hot water cylinder. As a result less energy from electric immersion heaters or gas boilers is needed to further heat the water to reach the desired temperature.

Larger solar panels can also be arranged to provide some contribution to space heating. However, the amount of heat provided is generally very small and it is not normally considered worthwhile.

There are two types of solar water heating panels:

Evacuated Tubes
Evacuated tube collectors are made up of a number of vacuum tubes containing a finned metal collector tube. Each tube is filled with a heat transfer fluid and their upper ends are connected to a manifold heat exchanger, which is in turn connected to the building's hot water system.



Flat Plate collectors
Flat Plate collectors comprise of a glazed, insulated box housing a black coated metal "envelope" filled with water. The black coating improves absorption of solar energy and heat transfer. The collector is connected to the hot water system of a building in a similar way to a conventional boiler, usually using an indirect coil in the hot water cylinder. Water is circulates through the system when the temperature of the collector is at least a few degrees higher than the water around the coil in the hot water tank.

Photovoltaic Panels

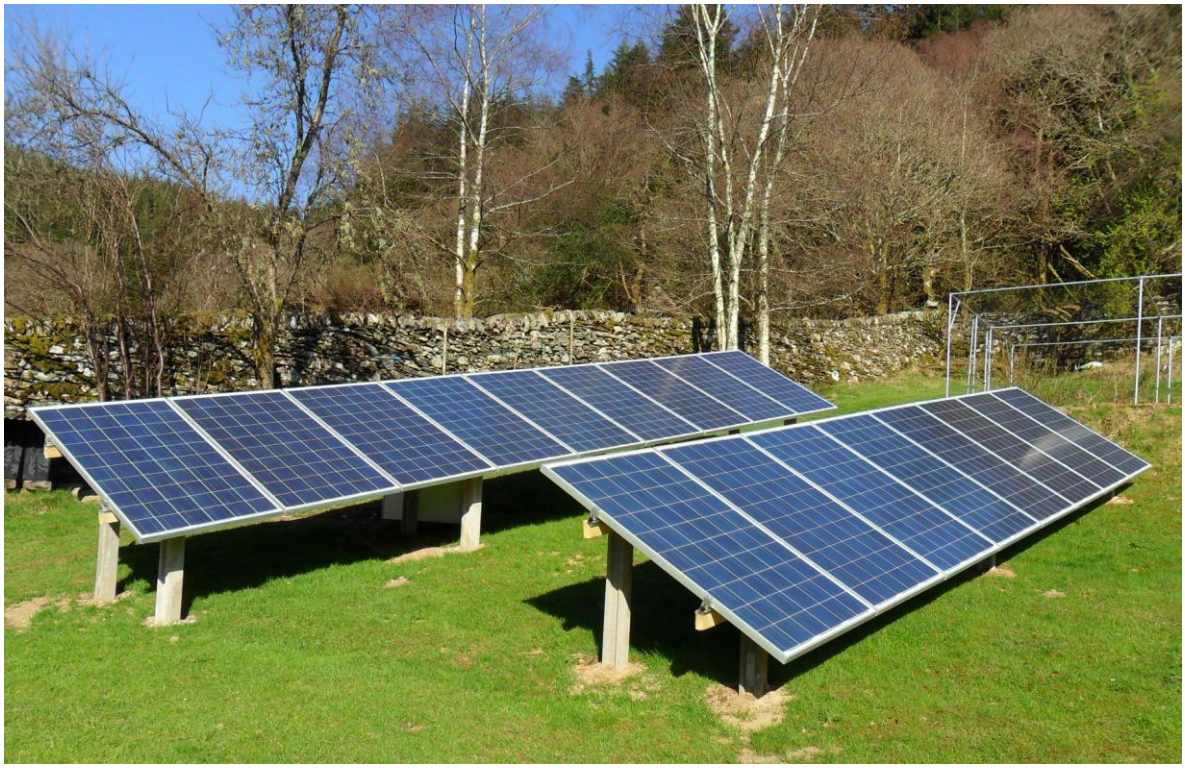
Photovoltaic (pv) Panels harness energy from the sun to generate electricity by converting solar radiation into direct current electricity using semiconductors that exhibit the photovoltaic effect. The materials used to manufacture photovoltaic cells may comprise the following; monocrystalline silicon; polycrystalline silicon; amorphous silicon, cadmium telluride and copper indium gallium selenide/sulphide.

Pv panels don't necessarily need direct sunlight to work as they can still generate some electricity on cloudy days so they are still a viable option in Snowdonia. However to maximise performance at the latitudes of the British Isles, pv panels need to be inclined at an angle of about 35° and orientated to face due south.

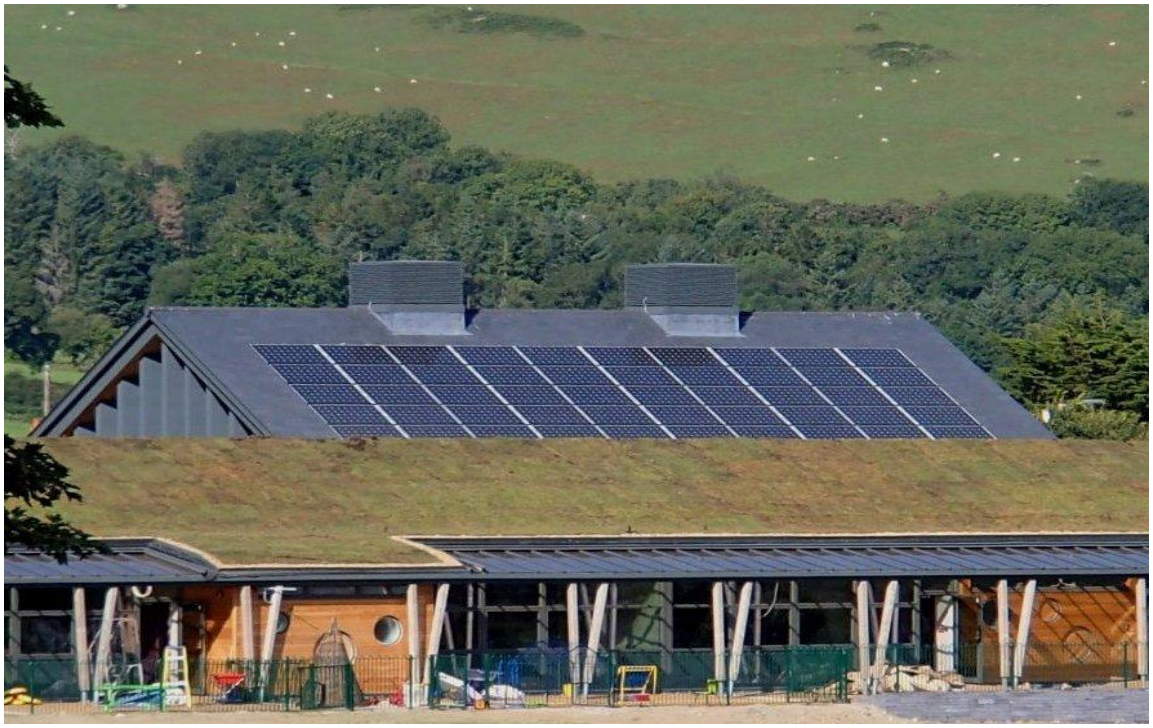
In practice the panels are usually set at the inclination of the roof and situated on the roof slope closest to a southerly aspect. This will affect their performance to a certain extent but the panels will function reasonably well at inclinations between 10° and 60° and an orientation within 90° of south.

Not only are photovoltaic panels a solution for generating renewable energy in the home or workplace but they are also ideal for generating electricity in remote areas which not connected to the national grid.

Photovoltaic panels can be installed as single units or assembled together to form what is called an "array". Although it is theoretically possible for a household to generate all its electricity needs from pv panels, this is an unlikely target in most cases as the current costs of installing such a system would be very high for the average homeowner.



Pv cells can be incorporated into “solar slates” and used in roof construction similar to normal roofing slates or tiles. As such they may be used in new-build or when re-roofing to give a more aesthetic finish than retro-fitted panels which sit proud of the plane of the roof.



The introduction of Feed in Tariff has resulted in a recent increase in the number of solar photovoltaic (pv) panels being installed on domestic and farm buildings in Snowdonia

Heat Pumps/Heat Exchangers

Heat pumps are used to raise the temperature of water which then can be used to heat radiators or underfloor heating systems. Doing this reduces demand for heating oil, gas and electricity thereby generating monetary and energy savings.

Ground Source Heat Pumps
Ground Source Heat Pumps work by circulating a heat transfer fluid, for example a mixture of water and antifreeze, round a loop of pipes buried in the ground. This fluid absorbs heat from the ground, heat that is derived from the sun which warms the surface layers of the earth. The heat is then transferred to a wet heating system by means of a heat exchanger. The length of the buried pipe loop required depends on the size of the property.

Water Source Heat Pumps
Water source heat pumps operate on a similar principle to ground source heat pumps but the coils are laid in a water body, for example a river, lake or pond.

Air Source Heat Pumps
Air source heat pumps (ASHP) look similar to air conditioning units and are usually positioned on or near the exterior walls of buildings. Air source heat pumps work on the same principle as domestic fridges, but in reverse, that is by absorbing heat from the outside air. This heat is usually used to heat radiators, underfloor heating systems, or warm air convectors and hot water in buildings.

There are two types of ASHP, “air to air” and “air to water”. Air to air heat pumps release the captured energy through an air heat exchanger, which is then forced (by fan) around the dwelling through trunking, or directly into the room.

Air to water heat pumps release the energy into a water circuit which is then used in a wet heating system radiators or underfloor pipes.

Biomass

Biomass is material derived from living, or recently living organisms. Although the term biomass can equally apply to both animal and vegetable derived material in the context of generating energy the term biomass refers mainly to plant derived materials.

There are five basic categories of material:

- **Virgin wood** - from managed forests or from wood processing
- **Energy crops** - high yielding crops, such as Miscanthus and short rotation coppicing of willow and poplar species, specially grown as feedstock.
- **Agricultural residues** - from agriculture harvesting or processing e.g. straw.

- **Food waste** - from manufacture, processing and preparation of food and drink, and post-consumer waste.
- **Waste and other co-products** - from manufacture and industrial processes.

Combustion
Combustion is the simplest and most familiar method in which biomass is used for energy in the form of heat. This heat can be used in a number of different ways:

- Space heating e.g. room heating from log fires or stoves.
- Heating water (or other fluid) for domestic central heating systems or larger scale district heating.
- Steam production for electricity generation.

Gasification
Gasification is a process partial oxidation where sources rich in carbon, such as biomass, are broken down into a mix of gaseous components. This technology can be used for:

- Heating water (or other fluid) for domestic central heating systems or larger scale district heating.
- Steam production for electricity generation
- Producing calorific gases, such as methane, for generating electricity

Pyrolysis
Pyrolysis is the thermal decomposition of biomass in the absence of oxygen and is part of the gasification process. The most familiar example of the pyrolysis process is the production of charcoal. Applications for pyrolysis include:

- Biomass energy densification for transport or storage
- Co-firing for heat or power
- Feedstock for gasification.

Wood-fuelled heating

Wood-fuelled or biomass heating systems can power central heating and hot water boilers or simply provide space heating in a single room and log stoves are already common in dwellings in rural areas. Automated stove and boiler systems are available with logs, wood chips or pellets as their feedstock. Wood pellets are manufactured from clean dry wood waste and represent a convenient and easy fuel to use. These systems would be more suited to commercial properties, workshops and community facilities such as village halls and schools

There are number of possible benefits from wood-fuelled heating. In terms of cost wood fuel is often cheaper than other heating options, although the price can vary considerably. Furthermore the installation of wood fuel boiler systems could benefit from the Renewable Heat Premium Payment and the Renewable Heat Incentive.

Appendix 3 sets out the Permitted Development Rights for the installation of flues which may be required by wood fuelled heating systems.

Combined Heat and Power

An efficient way of making use of renewable fuels, such as woodchips, is by using one or more boilers, located in, for example, a block of flats, a hospital complex or perhaps an estate of houses or small community, connected to heat distribution network.

Ideally this would require a variety of users with a good, spread of demand throughout the day and week. A mix of residential, leisure, commercial and industrial users would be best. The general pattern of settlements in Snowdonia tends to militate against this type of development.

Domestic scale CHP

Micro-CHP systems are similar in size and shape to ordinary, domestic boilers and like them can be wall hung or free standing. The only difference to a standard boiler is that they are able to generate electricity while they are heating water.

Currently domestic micro-CHP systems are powered by mains gas or LPG although in the future they may be system powered by oil or bio-fuels. Whilst gas and LPG are fossil fuels the technology is considered to be a 'low carbon technology' because it can be more efficient than just burning a fossil fuel for heat and getting electricity from the national grid.

Appendix 1 below sets out the Permitted Development Rights for external flues which may be required by Domestic CHP.

Landfill Gas and Anaerobic Digestors

Landfill gas

The hydrocarbon methane (CH_4) is a powerful greenhouse gas (about 20 times more potent carbon dioxide). Methane is produced naturally when bacteria decompose organic waste in the absence of oxygen (anaerobically) and as such it is often produced in significant quantities at landfill sites along with other gases. Although methane is odourless other gases, such as hydrogen sulphide, produce an unpleasant smell and this can impact on public health and amenity well as contribute to climate change. Landfill gas can be combusted at high temperature in a flare stack, where the energy is wasted, or it may be used, after "cleaning" as fuel in an engine used to generate electricity. Strictly speaking whilst landfill gas is not considered to constitute renewable energy, it is eligible for Renewable Obligation Certificates (ROCs) as its use as a fuel recovers some embodied energy from the waste and goes some way towards reducing the environmental impact of landfill sites.

There are a number of small historic landfill sites in the National Park which served the towns and villages of the area. They were fairly small in size and the waste was often burnt before being covered. Given these factors it is highly unlikely that these old tips have any potential as locations for generating electricity from landfill gas.

However Gwynedd Council currently owns and operates the active Ffridd Rasus landfill site located in the National Park near Harlech. At present the landfill gas generated at the tip is burnt in a flare stack. It is understood that an investigation of the potential for generating electricity on this site has been undertaken.

A 2.13MW gas engine has been installed at Gwynedd Council's Cilgwyn landfill site (outside the Park) and this has a ROC and has been supplying electricity to the Grid.

Anaerobic Digestors

Anaerobic Digestors make use of the natural process of anaerobic digestion of organic materials (animal wastes and/or vegetable matter) in a closed vessel to produce biogas (a mixture of carbon dioxide and methane) and digestate (a nitrogen-rich fertiliser). The biogas can be used directly in engines generate electricity, burned to produce heat, or can be cleaned and used in the same way as natural gas or as a vehicle fuel. The remaining digestate can be used as a fertiliser or soil conditioner provided it meets certain standards. (BSI PAS 110 covers all anaerobic digestion (AD) systems that accept source-segregated biowastes).

The technology can be used at a variety of scales, from small digestors on individual farm holdings to larger plant sourcing organic wastes from a wide area. One example of the latter is Gwynedd Council's plan to install AD plant and Combined Heat and Power (CHP) units at their Ffridd Isaf site (outside the National Park) this will have the capacity to accept a throughput of some 11,000 tonnes per annum of food waste wastes from the whole of Gwynedd.

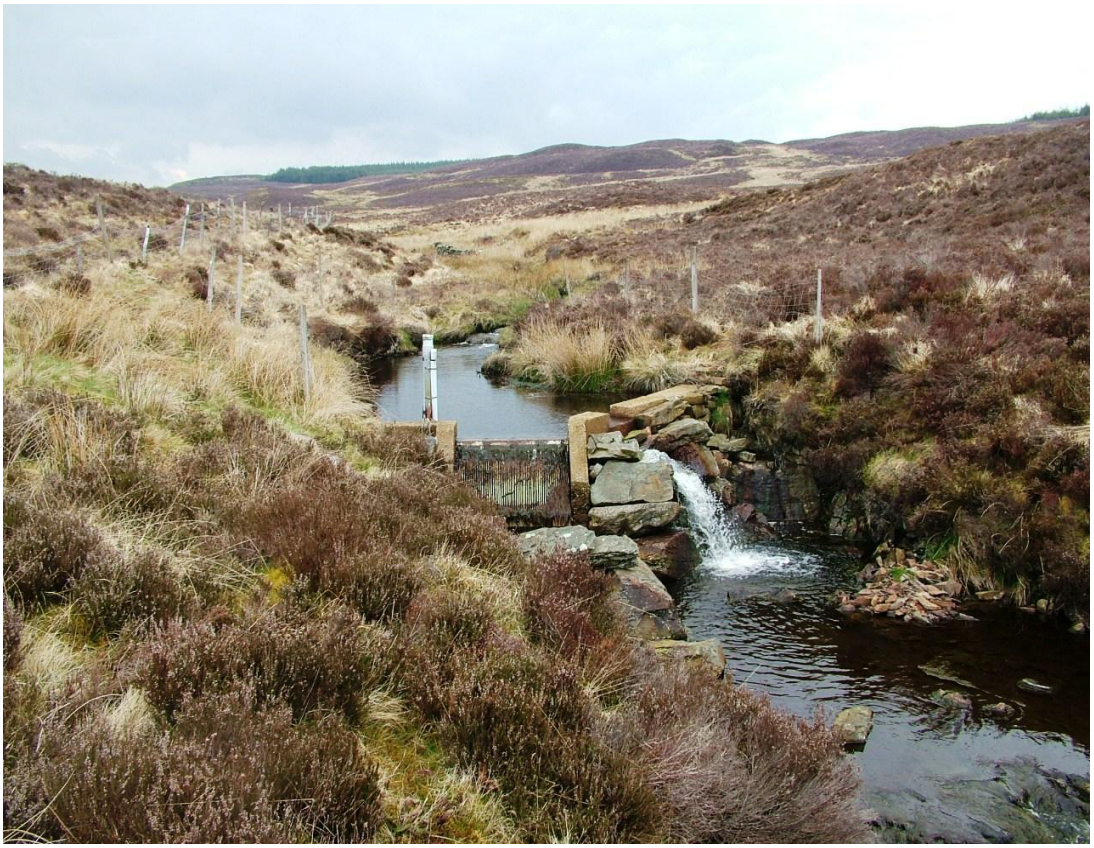
The plant will process 11,000 tonnes of food waste per year by means of anaerobic digestion which will generate 3,500 megawatt hours per year of renewable electricity for the national grid. This is enough to meet the annual demand of more than 700 homes. This will make a valuable contribution to the renewable energy needs of the region

It will also produce biofertiliser for use on local farmland. It will divert some of the food waste which currently goes to landfill, helping Gwynedd Council to meet its recycling targets and avoid substantial fines for failing to meet those targets.

Hydro

A hydro scheme may be described as either 'high head', where there is a significant height difference between the abstraction point and the turbine, or **'**low head' where the gradient isn't as steep but a larger quantity of water is required to generate the same amount of electricity

A typical high head hydro-scheme involves taking water from a river (run of river), or a purpose built impoundment dam, and diverting it through an intake along a pressurised pipe, or penstock, which can be buried or sometimes lain on the surface.



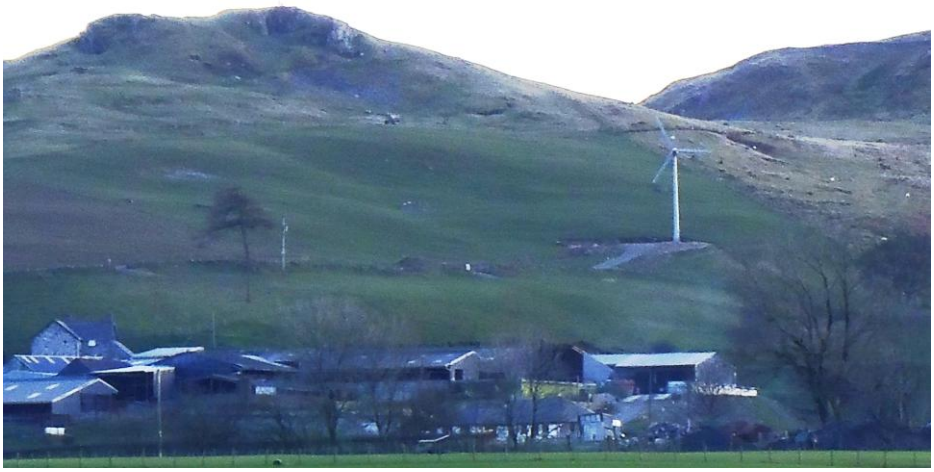
The high pressure water then runs through a turbine which is housed in a building, the powerhouse, along with a generator and the necessary control equipment. The exhaust water is then allowed to flow back to the river down a tail race.

This is the type of scheme which is most commonly found in Snowdonia. Micro hydro, i.e. very small-scale high head run of river schemes, can produce a worthwhile amount of electricity and it is these types of schemes which are likely to be appropriate to the smaller, steeper gradient rivers found in the National Park.

The scope for low head schemes in Snowdonia is limited. However, whilst some old watermills remain, they have become redundant or converted to other uses. Where the mill building remains but is unused, there may be potential to reuse the leat, either to take the water directly through a modern turbine in the refurbished mill or a new purpose built powerhouse.

Wind Turbines

A wind turbine is a device which converts the moving (kinetic) energy of the wind into mechanical energy which in turn can be used to generate electricity. Wind turbines are available in a range of vertical and horizontal axis types. The smallest turbines are used for applications such as battery charging or auxiliary power on sailing boats generating a few kilowatts; while large grid-connected turbines are available in a range of sizes.



APPENDIX 2

Renewable Energy Capacity Assessment – Summary of Available resource in the Snowdonia National Park

Category	Sub-Category	Potential Capacity (MWe) [Electricity]	Potential Capacity (MWt) [Heat]	Potential Generation (GWh) [Electricity]	Potential Generation (GWh) [Heat]
Wind (onshore)	Micro-wind	18.4	-	16.1	-
Biomass	Managed Woodland	4	8	31.55	63.11
Energy from Waste (EfW)	Energy Crops	5.66	11.33	44.65	89.31
	MSW and C&IW	0.11	0.35	0.88	1.53
Anaerobic Digestion (AD)	Animal Manure	0.19	0.29	1.5	1.3
	Poultry Litter	0.02	0.05	0.19	0.21
	Sewage Sludge	0.07	0.10	0.52	0.43
	Food Waste	0.17	0.26	1.38	1.15
Hydropower	Small-scale Hydropower	1.9	-	6.1	-
Microgeneration	Solar	16.7	16.7	14.6	14.6
	Heat Pumps	-	51	-	-
Total		**47.2**	**88.8**	**20.7**	**171.6**

Table 12. Summary of available resource.

APPENDIX 3

Permitted Development

Recent changes in the General Permitted Development Order have removed the requirement for planning permission for a range of microgeneration technologies for domestic and non-domestic properties.

Before commencing any work you should check whether the property in question is subject to an Article 4 Direction, or a condition on the original planning permission, which removes permitted development rights.

Different rules apply in case of Listed Buildings, Conservation Areas or World Heritage Sites as there are greater restrictions on the types of equipment that can be installed, particularly on the walls of buildings facing a highway. If you are proposing a wind turbine you should also check if you are within a within an Aviation Safeguarding Area.

The National Park Authority will be able to provide you with this advice

In most categories of microgeneration technologies listed below, and in particular for solar electricity (pv) and solar thermal panels, permitted development is conditional on minimising the effect on the external appearance of the house or flat and also on minimizing the effect on the local amenity of the area. It will be a requirement that the equipment must be removed if no longer needed for microgeneration.

Householders and developers should also check to see whether "Buildings Regulations" apply to the technology/ies in question, to this end they should contact their relevant Local Authority (Gwynedd Council or Conwy County Borough Council)

Domestic Renewable Energy Developments - Domestic Properties

Solar Panels
The fixing of solar panels to the roofs of domestic properties is deemed to be permitted development, provided they fulfill the following requirements:

- *Panels should not project above the ridgeline and should project no more than 20cm perpendicular from the surface of the roof or wall.*
- *On flat roofs the panels may not be installed within 1m of the external edge of the roof or protrude more than 1m above the plane of the roof;*

Free Standing PV and Solar Thermal Panels
A single free standing (stand-alone) PV and solar thermal panel is also permitted development provided:

- *It is located no closer than 5m to a highway and does not exceed 2m in height anywhere within 5m of the property boundary, or 4m in height elsewhere.*

- *The total surface area of the panels must not exceed 9m^2 and the array (including any housing) must not exceed 3m in any dimension.*

Heat Pumps

The installation of an air source heat pump (ASHP) on domestic premises is considered to be permitted development, provided the limits and conditions listed below are met.

These permitted development rights apply to the installation, alteration or replacement of an air source heat pump on a house or block of flats, or within the curtilage of a house or block of flats, including on a building within that curtilage. A block of flats must consist wholly of flats (e.g. should not also contain commercial premises).

Limits to be met:

- *Both ground and water source heat pumps anywhere within the boundary of your house or flat.*

- *Air source heat pumps are allowed providing that noise complies with the MCS Planning Standard 020 (www.microgenerationcertification.org),*

- *the compressor (including any housing) does not exceed 1m^3,*

- *any part of the ASHP is not installed within 3m of the boundary of the curtilage,*

- *and the ASHP is used solely for heating purposes.*

Domestic-scale CHP and Domestic Wood–fuelled Heating

Planning permission is not normally needed when installing a micro-combined heat and power system in a house if the work is all internal. If the installation requires a flue outside, however, it will normally be permitted development provided the following conditions are met.

However if the building is listed, or in a designated area, it is advisable to check with the National Park Authority before a flue is fitted. Consent is also likely to be needed for internal alterations

- *Flues on the rear or side elevation of the building are allowed to a maximum of 1m above the highest part of the roof.*

- *In a conservation area or in a World Heritage Site the flue should not be fitted on the principal or side elevation if it would be visible from a highway.*

Planning permission would not be required for the installation of a domestic woodfuel system where the flue would utilise an existing chimney. If the installation requires an external flue, however, it will normally be permitted development provided certain conditions are met

- *Flues on the rear or side elevation of the building are allowed to a maximum of 1m above the highest part of the roof.*

- *In a conservation area or in a World Heritage Site the flue should not be fitted on the principal or side elevation if it would be visible from a highway.*

If the project also requires an outside building to store fuel or related equipment the same rules apply to that building as for other extensions and garden outbuildings

Wind Turbines
The development of any stand-alone wind turbine must comply with MCS Planning Standards 020.

- *Only the first installation of stand-alone turbine would be permitted development, and only if there is no existing air source heat pump on a building or within the curtilage of that property. Additional wind turbines or air source heat pumps at the same property requires an application for planning permission.*

- *the highest part of the stand alone wind turbine (including blades) should not exceed 11.1m in height and the lowest part of the turbine blades must be higher than 5m;*

- *no part of the stand alone wind turbine (including blades but excluding guy lines) can be located closer than its height plus 10% from the boundary of the curtilage of the dwelling*
- *the swept area of the blades of the stand alone wind turbine must not exceed 9.6m^2;*
- *a stand-alone wind turbine may not be installed on safeguarded land or which is within an area of outstanding natural beauty, a World Heritage Site or a site of special scientific interest or within the curtilage of a listed building or on a site designated as a scheduled monument*
- *within a conservation area, the stand alone wind turbine must not be visible from a highway which bounds the curtilage of the dwellinghouse.*

In all other cases wind turbines will require planning permission.

Non-Domestic Renewable Energy Developments- Permitted Development[7]

Solar panels
The fixing of solar panels to the roofs of non-domestic properties is deemed to be permitted development, provided they fulfill the following requirements:

- *Panels should not project above the ridgeline and should project no more than 20cm perpendicular from the surface of the roof or wall.*

- *The panels do not increase the height of the building (excl chimneys or vent housings) more than 1m*

- *The panels are not installed within 1m of the edge of the roof.*

[7] The installation, alteration or replacement of solar PV or solar thermal equipment on a building other than a dwellinghouse or a block of flats.

On a building on article 1(5)[8] land or on land within a World Heritage Site there are no permitted development rights for PV or solar thermal equipment to be installed on a wall or roof slope which fronts a highway;

There are no permitted development rights if the PV or solar thermal equipment would be installed on a wall or roof slope which fronts a highway; on a building in the curtilage of a listed building; or installed on a site designated as a scheduled monument

Free Standing PV and Solar Thermal Panels
A single free standing (stand-alone) PV and solar thermal panel is also permitted development provided:

- *Less than 4m in height.*
- *More than 5m from the boundary of the curtilage.*
- *The panels are not installed on the site of a scheduled monument, on or within the curtilage of a listed building, or fronting the highway within a building conservation area*.
- *It is located no closer than 5m to a highway and does not exceed 2m in height anywhere within 5m of the property boundary, or 4m in height elsewhere.*
- *The total surface area of the panels must not exceed 9m^2 and the array (including any housing) must not exceed 3m in any dimension.*

On article 1(5) land or on land within a World Heritage Site there are no permitted development rights if the PV or solar thermal equipment would be installed so that it would be visible a highway.

There are no permitted development rights if the panels would be installed within the curtilage of a listed building; or installed on a site designated as a scheduled monument.

Ground Source Heat Pump
Ground Source Heat Pumps

- *Excavation less than 0.5ha*
- *Limited to one installation*

There are no permitted development rights if the ground source heat pump would be installed within the curtilage of a listed building; or installed on a site designated as a scheduled monument.

Water Source Heat Pump
Water Source Heat Pumps are permitted within the curtilage of a building if:

[8] 'Article 1(5) land' - this is land within a National Park, the Broads, an area of outstanding natural beauty, an area designated as a conservation area, and land within World Heritage Sites.

- *The total area covered by the water source heat pump is less than 0.5ha*

Flue for a Biomass Boiler, Flue for a Combined Heat & Power Unit (CHP) if:

- *Less than 45kW thermal capacity.*

- *Less than the height of a replaced flue or less than 1m above the height of the building, whichever is highest.*

On a building on article 1(5) land or on land within a World Heritage Site there are no permitted development rights for a flue installed on a wall or roof slope which fronts a highway;

There are no permitted development rights for flues installed on the site of a scheduled monument, on or within the curtilage of a listed building, or fronting the highway within a building conservation area.

APPENDIX 4

Useful Websites

http://www.energysavingtrust.org.uk/wales/Generate-your-own-energy/About-microgeneration

http://www.planningportal.gov.uk/planning/greenerhomes/generation/

http://www.decc.gov.uk/en/content/cms/meeting_energy/microgen/strategy/strategy.aspx

http://www.decc.gov.uk/en/content/cms/meeting_energy/microgen/microgen.aspx

http://www.legislation.gov.uk/wsi/2012/1346/article/2/made

www.microgenerationcertification.org/

www.carbontrust.co.uk

www.energysavingtrust.org.uk/Generating-energy/Getting-money-back/Feed-In-Tariffs-scheme-FITs

http://naturalresourceswales.gov.uk/apply-buy-report/apply-buy-grid/water/abstrations-impoundment/hydropower-scheme/?lang=en

The Welsh Government has published a range of documents under the broad heading of *Generating Your Own Renewable Energy a Planning Guide*

http://wales.gov.uk/topics/planning/policy/guidanceandleaflets/generaterenewable/?lang=en