# Cornwall Renewable Energy Planning Advice

March 2016

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CORNWALL COUNCIL

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# 1 Introduction

The UK is committed to producing at least 20% of energy supply from renewable and low carbon sources by 2020, with a further legally binding target to cut greenhouse gas emissions by 80% by 2050. Analysis at the national level suggests that this is challenging, but achievable. Throughout this transition, planning will continue to have a key role to play in mitigating climate change and enabling a low carbon economy while ensuring that the local environment is also protected.

Cornwall benefits from a range of significant renewable energy resources, including onshore wind, solar, deep geothermal, biomass and marine energy potential. The role of this Supplementary Planning Document (SPD) is to support the draft Local Plan in providing a comprehensive planning framework to enable those energy sources to be exploited in a sustainable and appropriate manner by balancing such proposals with the conservation of our natural environment.

While the remit of this SPD only extends as far as the mean low water mark, it is important to recognise that Cornwall's energy resources extend into the marine environment. The Cornwall and Isles of Scilly Local Enterprise Partnership (LEP) places 'green and marine' growth at the heart of its strategy for growth.

Cornwall is an area of many contrasts and varied landscapes with remote rural, coastal and environmentally sensitive areas, interspersed with villages and historic market towns. 30% of Cornwall is designated as Areas of Outstanding Natural Beauty. Cornwall also benefits from numerous European habitat site designations and historic assets, including Listed Buildings, Conservation Areas, Scheduled Ancient Monuments and the World Heritage Site, which has been designated in recognition of Cornwall's Mining Heritage. The SPD provides guidance to help ensure that renewable energy can be deployed in Cornwall without harming these important assets.

Cornwall is characterised by a dispersed settlement pattern. Our communities are equally diverse, having developed strong local identities and traditions - many of which continue today. Community ownership of renewable energy offers a significant opportunity for local communities in tackling many of the challenges which face them today and in the future. By reversing some of the trends in Cornwall's energy spend community energy can help to retain more money within the locality, reduce fuel poverty, and support local economic activity. The opportunities for communities to take a share of the benefits from renewable energy are increasing. The SPD provides clarity for communities who wish to bring forward such proposals.

Once adopted, the SPD will become part of the local planning framework for Cornwall. As such it will be a material consideration in the determination of renewable energy planning applications in the area. Through the provision of detailed guidance it supports the positive implementation of the policies in the Cornwall draft Local Plan.

The SPD includes general guidance relating to all renewable energy technologies and specific siting and design guidance relating to the following technologies:



# 2 Policy context

## 2.1 National Planning Policy Framework (NPPF)

The NPPF sets the overarching context for the development of Local Planning policy and guidance. In relation to renewable and low carbon energy, the NPPF states that Local Planning Authorities should have a positive strategy to help increase the use and supply. It says that local planning policies should be designed to maximise deployment, while ensuring that adverse impacts are addressed satisfactorily. It suggests identifying suitable areas for renewable and low carbon energy and highlights the responsibility of all communities to contribute to energy generation. Finally, it contains support for community-led initiatives for renewable and low carbon energy.

## 2.2 National Planning Practice Guide (NPPG)

The NPPG reinforces the role that planning has in the delivery of new renewable and low carbon energy infrastructure in locations, but states that renewable energy developments should be acceptable for their proposed location. In relation to community energy it explains that such initiatives *'are likely to play an increasingly important role and should be encouraged as a way of providing positive local benefit from renewable energy development.'*

## 2.3 Overarching National Policy Statement for Energy (EN-1)

EN-1 highlights the potential for renewable energy to improve security of supply by reducing reliance on tradition fossil fuel supplies. It recognises the urgency in relation to increasing renewable energy generation if the UK climate change commitments are to be met. The Policy Statement also includes a list of generic impacts which must be considered by energy development proposals.

## 2.4 Overarching National Policy Statement for Renewable Energy (EN-3)

In addition to the policies set out in EN-1, EN-3 is concerned with impacts and other matters which are specific to biomass and energy from waste, onshore and offshore wind energy. It includes guidance on those factors which influence site selection by developers for renewable energy generating stations.

## 2.5 Cornwall draft Local Plan

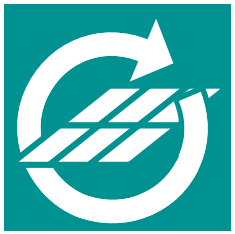
The Cornwall draft Local Plan is currently subject to consultation on focussed changes prior to its submission to the Secretary of State for formal inspection. Following the inspection stage, it is anticipated that the draft Local Plan will be adopted by the Council and become the development plan document for Cornwall.

The draft Cornwall draft Local Plan must be read as a whole with all the policies being relevant to each development proposal, regardless of its nature. However, the Plan contains a specific renewable energy policy which seeks to increase the use and production of renewable and low carbon energy. The policy does this by supporting development which maximises the use of the available resource and makes use of waste heat. The policy also gives particular support to community schemes, co-location of energy production with consumers and proposals which facilitate renewable and low carbon energy innovation.

The policy also contains a range of safeguards which seek to protect the local environment, in particular the landscape, and avoid unacceptable impacts from shadow flicker, overshadowing, overbearing and on air traffic, radar and air navigation; both directly and cumulatively.

This **Supplementary Planning Document** has been developed to provide guidance to assist in the implementation of these policies.

**Neighbourhood Development Plans** are also being prepared by communities across Cornwall. These plans carry statutory development plan status and must be in general conformity with the strategic policies of the development plan in force. Cornwall's Neighbourhood Plans must be considered alongside the draft Local Plan (once adopted) and this Supplementary Planning Document when proposals for renewable energy are being developed.



# 3 General Guidance – relevant to all technologies

The following section provides guidance which is relevant to all renewable energy development, regardless of the technology and scale.

## 3.1 Community Energy

There is the potential to develop a local energy economy in Cornwall which can deliver significant long term benefits to the community, including reduced energy bills, increased energy sustainability and security, and a shift of ownership to local people. The Council believes that this model of renewable energy deployment should receive particular support when considering the merits of renewable energy development at the planning decision stage.

This approach is supported by the Government, which published the first Community Energy Strategy in 2014. The Strategy set out the role communities can play in helping to meet the UK's energy and climate change challenges. The Strategy has led to the development of a shared ownership framework for the onshore renewable energy industry which introduced the commitment to offer opportunities for communities to invest in commercial projects.

The Cornwall draft Local Plan recognises the importance of enabling communities and residents to take a greater share in the benefits of our transition to a low carbon energy system and states that *'Particular support will be given to renewable and low carbon energy generation developments that are led by, or meet the needs of local communities'.* Such development would normally;

- be conceived and/or promoted within the community within which the development will be undertaken; and
- provide long term and inclusive socio-economic and/or environmental benefits which are accessible to all members of the community.

Developments which are 'led by' or 'meet the needs' of local communities are defined by the outcomes achieved for the community, rather than number of people who support or oppose the scheme, and it should be recognised that 100% endorsement within the locality is unlikely.

The model which the Council believes most closely meets the definition of 'led by' or 'meet the needs' of local communities is full community ownership and control of a renewable energy project. This means the community, through an appropriately constituted community energy enterprise, has ownership and control of the revenue, any surplus income and any energy generated by the development (which could include being used to provide cheaper energy within the community through locally discounted tariffs). This model provides the greatest scope for long term accessible and inclusive benefits for the local community and will therefore receive the greatest level of support.

Other models exist where ownership can be shared between communities and another party (usually a commercial developer). Under certain circumstances these models can meet the needs of local communities. Examples of shared ownership models include:

- Split ownership – the community and a developer independently own and control different parts of the same development.
- Joint venture – the community partners with a developer to develop a project together.
- Equity shares – the community invests in a project through a share offer.
- Post-construction community buy-out - the community is not directly involved in the development stages, but agrees to purchase it post-legal completion or once it has been built.

All developers seeking to deploy renewable energy generation in Cornwall are encouraged to actively seek community energy partners to deliver development which is 'led by' or 'meets the needs' of communities

**How do renewable energy development proposals demonstrate that they are 'led by' or 'meet the needs' of local communities?** In order for renewable energy development proposals to be 'led by' or 'meet the needs' of local communities they must be able to demonstrate compliance with the following:

### 3.1.1 'Led by' local communities

The proposed development has community involvement at the heart of the project's development process. Examples include:

- Proposals which are conceived in partnership between a community organisation and a developer (commercial or non-profit), or another party;
- Proposals which are supported, or promoted by a community at the planning or pre-planning stage.

### 3.1.2 'Meets the needs' of local communities

The proposal is capable of producing social, economic or environmental benefits which are inclusive and accessible to all within the local community over the lifetime of the project. Examples of such benefits include:

- Community ownership and control over renewable energy assets (and their energy and financial outputs);
- The generation of surpluses which can be spent by the local community;
- Cheaper and more secure local energy supply (which could be achieved through measures such as deployment of smart energy management technologies, energy storage and through community controlled energy supply);
- Benefits to the local environment which are identified and desired by the local community.

### 3.1.3 Securing the community outcome

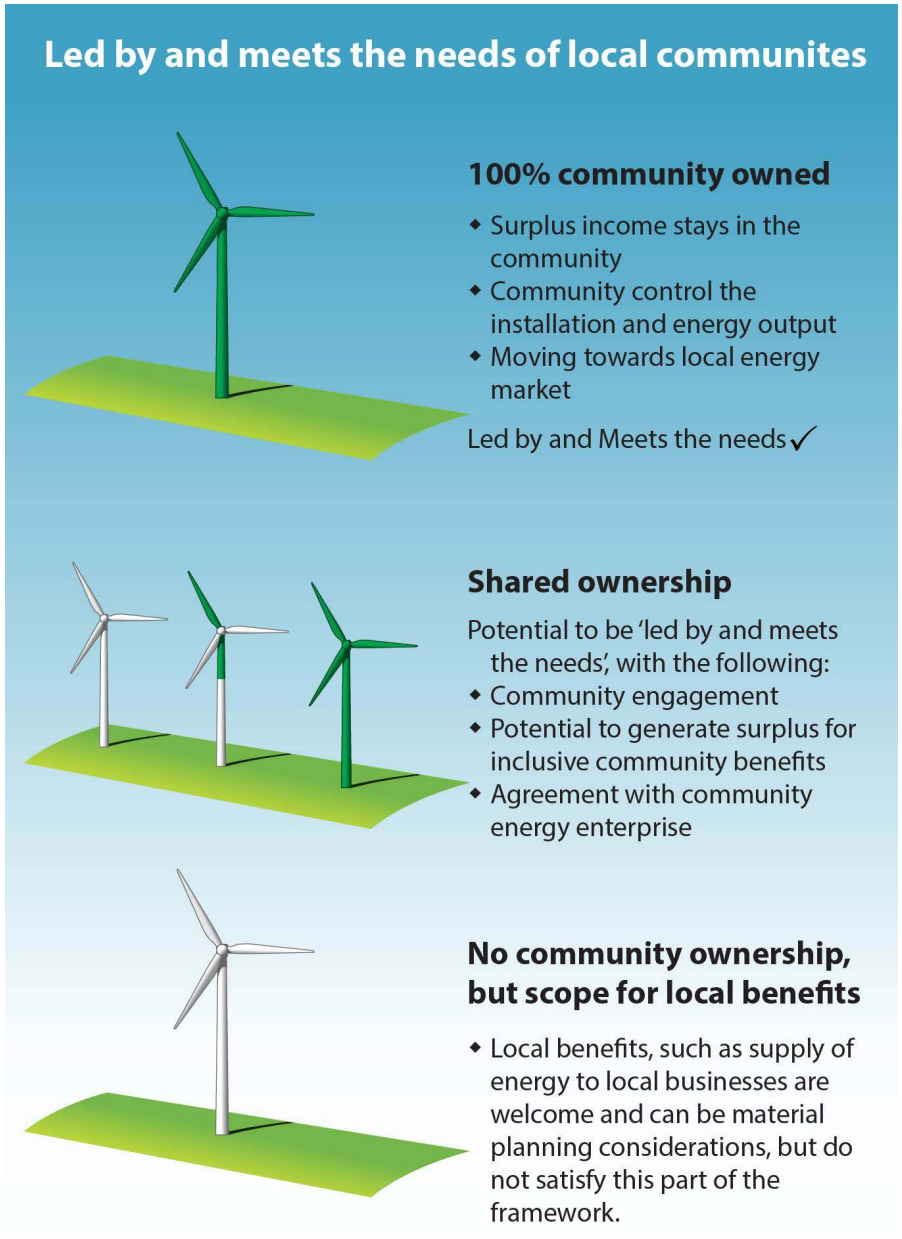
In order for any of the above to be considered in the planning process they need to be secured through planning consenting process. Where a project has not been brought forward by, or developed in partnership with, a formally constituted community energy enterprise, the developer will need to enter into a written agreement with a community energy enterprise to deliver the project in accordance with the arrangements agreed between the two parties. This agreement should include the broad terms under which any transaction will take place following determination of the planning application and will need to be produced at the planning stage to demonstrate that the community ownership benefits can be secured.

### 3.1.4 The community energy enterprise

The legal structure of the community energy enterprise and ownership structure of the project are critical to enabling the benefits to be secured for the community. The ownership arrangements need to demonstrate the intention that the benefits of all, or part of the project will flow to the community (in an inclusive and accessible way) for the lifetime of the project. This requires three components:

1. The project is owned, in full or in part, by a Community Benefit Society, or similarly constituted organisation with the primary function of benefitting the community.
2. The Community Benefit Society (or similarly constituted organisation) will have open membership and a set of Rules which set out that it will operate to benefit the community.
3. The Community Benefit Society (or similarly constituted organisation) should put in place a suitable mechanism (for example, an asset lock or dissolution clause), which prohibits the distribution of residual assets to members, or their transfer to another organisation other than a similarly constituted community organisation.

The graphic below visually illustrates how the range of community ownership models contribute towards both 'meeting the needs' and being 'led by' the local community.




**Community Benefit** is the term generally used to refer to the voluntary provision of a payment (financial, or in-kind) to the host community. In order for such payments to be considered as part of the planning decision they must resolve a particular issue with the development; for example, by paying for offsite infrastructure to help manage the additional impact created by the proposed development. Specifically, these payments must be (i) directly related to the proposal; (ii) necessary to make the proposal acceptable in planning terms; and (iii) fairly and reasonably related in scale and kind to the proposal; if they are to be considered as part of the planning application.

Typically, community benefits do not meet these criteria and are therefore not part of the planning decision-making process.

## 3.2 Optimising renewable energy

The draft Local Plan seeks to minimise the impact of renewable energy by maximising its efficiency. Specifically, it states that renewable energy developments will be supported where they *'maximise the use of the available resource'.* This means that the Council will encourage renewable energy installations which make the optimum use of the available resource in a given location where it is acceptable to do so, taking into account the provisions of the draft Local Plan (including, for example, considerations such as landscape, heritage and residential amenity impacts).

The following are examples of where optimisation opportunities might occur:

- Where electricity generation produces heat as a by-product optimisation might include the identification and connection of a suitable user for this heat.
- Repowering of existing installations to achieve greater generation capacity where the site is technically and environmentally capable of accepting the repowered scheme. In some circumstances the site may be capable of accommodating renewable energy development of a different size, scale, design or type.
- Consolidation of multiple renewable energy developments into fewer developments or a single development capable of providing greater overall generation capacity.

De-rating of installations (operating them at less than their maximum generation potential) for a significant periods of time will not be considered an optimal use of the available resource. Where development proposals are required to be operated on de-rated settings, for reasons other than those related directly to the mitigation of material planning impacts (as agreed by the planning authority), compelling evidence should be submitted to justify the wider benefits.

## 3.3 Co-location

The Cornwall draft Local Plan gives particular support to renewable and low carbon energy generation developments that *'create opportunities for co-location of energy producers with energy users, in particular heat, and facilitate renewable and low carbon energy innovation'.*

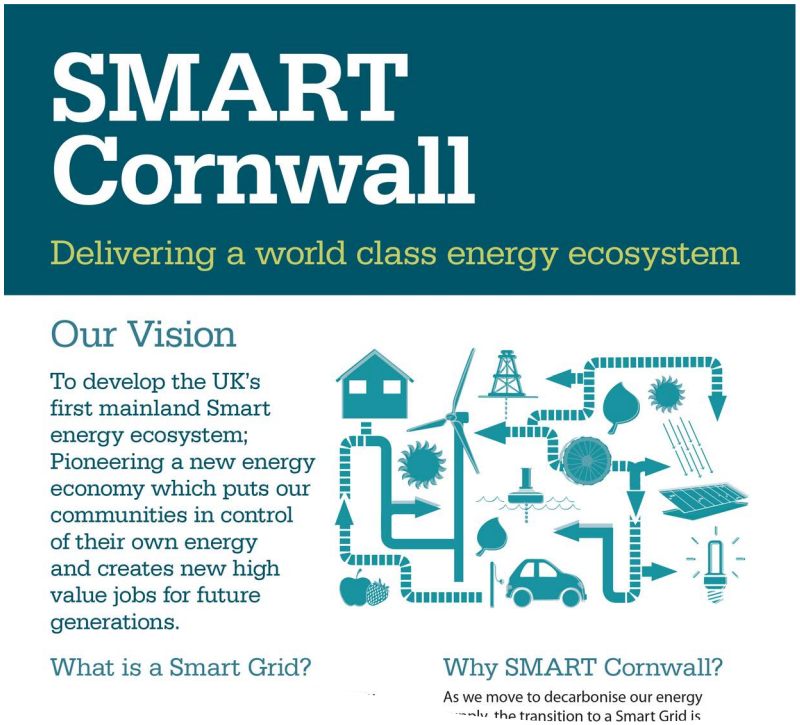
In the case of heat generation the aim is to maximise the use of locally generated heat (primary or secondary) within the immediate locality. This can include:

- Locating waste heat producers (e.g. industrial processes) in close proximity to potential heat consumers and / or undertaking steps to enable distribution of that heat.
- Locating heat consumers in close proximity to primary or significant secondary heat sources and / or taking steps to enable distribution and use of that heat.
- Locating primary heat energy generation close to heat consumers and /or taking steps to enable distribution and use of that heat.

Examples where co-location between heat generation and consumption is likely to be encouraged include geothermal energy and warm bodies of water, such as flooded mine workings. More guidance on colocation of geothermal energy development is contained within the Geothermal chapter.

It is easier to transport electricity over longer distances than heat. However, with the right infrastructure and mechanisms in place, co-location of electricity generation and demand has the potential to reduce cost to the consumer and pressure on grid infrastructure. In the case of electricity generation co-location can therefore include:

- Locating generation in close proximity to businesses, homes and facilities and providing direct supply of electricity to those buildings.
- Designing developments to enable direct supply to local businesses, homes and facilities.
- Development which delivers smart energy management infrastructure which enables an improved relationship between local supply and demand.
- Development which facilitates the realisation of a Local Energy Market[1] in Cornwall.




## 3.4 Grid connection

In most cases the ability and capacity of a proposed wind energy development to connect to the electricity distribution grid will not be a planning consideration.

1 A Local Energy Market is a mechanism which, amongst other things, enables local energy generators to supply directly to local energy users.

However, given the importance of exporting electricity to the grid in many cases, it is recommended that developers conduct initial discussions with the Distribution Network Operator (DNO) at an early stage in the development of the project. These discussions should seek to identify routes for grid connection infrastructure which avoid areas of high landscape, ecological or archaeological sensitivity.

This will not be an issue in circumstances where it is not proposed to connect the wind turbine to the electricity distribution grid. Examples of this include using the electricity generated directly, or using storage solutions, such as batteries.

# 4 Onshore Wind

## 4.1 Context and technology overview

The UK's first commercial wind farm was built in Cornwall in 1991 near Delabole. Since then, onshore wind energy has established itself as a mature, clean and productive technology. Today's wind turbines are manufactured in a wide range of vertical and horizontal axis types. The most common types installed in Cornwall are three bladed horizontal axis constructions.

A typical wind turbine consists of the following components:

- **The Tower** – usually cylindrical, made of steel, painted light grey.
- **Rotor Blades** - made of fibreglass-reinforced polyester or wood-epoxy. The longer the blades, the greater the energy output. They rotate at 10-30 revolutions per minute at constant speed, although an increasing number of machines operate at a variable speed. The blades can be rotated to change the pitch, angle and modify power output.
- **The Yaw Mechanism** – the mechanism which turns the turbine to face the wind.
- **Wind Speed & Direction Monitor** - sensors are used to monitor wind direction and the tower head is turned to line up with the wind.
- **The Gear Box** – some wind turbines have gearboxes, although there are increasing numbers with direct drives.

In June 2015 the Secretary of State for Communities and Local Government issued a Written Ministerial Statement concerning planning applications for wind energy development involving one or more wind turbines. It stated that local planning authorities should only be granted planning permission where: the development site is in an area identified as suitable for wind energy development in a Local or Neighbourhood Plan; and following consultation, it can be demonstrated that the planning impacts identified by affected local communities have been fully addressed and therefore the proposal has their backing.

The Cornwall draft Local Plan does not identify any sites for the development of wind turbines and the Council does not envisage that sites will be allocated in a Site Allocations Development Plan Document. The Council therefore anticipates that, should applications for wind turbines come forward this will be as a result of a Neighbourhood Plan allocation, or as an application for repower of sites which benefit from extant planning consent.

The guidance set out in this chapter is intended to assist communities in bringing forward site allocations and support the implementation of the relevant policies within the draft Local Plan.

### 4.1.1 The Resource

Wind Resource is the fundamental requirement in order for a wind turbine to operate effectively. An assessment of the wind resource is an important part on the initial feasibility process for both site allocations and planning applications.

Most wind turbines require an annual average wind speed of at least 6 metres per second to be considered operationally viable. Average wind speed data is available from a number of sources.

The wind speed at a particular site may be affected by topography, screening (by tall buildings or trees), or even turbidity from existing wind turbines in the area. Therefore in some instances it may be prudent to measure the average wind speed at the site over a 12 month period.

If an anemometer is needed to monitor wind speed at a prospective site a temporary planning consent will be required.

The met office provides a 'Virtual Met Mast' wind data service for wind turbine developers which can be obtained via the following weblink: Virtual Met Mast™

## 4.2 Landscape & visual impact

Cornwall's landscape in a significant asset which requires careful stewardship. Approximately 30% is designated as Area of Outstanding

Natural Beauty, which benefits from the highest status of protection in relation to landscape and scenic beauty. The draft Local Plan states that 'Development should be of an appropriate scale, mass and design which recognises and respects landscape character of both designated & un-designated landscapes'.

Wind energy developments are usually temporary and removable. Where applications are approved for a temporary wind energy development, planning consent will be limited by condition to that temporary period. The impact of a wind energy development on the landscape can be linked to the lifetime of the project and the extent to which the development is reversible at the end of its consented operational lifetime.

### 4.2.1 Finding a site

Careful site selection as well as the choice of turbine type and layout is the most effective way to minimise landscape and visual impacts.

Annex 1 provides detailed guidance based on an assessment of the sensitivity of the landscape to wind turbines. This guidance is designed to achieve the following broad strategy and should be consulted at an early stage to inform site selection:

- Maintain diversity of landscapes.
- Retain areas of undeveloped landscape especially the coast.
- Conserve and enhance the natural beauty of AONBs.
- Allow breaks of undeveloped landscapes when travelling through the landscape.
- Minimise impact by maximising efficiency.

As there are local variations in landscape character and sensitivity within a Landscape Character Area (LCA), a site-specific analysis should be undertaken to identify specific landscape and visual issues. It is important to consider any potential impact on landscape characteristics, special qualities of landscape designations and potential impact on key views –a zone of theoretical visibility (ZTV) may help this assessment.

The choice of site should respect the specific sensitivity of the landscape in the vicinity and the LCA concerned; and should accord with the guidance set out for that LCA (see Annex 1, Appendix 1). It is also important to consider any effect upon adjacent LCAs and the potential cumulative effects at this stage. In addition to Annex 1, Communities preparing to identify sites for wind turbine development and developers preparing to deliver those sites should consider the following guidance as part of the site identification and planning application preparation processes.

***Landform and topography***

- The most suitable sites are likely to be on large scale smooth, convex or flat landforms rather than dramatic rugged landforms or distinct landform features (including prominent headlands and cliffs) where this does not compromise other landscape sensitivities.
- Select sites in simple, regular landscapes with extensive areas of consistent ground cover, in preference to landscapes with more complex or irregular land cover patterns, smaller field sizes and landscapes with frequent human scale features.
- Avoid sites on important undeveloped or distinctive skylines, or skylines with important cultural or historic landmark features (including skylines of elevated coastlines and coastal headlands).
- Ensure sites do not span across marked changes in character on the ground, such as changes in topography (this may be less important where changes in character are less readable on the ground).

***Views and screening***

- Minimise views in which only the blade tips are visible (which can be distracting).
- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes, public rights of way and settlements.
- Consider sites where areas of existing woodland could filter views of wind turbines and screen the ground-level features of wind energy developments;

***Historic landscape***

- The siting of turbines should not dominate, or prevent the understanding and appreciation of, historic landmarks features such as hilltop monuments, engine houses or church towers.

***Previously used land***

- Consider locations associated with transport corridors and existing development, as well as reclaimed, industrial and man-made landscapes, where other landscape sensitivities are not compromised.

***Site access***

- Avoid sites which give rise to the need to introduce tracks into areas of open moorland or coastal rough ground.
- Consider the potential impact of transporting turbines to site, and the possible limitations presented by winding narrow lanes bounded by high Cornish hedges and enclosed by tree tunnels.

***Key landscape features and designations***

- Wind turbines should be set back from the coastal edge and its immediate hinterland, so that they do not detract from the relative remoteness or undeveloped character of Cornwall's coastline.
- Avoid the edge of hills and plateaux to minimise impacts on views from the valleys, estuaries, rias and coast.
- Avoid areas where ground level disturbance will affect landscapes which are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site on the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site on the special qualities of Cornwall's Areas of Great Landscape Value (AGLVs).

***Residential impact***

- While there is no provision within the planning system which gives an individual the right to a particular view, the impact on the amenity of residential dwellings must be considered. When identifying sites for wind turbine development, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

### 4.2.2 Designing the scheme

To achieve the optimum layout and design for a wind turbine development, the design process should consider a range of layouts and compare their relative impacts. The scale and number of turbines is particularly critical in the most sensitive areas.

The layout and design of a wind energy development should be informed by a Landscape and Visual Assessment. The detail of this assessment will depend on the scale of the proposed development and whether or not the Environmental Impact Assessment (EIA) Regulations apply.

The following guidance should be considered when designing the scheme:

***Layout***

- Turbines should read as a coherent group in all the main views – aim for a balanced composition.
- Avoid siting turbines so only the blade tips are visible which can be distracting
- Avoid 'stacking' of turbines when seen from one direction (such as is experienced when looking along a row).
- When planning clusters, avoid siting turbines which are remote from the rest of the group – maintain a clear and balanced cluster.
- Locate turbines on the most level part of a site, or following contours, to avoid a confusing variation of turbine heights.

***Scale***

- Ensure heights and cluster size is in proportion with, and does not overwhelm, the scale of hills, ridges, woodlands and fields.
- Ensure wind turbines respect the hierarchy of elements in the landscape and do not compete, or create clutter when seen together, with other man-made landscape elements such as pylons.
- In urban or industrial contexts, developments should respond to the scale of the built form and sit comfortably alongside large buildings or structures, providing a balanced composition.

***Turbine design***

- Ensure that the proportion of rotor diameter to tower height is balanced - short blades on a tall tower or long blades on a short tower may look unbalanced. Aim for a ratio of approximately 1:1 for tower height: blade diameter.
- A simple pale grey colour will be most suitable for larger turbines (to reduce contrast with the sky and match existing turbines in Cornwall).

However, in some cases darker colours may be suitable for very small turbines to help them blend into their setting.

- All turbines on a specific site should rotate in the same direction and at the same rotation speed.
- The speed of blade rotations should be kept as low as possible (particularly on smaller turbines) to reduce visual impact.
- Avoid the use of coloured advertising banners on turbines, particularly in rural areas.

***Design of ancillary elements***

- The materials for ancillary buildings should be sourced locally to reflect the local landscape character.
- Where possible, house transformers within the turbine to reduce their visual impact.
- Wherever practicable, bury on-site cables underground (without damage to existing Cornish hedges or archaeology) to minimise their impact on landscape character and visual amenity.
- Substations and control buildings should be sited to avoid high or exposed locations and screened with existing and locally occurring vegetation.

***Land management and landscaping***

- Aim for continuation of the existing land use underneath the turbines so that the landscape continues to flow around the turbines.
- Reflect the local landscape character in the species and layout of new planting by selecting suitable native species.
- Limit the use of bunding to where its appearance would not be contrary to the existing landscape character.
- Consider providing enhanced management of landscape features.
- Encourage traditional farmland management, including retaining small fields and hedgerows, allowing elm and other hedge trees to regenerate or, where appropriate, planting native or locally naturalised tree species on hedges to restore landscape character following the impacts of elm disease.
- Ensure existing trees and Cornish hedges are protected during the erection of fencing and lighting.

### 4.2.3 Cumulative Impact

When siting a wind energy development, it is important to consider how the scheme fits with other operational and consented schemes to minimise cumulative impacts. Annex 2 provides detailed guidance on assessing cumulative impact, including advice on how the results should be applied to each LCA. Developers should consider this guidance in full as part of the process of preparing their planning application. In addition to this guidance, the following provides some generic advice to be considered when identifying a site and refining the design:

- If wind energy development already exists in a particular LCA, or a particular part of a LCA, wind energy proposals should continue this pattern of development (e.g., on hill tops, or associated with buildings), as long as the existing development is considered appropriate to the landscape character.
- In designing new development to achieve continuity of design with existing development within a LCA, consideration should be given to the relationship between the height, design, proportions and rotation speed of the proposed and existing developments.
- Ensure multiple developments do not obscure distinctive landforms and are in scale with ridges and hills.

- Ensure the proposed development and existing or consented developments do not compete with, or create clutter when seen together with other man made landscape elements such as pylons.
- As multiple energy developments are built they may 'compete' with the landscape's original foci – aim to maintain a hierarchy of focal points so that the original foci can still be appreciated in the landscape.
- Individual developments should generally appear visually separate unless specifically designed to create the appearance of a single combined wind farm.

### 4.2.4 Mitigation

When preparing an application for wind turbine development any required mitigation proposals should be included, explained and referenced on a Landscape Mitigation Plan, which should also explain how they will be implemented. The plan should also include a description of the main reasons for site selection and any alternatives in site design or layout considered.

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## 4.3 Ecology

Wind energy developments have the potential to impact on ecology and biodiversity. As part of the site identification process an assessment should be carried out to identify any potential impacts. Ecological survey findings can also be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species the site identification and planning application preparation processes should consider the following guidance:

- Avoid locating turbines in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites. This is particularly important for sites which are designated for species which are vulnerable to wind energy developments, such as birds and bats.
- Ecological surveys should be undertaken before a planning application can be determined and may also be required to help establish whether or not a site is suitable for identification within a Neighbourhood Plan. It should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application. The chart below outlines the seasons when particular surveys should and should not be undertaken.
- Natural England, the Royal Society for the Protection of Birds and The Bat Conservation Trust provide guidance on ecological surveys as well as mitigation and enhancement for protected species.
- Development proposals should consider opportunities for ecological enhancement. For example, retained habitats can be extended and enhanced and habitats lost through the development can be enhanced or extended off site as an offsetting measure.
- The ecological constraints and opportunities of the proposal should be set out clearly within an Ecological Constraints and Opportunities Plan as advised in the British Standard BS42020 (and any subsequent amendments to that Standard).
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. Factors to be considered can include surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site, so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).

**4.3.1**


The survey timings are provided as a guide only and may vary depending on the specific project requirements.

## Birds

Wind energy developments have the potential to impact on birds, with some species being particularly vulnerable or sensitive to wind developments. It should be remembered that ground nesting birds also have the potential to be impacted on, especially during the construction phase when access to the site will be needed. The Royal Society for the Protection of Birds holds useful information on birds which are sensitive to wind energy developments. The site identification and plan preparation process should therefore consider any likely impact on birds and undertake surveys if required.

- Survey work should take account of possible bird presence throughout the year (i.e. birds may be breeding, wintering, or flying through the site on passage in spring and autumn). Nocturnal as well as diurnal surveys may be required.
- Survey work over more than one season or year may be required if significant populations of sensitive species are found.

*Turbine at Delabole*

- Consultation with the relevant nature conservation organisations can help by providing desk study data, shaping survey requirements and assisting with mitigation and enhancement requirements. Where planning applications are being prepared consultation with the Council (as part of the Council's pre-application process) can also assist.

### 4.3.2 Bats

Wind energy has the potential to impact on bats. It is therefore important to assess local bat populations and their use of the proposed site for foraging and migrating.

The siting of the turbine/s is the key to avoiding impact on bats, for example by distancing the turbine from bat foraging features such as wetland and hedges. Bat surveys therefore play a key role in selecting the most appropriate site for turbine/s and are considered necessary in most cases.

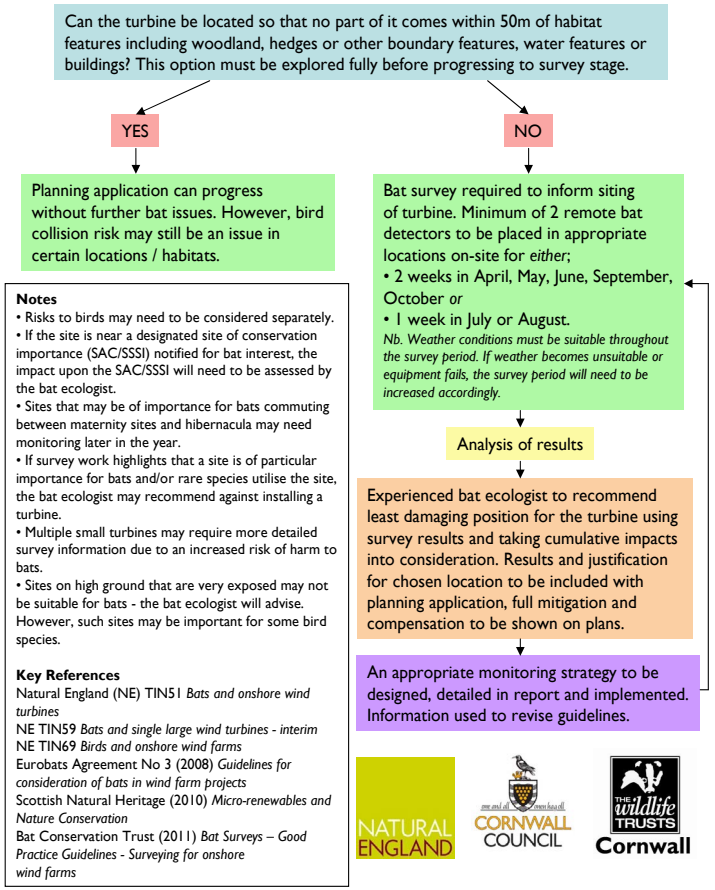
In order to assist applicants proposing smaller wind turbines (typically between 10m and 30m), Cornwall Council has produced the following guidance in partnership with Natural England Cornwall Wildlife Trust.

### 4.3.3 Land use management

For all developments, appropriate land use management is encouraged and the following advice should be considered:

- Manage land use around wind turbines to prevent the habitat from attracting species sensitive to collision with wind turbines.
- If mitigation is required, consider creating a suitable replacement habitat at a safe distance from the wind turbines rather than maintaining habitat underneath them.
- Consider providing enhanced management of landscape features, habitats and historic assets as part of a development, with the exception of where this may increase the risk of collision between bird or bat species and the turbines.
- Provide buffer zones between turbines and streams, hedgerows or other linear landscape features to reduce the potential impact on navigation and species movement. For hedgerows this should be at least 50m.

**Recommended approach for bats and single small wind turbines in Cornwall (Approximately 10-30m hub height or 5-100kW)**
Cornwall Wildlife Trust, Natural England and Cornwall Council




## 4.4 Historic environment

Cornwall has an especially important historic environment, a key part of its distinct cultural heritage, with one of the highest densities of designated historic assets in the country (Scheduled Monuments, Listed

Buildings, Conservation Areas, the World Heritage Site, Registered Battlefields and Registered Parks and Gardens).

In addition, Cornwall has a rich heritage of undesignated sites, the conservation of which is a material consideration under national (NPPF) and local planning policy. The Council's Historic Environment Record can provide an indication of the known distribution of these sites. However, further unknown sites may exist almost anywhere across Cornwall.

### 4.4.1 Potential impact on the historic environment

The potential impact of a wind turbine(s) on Cornwall's historic environment can be defined in two ways:

1. Direct physical impact on identified features of historic interest, including previously undiscovered archaeology. This can be through ground disturbance associated with foundations, trenching for cable runs, fencing and temporary haul routes etc. Generally, proposals should be located away from known archaeological sites (as recorded on the Cornwall Historic Environment Record).
2. Visual impact on the setting of historic assets. Every heritage asset has a setting, defined as the surroundings in which it is experienced, and elements of which can make a positive or negative contribution to the significance of an asset. The extent and significance of setting, and the impact of development upon it, are not fixed as they change over time and need to be assessed on a case by case basis.

Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have *"special regard to the desirability of preserving"* listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.

The following guidance should be considered when identifying sites for wind energy development and, where such sites are identified, designing the details of the scheme:

- The assessment of impacts on the historic environment must be considered with great care at the site identification and detailed design stage. Where it is clear that a development may affect historic sites or buildings, specific advice may be required. The Council can provide such advice as part of the pre-application stage.
- Such assessments should be undertaken to the professional standards set out by the Institute for Archaeologists by an appropriately qualified and experienced person.
- These assessments may be necessary to help determine whether or not a site is suitable to be identified within a Neighbourhood Plan and should be completed at the planning application stage and are likely to be required even where an EIA is not. Where a development is likely to affect the historic environment, any planning consent will include conditions requiring the mitigation of these impacts.
- Assessments should focus on the significance of the site and its setting, whether development proposals will harm the historic environment, and to what degree.
- Assessments should go beyond a consultation with the Cornwall and Isles of Scilly Historic Environment Record by exploring the potential for previously unrecorded archaeological remains. They should also consider the wider visual impacts on historic buildings, upstanding archaeological monuments and historic landscapes. Briefs for archaeological and setting assessments are available as a part of the Council's pre-application services.
- Assessments should follow the latest guidance provided by English Heritage on assessing direct and indirect impacts on heritage assets.
- Not all designated assets have settings to which a wind turbine, even at close distances, would represent an unacceptable impact, but some types of asset, particularly those with a strong presence in the landscape, are especially vulnerable.
- Heritage asset setting assessments are distinct from those undertaken as part of Landscape and Visual Impact Assessments because they depend on specialist consideration of the specific significance of each heritage asset. Where a Zone of Theoretical Visibility has been produced (as part of a Landscape and Visual Impact Assessment), this should inform the heritage setting assessment.

Wind energy development can also affect historic landscape designations. Annex 2 provides guidance on the impact of wind energy development on the character of the landscape (including the historic landscape character). In addition to that guidance the following should be considered:

- Development should protect the outstanding universal value (OUV) of the World Heritage Site (WHS) by conserving the components that contribute to OUV (including remains of mines, engines houses, smallholdings, ports, harbours, canals, railways, tramroads, industries allied to mining, and new towns and villages reflecting the extended period of industrial expansion and prolific innovation). Developers should avoid siting wind turbines on areas of Recently Enclosed Land, industrial and post-industrial land, ornamental landscapes and settlements within the WHS.
- Development should protect the character of conservation areas (including views integral to their character) and views to and from historic parks, gardens and battlefields (particularly designed views).

## 4.5 Noise

All wind turbines produce sound when rotating, which usually comes from two sources:

1. Aerodynamic Noise-generated by the movement of the blades through the air; and
2. Mechanical Noise- from the generator and any associated gearbox.

Potentially noise sensitive receptors such as residential accommodation, schools, offices and tourist businesses which require relative tranquillity, such as campsites & caravan sites, may be affected depending on wind speed, wind direction, background noise levels and distance from the wind turbine(s). When identifying sites for wind turbines, an initial assessment of the potential for noise impacts upon sensitive receptors should be undertaken.

A noise report undertaken by a qualified acoustician is required as part of any wind turbine planning application. This will enable an assessment of the noise produced by the turbine, both on its own and cumulatively with any other turbines in the area, and whether it will have an adverse effect on the amenity of nearby noise sensitive premises.

The noise impacts of wind turbines are assessed against the framework set out in *ETSU-R-97 - The Assessment and Rating of Noise from Wind Farms*. The key objective of Cornwall Council is to ensure turbine noise levels at noise sensitive receptors are limited to a maximum of:

- 35dB $L_{Aeq}$ – single turbines with an installed capacity of less than 50kW.

For large turbines and wind farms a fixed limit or 5dB above the prevailing background noise level (whichever is the greater) measured using the LA90 noise parameter where the fixed limit is either;

- 35dB $L_{A90}$ during the daytime (0700 to 2300 hours)
- 43dB $L_{A90}$ during the night time (2300 to 0700 hours), or
- 45dB $L_{A90}$ at Financially Involved premises regardless of the time of day.

Regardless of the size of the turbines proposed, in the absence of background noise survey a flat noise limit of 35dB will be applied at all times of day.

The above noise limits must take account of all wind turbines in the vicinity. Therefore, in order to preserve the integrity of any cumulative noise predictions and to provide noise "headroom" for future wind turbine development, the Council will normally seek to base limits on the predicted sound levels contained in the relevant planning consents associated with the existing turbines which make up the cumulative assessment. This is likely to result in a noise limit for an individual turbine of less than 35dB $L_{A90}$.

The purpose of ETSU-R-97 is to achieve a balance between the level of noise generated by wind turbines and the benefit of generating clean energy. In recent years Cornwall has experienced an increasing number of small turbines with relatively low electricity generation capacity compared to larger turbines. In the interest of balancing the need to protect residential amenity and public health (Policy 17 of the Cornwall draft Local Plan) against the lower levels of clean energy production associated with smaller turbines the use of full ETSU-derived limits (limits which include an allowance for background noise) for wind turbine proposals with an installed capacity of less than 50kW will normally be restricted. In these cases turbines must not exceed 35dB $L_{A90}$ at the nearest noise sensitive property.

Where noise limits are set with an allowance for background noise levels (i.e. for turbines with an installed capacity of 50kW or greater) a post-commissioning monitoring condition will be attached to the planning consent. Other applications may also have post commissioning monitoring conditions applied.

### 4.5.1 Assessing noise levels

- The noise assessment should be undertaken by a qualified and

competent acoustician, and all the data inputs, justification for use of these values, assumptions made, and margins of error must also be included in the assessment.

- A site specific desktop noise assessment will be required for all wind turbine applications. However, where ETSU-derived limits are sought (those which require an allowance for background noise), a more detailed site specific noise assessment and report will be necessary.
- The Institute of Acoustics provide good practice guidance on the application of ETSU-R-97 for the assessment and rating of wind turbine noise. It is recommended that this guidance is followed.
- For applications that require background noise monitoring, the monitoring locations should be agreed in writing with Environmental Health in advance.
- Care should be taken to choose appropriate monitoring locations for background noise monitoring, and avoid taking measurements during unrepresentative noisy periods such as local events, peak holiday times near main roads, or following unusually heavy rainfall events near streams.
- Noise assessments should take account of the potential for excessive amplitude modulation. Where excessive amplitude modulation cannot be predicted, action may be required to remediate any subsequent issues which may arise. This is likely to be implemented through a planning condition.
- For applications where micro-siting is likely to be required, noise assessments should take into account the closest possible location of each turbine in relation to each noise sensitive receptor.

### 4.5.2 Cumulative noise assessments

In addition to the guidance for single development noise assessment, consider the following:

- Screening for cumulative effect is complex and requires a competent and qualified acoustician. The area should first be screened for turbines within a 2km radius of the proposed turbine.
- If the proposed turbine produces noise levels within 10dB of any turbines (existing or consented) at the same receptor locations, then a cumulative noise impact assessment will be required.
- Cumulative impact assessments will normally be expected to be based on the consented levels of existing or approved turbines. However, there may be some circumstances where an alternative approach is more appropriate. Alternative arrangements will need to be agreed with an Environmental Protection Officer in the Council's Community and Environmental Protection team.

The Council has prepared a guidance document on the minimum requirements for noise reports. This guidance sets out the minimum level of information that must be contained in a noise report submitted as part of the application process in Cornwall and includes a checklist to be completed and returned with the report. For more information please contact the Council's Public Protection and Business Support Service.

### 4.5.3 Financial Involvement

'Financial Involvement' is a term used in ETSU-R-97 which allows a consideration to be given to increasing the permissible margin above background levels to be increased to 45 dB(A) where *'the occupier of the property has some financial involvement in the wind farm'* (ETSU-R-97 paragraph 24).

The Council considers financial involved parties to comprise:

- The occupiers of properties who own the land on which the development is proposed and will receive a direct benefit from the income generated by the turbine, where they are the permanent occupiers of the affected property.
- Individuals who have a financial interest in the development, where they are the permanent occupiers of the affected property.

The following are not considered to be within scope of financial involvement:

- Where the property is owned by an individual/s with a financial interest in the wind turbine development, but the property is leased to a third party on a long term lease and the occupiers of the property do not have any financial interest in the development.
- Where payments are made to an occupier of a property that is not otherwise considered to be financially involved (whether those payments are accepted or not).
- In the case of relatives of applicants or operators who would be beneficiaries of will trusts in the site.

All proposed wind turbines will be expected to meet the appropriate noise limit at all non-financially involved properties, regardless of whether or not the property has a financial involvement (and associated higher noise level limit) with an existing turbine.

## 4.6 Use of Land

Proposals for wind energy development on agricultural land should consider the following guidance:

- Minimise impact on the availability of the land for food production;
- Ensure that the land around the facility can continue to be used for agricultural purposes;
- Minimise disturbance to agricultural land and field boundary features;
- Design installations to be temporary, capable of removal and 'reversible'.

## 4.7 Drainage - flood management - water quality

Wind energy development can affect water management and quality by virtue of any disturbance to land cover or ground conditions. Wind development proposals should give consideration to the following:

- Site wind turbines away from Flood Risk Areas and avoid adverse impacts on bore holes.
- A water interest survey may need to be undertaken to identify all boreholes, springs, wells and any surface water features and identify any future mitigation measures.
- Minimise impact on the water cycle when stripping, storing and replacing soils.
- Minimising the impact of the proposed wind turbines and ancillary infrastructure on the natural drainage characteristics of the site, in order to prevent an increased risk of flooding.

## 4.8 Aviation and Electromagnetic Transmissions

A single wind turbine can cause air traffic safety problems due to:

- Representing a potential collision risk for low flying aircraft, especially if near an aerodrome or military air field.
- Interference with ground based air traffic control radar and aircraft landing instruments.

Therefore, in accordance with Civil Aviation Authority (CAA) Policy, consultation with the CAA, Ministry of Defence (MOD) and the National Air Traffic Services (NATS) at an early stage of the site identification process is recommended. An air safety objection which cannot be viably overcome could prevent the development progressing and may result in the refusal of planning permission.

### 4.8.1 Interference with Electromagnetic Transmissions

- This can normally be achieved by avoiding radio and microwave signal corridors, but in some cases, it may be possible to re-route the signal around the development. This is usually undertaken at the developer's expense.
- The siting of wind turbines should also avoid impacts upon domestic TV and radio reception. If this is not possible, mitigation measures may be required.
- Consultation with the Joint Radio Company, via Ofcom (Independent regulator and competition authority for the UK communications industries) at an early stage of the project is recommended.
- Organisations responsible for the operation of electromagnetic links typically require a 100m clearance either side of a line of sight link from the swept area of turbine blades, although individual consultation is necessary to identify each organisation's safeguarding distance. Effects on such links can usually be resolved through the careful siting of individual turbines.

## 4.9 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before

designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

When identifying a site and designed the detailed layout in preparation for a planning application, consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
  - The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
  - The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.
  - Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
  - Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' *the development*.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 4.10 Construction / traffic

Before a project can proceed to a planning application, the developer must confirm that vehicle access will be possible during the construction and operation of the site. When identifying suitable sites for a Neighbourhood Plan an initial high level assessment of the access can provide some early clarity to assist the developer at the application stage.

Consider the following guidance:

- Access to the site should be suitable for the vehicles required. This can include a mobile crane and should be discussed locally with the wind turbine supplier/developer. However, the creation of a new access into a field, the widening of an existing field entrance, or to creation of a permanent access or maintenance track may require planning permission.
- Many sites are approached by narrow winding lanes, often with overhanging trees creating tunnels of vegetation. These vegetated lanes are characteristic of rural Cornwall and access to the site should avoid the removal of or damage to these important features.
- Minimise damage to narrow lanes, Cornish hedges, trees, historic bridges and gateposts as a result of road widening – repair and replace any features lost.
- If hedgerow removal is required the Hedgerow Regulations 1997 (and any subsequent amendments) should be adhered to. This makes it illegal to remove most countryside hedges without permission of the local planning authority. Early engagement is recommended through the pre-application process.
- Minimise the length of new tracks and use existing routes.
- If it is necessary to create a new access into a field, widen an existing

field entrance, or create permanent access or maintenance tracks, consideration must be given to; retaining local character, minimising loss of vegetation to create visibility splays, and reconstructing Cornish hedges to compensate for any losses in the creation of the access.

- Where new tracks are necessary they should follow contours, avoid steep slopes or wet ground and follow the hedge boundaries without causing damage to tree growth through compaction.
- Avoid the urbanisation of rural locations in the use of kerbing, extensive visibility splays, hard surfacing and lighting.
- Restoration should include where applicable, the removal and or re-vegetation of access tracks, reinstatement of Cornish hedges and reinstatement of original site access.
- The Council provides advice on the movement of abnormal loads and can be contacted via abloads@cornwall.gov.uk.

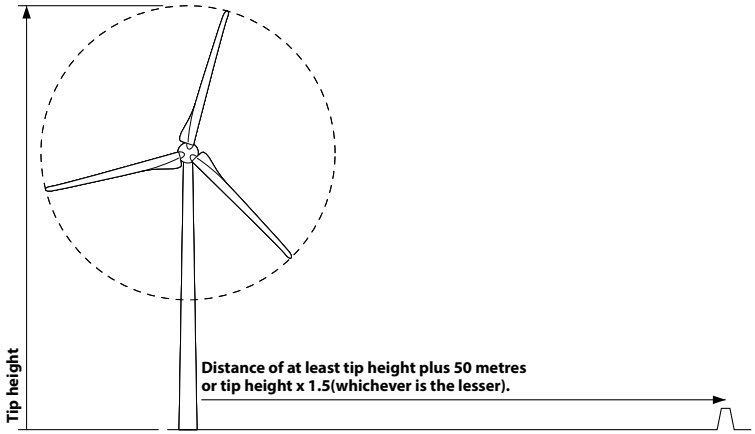
A large facility may generate significant vehicle movements and there is a need to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid of HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Where required use speed limits on all identified routes to reduce potential of traffic accidents.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters at the pre-application stage.
- Design vehicle approaches to avoiding sensitive areas, such as residential access roads.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 4.11 Proximity to Roads, Railways, Buildings and Public Open Spaces

The following guidance should be considered when locating wind turbines in close proximity to roads, railways, buildings, formal public open spaces and Public Rights of Way:

- Allow sufficient distance between the base of the turbine and any highways (public roads) or railway to allow safe separation distance to prevent harm in the event of the turbine toppling or causing distraction to drivers. This distance should be the height of the turbine to tip plus 50m, or 1.5 times the turbine height (whichever is the lesser).
- When in close proximity to highways (public roads), turbines should wherever possible be located away from junctions, tight bends and crossings. Visual distraction should be minimised by the provision of clear, continuous views of the turbines that develop over the maximum possible length of approach.




- Highways England recognises that, in certain circumstances, variation to the above set-back may be considered appropriate, subject to the findings of a site-specific assessment. Refer to the latest guidance from the Department of Transport and Highways England for details of acceptable topple distances for turbines in close proximity to trunk roads.
- It is also advised that appropriate bodies such as Highways England

or Network Rail are contacted if the proposed turbine is to be located near such infrastructure a trunk road or railway line.

In the case of building, formal public open spaces and Public Rights of Way a distance of the turbine to tip plus 10% should be allowed to ensure safe separation.

## 4.12 Site security/safety/lighting

The use of lighting should be minimised, particularly in rural locations away from urban areas. If lighting is required on wind turbines for aviation purposes, use infra-red lighting where possible to minimise visual impacts at night.

## 4.13 Groundwork's - site profiling, soil storage, re-profiling

The following guidance should be considered when developing the detailed layout and design:

- Where soil stripping is required, topsoil and subsoil should be stripped, stored and replaced separately in order to minimise soil damage and to provide optimal conditions for site restoration.
- Consider soil protection by minimising compaction during the construction and operational phases, and avoiding the use of construction practices which exacerbate the loss of top soil, such as uncovered stockpiling of soil.
- Submit details of the methodology for soil stripping, storage and replacement as part of the planning application and, once agreed, use this methodology during site construction.
- Avoid bringing alien soil material onto the development site.

## 4.14 Visitor attraction/educational facilities

Where a wind turbine is proposed adjacent to a public right of way, viewpoint or other location frequented by members of the public, information and interpretation boards are recommended to inform people about the project. The example shown in the image below is located at the Delabole wind farm.


## 4.15 Site restoration / duration of planning permission

Wind energy development is normally temporary and reversible. The application should, therefore, clearly set out the length of time that the wind turbine will be in place. All temporary permissions wind turbine will have a condition imposing a time limit and require restoration of the site. In addition, a restoration or performance bond may be required to ensure that site is appropriately restored post decommissioning.

Restoration means that all development, including ancillary infrastructure, footings and access tracks should be removed from the site and any soils and vegetation restored, to ensure the land is returned to its original pre-development condition.

# 5 Solar PV – Ground Mounted

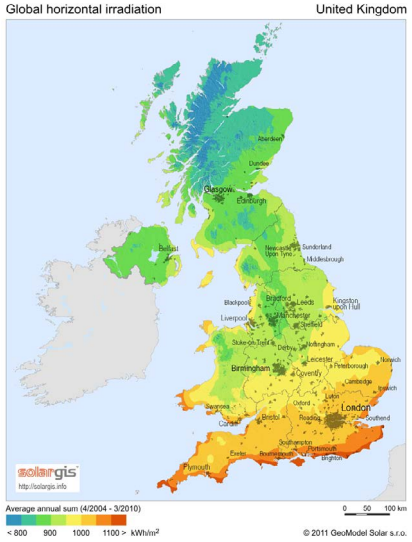
## 5.1 Context and technology overview

Photons (particles of light energy) hit the silicone in the cell and generate a voltage which causes an electrical current to flow. In the case of a solar PV array this current is collected from all the panels and fed into an inverter. The inverter converts the current from DC to AC to allow it to be fed into the electrical grid.

For the purposes of planning stand-alone solar PV installations are those that are not physically attached to a building, although they can be wired to provide electricity to a building.

### 5.1.1 The Resource

The UK receives a significant amount of solar energy from the sun and Cornwall is receives some of the highest levels in the UK. The map below shows the total average solar irradiation across the UK (per square meter), measured in kilo-watt hours (kWh).




*SolarGIS © 2014 GeoModel Solar*

## 5.2 Landscape & visual impact

Solar PV developments are usually temporary and removable. Where applications are approved for a temporary solar PV development, planning consent will be limited by condition to that temporary period.

The impact of a solar PV development on the landscape can be linked to the lifetime of the project and the extent to which the development is reversible at the end of its consented operational lifetime.

### 5.2.1 Finding a site

Careful site selection and layout of solar PV development is the most effective way of minimising landscape and visual impacts.

The layout and design should be informed by a Landscape and Visual Assessment. The detail of this assessment will depend upon the scale of the proposed development and whether or not the Environmental Impact Assessment (EIA) Regulations apply.

Annex 1 provides detailed guidance based on an assessment of the sensitivity of the landscape to solar PV development. This guidance is designed to achieve the following broad strategy and should be consulted at an early stage to inform site selection:

- Maintain diversity of landscapes.
- Retain areas of undeveloped landscape especially the coast.
- Conserve and enhance the natural beauty of AONBs.
- Allow breaks of undeveloped landscapes when travelling through the landscape.
- Minimise impact by maximising efficiency.

As there are local variations in landscape character and sensitivity within a Landscape Character Area (LCA), a site-specific analysis should be undertaken to identify specific landscape and visual issues. It is important to consider the potential impact on landscape characteristics, special qualities of landscape designations and potential impact on key views; a zone of theoretical visibility (ZTV) may help this assessment.

The choice of site and development type should respect the specific sensitivity of the site and the LCA concerned and should accord with the guidance set out for that LCA (see Annex 1, Appendix 1). It is also important to consider the impact upon adjacent LCAs and the potential cumulative effects at this stage. Developers should consider this guidance in full as part of the process of preparing their planning application.

In addition to the specific guidance provided for each LCA within Annex 1 (Appendix 1), consider the following guidance when identifying your site:

***Landform and topography***

- The most suitable sites are likely to be on flat landforms or on lower slopes/within folds in gently undulating lowland landscapes rather than on prominent upland landforms, highly visible slopes, or coastal headlands.
- Landscapes with a sense of enclosure (e.g. provided by woodland or high hedges) are better suited to solar PV development than open and unenclosed landscapes.
- Ensure sites do not span across different landscape types, particularly where boundaries form marked changes in character on the ground, such as changes in topography (this may be less of an issue where changes in character are less readable on the ground).

***Views and screening***

- Avoid locating solar PV development where it would be directly overlooked by important or sensitive viewpoints. Consider views from local viewpoints and popular routes (including Rights of Way).
- For sites that are overlooked by high ground, particularly within 1-2km, the design of the site and how it integrates with the landscape will be particularly important.
- Minimise significant impacts on key views from important viewpoints (including views which are integral to the character of conservation areas and elevated viewpoints in sensitive areas such as Bodmin Moor), popular tourist and scenic routes and settlements.

***Historic landscape***

- Avoid siting solar PV development within the Historic Landscape Classification Types of 'Upland Rough Ground', 'Coastal Rough Ground', 'Prehistoric Enclosures', and 'Ornamental' which are highly vulnerable to solar PV development.
- Avoid areas of predominantly medieval pattern.

***Key landscape features and designations***

- Site development back from the coastal edge and its immediate hinterland so that it does not detract from the relative remoteness or undeveloped character of Cornwall's coastline.
- Aim to maintain the most remote areas of Cornwall free of large scale PV development, for example, open moorland areas at Bodmin Moor, Penwith Hills and Kit Hill, the undeveloped coastal edge and estuarine edges (including coastal heath) and their immediate hinterland, and steep valley sides of the remote stretches of the distinctive wooded valleys such as the Looe, Seaton, Tamar, Tavy and Ottery Valleys.
- Set development back from edges of plateaux to minimise impacts on views from surrounding valleys, estuaries, rias and coast.
- Avoid areas with semi-natural land cover.
- Ensure siting of solar PV development does not adversely affect the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Ensure siting of solar PV development does not adversely affect the special qualities of Cornwall's Areas of Great Landscape Value.

### 5.2.2 Residential impact

- While there is no provision within the planning system which gives an individual the right to a particular view, the impact on the amenity of residential dwellings must be considered. When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

### 5.2.3 Designing the scheme

To achieve the optimum layout and design for a solar PV development, the design process should consider a range of layouts and compare their relative impacts. The scale of development and the potential for mitigation is particularly critical in the most sensitive areas.

The following guidance should be considered when designing the scheme:

***Layout***

- Ensure the layout and design of schemes follows the contours and enclosure patterns of the landscape to integrate them into the landscape - avoid siting panels that are remote from the rest of the group.

- When designing the layout of panels, consider the appearance of the development as viewed from the 'backs' and 'sides' (where frames will be more visible) as well as from the 'front'.
- Consider locating solar arrays in close proximity to existing farm buildings to encourage a clustering of built development and reduce the need for more isolated development.

***Scale***

- Ensure the area of development is in scale with the landscape in which it lies.
- Guidance on suitable development sizes is given in the LCA strategies, but bear in mind good location/design may allow for flexibility in size and, conversely, poor location/design may introduce restrictions in size.
- Developments should respond to the scale of the built form in relation to settlement pattern, urban and industrial contexts.

***Landcover***

- Maintain field pattern and diversity to avoid a dominating character in the locality and to ensure the development is compatible with the landscape scale (areas with smaller scale fields are likely to be more appropriate for smaller developments).
- Aim to fit panels comfortably into the fields, avoiding ragged and staggered edges such as those produced by rows of arrays within oddly shaped fields.
- Preserve the legibility of field patterns by minimising the number of adjacent fields that are developed and setting PV panels back from the edges of fields. Consider reinstating hedge lines that were historically lost. This will also enable hedgerow management.

***Solar PV design***

- Ensure the height of panels and use of screening are designed to make the development as unobtrusive as possible. Wherever it is possible to do so, panels should be lower than any Cornish hedges on the site.
- Aim to work with the natural topography and avoid the need for large scale earthworks, banks and bunds which can highlight the development rather than screening it.

***Design of ancillary elements***

- Avoid urbanising elements, such as kerbs in rural situations and minimise areas of hard surfacing, fencing and lighting.
- On-site cables should be buried underground (without damage to existing Cornish hedges or archaeology) to minimise their impact on landscape character and visual amenity.
- House inverters in existing buildings where possible, particularly where these are in the local vernacular and located near the site.
- New inverter buildings should match the local vernacular, be carefully sited and should generally avoid high or exposed locations. Existing and locally occurring vegetation should be used to screen new buildings.
- Aim to use existing or new landscape features instead of fencing. If fencing is unavoidable, minimise its height to make it as unobtrusive as possible and set perimeter fences back from hedge boundaries to reduce their visibility from outside the site.
- Landscape features used for security or screening should be in character with the landscape – different features may be appropriate for different landscapes e.g. ditches, berms (bunds), hedges or tree lines. Ensure any planting is of locally occurring species and in character with the landscape.

- Minimise the use of security lighting. Where lighting is required, use passive infra-red (PIR) technology wherever possible and ensure that any visible lighting is designed and installed in a manner which minimises glare and light spill into the surrounding landscape. The use of lighting shields may be required to maintain dark wildlife areas and corridors
- On greenfield sites, ensure the choice of footing design minimises impact on the landscape.

***Land management and landscaping***

- Maintain land uses on the site that fit with the character of the area and manage vegetation under the solar panels to avoid the site becoming overgrown, e.g. by grazing – mulching large areas should be avoided, particularly on visible sites. This should be set out in a landscape management strategy.
- Use existing landscape features, such as Cornish hedges, hedgerows, woodland and buildings to screen development, ensuring that any additional screening provided is in character with the landscape.
- Allowing hedgerows to grow out is only suitable as a screening method where it fits with the local landscape character or restores historic landscape management practices.
- Reflect local landscape character in the species and layout of new planting by selecting suitable native species.
- Avoid removing trees and shrubs from within or on the periphery of the site. Where removal of such vegetation cannot be avoided and can be justified, restoration and re-planting is encouraged. Scheme design should allow for tree growth and shadow impact on the arrays.
- All field boundaries (often Cornish hedges), associated vegetation and margins should be retained, and where appropriate enhanced, ensuring that field scale and patterns are retained and hedgerow networks are maintained. These should clearly be shown on the plans.
- All hedges should be afforded a minimum 5m undeveloped buffer to each side. The landscape buffer areas should be free of buildings, fences, panels, tracks, cable runs or any other construction and should be measured from the base of the Cornish hedge to the development fence line or where there is no fence line, to the edge of the panels.
- Hedgerow buffer zones should be protected during construction by appropriate fencing.

***Access tracks***

- Seek to use existing access points and minimise the introduction of new tracks into the landscape.
- Consider using existing tracks, or laying temporary surfaces to transport panels onto site where necessary tracks are absent to minimise soil compaction and loss of topsoil
- Avoid locating access tracks within 2m of a hedge base, where compaction can impact on the root zone of trees or woody species within the hedge line.

### 5.2.4 Cumulative Impact

When siting a solar PV development, it is important to consider how the scheme fits with other operational and consented schemes to minimise cumulative impacts.

Annex 2 provides detailed guidance on assessing cumulative impact, including advice on how the results should be applied to each LCA. Developers should consider this guidance in full as part of the process of preparing their planning application. In addition to this guidance, the following provides some generic advice to be considered when identifying a site and refining the design.

- Aim for similarity of design between schemes that fall in the same type of landscape or LCA (in terms of siting, layout, scale, form and relationship to key characteristics), to maintain a simple composition and reinforce links between landscape characteristics and design response.
- Ensure the overall 'green hills' character remains in Cornwall – ensure PV developments do not dominate.
- Ensure that some breaks are retained between developments to enable the landscape to be appreciated free of solar PV developments.
- Consider views from settlements when designing multiple solar PV developments – avoid 'surrounding' a settlement at close quarters.
- Multiple solar PV developments should generally appear visually separate unless specifically designed to create the appearance of a single combined development.

### 5.2.5 Mitigation

Landscape mitigation measures aim to avoid, reduce or remedy significant adverse impacts on the landscape. These should be set out in a landscape mitigation plan. Mitigation proposals will usually have a spatial element and therefore need to be included, explained and referenced on a site layout plan. A site layout plan which clearly includes a set of landscape and biodiversity mitigation measures may be referred to as a Landscape and Ecological Mitigation Plan or a Landscape Mitigation Plan.

Where required, space should be allocated in the development to accommodate measures to mitigate its impact on the landscape. Space should also be provided for measures which protect and enhance both biodiversity and the landscape and maintain visual amenity.

The Landscape Mitigation Plan should be site specific and clearly show how the evaluation of the site's landscape needs informs the proposed detailed site layout.

The plan should cover all development phases:

- Pre-construction (e.g. carrying out further surveys, establishing protected areas, carrying out early mitigation works).
- During construction (e.g. carrying out agreed mitigation measures)
- Post construction/completion/operational phases (e.g. ongoing maintenance/management and monitoring).

Examples of mitigation measures that could be included on the plan:

- Siting and layout of arrays to protect visual amenity and landscape character.
- Choice of materials for ancillary buildings to protect visual amenity and landscape character.
- Protection of soil structure and management of water runoff.
- Provision and management of protective landscape buffer areas for watercourses, woodlands/copses, individual trees, areas of scrub, hedgerows and Cornish hedgerows and biodiversity features.
- Retaining existing trees, shrubs and hedges to aid screening, protect and enhance landscape character and biodiversity. Positioning new trees, shrubs and hedges to achieve the same goals.
- Selecting species native to the site for new trees, shrubs and hedges.
- Other specific biodiversity protection, mitigation and enhancement measures;
- Programming of works to support the protection of landscape and biodiversity.
- Ongoing management of new and existing landscape and biodiversity features.
- Monitoring of the site's landscape and biodiversity.

### 5.2.6 Landscape enhancement measures

In addition to the above guidance, the following enhanced landscape management measures should be considered:

- Plan for post-construction hedgerow management which allows perimeter and internal hedges to grow and larger trees to emerge to increase screening value and diversity (including biodiversity). This will have the added benefit of helping to restore landscape character following the impacts of elm disease.
- Review opportunities to provide enhanced management of landscape features and habitats as part of a development. This might include contributing to wider landscape scale targets and projects in the AONB Management Plans, Cornwall's Biodiversity Action Plan, Cornwall's Biodiversity and Geodiversity Action Plan, and the emerging Green Infrastructure Strategy.
- Encouraging traditional farmland management including grazing and maintaining small fields and hedgerows.

## 5.3 Ecology

To help avoid or minimise damage to important species and habitats, developers should consider the following guidance:

### 5.3.1 Finding a site

- Solar PV schemes may reduce habitat and habitat suitability for some species, but they may also enable the land to be used in multiple ways which deliver environmental gains.
- Intensively managed agricultural land is likely to be of least ecological value. The ecological value of land which is not under intensive management, including previously used land should be carefully

assessed through an ecological survey (see below for further guidance on ecological surveys).

- Avoid areas of semi-natural habitats.
- Ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAV), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves and County Wildlife Sites should be avoided.

### 5.3.2 Designing the scheme

- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- Development proposals should consider opportunities for ecological enhancement. Examples of this include the extension of retained habitats or planting of new flora rich lay under the panels.
- The design should be informed and influenced by ecological surveys. Issues that may need particular assessment include ground nesting birds, wintering birds, bats, dormice, reptiles and badgers.
- Employing an ecologist throughout the design process will help ensure the best ecological outcome. Protected species surveys are season-dependent (see the ecological survey calendar within the ecological information of the Wind Energy section), so contacting an ecologist at a very early stage is advisable.
- Ecological assessments should include a 'desk study' of existing ecological records, an evaluation of the likely impacts of the development upon ecological features, specify mitigation to avoid or minimise these impacts and list any further surveys required as well as any enhancement to be provided.

The key objectives of the ecological survey are to:

- Identify all relevant statutory and non-statutory designated sites and features of ecological significance within the site and its surroundings.
- Categorise habitat types within the site in accordance with JNCC Phase 1 Habitat Survey methodology.
- Assess potential for the presence of protected species and species of principal conservation importance within the site and its surroundings, including UK Biodiversity Action Plan (BAP) habitats and species.
- Identify the potential impact of the development upon any protected species or habitats which may be present.
- Make recommendations for further surveys (particularly relating to protected species/habitats).
- Provide an early indication of the ecological mitigation, compensation and enhancement measures which may be required

The main impacts and mitigation requirements are likely to be:

- Lighting – security lighting may affect bats. Lighting should not be used unless absolutely necessary. If lighting is necessary, it must be minimised and directed away from hedges, woodland and scrub. A bat survey will be needed to inform any other mitigation required and indeed whether lighting would be allowable on site.
- Cables – overhead and underground cables can have an adverse impact on biodiversity. Cable routes need to be carefully designed in consultation with the consulting ecologist.
- Construction – Pile driving may affect badgers and nesting or feeding birds. Impacts will need to be informed by surveys and licences may be necessary, for example if badger disturbance will occur.
- If hedgerow removal is required the Hedgerow Regulations 1997 (and any subsequent amendments) should be adhered to. This makes it illegal to remove most countryside hedges without permission of the local planning authority. Early engagement is recommended through the pre-application process.
- Fencing - buffer strips (at least 5m) should be left between perimeter fencing and Cornish hedges. The fencing must allow badgers, reptiles and other fauna access into the site (whilst retaining grazing sheep);
- Trees - permanent undeveloped buffer zones should be afforded to existing trees, the size and extent of which will be determined by the canopy and root zone. British Standard BS 5837 (and any subsequent amendments to that Standard) should be referred to for provide further information on root protection zones.

Survey findings should inform the detailed layout of the site to deliver any required biodiversity protection, mitigation and enhancement. The ecological constraints and opportunities of the proposal should be set out clearly within an Ecological Constraints and Opportunities Plan as advised in the British Standard BS42020 (and any subsequent amendments to that Standard).

The findings should be presented in the form of a site specific Landscape and Ecological Mitigation Plan (LEMP), as described in the Landscape & Visual Impact section above. The LEMP should:

- Identify any potential impacts arising from the site's development and outline mitigation to address these.
- Detail specific objectives for key elements of biodiversity and the habitat enhancements that are planned to achieve these.
- Where possible, contribute to biodiversity in the wider landscape and local ecological network by improving connectivity between existing habitats.
- Identify species for planting and suitable sources for seed and plants.
- Consider wider enhancements such as nesting and roosting boxes.
- Establish management techniques to improve biodiversity, such as hedge cutting on a two to three year rotation.
- Summarise a management regime for identified habitats for the entire life of the site.
- Provide a plan for monitoring the site and adapting management to act upon the findings.
- Set out how the site will be decommissioned and how any ecological enhancements will be retained and maintained post decommissioning.

### 5.3.3 Ecological enhancement

Various options exist to enhance the biodiversity value of a site and it should be noted that, while some enhancements may have broad suitability, there is no 'one size fits all' approach. The following guidance may assist in designing ecological enhancements into ground mounted solar PV developments:

- Consider the creation of different habitats within a ground-mounted solar PV development, including hedgerows, field margins, wild flower meadows, nectar-rich areas and winter bird crops. In many cases comprehensive enhancements across wide areas are possible, if properly maintained through the lifetime of the project.
- Opportunities are likely to be more limited where the land is also being used for agricultural production although biodiverse hay meadow is still a valuable grazing resource for lower stocking densities.
- Whatever habitat enhancement is selected it is generally desirable that the species used are native to the UK.
- Where possible, species introduced should tie in with local biodiversity targets (where such targets exist).
- Seed and plants should be sought from a supplier who can guarantee appropriate provenance. Green hay may be suitable for providing diverse seed and may be available locally through Cornwall Council or Cornwall Wildlife Trust.
- Ground disturbance may be an option for encouraging naturally occurring species in the soil's seed bank. Consideration may need to be given to future climate conditions in the provenance and choice for establishing longer lived species.

### 5.3.4 Grazing

Low intensity grazing can be a low cost means of managing grassland as well as increasing its conservation value. Grazing also enables the land to

remain agriculturally productive, although it should be noted that higher intensity grazing is unlikely to be beneficial to wildlife. The following guidance may assist with designed a grazing regime:

- Sheep are the usual choice for solar farms, being generally small enough to pass beneath the rows of panels. Sheep have been successfully used at multiple solar farms for several years, including in Cornwall.
- A qualified ecologist should assist with the development of a conservation grazing regime suited to the site's characteristics and management objectives, and this regime should be incorporated into the LEMP.
- If grazing is being managed for biodiversity, a lower stocking density should be maintained so the grassland retains some structural diversity. Maintaining grassland structure through the winter is good for invertebrates.
- Stopping grazing in the spring (April – June) will enable early flowering plants to flourish and stopping in the summer (July - September) will favour summer flowering herbs. Ceasing grazing April-September will return the greatest biodiversity benefits but it is appreciated this may not always be possible.
- A combination of low stocking density and breaks in grazing should lead to a high diversity of wild flowers and invertebrates as well as benefiting ground nesting birds and mammals.
- Where grassland is being managed for ground-nesting birds, light grazing is usually acceptable but topping or mowing must be avoided through the spring and summer months.
- If grazing is being managed with agricultural production as the primary goal, the landowner may choose to graze livestock at higher stocking densities through much of the year. While the biodiversity value of the pasture would be minimal, this approach does not preclude the use of other habitat enhancements, such as hedgerows and field margins which can still provide benefits to biodiversity for the wider site.

## 5.4 Historic environment

Cornwall has an especially important historic environment, a key part of its distinct cultural heritage, with one of the highest densities of designated historic assets in the country (Scheduled Monuments, Listed Buildings, Conservation Areas, the World Heritage Site, Registered Battlefields and Registered Parks and Gardens).

In addition, Cornwall has a rich heritage of undesignated sites, the conservation of which is a material consideration under national (NPPF) and local planning policy. The Council's Historic Environment Record can provide an indication of the known distribution of these sites. However, further unknown sites may exist almost anywhere across Cornwall.

The impacts of solar PV developments on the historic environment will require expert assessment in most cases. Solar developments generally have a high potential to affect heritage assets (archaeological sites, monuments, buildings and landscape features) both above and below ground.

Above ground impacts may include the effects on the setting of Listed Buildings and Scheduled Monuments as well as on the Historic Landscape Character of Cornwall. Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have *"special regard to the desirability of preserving"* listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.

Where solar farms lie within a 5km visual envelope of designated historic assets, planning applications should be supported by an assessment of the setting of historic assets using the latest English Heritage guidance.

Solar PV development can also affect historic landscape designations. Annex 3 provides guidance on the impact of solar PV development upon the character of the landscape (including the historic landscape character). In addition to that guidance the following should be considered:

- Solar PV development should protect the outstanding universal value (OUV) of the World Heritage Site (WHS) through conservation of the components that contribute to OUV (including remains of mines, engines houses, smallholdings, ports, harbours, canals, railways, tramroads, industries allied to mining, and new towns and villages, reflecting the extended period of industrial expansion and prolific innovation). Developers should avoid siting solar arrays on areas of Recently Enclosed Land, industrial and post-industrial land, ornamental landscapes and settlements within the WHS.
- Solar PV development should protect the character of conservation areas (including views integral to their character) and views to and

from historic parks, gardens and battlefields (particularly designed views).

Below ground impacts may include direct impacts on archaeological deposits through ground disturbance associated with ground levelling, piling, trenching, foundations, fencing, temporary haul routes etc. The following guidance should be considered when designing to accommodate or mitigate impacts on archaeological deposits:

- The design and layout should be informed by consultation with the Historic Environment Record (HER) maintained by the Strategic Historic Environment Service (SHES) of Cornwall Council;
- Applications within anciently enclosed land should be supported by archaeological desk based assessments and geophysical survey reports. Such assessments should demonstrate the use of appropriately qualified professional expertise;
- Identify archaeological sites identified through geophysical survey or desk based assessment can be protected from impact, either by exclusion or protection from ground impacts; 'Concrete shoe' foundations may provide a solution to ground impacts where they do not involve any disturbance of existing ground conditions;
- Where development proposals seek to offset damage to archaeological sites by recording them prior to development, the Council will require intrusive field evaluation to inform their decision making. Due to the nature of solar farm construction practices 'archaeological watching briefs' do not normally provide useful mitigation of the damage to archaeological sites and proportionate mitigation is more likely to involve targeted excavation.

## 5.5 Noise

Ground mounted solar PV developments can emit noise during their operational phase, particularly in association with transformers and inverter equipment. Policy 13 of the draft Local Plan states that development should protect individual properties from 'unreasonable noise'. Developers should, therefore, consider the following guidance in relation to operational noise emissions:

- The development should be designed to ensure any significant adverse impacts on residential amenity arising from noise from the proposed development are avoided by locating noise-emitting equipment away from noise sensitive receptors, and taking other relevant measures, such as housing noise-emitting equipment in acoustic enclosures.
- A sound assessment undertaken by a qualified acoustician in accordance with the current versions of BS 4142 and BS 8233 should demonstrate that any identified adverse effects have been mitigated and reduced to a minimum, and that the Council's standards in respect of noise from development are achieved.
- More detailed information on the Council's noise standards can be provided at the pre-application stage via the Council's Community Protection Team in the Public Protection and Business Support Service.

## 5.6 Use of Land

Ground mounted solar PV development should be directed towards previously developed/brownfield sites, degraded, despoiled, derelict or contaminated land (which cannot easily be remediated for other uses, or is not of high environmental value), or industrial land. Where development is located on agricultural land it should be temporary, capable of removal and reversible (i.e. at the end of the life of the development the land can be return to its pre-development condition).

The following process should be undertaken by the developer when considering the location of a ground mounted solar PV development on agricultural land.

1. Identify the agricultural land classification/s of the proposed development site.
2. Land classified under the Agricultural Land Classification as grades 1 – 3a (Best and Most Versatile) is safeguarded for food production and should be avoided. For development proposed on grade 3b land, consideration should be given to reasonable alternative locations on land of lesser agricultural and environmental value.
3. Where development on grades 1 – 3b cannot be avoided, applications should be justified by the most compelling evidence. This should include the following:

a) Clear justification for the development being located on the site and not on land of a lower agricultural grade within the area.

b) Information on the impact of the proposed development on the local area's supply of farming land of the same classification.

c) If the proposed development site makes up part of an existing farm, provide information on the viability of this farm to continue to function (as an agricultural unit) with the development in situ. Where the solar PV development supplies energy to support farm operations this should be considered as part of the assessment.

d) Consideration of the cumulative impact of the proposed development and other permitted large-scale solar PV developments on the supply of agricultural land within the same classification across the local area.

*Solar Farm at Wheal Jane*

4. Small pockets of higher quality land, where they make up part of a scheme on non-BMV land which cannot be delivered without their inclusion, may be acceptable.

## 5.7 Drainage - flood management - water quality

Most proposals for ground mounted solar PV development will require a Flood Risk Assessment. The following guidance should be considered when designing measures to managed runoff:

- Install Sustainable Drainage Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trenches, to control runoff rates and replicate natural drainage characteristics.
- Any access tracks should be permeable, with localised SUDS to control runoff.
- Retain soil permeability and vegetation cover to allow the absorption of rainfall and prevent excessive run off and soil erosion, which would compromise the return of the land to agricultural use.
- Soil compaction should be avoided. Where it cannot be prevented, the topsoil and subsoil layers should be stripped off in advance and stored separately for later re-spreading. Tracking over ground in wet weather should be avoided. Any compacted areas arising should be loosened through aeration undertaken in dry weather. The use of temporary tracks should be considered.
- Herbicide spraying should be avoided at all times as it can lead to soil erosion and pollution.
- The culverting of existing watercourses and drainage ditches should be avoided. Where culverting for access is unavoidable, it should be demonstrated that no reasonable alternatives exist. Where culverting is unavoidable, it should be temporary and only for the construction period. Where alterations are required to a watercourse a Land Drainage Consent may be required. Further information should be sought from Cornwall Council as part of the pre-application process.
- Buffer zones for watercourses should be a minimum of 5m to each side of the watercourse (or 8 m if it is designated as a main river). The width should be determined according to the watercourse characteristics as well as the characteristics of the wider site.

## 5.8 Aviation and Electromagnetic Transmissions

Solar PV development can be safely located near airports. However, when locating a solar PV development in close proximity to a civil or MOD airport or airfield, guidance provided by the Civil Aviation Authority (CAA) and the MOD (as relevant to the site in question) should be followed.

## 5.9 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
  - The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
  - The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.
  - Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
  - Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' *the development*.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 5.10 Construction / traffic

Before a project can proceed to a planning application, the developer must confirm that vehicle access will be possible during the construction and operation of the site.

Consider the following guidance:

- Access should be suitable for the vehicles required. A new access point, or a permanent access or maintenance track may require planning permission.
- Many sites are approached by narrow, winding lanes, often with overhanging trees creating tunnels of vegetation. These vegetated lanes are characteristic of rural Cornwall and access to the site should avoid the removal or damage of these important characteristic features.
- Minimise damage to narrow lanes, Cornish hedges, trees, historic bridges and gateposts as a result of road widening – repair and replace any features lost.

- Minimise the length of new tracks and use existing routes;
- If it is necessary to create new access into a field, widen an existing field entrance, or create permanent access or maintenance tracks, consideration must be given to; retaining local character, minimising loss of vegetation to create visibility splays and reconstructing Cornish hedges to compensate for any losses in the creation of the access;
- Keep ground disturbance associated with the installation and use of access tracks to a minimum.
- Where new tracks are necessary, they should follow contours, avoid steep slopes or wet ground and follow hedge boundaries without causing damage to tree growth through compaction;
- Avoid the urbanisation of rural locations through the use of kerbing, extensive visibility splays, hard surfacing and lighting;
- Restoration should include where applicable, the removal and or re-vegetation of access tracks, reinstatement of Cornish hedges, reinstatement of original site access.

A large facility may generate significant vehicle movements and there is a need to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid of HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Where required use speed limits on all identified routes to reduce potential of traffic accidents.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters at the pre-application stage.
- Design vehicle approaches to avoiding sensitive areas, such as residential access roads.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

Large scale solar PV development is likely to require a temporary construction compound. Such compounds should be carefully located in order to minimise environmental or amenity impact and any planning application should contain details of their size and location.

## 5.11 Site security/safety/lighting

Whilst there is an acknowledged need to ensure solar PV facilities are adequately secured consideration should be given to the impacts of such security measures on the landscape and visual amenity.

The following guidance should be considered when designing lighting and security measures:

- Minimise the use and height of security fencing (recognising the need to provide adequate security).
- Use existing features, such as Cornish hedges or landscaping, to screen security fencing.
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- Ensure appropriate measures to enable continued access by larger mammals, such as badgers and foxes.
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 5.12 Glint & glare

Glint is produced as a direct reflection of the sun in the surface of the solar PV panel. Glare is a continuous source of brightness. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the sun. Glare is less intense than glint.

Glint and glare can be a significant issue and should not be underestimated, particularly to the south east of a solar PV development. The potential impacts upon homes, businesses and public highways in particular, should be thoroughly assessed at the pre-planning stage.

The design of solar PV developments should be informed by a glint and glare assessment which should be submitted in support of a planning application. Where necessary, appropriate mitigation measured, such as screening, should be employed to ensure that harmful impacts are avoided.

The following guidance should be considered in respect of glint and glare assessments:

- Glint and glare can be a particular issue if 'tracking' panels are proposed as these may cause differential diurnal and/or seasonal impacts.
- Particular impacts can be experienced in the 'ground based glint zone' (close to ground level). This zone will vary depending upon the circumstances of the site and impacts will vary according to topography, buildings, vegetation, etc. Assessments should fully consider the potential for ground-based impacts on residential amenity.
- The potential for PV panels, frames and supports to have a combined reflective quality should also be assessed. This assessment should consider the likely reflective capacity of all of the materials used in the construction of the solar farm.

## 5.13 Groundwork's - site profiling, soil storage, reprofiling

Consider the following guidance when developing the layout and design of your proposal:

- Where soil stripping is required, topsoil and subsoil should be stripped, stored and replaced separately in order to minimise soil damage and to provide optimal conditions for site restoration.
- Avoid bringing alien soil material onto the development site.
- Submit details of the methodology for soil stripping, storage and replacement as part of the planning application and, once agreed, use this methodology during site construction.

## 5.14 Site restoration / duration of planning permission

Solar PV development is normally temporary and reversible. The planning application should, therefore, clearly set out the length of time that the development will be in place. All temporary permissions for ground mounted solar PV will have a condition imposing a time limit and require restoration of the site. In addition, a restoration or performance bond may be required to ensure that site is appropriately restored post decommissioning

Restoration means that all development, including ancillary infrastructure, footings and access tracks should be removed from the site and any soils and vegetation restored to ensure the land is returned to its original pre-development condition.

## 5.15 Visitor attraction / educational facilities

Where a solar PV development is proposed adjacent to a public right of way, viewpoint or other location frequented by members of the public, information and interpretation boards are recommended to inform people about the project. An example can be seen at Hendra Holiday Park (image below).

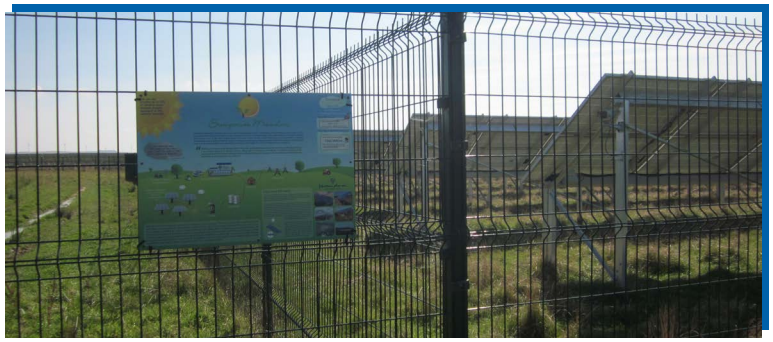


*Image courtesy of Hendra Holiday Park.*

# 6 Solar – Roof Mounted

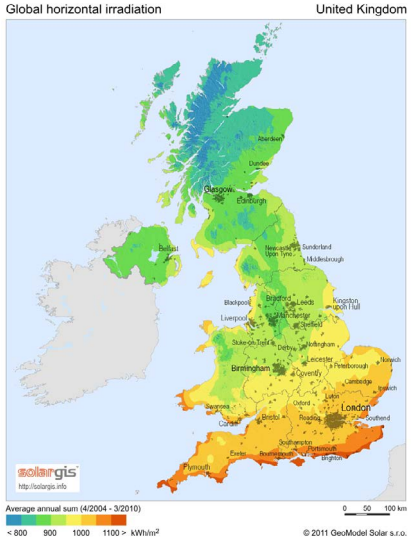
## 6.1 Context and technology overview

### 6.1.1 Solar PV

Photons (particles of light energy) hit the silicone in the cell and generate a voltage which causes an electrical current to flow. In the case of a solar PV array this current is collected from all the panels and fed into an inverter. The inverter converts the current from DC to AC to allow it to be used in the building upon which the panels are installed and any excess to be fed into the electrical grid.

### 6.1.2 Solar thermal (hot water)

The sun can also heat water. There are two main types of solar thermal panels: Flat Plate or Vacuum Tube. Generally, Vacuum Tubes are better suited for hotter water and winter performance and Flat plate collectors are more cost effective for summer use (e.g. campsites with large roof areas available).




*SolarGIS © 2014 GeoModel Solar*

The use of solar energy (PV and thermal) on rooftops is encouraged in the draft Local Plan. This includes domestic and non-domestic rooftops, such as factories, offices and farm buildings. It also includes other structures such as car ports (individual, or car park scale). When used in this format solar energy can provide multiple benefits, including the potential to supply clean electricity and heat to businesses and electricity for electric transport infrastructure. The draft Local Plan gives particular support to renewable energy innovations of this type.

Below are some examples where solar energy generation can be installed on structures other than rooftops:

- Integrating into the roof of car ports in car parks.
- Installing on a garage or other outbuilding.
- Creating covered walkways using solar panels as roofing.
- Incorporating within a conservatory or other extension.
- Integrating into street lighting to provide a low carbon power source.

Increasingly, the use of solar PV in this way can be combined with storage and direct use applications (such as electric car changing), to maximise the benefits of arising from the energy generated.

*Solar car port. Image: www.solarteam3.de*

### 6.1.3 The Resource

The UK receives a significant amount of solar energy from the sun and Cornwall is receives some of the highest levels in the UK. The map below shows the total average solar irradiation across the UK (per square meter), measured in kilo-watt hours (kWh).

## 6.2 Permitted Development

Permitted Development refers to planning consent which is granted upfront by the Government rather than the local planning authority. This means that where a development meets a set of pre-defined criteria, an application for planning permission is not required.

The Town and Country Planning (General Permitted Development) (England) Order 2015 (and any subsequent amendments to that Order), sets out the circumstances under which both solar PV and solar thermal development qualify for Permitted Development. Applicants should consult the most up to date version of the Order when consideration installing such development on rooftops for both domestic and non-domestic buildings.

The Council operates a service which will determine whether or not a proposed rooftop solar development requires a planning application. Applications for service, referred to as Certificates of Lawfulness of Proposed Use or Development can be submitted via the Council's website.

In some cases, it may be necessary to obtain prior approval from the local planning authority before renewable energy development (qualifying as permitted development under the 2015 Order) can be carried out. The matters that require prior approval vary depending on the type of development.

## 6.3 Landscape, visual impact and design considerations.

The following guidance should be considered to minimise impacts upon the landscape, streetscape and visual amenity:

- Consider the effect of any solar installation on the character or appearance of the building.
- Installations should be configured in a way which maintains, enhances or improves the balance and proportions of the recipient building or nearby buildings. This may include designing the solar installation to complement existing windows and roof lights and avoiding designs which may appear disproportionate and unbalanced.
- Where more than one installation is proposed within a street, consider joint design and installations to maximise the design coherence (and minimise the overall impact upon the street-scape). In such case, single planning applications covering all the installations may be possible.
- Consider the potential for cumulative impacts between the proposed and existing rooftop solar developments on the overall appearance on a collection of buildings or roofs.
- Solar panels with dark coloured, non-reflective frames may be more acceptable on buildings with slate roofs, or on new buildings in areas where slate roofs are characteristic..

*Image: WREN*

- Outbuildings or extensions can provide good locations for solar panels while having a minimal effect on the original building.
- Consideration should also be given to the landscape character impacts, particularly within the AONB and World Heritage Site. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.

In some instances, for example where there is no suitable roof elevation available consideration should be given to the development of standalone or ground mounted solar PV installation within the curtilage of the building.

A standalone or ground mounted solar PV array should be carefully located in order to ensure that the installation is protected from shade throughout its life. Allowance should be made for the future growth of trees and vegetation or the erection of buildings, particularly where such matters are outside your control (i.e. on neighbouring land or buildings).

## 6.4 Ecology

Roof mounted solar developments have the potential to impact on ecology and biodiversity, primarily through the disturbance of building nesting and roosting species such as birds and bats. Early assessment of is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

Careful consideration should be given to the seasonality of these surveys as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.

Natural England, the Royal Society for the Protection of Birds and the Bat Conservation Trust can provide guidance on how these surveys should be undertaken and what appropriate mitigation measures may be needed.

Development proposals should consider opportunities for ecological enhancements. For example, through providing additional bat and bird roosting opportunities through the provision of boxes.

### 6.4.1 Historic environment

The potential impact of rooftop solar on Cornwall's historic environment can be defined in two ways:

1. Direct physical impact on identified features of historic interest. In the case of roof mounted solar, this would normally historic buildings.
2. Visual impact on the setting of historic assets. Every heritage asset has a setting, defined as the surroundings in which it is experienced, and elements of which can make a positive or negative contribution to the significance of an asset. The extent and significance of setting, and the impact of development upon it, are not fixed as they change over time and need to be assessed on a case by case basis.

Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have "special regard to the desirability of preserving" listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.

The following guidance should be considered when developing proposals for rooftop solar:

- Where it is clear that a development may affect historic buildings specific advice on assessment can be sought as part of a pre-application enquiry.
- Assessments may be needed which should be undertaken to the professional standards set out by the Institute for Archaeologists and by appropriately qualified persons.
- Assessments should follow the latest guidance provided by English Heritage on assessing direct and indirect impacts upon heritage assets.
- Development should protect the outstanding universal value (OUV) of the World Heritage Site (WHS) through conservation of the components that contribute to OUV (including remains of mines, engines houses, smallholdings, ports, harbours, canals, railways, tramroads, industries allied to mining, and new towns and villages reflecting the extended period of industrial expansion and prolific innovation) and avoiding siting solar arrays on areas of Recently Enclosed Land, industrial and post-industrial land, ornamental landscapes and settlements within the WHS.
- Development should protect the character of conservation areas (including views integral to their character) and views to and from historic parks and gardens/battlefields (particularly designed views).

## 6.5 Aviation and Electromagnetic Transmissions

Rooftop solar ejnergy development can be safely located near airports. However, when seeking to locate a solar PV development on buildings or structures in close proximity to a civil or MOD airport or airfield, it is recommended that guidance provided by the Civil Aviation Authority (CAA) and the MOD (as relevant to the site in question) is followed.

## 6.6 Glint & glare (solar PV only)

Glint is produced as a direct reflection of the sun in the surface of the solar PV panel. Glare is a continuous source of brightness. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the

sun. Glare is less intense than glint.

Glint and glare can be a significant issue and should not be underestimated, particularly to the south east of a solar PV development. The potential impacts upon homes, businesses and public highways in particular, should be thoroughly assessed at the pre-planning stage.

The design of solar PV developments should be informed by a glint and glare assessment which should be submitted in support of a planning application. Where necessary, appropriate mitigation measured, such as screening, should be employed to ensure that harmful impacts are avoided.

The following guidance should be considered in respect of glint and glare assessments:

- Glint and glare can be a particular issue if 'tracking' panels are proposed as these may cause differential diurnal and/or seasonal impacts.
- Particular impacts can be experienced in the 'ground based glint zone' (close to ground level). This zone will vary depending upon the circumstances of the site and impacts will vary according to topography, buildings, vegetation, etc. Assessments should fully consider the potential for ground-based impacts on residential amenity.
- The potential for PV panels, frames and supports to have a combined reflective quality should also be assessed. This assessment should consider the likely reflective capacity of all of the materials used in the construction of the solar array.

# 7 Hydropower

## 7.1 Context and technology overview

There are three main types of hydropower scheme:

1. **Pumped storage schemes** - these usually require a high level and a low level storage reservoir. At times of low electricity demand, or when electricity is abundant, energy is used to pump water from the lower level to the higher level storage reservoir. This water is released through turbines to generate electricity when demand is high.
2. **Storage schemes** – these require water to be impounded in a reservoir which feeds a turbine and generator.
3. **Run of river schemes** - water is taken from a watercourse, usually involving a weir, with no facility for water storage, directed through a turbine (or water wheel) and returned to the watercourse. These are the most likely hydropower schemes in Cornwall.

The following components are usually present in a hydropower facility:

- **Intake** - usually comprises a weir or dam across a watercourse in order to direct a regular supply of water towards the hydropower turbines. A settlement tank, or silt trap, may be required behind the weir in order to collect silt being carried downstream.
- **Penstock/pipeline or headrace** - the pipeline (sometimes called the penstock) connects the intake with the turbine.
- **Turbine house** - the building or structure which houses the turbine, generator and any ancillary equipment.
- **Tailrace** - the channel which returns water from the turbine to the watercourse.
- **Grid connection** - the electrical connection between the turbine house and the electricity network.

### 7.1.1 The Resource

There are approximately 4,000km of river in Cornwall, of which 3,250km are classed as 'Ordinary watercourses' (under the responsibility of Cornwall Council), and 750m are classed as Main Rivers (under the responsibility of the Environment Agency).

Being a peninsular, nowhere in Cornwall is far from the sea, meaning rivers tend to be relatively short in length and have small catchments, which respond quickly to rainfall events. Also, the topography of Cornwall with its higher upland interior tends to create rivers with more 'flashy' flow regimes.

In most cases the rivers flow through farms and woodland and, in some cases, past mills before they reach estuaries. Prior to the advent of steam power many of Cornwall's industrial businesses were powered by water in the form of river or leat based water wheels and a number of tidal mills were in operation. These installations harnessed the power of the water to drive mills, workshops and pump water from the mines. It has been suggested that, over the centuries, there may have been as many as three thousand mills operating throughout Cornwall.

While the majority of the run of river resource in Cornwall is relatively small scale, the benefits to farming, domestic and businesses users in terms of the energy and economic returns should not be underestimated. Pumped hydro storage also presents a significant opportunity for Cornwall, particularly as part of the balancing mechanisms which are emerging to support variable electricity supply elsewhere in the regional distribution network.

## 7.2 Landscape & visual impact

Careful site selection as well as the design and layout are the most effective ways of minimising landscape and visual impacts. This requires detailed consideration in the early stages of the project. The following guidance should be considered when siting and designing hydropower development proposals:

- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes and settlements.

- Avoid areas where ground level disturbance affects landscapes that are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site upon the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site upon the special qualities of Cornwall's Areas of Great Landscape Value.
- If the development is proposed in an open landscape any built elements should be minimal or designed to match the character and appearance of the local landscape and any existing architectural features.
- It may be possible to adopt or renovate existing buildings or structures, particularly if these are former mill features, and such investment may enable older properties to be redeveloped and could provide additional interest.
- Careful consideration should be given to the design and landscaping of any hydropower scheme. The introduction of a 'modern' technology within a rural landscape, or in close association with older properties or structures, will require attention to detail.
- Hydropower schemes can operate for many years and some built elements, such as weirs and turbine houses, may become features of landscape and architectural interest and this should be reflected in their design and quality.
- The design of any fencing or security measures should be carefully considered. In rural areas, materials and construction styles should be used which reflect local vernacular.
- Any pipelines should normally be ducted or buried and any pipeline routes, disturbed ground or ground works should be carefully restored.
- Existing Cornish hedges and established vegetation, including mature trees, should be retained. Trees and hedges should be protected during construction. Additional hedge planting should be considered where such landscape screening would beneficially screen the proposed development.
- Design any buildings, storage or ancillary infrastructure to minimise the impact and, where practicable, make a positive contribution, in landscape and visual terms, to a locality.
- The colour and external finish of any new buildings should complement existing buildings.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

## 7.3 Ecology

The potential ecological impact of a proposed hydropower development should be carefully considered at the site selection and initial design stages. This should include the impact of potential disturbance within and beside the watercourse during construction and any impacts during operation.

Where ecological issues are potentially significant there should be early liaison between the developer, the Environment Agency and Natural England in order to determine the level and extent of ecological information likely to be required at the planning application stage. This may include surveys of the watercourse together with specialist surveys for bryophytes, invertebrates, amphibians, birds and mammals.

The following guidance should be considered when identifying a site and designing a hydropower scheme:

- Potential ecological impacts should be avoided, by careful site selection, sensitive design and construction techniques and the timing of any construction works to minimise or avoid unnecessary disturbance or intrusion to sensitive species or habitats.
- If a hydropower scheme is proposed on, or in close proximity to, designated areas of special ecologic interest, they may contain some of the most important and sensitive habitats and species, some of which are legally protected. Potentially significant or damaging effects on these habitats and species are avoided or minimised.
- Where the proposed development incorporates existing older structures or buildings a bat or owl survey may be required.
- Avoid locating turbines on ecologically important sites, including Sites of Special Scientific Interest (SSSI), Special Areas of Conservation (SAC), National and Local Nature Reserves; and Cornwall Conservation sites (County Wildlife Sites).
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through its pre-application process) and Natural England can provide more detailed advice on this process.
- The potential enhancement of ecological habitats should be carefully considered as part of any design proposals. A hydropower proposal should, where practicable, provide opportunities to enhance ecological interest and biodiversity.
- Where engineered features are introduced alongside, or within, watercourses these should be designed and constructed in a manner which encourages and promotes biodiversity.
- Any structures, such as dams or weirs, should be designed and constructed in a manner which allows the safe passage of fish while providing fish, and other freshwater animals, protection from any turbines.
- The development of a hydropower should, be designed and constructed in a manner which benefits the fish population, for example by oxygenating the water or providing fish passage through a section of watercourse which is currently inaccessible.
- Any work should be programmed and scheduled to protect spawning salmonids.
- Early liaison with the Environment Agency, and any fishing interest groups, is highly recommended.

## 7.4 Historic environment

Small scale hydropower schemes were once a familiar part of the Cornish landscape. The need for a good head of flowing water usually places such hydropower schemes in a scenic rural setting and traditional water mills have become an iconic part of the countryside. Many water mills have become Listed Buildings and are now located in protected landscapes.

The potential impact of a hydropower scheme on Cornwall's cultural heritage can be defined in two ways:

1. Direct physical impact or loss of identified features of historic interest including undiscovered archaeology.
2. Visual impact on the character or appearance and setting of features of historic interest.

Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have *"special regard to the desirability of preserving"* listed buildings and their settings.

This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.

The following guidance should be considered when identifying a site or designing a scheme, to ensure that direct or visual impacts are avoided or managed:

- Avoid locations of known archaeology as recorded on the Cornwall Historic Environment Record. Where it is clear that a development may affect historic sites or buildings specific advice on assessment can be sought as part of a pre-application enquiry.
- Special care will be needed if the scheme needs to be located near to, or as part of, a listed buildings or structure. In this case the proposed development may require Listed Building consent.
- If the site proposed is located within a Conservation Area early consultation with the relevant consultation area management plan is recommended to understand how the proposal might impact upon the character of the Conservation Area.
- Proposals within, or adjacent to, the World Heritage Site must be designed and installed in a manner which does not harm the values of the site, in particular its Outstanding Universal Value.
- Where hydropower plants are proposed in association with historic buildings, in particular, historic mills, these should be designed and installed with the appropriate sensitivity. The aim should be to retain and maintain as much as possible of the existing structure and machinery of this historic building. Particular care should be taken to protect the mill / building and site before commencement and during the progress of any repair and installation works.
- Original features that relate to the working of any historic buildings should be kept in their correct context. Old parts removed are often worth preserving separately as they may be of historical or technical interest.

## 7.5 Noise

Wherever possible the turbine associated with a hydropower facility should be accommodated within a turbine housing which should be capable of reducing and controlling the noise emissions to acceptable levels.

The following guidance should be considered to ensure that noise from water flowing or cascading over other structures, such as weirs and water wheels, does not provide justifiable cause for complaint.

- If the proposed development is to be located in close proximity to noise sensitive receptors (for example homes), this is likely to trigger the requirement for a noise assessment to be provided in support of the planning application.
- Where noise assessments are required they will normally be expected to include detailed predictions of likely noise levels at receptors and information on the prevailing background noise level, at typical hydropower operating levels.
- The level of detail required will depend on the number of properties that are likely to be affected and the specific details of the proposed development.

*Image: Devon&CornwallOnline*

## 7.6 Drainage - flood management - water quality

The hydrological impact of a hydropower scheme is predominantly a matter to be considered by the Environment Agency. However, any alteration to the flow of a river can cause potential flooding issues especially during extreme weather events and therefore a Flood Risk Assessment would be required as part of a planning application.

The primary purpose of a Flood Risk Assessment is to understand whether or not an additional risk of flooding, either up or downstream, will arise as a result of the proposed development. Where this is likely to happen, mitigation should be identified (including potentially relocating the proposal) to remove the risk.

The following guidance should also be considered when designing measures to manage runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

## 7.7 Rights of way

Any proposal for a hydropower facility should carefully consider the impact on the users of any adjacent public right of way, including footpaths and bridleways. Public rights of way include footpaths, bridleways and byways open to all traffic. It is an offence to obstruct a public right of way (including pavements) irrespective of the outcome of any planning decision.

The Definitive Map and Statement is the legal record of public footpaths, bridleways and byways. Note that some public rights of way may not be recorded on the Map. Early engagement with the Council (through the pre-application process) is recommended to ensure all public rights of way are identified.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of users of any adjacent public right of way, including footpaths and bridleways.
- A diversion of extinguishment of a public right of way may be possible, where required, under the provision of the Town and Country Planning Act 1990 (as amended) should planning consent be granted. If such changes are required a legal Order must be made by the Council. Early engagement with the Council's Countryside Access Team is recommended.

## 7.8 Construction / traffic

The following guidance should be considered when developing a construction plan for the proposed development:

- Construction of hydropower plants should not normally necessitate large numbers of HGV movements. This should be kept to a minimum, particularly where the road network and site access are not designed to accommodate such vehicles.
- Where such vehicle movements are necessary, the schedule and routing will need to be defined and agreed with the planning authority.
- A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should seek to include measures such as:
  - Avoid HGV deliveries during local peak/school traffic periods.
  - Temporary traffic management systems for site access.
  - Reduced speed limits on all identified routes to reduce potential of traffic accidents.
- The developer may be required to demonstrate that the local highway network is able to accommodate the type and number of vehicles likely to be required to install, construct and maintain a hydropower facility.

## 7.9 Site security/safety/lighting

Whilst there is an acknowledged need to ensure that hydropower schemes are adequately secured, consideration should be given to the impacts of such security measures on the landscape, historic environment and visual amenity.

The following guidance should be considered when designing lighting and security measures:

- If security perimeters are required, minimise the use and height of security fencing and, where available, utilise existing features, such as Cornish hedges.
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 7.10 Groundwork's - site profiling, soil storage, re-profiling

The construction of a hydropower plant will have similar impacts to many other construction projects. However, the location of such a construction project in close proximity to a watercourse may present particular challenges and concerns, particularly in relation to pollution caused by the spillage of oils, fuels or lubricants or the disturbance and release of silt, mud or suspended solids into any watercourse. The Council may, in conjunction with the Environment Agency, request that specific site management measures are set out and adopted in order to minimise and avoid such pollution. In addition:

- Groundworks should ensure that impacts on sensitive habitats are avoided. This may require the preparation, submission and implementation of a detailed construction specification.
- Keep ground disturbance associated with the installation and use of access tracks to a minimum.
- Where new access routes have to be constructed identify and, where necessary, mitigate any potential impacts on hydrology, drainage and surface water run-off.

## 7.11 Site restoration / duration of planning permission

Planning permission for a hydropower plant might be time limited (usually 25 years). Where this is the case, planning conditions may be applied which require the decommissioning of the facility and the ground reinstated to avoid the potential visual harm of a derelict structure in the landscape or watercourse, once the lifetime of the permission has expired.

Similarly, planning conditions may be applied requiring decommissioning if the hydropower plant fails during the consent period and stops generating electricity for a period of more than 12 months.

This does not preclude an extension of time application should the hydropower plant still be viably functioning after 25 years.

# 8 Biomass

## 8.1 Context and technology overview

Biomass is defined as any organic matter recently derived from plants or animals. Biomass can be produced by farming, land management and forestry sectors and can be used for the generation of renewable energy. Biomass fuels are those that can be converted into energy and therefore can be regarded as a renewable energy.

Biomass installations can range in size from the very small box stoves of a few kW suitable for heating domestic properties to very large scale biomass plants producing over 50 megawatts. Projects around 150kW are typically suitable for primary schools, small housing developments or large community centres. Medium scale schemes take many forms, with typical examples include plant nurseries, universities, hospitals, local authority buildings and any location performing significant industrial processes.

### 8.1.1 Resource

Biomass fuels can be divided into two categories; dry biomass that can be combusted, e.g. woody material and wet biomass that is best treated by anaerobic digestion. This guidance covers dry biomass only. For proposals related to mainly wet biomass, please see the planning guidance on anaerobic digestion.

Sources of biomass include:

- Virgin wood from the conventional management of trees. This includes thinning, felling and coppicing of sustainably managed forests, parks and trees.
- Wood residues from sawmills and other wood processing industries.
- Agricultural energy crops such as short rotation coppice (SRC), or miscanthus (a tall, woody grass also known as *'Elephant Grass'*) which may be grown on land unsuitable for food crops.
- Sources of waste wood can also come from undermanaged woodland in Cornwall.

*Short rotation coppicing*

## 8.2 Landscape & visual impact

Careful site selection as well as the design and layout are the most effective ways of minimising landscape and visual impacts. This requires detailed consideration in the early stages of the project. The following guidance should be considered when siting and designing biomass development proposals:

- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes and settlements.
- Avoid areas where ground level disturbance affects landscapes that are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site upon the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site upon the special qualities of Cornwall's Areas of Great Landscape Value.
- If the development is proposed in an open landscape any built

elements should be minimal or designed to match the character and appearance of the local landscape and any existing architectural features.

- Careful consideration should be given to the design and landscaping of any biomass scheme. The introduction of a 'modern' technology within a rural landscape will require attention to detail.
- The design of any fencing or security measures should be carefully considered. In rural areas, materials and construction styles should be used which reflect local vernacular.
- Existing Cornish hedges and established vegetation, including mature trees, should be retained. Trees and hedges should be protected during construction. Additional hedge planting should be considered where such landscape screening would beneficially screen the proposed development.
- Design any buildings, storage or ancillary infrastructure to minimise the impact and, where practicable, make a positive contribution, in landscape and visual terms, to a locality.
- The colour and external finish of any new buildings should complement existing buildings.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

## 8.3 Ecology

Biomass energy developments have the potential to impact on ecology and biodiversity. Early assessment is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species applicants should consider the following:

- Avoid locating biomass plants in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites.
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site and so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).
- Ecological surveys must be undertaken before a planning application can be determined and should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.
- Indirect impacts of biomass plants should also be considered in terms of feedstock provision and transportation. Large scale land use change close to biomass plants to provide feedstock has the potential to impact on biodiversity and should therefore also be considered at the design phase.
- Where ancient woodland is used as a source of feedstock for biomass plants consideration should be given to the harvesting practice. Sensitive harvesting is necessary in order to protect and enhance the biodiversity of ancient woodland ecosystems. The Forest Stewardship Scheme and UK Woodland Assurance Scheme offer certification standards that can help to ensure appropriate harvesting operations.

## 8.4 Historic environment

Biomass plants can have direct and indirect (visual) impacts on Cornwall's cultural heritage. Direct physical impacts normally result in a loss of identified features of historic interest including undiscovered archaeology. Visual impact means the development affects the character or appearance and setting of features of historic interest.

Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have "special regard to the desirability of preserving" listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.

- Biomass developments should be located away from known archaeological sites, as recorded on the Cornwall Historic Environment Record.
- Where it is clear that a development may affect historic sites or buildings, specific advice on assessment can be sought as part of a pre-application enquiry.
- Biomass plants should normally be located away from Scheduled Monuments and from sites or areas where they would affect the character or setting of a Listed Building.
- Visual impacts on historic sites may include the effects of such development on the Historic Landscape Character of Cornwall. An assessment of the impacts upon the historic landscape may be required which, in some cases, could be informed by the creation and use of photomontages and Zones of Theoretical Visibility (ZTVs).
- The landscape/visual impact must be considered with great care at the pre-application stage. Where it is clear that a development may affect historic sites or buildings, specific advice on assessment can be sought as part of a pre-application enquiry.
- When locating development within, or adjacent to, the World Heritage Site it should be designed and operated in a manner which does not harm the outstanding universal value of the site.

## 8.5 Noise

A typical biomass facility may operate continuously. Such operational requirements have the potential to cause unacceptable impacts on sensitive receptors such as residential properties and schools. The major source of noise is likely to be from lorry movements both entering and leaving the site and unloading of biomass.

Noise limits may be set at site boundaries or nearest sensitive receptors, these could be fixed limits based on guidance from the World Health Organisation (such as 55dB(A) during the day or 45dB(A) during the night). However, in rural areas where the ambient or background noise levels are very low the noise levels could also be lower. Background noise levels will need to be monitored and recorded so that an appropriate noise limit can be set. More detailed information on the Council's noise standards can be provided at the pre-application stage via the Council's Community Protection Team in the Public Protection and Business Support Service.

The following guidance is intended will ensure noise levels can be appropriate managed:

- Undertake all operations within closed buildings.
- Design buildings to reduce internal noise transmission.
- Designed plant with noise reduction measures such as external motors housed in sound proofed covers.
- Design the site with acoustic barriers such as bunding, planting and fencing where required.
- Maintain vehicles servicing the site properly, especially exhaust systems.
- Limit deliveries to normal working hours (usually 0800 and 1800 hours Monday to Friday and 0800 and 1300 hours on Saturday).
- Employ visual vehicle reversing warning systems rather than audible when on site if close to sensitive noise receptors.
- For larger schemes, if sensitive receptors such as housing are present, deploy noise monitoring regimes on site.

## 8.6 Use of land

Proposed biomass development should avoid higher grade agricultural land. Where this cannot be avoided any application for development affecting agricultural land should provide details about the impact of the development on that land including any mitigation measures.

Biomass energy crop production should avoid the use of land classified under the Agricultural Land Classification as grades 1 – 3a (Best and Most Versatile). Consideration should also be given to the local economic impacts of promoting energy crop growth on Best and Most Versatile agricultural land, in particular the extent to which this practice limits the availability of land at a competitive price for other existing forms of agriculture in the immediate locality.

## 8.7 Drainage - flood management - water quality

Climate change over the next few decades is likely to result in different weather patterns and conditions in the UK. In addition, sea levels are expected to rise. These factors may lead to increased and new risks from flooding within the lifetime of the proposed development. This should to be considered as part of the Flood Risk Assessment.

The primary purpose of a Flood Risk Assessment should understand whether or not the proposed development will result in an additional risk of flooding either up or downstream will arise as a result of the proposed development. Where this is likely to happen mitigation should be identified (including potentially relocating the proposal) to remove the risk.

The following guidance should also be considered when designing measures to manage surface water runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

## 8.8 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
  - The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
  - The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.

- Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
- Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' the development.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 8.9 Construction / traffic

Biomass delivery vehicles will need to be able to manoeuvre internally without impacting upon vehicle movement on the highway. Therefore the following issues need to be addressed by the operator of the biomass facility.

- Suitable parking spaces and manoeuvring areas within the site for operational, employees and visitor vehicles.
- Adequate vehicle turning and manoeuvring arrangements within the site during plant operation, to be shown on scaled site plan.
- Waiting area for feedstock lorries within site to prevent lorries "stacking" up and having to park on the public highway causing a potential hazard,
- Avoid the urbanisation of rural locations in the use of kerbing, extensive visibility splays, hard surfacing and lighting.

Medium to large scale biomass schemes will need to consider site access issues to facilitate delivery of fuel, usually by road transport, on a regular basis. A large facility may generate significant vehicle movements and there is a need to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Use speed limits on all identified routes to reduce potential of traffic accidents, where required.
- Design and construct the site entrance and access onto the public highway to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters.
- Design vehicle approaches to avoid sensitive areas, such as residential access roads.
- Consider the current (surveyed) and predicted traffic flows on the highways to be used to access the proposed development, and understand the impacts of daily movements to and from the site, broken down by vehicle types, over the length of a working day.
- Design the scheme to include adequate visibility splays onto the highway for traffic entering and leaving the site.
- Design and locate signage so as not to be visually intrusive in the local area especially if in a designated landscape.
- Ensure all vehicles leaving the site have clean wheels to avoid spreading of mud or debris on the highway. This may necessitate an onsite wheel wash facility with good drainage and maintenance features.
- Where wheel wash facilities are required, design the site access to be hard surfaced and sweepable between the wheel wash and the public highway.
- The site access should be designed to avoid surface water flowing out onto the public highway.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 8.10 Security/safety/lighting

For large commercial scale schemes the Health and Safety Executive can advise on safety considerations. The following guidance should be considered in relation to managing the impact of security and safety measures:

- If security perimeters are required, minimise the use and height of security fencing and, where available utilise existing features, such as Cornish hedges.
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 8.11 Emissions odour air quality

Both delivery and storage of biomass can all potentially contribute to unacceptable odour and air quality around the site if not properly managed.

Emissions to air from biomass facilities would normally be controlled through an environmental permit from the Environment Agency. Air Quality Management Areas have been designated in parts of Cornwall due to existing air quality issues. Careful consideration should therefore be given to the height and proximity of flues to other buildings and openings, such as windows or air intakes. An assessment of the air quality impact should be considered, taking into account any potential for cumulative effects. Early consultation with the Council's Public Protection and Business Support Service is recommended to ensure that proposed emission levels are appropriate.

Depending on the type of material being used (for example decomposing biomass), there may be odour issues that could affect local residents. The control of odours starts with routine maintenance of plant and equipment, and locating sources of odour, as far as practicable, from the site boundary and any sensitive receptors. An Odour Management Plan should be prepared for any site with a significant risk of odorous emissions. The Odour Management Plan formalises operative training and procedures, e.g. correct use of plant/process/materials, checks on plant performance, maintenance and inspection.

Dust can also be an issue to be managed at biomass sites, in particular from the movement of waste ash. Careful design and enclosure of operations within buildings can manage this issue. Similarly, wheel washing and clean access roads can prevent dust generation from vehicle movements on and off the site.

## 8.12 Pest control

The design and operation of a biomass installation should be undertaken in a manner which facilitates and promotes all unloading, processing and loading of biomass within a controlled environment. For larger schemes regular inspections and treatment by pest control specialists may be required. Other measures, such as grates covering drainage systems, can be employed to prevent rodents entering buildings.

# 9 Heat Pumps

## 9.1 Context and technology overview

There are three main types of heat pump technologies. These are:

- Ground source heat pumps
- Air source heat pumps
- Water source heat pumps

These technologies utilise heat that is stored in the ground, air or water and transfer this heat for heating floors, rooms or water.

Ground source heat pumps normally require the excavation of a trench in which a length of pipe is laid, or the drilling of a relatively shallow borehole. Fluid is circulated around the pipes which absorbs the heat from the ground. The fluid transfers the heat into the unit where it is transferred into the compressor (which increases the temperature) and circulated around the property. Air and water source heat pumps use the same process, but draw their heat from the air and water. Air source heat pumps do not require lengths of pipework to extract heat from the air.

## 9.2 Landscape & visual impact

Ground source heat pumps will normally require the installation of underground pipes to act as heat exchangers. Water source heat pumps have require similar infrastructure installed in water bodies. Neither are likely to be highly visible and cause significant landscape impacts.

Heat exchangers required for air source heat pumps may have a visual impact. If possible such heat exchangers should be installed in secluded spots away from the primary elevations of building where they are not highly visible.

Wherever practicable, all other equipment should be housed and located inside existing buildings.

Proposals for large scale communal heat pumps should consider the following guidance:

- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes and settlements.
- Avoid areas where ground level disturbance affects landscapes that are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site upon the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site upon the special qualities of Cornwall's Areas of Great Landscape Value.
- The design of any fencing or security measures should be carefully considered. In rural areas, materials and construction styles should be used which reflect local vernacular.
- Existing Cornish hedges and established vegetation, including mature trees, should be retained. Trees and hedges should be protected during construction. Additional hedge planting should be considered where such landscape screening would beneficially screen the proposed development.
- Design any buildings, storage or ancillary infrastructure to minimise the impact and, where practicable, make a positive contribution, in landscape and visual terms, to a locality.
- The colour and external finish of any new buildings should complement existing buildings.

## 9.3 Ecology

Heat pump developments have the potential to impact on ecology and biodiversity. Early assessment is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species applicants should consider the following:

- Avoid locating heat pumps in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites.
- The use of heat exchangers in water bodies, such as ponds and lakes, could lead to ecological impacts and should be carefully considered.
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.

*Image: historic-scotland*

- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site and so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).
- Ecological surveys must be undertaken before a planning application can be determined and should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

## 9.4 Historic environment

The following guidance should be considered in respect of heat pumps and the historic environment:

- The excavation of trenches required for pipework or cabling associated with a heat pump proposal may have an impact on buried archaeology. Sites of known archaeological interest are recorded on the Cornwall Historic Environment Record.
- Where it is clear that a development may affect historic sites or buildings specific advice on assessment can be sought as part of a pre-application enquiry.
- Where archaeology may be an issue a vertical borehole, possibly beneath a new building, may be preferable to horizontal trenches across surrounding land.
- The main impact associated with the installation of an air source heat pump is likely to be the siting of a heat exchanger on the outside of a building, particularly if it is located on, or adjacent to, a listed building or conservation area. In all instances design issues such as fixings, colour, reflectivity and size should be carefully considered.
- Any heat pumps installed on a Listed Building or on a building within its curtilage will normally require planning permission and may also require Listed Building consent.

- Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have "special regard to the desirability of preserving" listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.
- Any standalone heat pump installation within the curtilage of a Listed Building will also normally require planning permission although there may often be a preference for installations on outbuildings/ extensions to listed buildings, rather than applying such an installation on the Listed Building itself.
- The Council's Historic Environment Record can provide comprehensive advice relating to the most appropriate and sensitive way to install heat pumps on buildings of historic importance.
- Large scale communal heat pumps may have indirect visual impacts on the setting of features of historic interest (as well as a direct impact upon archaeology). In such cases development proposals should carefully consider the impact terms of the design and location on any features of historic interest in the vicinity.

## 9.5 Noise

Air source heat pumps usually require a small cabinet to be installed immediately outside the recipient building in order to accommodate the equipment. This often includes an exposed fan which has potential to cause noise nuisance, particularly to neighbours. The design, location and installation of this equipment should be given careful consideration in order to prevent noise impacts. Under certain circumstances air source heat pumps can be installed in association without the need for a full planning application (under Permitted Development). In these cases the heat pump should be installed in accordance with the MCS Planning Standard for Air Source Heat Pumps (MCS 2020).

Any equipment associated with larger scale communal heat pumps should be appropriately housed and located away from residential properties in order to prevent unacceptable impacts arising from noise emissions.

## 9.6 Drainage - flood management - water quality

Individual building scale heat pumps are not likely to present flood or water quality issues where they are properly installed and maintained. Larger scale communal heat pumps have potential to result in flood and water quality impacts particularly, as in the case of water source heat pumps, where they are located close to water courses or bodies. In these cases a Flood Risk Assessment may be required.

The primary purpose of a Flood Risk Assessment is to understand whether or not an additional risk of flooding, either up or downstream, will arise as a result of the proposed development. Where this is likely to happen mitigation should be identified (including potentially relocating the proposal) to remove the risk.

The following guidance should also be considered when designing measures to manage surface water runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

## 9.7 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful

inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
  - The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
  - The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.
  - Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
  - Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' the development.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 9.8 Groundwork's - site profiling, soil storage, re-profiling

The development of heat pump installation is likely to require trenching works for pipework or cabling (particularly in the case of ground source heat pumps). Such earthworks should be undertaken in a manner which facilitates easy and successful restoration.

Soil types, particularly topsoil and subsoil, should be excavated, stored and replaced separately. This is best undertaken where topsoil is excavated and placed to one side of a trench with subsoil then being excavated and placed to the other side of the excavation, thereby avoiding the mixing of soil types and facilitating replacement and restoration.

## 9.9 Construction / traffic

It is not anticipated that small and individual building scale heat pumps will require specific construction / traffic management considerations, but larger scale communal heat pumps may require traffic management during the construction and decommissioning phases. The following guidance should be considered:

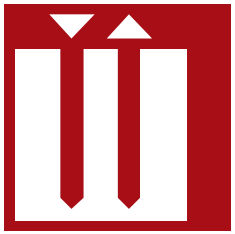
- Where HGV deliveries are required, avoid these during local peak/ school traffic periods.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters.
- Design the scheme to include adequate visibility splays onto the highway for traffic entering and leaving the site.
- If multiple deliveries are required during the construction stage consider the current (surveyed) and predicted traffic flows on the highways to be used to access the proposed development and understand the impacts of daily movements to and from the site, broken down by vehicle types, over the length of a working day.
- The site access should, be designed to avoid surface water flowing out onto the public highway.

- Where abnormal loads need to be brought to the site, consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 9.10 Security/safety/lighting

For large communal heat pump developments site security and health and safety may be a consideration. The Health and Safety Executive can advise on specific site safety considerations. In addition, the following guidance should be considered in relation to managing the impact of security and safety measures:

- If security perimeters are required, minimise the use and height of security fencing and, where available, utilise existing features, such as Cornish hedges.
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity.
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.



# 10 Deep Geothermal

## 10.1 Context & technology overview

Deep geothermal energy derives from a variety of sources. The Earth's crust is heated by the slow conduction of the planet's enormous internal heat reserves and by natural radioactive decay. In some rocks the mineral content boosts the radioactive heating component and creates higher geothermal gradients (the rate of increasing temperature compared to the increasing depth in the Earth's interior). Most of Cornwall is underlain by such 'heat producing' granite, which represents a significant geothermal resource. There are various types of geothermal resource which may potentially be exploited in Cornwall.

### 10.1.1 Recovering hot water from mines

Water contained within, or flowing through, mine workings will absorb heat from the surrounding rock. Water temperature will, generally, increase by 3˚C with each additional 100m depth and at a depth of 800m the temperature may potentially reach 30-40˚C. Warm water can be pumped from the mine, or allowed to flow out naturally, and the warm water can be used directly or indirectly for heating purposes. There are many mines in Cornwall from which energy could potentially be recovered from warm mine water in combination with a range of technologies, including heat pumps (more guidance is provided in the Heat Pumps section).

### 10.1.2 Recovering hot water from permeable rocks

Water enclosed within permeable rocks, known as hot sedimentary aquifers (HSA's), becomes heated and may be pumped from the aquifer and used directly or indirectly for heating purposes. This requires specific geological conditions to exist and the underlying geology of Cornwall is likely to provide very limited opportunity for such development.

### 10.1.3 Engineered/Enhanced Geothermal Systems (EGS)

Water is injected to a depth of between 4 and 5km where it is heated to temperatures exceeding 170˚C by passing through the natural fractures in the rock. The heated water is captured in one or more production wells and returned to surface to produce renewable heat or drive steam turbines to generate electricity. Cornwall was the location for Europe's first deep geothermal research and development facility, the Hot Dry Rocks (HDR) project, which took place at Rosemanowes Quarry, near Penryn, between 1976 and 1991. It has been estimated that geothermal power in Cornwall could generate up to 4GW of electricity.

## 10.2 Optimising and Co-locating Deep Geothermal

Deep geothermal has significant potential for optimisation and the benefits of co-location with heat and power users can be significant. Policy 15 of the Cornwall draft Local Plan encourages measures which give rise to these outcomes.

Optimisation of deep geothermal in Cornwall means developments will be encouraged which make the optimum use of the available resource in a given location where it is acceptable to do so, taking into account the provisions of the draft Local Plan (including, for example, considerations such as landscape, heritage and residential amenity impacts).

Optimisation can also mean maximising the output of the plant in terms of generating heat and power. Optimum plant performance will depend upon the circumstances affecting each plant and the external demands placed upon it. Such circumstances may include, for example, the local electricity grid or heat network management requirements, the needs of local energy consumers, or the desire to connect and supply a particular energy load. Where such measures can be shown to have local benefits they will be supported.

## 10.3 Landscape & visual impact

Careful site selection as well as the design and layout are the most effective ways of minimising landscape and visual impacts. This requires detailed consideration in the early stages of the project. The following guidance should be considered when siting and designing geothermal development proposals:

- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes and settlements.
- Avoid areas where ground level disturbance affects landscapes that are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site upon the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site upon the special qualities of Cornwall's Areas of Great Landscape Value.
- If the development is proposed in an open landscape any built elements should be minimal or designed to match the character and appearance of the local landscape and any existing architectural features.
- Careful consideration should be given to the design and landscaping of any geothermal development. The introduction of a 'modern' technology within a rural landscape will require attention to detail.
- Existing Cornish hedges and established vegetation, including mature trees, should be retained. Trees and hedges should be protected during construction. Additional hedge planting should be considered where such landscape screening would beneficially screen the proposed development.
- Design any buildings, storage or ancillary infrastructure to minimise the impact and, where practicable, make a positive contribution, in landscape and visual terms, to a locality.
- The colour and external finish of any new buildings should complement existing buildings.
- The colour and external finish of any new plant/buildings should reflect the vernacular of any existing buildings in the vicinity of the site.
- Where feasible re-use existing buildings and structures to accommodate part of the deep geothermal energy process, particularly where those structure merit retention.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

*Image: Geothermal Project Insheim by K. Venus*

## 10.4 Ecology

Deep geothermal energy facilities have the potential to impact on ecology and biodiversity. Early assessment is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species applicants should consider the following:

- Avoid locating geothermal facilities in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites.

- The use of heat exchangers in water bodies, such as ponds and lakes, could lead to ecological impacts and should be carefully considered.
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site and so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).
- Ecological surveys must be undertaken before a planning application can be determined and should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.

## 10.5 Historic environment

Geothermal development can have direct and indirect (visual) impacts on Cornwall's cultural heritage. Direct physical impacts normally result in a loss of identified features of historic interest including undiscovered archaeology. Visual impact means the development affects the character or appearance and setting of features of historic interest. In order to effectively minimise the impact upon the historic environment the following guidance should be considered:

- Development should be located away from known archaeological sites, as recorded on the Cornwall Historic Environment Record.
- Where development is proposed within known archaeologically sensitive locations, professional archaeological monitoring of ground works may be required.
- Development should normally be located away from Scheduled Monuments and from sites or areas where they would affect the character or setting of a Listed Building.
- Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have "special regard to the desirability of preserving" listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable weight given to the findings of that assessment when the application is determined.
- Visual impacts on historic sites may include the effects of such development on the Historic Landscape Character of Cornwall. An assessment of the impacts upon the historic landscape may be required which, in some cases, could be informed by the creation and use of photomontages and Zones of Theoretical Visibility (ZTVs).
- The landscape/visual impact must be considered with great care at the pre-application stage. Where it is clear that a development may affect historic sites or buildings, specific advice on assessment can be sought as part of a pre-application enquiry.

## 10.6 Noise

The development of a deep geothermal energy facility will require a significant, albeit temporary, drilling operation which would normally operate continuously (24 hour, 7 days a week). If not carefully managed, such operational requirements have the potential to cause significant and unacceptable impact on sensitive receptors such as residential properties or schools. Appropriate noise management is particularly important given the desire expressed in Policy 15 of the Cornwall draft Local Plan to locate heat generating development, such as deep geothermal, within the proximity of heat users (potentially homes), in order to enable those users to benefit from the availability of low carbon heat.

Noise limits may be set at site boundaries or nearest sensitive receptors, these could be fixed limits based on guidance from the World Health Organisation (such as 55dB(A) during the day or 45dB(A) during the night). However, in rural areas where the ambient or background noise levels are very low the noise levels could also be lower. Background noise levels will need to be monitored and recorded so that an appropriate noise limit can be set. More detailed information on the Council's noise

standards can be provided at the pre-application stage via the Council's Community Protection Team in the Public Protection and Business Support Service.

- Developers should demonstrate that, throughout the construction, operation and decommissioning phases of a deep geothermal development, all practicable measures will be taken to minimise noise emissions.
- If sensitive receptors, such as houses, are present noise monitoring regimes should be deployed using an open book approach to the monitoring data. The monitoring regime should be agreed with the local planning authority.

## 10.7 Use of land

Wherever geological and thermal conditions allow, geothermal development should be sited on previously developed/brownfield sites, contaminated land (which cannot easily be remediated for other uses) and industrial land. Where development is located on agricultural land it should, avoid significant loss of Best and Most Versatile agricultural land. Where such agricultural land cannot be avoided clear justification of the benefits of the development and understanding of the impact on the supply of agricultural land would have to be demonstrated.

The following steps are recommended:

- Provide an explanation of why the proposed development needs to be located on the site and not on land of a lesser agricultural classification within the area.
- Provide information on the impact of the proposed development on the local area's supply of farming land within the same classification.

## 10.8 Flood management - water quality

Climate change over the next few decades is likely to result in different weather patterns and conditions in the UK. In addition, sea levels are expected to rise. These factors may lead to increased and new risks from flooding within the lifetime of the proposed development. This should be considered as part of the Flood Risk Assessment.

The primary purpose of a Flood Risk Assessment is to understand whether or not an additional risk of flooding, either up or downstream, will arise as a result of the proposed development. Where this is likely to happen mitigation should be identified (including potentially relocating the proposal) to remove the risk.

The following guidance should also be considered when designing measures to manage surface water runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Install rainwater harvesting and retention for use on site.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

Consideration should also be given to the following issues:

- The source of the water to be used during the development and operation of the deep geothermal plant.
- The method of water abstraction and circulation within the heat exchange process.
- The hydrological conditions in the area.
- The quality of the water used within the heat exchange process and the risk of water leakage from the process (including the reservoir), including the consequence of this water getting into the local water environment.
- The distances from the boundary of the site to residential or recreational areas, waterways, water bodies and other agricultural or urban sites.
- The existence of groundwater, coastal water or nature protection areas in the locality.
- The risk of flooding or subsidence on the site and the potential issues for water quality which may arise from such incidents.

## 10.9 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with

or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
  - The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
  - The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.
  - Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
  - Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' the development.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 10.10 Construction / traffic

Vehicles associated with the construction and maintenance of a deep geothermal facility will need to be able to manoeuvre internally without impacting upon vehicle movement on the highway. The following guidance will assist with this:

- Provide suitable parking spaces and manoeuvring areas within the site for development, operational, employees and visitor vehicles.
- Provide adequate vehicle turning and manoeuvring arrangements within the site during plant operation, to be shown on scaled site plan.
- Provide waiting area for lorries within site to prevent lorries "stacking" up and having to park on the public highway causing a potential hazard.
- Avoid the urbanisation of rural locations in the use of kerbing, extensive visibility splays, hard surfacing and lighting.

Deep geothermal schemes will need to consider site access issues, particularly in relation to importing construction equipment and drilling equipment. It is important to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements which may be generated. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Where required use speed limits on all identified routes to reduce potential of traffic accidents.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters.
- Design vehicle approaches to avoiding sensitive areas, such as residential access roads.
- Consider the current (surveyed) and predicted traffic flows on the highways to be used to access the proposed development and understand the impacts of daily movements to and from the site, broken down by vehicle types, over the length of a working day.
- Design the scheme to include adequate visibility splays onto the highway for traffic entering and leaving the site.
- Design and locate signage so as not to be visually intrusive in the local area especially if in a designated landscape.
- Ensure all vehicles leaving the site have clean wheels to avoid spreading of mud or debris on the highway. This may necessitate an onsite wheel wash facility with good drainage and maintenance features.
- Where wheel wash facilities are required, design the site access to be hard surfaced and sweepable between the wheel wash and the public highway.
- The site access should, be designed to avoid surface water flowing out onto the public highway.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 10.11 Security/safety/lighting

Geothermal development may require external lighting, particularly during initial drilling operations. The following lighting guidance should be considered to minimise the visual impact of lighting:

- Where possible, use timer switches/motion detectors to enable lower levels of lighting outside of normal operating hours or when lighting is not required.
- Direct lighting downwards towards the ground to avoid unnecessary light spill and light trespass off site.
- Avoid permanent lighting on edge of site particularly at access points that front the public highway.
- Use of planting and bunding to contain lighting effects.
- Direct lighting away from the public highway and any dwellings within the vicinity of the site.
- Minimise the use of security lighting. Wherever possible, use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- If security perimeters are required, minimise the use and height of security fencing and, where available, utilise existing features, such as Cornish hedges.
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 10.12 Drilling impact and seismic assessment

The form of geothermal energy likely to be proposed in Cornwall is Engineered Geothermal Systems (EGS), which may involve artificially enhancing the permeability of the rock at the heat source using a technique known as hydraulic stimulation. This is achieved by injecting water into the natural fractures in the rock to slightly increase their aperture. Injections of this sort can induce very low energy seismic events, some of which may be noticeable as ground vibrations at the surface, close to the site.

In order to ensure that geothermal development does not create an unacceptable risk of seismic activity, a seismic hazard assessment should

be undertaken. This should consider:

- The historical and existing level of seismic activity in the area of the development site and the nature of the underlying geology.
- The likelihood of the development inducing and/or triggering seismic activity and ground vibration and any measures to avoid or mitigate such seismic activity.
- The measures to be adopted to monitor seismic activity and ground vibration during site development and operation, the maximum acceptable level of ground vibration (see paragraphs below), and the measures to be adopted should this level be exceeded.

In order to create a simple and transparent framework for assessing, managing and monitoring the impacts of seismic activity upon sensitive receptors, hazard impact assessments should translate predicted seismic activity into resulting vibration at ground level and assess the impacts upon sensitive receptors within the vicinity of the proposed development, in accordance with the British Standards for evaluating and measuring vibration in buildings (BS 4866:2010 and BS 7385-2:1993 and any subsequent amendments).

Where sensitive receptors exist within the vicinity of the proposed development the Council will impose maximum acceptable ground vibration levels. Applicants should demonstrate suitable monitoring arrangements to ensure that ground vibration levels can be accurately monitored at the relevant sensitive receptors throughout the operational lifetime of the development. Data should be managed in an open book approach. Applicants will also be expected to demonstrate a suitable mitigation plan capable of being implemented if ground vibration levels exceed the maximum acceptable levels at any of the sensitive receptors.

In order to appropriately manage the environmental impact during the reservoir creation stage, the following guidance should be considered:

- Formal risk assessment of potential well drilling and completion operation impacts should be carried out prior to spudding (beginning) the well.
- Surface casing should be installed to protect freshwater aquifers.
- All casing strings should be designed and installed in accordance with the Borehole Sites and Operations Regulations, 1995 (as amended).
- Drilling stimulation fluids should be stored in tanks, with appropriate spill protection.
- As far as possible, drilling and stimulation fluids should be re-used in order to reduce freshwater resource impacts and potential disposal issues.
- Regular updates and frequent engagement with stakeholders about ongoing operations.

## 10.13 Safeguarding

Policy 16 of the Cornwall draft Local Plan states that *'new development, where appropriate, should show that it does not significantly harm the performance of any existing facility…or the availability of their resource (where the operation is dependent on uninterrupted flow of energy to the installation)'.* In respect of deep geothermal the key concern is access to and maintenance of a viable geothermal reservoir.

In order to manage this issue planning applications for new development which, by virtue of their proposed underground operation, may impact upon the operation of the existing deep geothermal development, should consider the implications of the geological characteristics in the vicinity of the proposed development and recognise that certain characteristics can lead to a requirement for significant separation between the proposed and existing developments.

Deep geothermal operations may also conflict with the interests of minerals safeguarding areas (areas safeguarded in planning policy to ensure access to mineral reserves). Where deep geothermal developments are proposed within, or near to minerals safeguarding areas, it is recommended that the issue be addressed as part of the pre-application process with the Council and, if necessary, through engagement with the land owner and relevant mineral operator.

# 11 Advanced Energy from Waste

## 11.1 Context and technology overview

There are a variety of technologies available that are able to create energy and heat from waste; either thermal or biological processes. This guidance relates to thermal processes. These include:

**Direct combustion** - the combustion of (normally) unprepared waste material. Waste produced from the incineration process is mostly converted into carbon dioxide and water. Bottom ash is produced from the combustion grate and fly ash is separated from the flue gases. The bottom ash can be used as an aggregate or landfilled. The fly ash normally constitutes hazardous waste and is disposed of at a controlled landfill facility. The gases produced are used to generate heat and electricity.

**Pyrolysis** - the thermal degradation of a waste material in the absence of oxygen. This process requires an external heat source to maintain the pyrolysis process. The products produced from pyrolysing materials are solid residue and gas. The solid residue (sometimes described as a char) is a combination of non-combustible materials and carbon.

**Gasification** – the part oxidisation and partial combustion of waste material. The process is largely exothermic but some heat may be required to initialise and sustain the gasification process. The main products are gas and a solid residue of non-combustible materials (ash).

### 11.1.1 Resource

Advanced energy from waste requires a constant source or material to enable energy production. Primary sources include the Municipal and Commercial/Industrial waste streams. In Cornwall this equates to approximately 650,000 tonnes per year. It is anticipated that future energy from waste proposals will, in general, be small scale, due to the fact that existing capacity provides for the majority of the demand arising from these waste streams.

*Image: Viridor*

## 11.2 Landscape & visual impact

Careful site selection as well as the design and layout are the most effective ways of minimising landscape and visual impacts. This requires detailed consideration in the early stages of the project. The following guidance should be considered when siting and designing advanced energy from waste development proposals:

- Minimise impacts on key views from important viewpoints, popular tourist and scenic routes and settlements.
- Avoid areas where ground level disturbance affects landscapes that are difficult to restore (e.g. deep peat or bog) or semi-natural habitats.
- Consider the impact of the site upon the natural beauty of the Cornwall and Tamar Valley Areas of Outstanding Natural Beauty. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Consider the impact of the site upon the special qualities of Cornwall's Areas of Great Landscape Value.
- If the development is proposed in an open landscape any built elements should be minimal or designed to match the character

and appearance of the local landscape and any existing architectural features.

- Careful consideration should be given to the design and landscaping of any advanced energy from waste development. The introduction of a 'modern' technology within a rural landscape will require attention to detail.
- The design of any fencing or security measures should be carefully considered. In rural areas, materials and construction styles should be used which reflect local vernacular.
- Existing Cornish hedges and established vegetation, including mature trees, should be retained. Trees and hedges should be protected during construction. Additional hedge planting should be considered where such landscape screening would beneficially screen the proposed development.
- Design any buildings, storage or ancillary infrastructure to minimise the impact and, where practicable, make a positive contribution, in landscape and visual terms, to a locality.
- The colour and external finish of any new buildings should complement existing buildings.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

## 11.3 Ecology

Advanced energy from waste facilities have the potential to impact on ecology and biodiversity. Early assessment is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species applicants should consider the following:

- Avoid locating advanced energy from waste facilities in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites.
- The use of heat exchangers in water bodies, such as ponds and lakes, could lead to ecological impacts and should be carefully considered.
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site and so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).
- Ecological surveys must be undertaken before a planning application can be determined and should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.

## 11.4 Historic environment

Advanced energy from waste plants can have direct and indirect (visual) impacts on Cornwall's cultural heritage. Direct physical impacts normally result in a loss of identified features of historic interest including undiscovered archaeology. Visual impact means the development affects the character or appearance and setting of features of historic interest. The following guidance is intended to assist in managing the potential impact upon the historic environment:

- Advanced energy from waste development should be located away from known archaeological sites, as recorded on the Cornwall Historic Environment Record.

- Where developments are planned within known archaeologically sensitive locations, professional archaeological monitoring of ground works may be required.
- Advanced energy from waste plants should normally be located away from Scheduled Monuments and from sites or areas where they would affect the character or setting of a Listed Building.
- Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have *"special regard to the desirability of preserving"* listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.
- Visual impacts on historic sites may include the effects of such development on the Historic Landscape Character of Cornwall. An assessment of the impacts upon the historic landscape may be required which, in some cases could be informed by the creation and use of photomontages and Zones of Theoretical Visibility (ZTVs).
- The landscape/visual impact must be considered with great care at the pre-application stage. Where it is clear that a development may affect historic sites or buildings specific advice on assessment can be sought as part of a pre-application enquiry.
- When proposing development within, or adjacent to, the World Heritage Site it should be designed and operated in a manner which does not harm the outstanding universal value of the site.

## 11.5 Noise

A typical advanced energy from waste facility may operate continuously. Such operational requirements have the potential to cause unacceptable impacts on sensitive receptors such as residential properties and schools. Noise at advanced energy from waste facilities, is principally generated by vehicle movements, especially reversing and loading/unloading, fans, vents and steam release valves.

Noise limits may be set at site boundaries or nearest sensitive receptors, these could be fixed limits based on guidance from the World Health Organisation (such as 55dB(A) during the day or 45dB(A) during the night). However, in rural areas where the ambient or background noise levels are very low the noise levels could also be lower. Background noise levels will need to be monitored and recorded so that an appropriate noise limit can be set. More detailed information on the Council's noise standards can be provided at the pre-application stage via the Council's Community Protection Team in the Public Protection and Business Support Service.

The site layout, design of the building and noise reduction measures on specific areas of the facility should enable noise to be kept to an acceptable level. The following measures could be implemented, where necessary to reduce the impact of noise:

- Undertake all operations within closed buildings.
- Design buildings to reduce internal noise transmission.
- Designed plant with noise reduction measures such as external motors housed in sound proofed covers.
- Design the site with acoustic barriers such as bunding, planting and fencing where required.
- Maintain vehicles servicing the site properly, especially exhaust systems.
- Limit deliveries to normal working hours (usually 0800 and 1800 hours Monday to Friday and 0800 and 1300 hours on Saturday).
- Employ visual vehicle reversing warning systems rather than audible when on site if close to sensitive noise receptors.
- For larger schemes, if sensitive receptors such as housing are present, deploy noise monitoring regimes on site.

## 11.6 Use of land

Proposed advanced energy from waste facility should avoid higher grade agricultural land. Where it cannot be avoided any application for development affecting agricultural land should provide details about the impact of the development on that land including any mitigation measures.

Energy crop production should avoid the use of land classified under the Agricultural Land Classification as grades 1 – 3a (Best and Most Versatile).

Consideration should also be given to the local economic impacts of promoting energy crop growth on Best and Most Versatile agricultural land, in particular the extent to which this practice limits the availability of land at a competitive price for other existing forms of agriculture in the immediate locality.

## 11.7 Drainage - flood management - water quality

Climate change over the next few decades is likely to result in different weather patterns and conditions in the UK. In addition, sea levels are expected to rise. These factors may lead to increased and new risks from flooding within the lifetime of the proposed development. This should to be considered as part of a Flood Risk Assessment for the proposed development.

The primary purpose of a Flood Risk Assessment should understand whether or not the proposed development will result in an additional risk of flooding either up or downstream will arise as a result of the proposed development. Where this is likely to happen mitigation should be identified (including potentially relocating the proposal) to remove the risk.

Therefore the proposed location of an advanced energy from waste facility should consider:

- The distances from the boundary of the site to residential or recreational areas, waterways, water bodies and other agricultural or urban sites.
- The existence of groundwater, coastal water or nature protection areas in the locality.
- The geological or hydrological conditions in the area.
- The risk of flooding or subsidence on the site.

In addition, the following guidance should also be considered when designing measures to manage surface water runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Install rainwater harvesting and retention for use on site.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

## 11.8 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
- The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
- The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable

to the Highway Authority.

- Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
- Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' *the development*.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights of way should be considered by developers of renewable energy schemes.

## 11.9 Construction / traffic

An advanced energy from waste facilities will need to accommodate delivery vehicles. This means designing the development to enable delivery vehicles to manoeuvre internally without impacting upon vehicle movement on the highway. Therefore the following issues need to be addressed by the operator of the facility.

- Suitable parking spaces and manoeuvring areas within the site for operational, employees and visitor vehicles.
- Waiting area for feedstock lorries within site to prevent lorries "stacking" up and having to park on the public highway causing a potential hazard,
- Avoid the urbanisation of rural locations in the use of kerbing, extensive visibility splays, hard surfacing and lighting.

Medium to large scale advanced energy from waste facilities will need to consider site access issues to facilitate delivery of fuel, usually by road transport, on a regular basis. A large facility may generate significant vehicle movements and there is a need to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Where required use speed limits on all identified routes to reduce potential of traffic accidents.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters at the pre-application stage.
- Design vehicle approaches to avoiding sensitive areas, such as residential access roads.
- Consider the current (surveyed) and predicted traffic flows on the highways to be used to access the proposed development and understand the impacts of daily movements to and from the site, broken down by vehicle types, over the length of a working day.
- Design the scheme to include adequate visibility splays onto the highway for traffic entering and leaving the site.
- Design and locate signage so as not to be visually intrusive in the local area especially if in a designated landscape.
- Ensure all vehicles leaving the site have clean wheels to avoid spreading of mud or debris on the highway. This may necessitate an onsite wheel wash facility with good drainage and maintenance features.
- Where wheel wash facilities are required, design the site access to be hard surfaced and sweepable between the wheel wash and the public highway.
- The site access should be designed to avoid surface water flowing out onto the public highway.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 11.10 Security/safety/lighting

It is expected that an advanced energy from waste facility should minimise its impact on the landscape and reduce its visual impact. However, advanced energy from waste facilities operate on a continuous basis and during hours of darkness a degree of illumination is needed to ensure a safe working environment. The following guidance should be considered in relation to managing the impact of security and safety measures:

- If security perimeters are required, minimise the use and height of security fencing and, where available utilise existing features, such as Cornish hedges;
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- Limit lighting of external facades and restrict lighting of external areas during normal working hours (especially during the winter) to times of vehicle deliveries. Consider the hours that illumination is necessary.
- Where possible, selected lighting circuits will be operated on timer switches/motion detectors to enable lower levels of lighting outside normal operating hours or when lighting is not required.
- The design of lighting should ensure that light is directed downwards towards the ground so as to avoid unnecessary light spill and light trespass off-site.
- Avoid permanent lighting on edge of site particularly at access points that front the public highway.
- Use of planting and bunding to contain lighting effects.
- Direct lighting away from the public highway and any dwellings within the vicinity of the site.
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 11.11 Groundwork's - site profiling, soil storage, re-profiling

In order to ensure that groundworks are appropriately managed and conducted the following guidance should be considered:

- Groundworks should ensure that impacts on sensitive habitats area avoided. This may require the preparation, submission and implementation of a detailed construction specification.
- Keep ground disturbance associated with the installation and use of access tracks to a minimum.
- Where new access routes have to be constructed identify and, where necessary, mitigate any potential impacts on hydrology, drainage and surface water run-off.
- Land due for stripping should be kept vegetated until as close as possible to the time of stripping then harvested.
- Soil stripping is normally scheduled between the drier months of April to September, however, this period may extended where the soil handling machinery is not repeatedly passed over the soil.
- If soil is to be stored it is best to avoid putting soil into store during winter months as the soil could be too wet to be handled without being damaged.
- The storage piles should have slope angles of between 25o and 45o, be sited on dry ground, not in hollows and should not disrupt local surface drainage.
- A soil storage mound should be shaped to shed water before rainfall occurs. Soils should only be stored upon soil of the same type.
- Soil piles should be covered with light coloured, weighted down, tarpaulins which will reduce both water absorption and the amount of viable weed seeds.

The construction of advanced energy from waste plants will have similar impacts to many other construction projects. However, the location of such a construction project in close proximity to a watercourse may present particular challenges and concerns, particularly in relation to pollution caused by the spillage of oils, fuels or lubricants or the disturbance and release of silt, mud or suspended solids into any watercourse.

## 11.12 Emissions odour air quality

Sources of odour may not always be the emissions from the stack and vents but could arise from the storage, handling and transport of waste. The greatest impact from odour arises when waste is stored or decomposed. The following guidance should be considered in order to manage sources odour:

- Ensure that all waste storage and decomposition is carried out within appropriately housed sections of the facility itself and waste sorting is minimised.
- An odour management plan should be prepared for any site with a risk of odorous emissions and will set out procedures and practices required to minimise the risk of odour, including during periods of scheduled and unscheduled plant maintenance.

Dust can also be an issue at waste management sites with potential nuisance and health impacts. The majority of dust from advanced energy from waste facilities arises from handling and processing operations. Mitigation measures such as reducing open-air storage and introducing water sprinkling can reduce dust, as well as enclosing waste delivery areas. Processes should take place in a negative pressure building so that air is drawn into the building preventing the release of dust.

Emissions to air from energy from waste facilities would normally be controlled through an environmental permit from the Environment Agency. Air Quality Management Areas have been designated in parts of Cornwall due to existing air quality issues. An assessment of the air quality impact should be considered, taking into account any potential for cumulative effects. Early consultation with the Council's Public Protection and Business Support Service is recommended to ensure that proposed emission levels are appropriate.

## 11.13 Pest Control

The design and operation of an energy from waste installation should be undertaken in a manner which facilitates and promotes all unloading/ loading and processing of waste within a controlled environment. For larger schemes regular inspections and treatment by pest control specialists may be required. Other measures, such as grates covering drainage systems, can be employed to prevent rodents entering buildings.

# 12 Anaerobic Digestion

## 12.1 Context & technology overview

Anaerobic digestion is a natural process which converts organic matter such as digestible waste (e.g. food, garden waste, farm slurry and sewage) and energy crops into energy. The main products resulting from anaerobic digestion are biogas (a mixture of methane and carbon dioxide), which is very similar to natural gas, and digestate, a low level fertilizer. The biogas can be used to generate electricity, gas or heat, or compressed for use as a biofuel.

### 12.1.1 Resource

Anaerobic digestion is typically supplied with biodegradable waste arising from food or farms operations (animal or crop waste). Under certain conditions anaerobic digestion can be used to generate energy as part of the sewage management process.

## 12.2 Landscape & Visual Impact

In order to minimise the landscape and visual impact of a proposed anaerobic digestion facility the following guidance should be considered at the initial stages of site identification, layout and design:

- Avoid the most sensitive landscape areas. In particular, careful consideration should be given to the impact upon the natural beauty of the AONB. Pre-application advice can be sought directly from the Cornwall or Tamar Valley AONB Units with regard to development proposals within or affecting the setting of the AONB.
- Choose a site that is naturally screened by virtue of existing topography or mature vegetation/trees.
- Consider locations in association with main road corridors, business parks, railways etc., as well as reclaimed, industrial and man-made landscapes where other landscape sensitivities are not compromised.
- Avoid locations which compromise important viewpoints especially at popular tourist destinations or along scenic routes.
- Avoid impact on existing important landmark features such as church spires and towers.
- When making an assessment of the potential for visual impact, careful consideration should be given to the relationship between the proposed development and the main views associated with nearby residential dwellings in order to prevent unacceptable overbearing impact on the residential amenity of these dwellings.

The industrial nature of the anaerobic digestion process dictates the scale and shape of the associated buildings. The following guidance is intended to ensure that the design and appearance appropriate:

- The colour and external finish of any new plant/buildings should complement any existing buildings.
- If located adjacent to existing farm buildings, the new buildings should have similar profile roofing/cladding and use sympathetic colours such as greys and greens.
- If located in an urban/industrial area there may be scope for a more iconic design that could enhance the area rather than copy existing designs.
- Where feasible reuse/convert existing buildings to accommodate the anaerobic digestion process, including the generator plant room.
- The scale and heights of anaerobic digestion plant should, where practical, be comparable with nearby buildings.
- The use of quality materials and finishes will not only improve the appearance of anaerobic digestion plant but will reduce future maintenance costs and ensure buildings will not become dishevelled in the near future.
- Design solutions should be sensitive to the locality.
- Where ground needs to be excavated the material that is removed could be used as bunding to provide a natural boundary or screening for the buildings or structures.

- Bunding can be planted with locally indigenous trees and bushes to provide additional appropriate screening and weather protection.
- Cornish hedging is encouraged, but it should be of the local style appropriate to that part of Cornwall.
- If located on an industrial site, fencing and/or boundary walls should be of a scale and type suitable to that location.
- Fencing and/or boundary walls should be constructed of quality materials that require little future maintenance and, where appropriate, these should be rust protected to prevent becoming unsightly in the future.

*Image: stuartmichael.co.uk*

## 12.3 Ecology

Anaerobic digestion facilities have the potential to impact on ecology and biodiversity. Early assessment is therefore important to identify any potential impacts. Ecological survey findings can be used to help shape the development proposal to deliver a scheme which results in no net less to biodiversity, and aims to deliver ecological enhancement.

To help avoid or minimise any adverse impacts on important habitats and species applicants should consider the following:

- Avoid locating anaerobic digestion facilities in or close to ecologically important sites, including Special Protection Areas (SPA), Special Areas of Conservation (SAC), Sites of Special Scientific Interest (SSSI), National and Local Nature Reserves; and County Wildlife Sites.
- The use of heat exchangers in water bodies, such as ponds and lakes, could lead to ecological impacts and should be carefully considered.
- Where a proposed development is considered likely to have a significant effect on the conservation objectives of a designated 'European Site' (also known as Natura sites) an Appropriate Assessment will be required under the Habitats Directive. The likely key factors to consider will include emissions as well as surface and/or ground water impacts. The Council (through the pre-application process) and Natural England can provide more detailed advice on this process.
- The Habitats Regulations process is required for both direct and indirect impacts on the conservation objectives of a European Site and so it is important that potential indirect impacts are considered at an early stage. Such indirect impacts could include those to water quality, or those on migratory birds passing to roost or feed at an off-site Special Area of Conservation (SPA).
- Ecological surveys must be undertaken before a planning application can be determined and should therefore be considered at an early stage.
- Careful consideration should be given to the seasonality of the surveys required as the need to undertake a particular survey can have a significant impact on the preparation, submission and determination of a planning application.

## 12.4 Historic environment

Anaerobic digestion plants can have direct and indirect (visual) impacts on Cornwall's cultural heritage. Direct physical impacts normally result in a loss of identified features of historic interest including undiscovered archaeology. Visual impact means the development affects the character or appearance and setting of features of historic interest. The following guidance is intended to assist in managing the potential impact upon the historic environment:

- Anaerobic digestion development should be located away from known archaeological sites, as recorded on the Cornwall Historic Environment Record.
- Where development is planned within known archaeologically

sensitive locations, professional archaeological monitoring of ground works may be required.

- Anaerobic digestion plants should normally be located away from Scheduled Monuments and from sites or areas where they would affect the character or setting of a Listed Building.
- Section 66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 places a statutory duty on local planning authorities to have "special regard to the desirability of preserving" listed buildings and their settings. This means that the setting of designated heritage assets must be appropriately assessed and considerable importance and weight will be given to the desirability of preserving the setting of listed buildings when the applications are determined.
- Visual impacts on historic sites may include the effects of such development on the Historic Landscape Character of Cornwall. An assessment of the impacts upon the historic landscape may be required which, in some cases could be informed by the creation and use of photomontages and Zones of Theoretical Visibility (ZTVs).
- The landscape/visual impact must be considered with great care at the pre-application stage. Where it is clear that a development may affect historic sites or buildings specific advice on assessment can be sought as part of a pre-application enquiry.
- When proposing development within, or adjacent to, the World Heritage Site it should be designed and operated in a manner which does not harm the outstanding universal value of the site.

## 12.5 Noise

A typical anaerobic digestion facility may operate continuously. Such operational requirements have the potential to cause unacceptable impacts on sensitive receptors such as residential properties and schools. Noise from large scale anaerobic digestion facilities is likely to be principally generated by vehicle movements, especially reversing and loading/unloading.

Noise limits may be set at site boundaries or nearest sensitive receptors, these could be fixed limits based on guidance from the World Health Organisation (such as 55dB(A) during the day or 45dB(A) during the night). However, in rural areas where the ambient or background noise levels are very low the noise levels could also be lower. Background noise levels will need to be monitored and recorded so that an appropriate noise limit can be set. More detailed information on the Council's noise standards can be provided at the pre-application stage via the Council's Community Protection Team in the Public Protection and Business Support Service.

The site layout, design of the building and noise reduction measures on specific areas of the facility should enable noise to be kept to an acceptable level. The following measures could be implemented, where necessary to reduce the impact of noise:

- Undertake all operations within closed buildings.
- Design buildings to reduce internal noise transmission.
- Designed plant with noise reduction measures such as external motors housed in sound proofed covers.
- Design the site with acoustic barriers such as bunding, planting and fencing where required.
- Maintain vehicles servicing the site properly, especially exhaust systems.
- Limit deliveries to normal working hours (usually 0800 and 1800 hours Monday to Friday and 0800 and 1300 hours on Saturday).
- Employ visual vehicle reversing warning systems rather than audible when on site if close to sensitive noise receptors.
- For larger schemes, if sensitive receptors such as housing are present, deploy noise monitoring regimes on site.

## 12.6 Use of Land

Proposed anaerobic digestion e facilities should be directed away from higher grade agricultural land. Where applications for development affect agricultural land details of the impact should be provided and mitigation measures should be considered to minimise to overall loss.

## 12.7 Drainage - flood management - water quality

Climate change over the next few decades is likely to result in different weather patterns and conditions in the UK. In addition, sea levels are expected to rise. These factors may lead to increased and new risks from flooding within the lifetime of the proposed development. This should to be considered as part of a Flood Risk Assessment for the proposed development.

The primary purpose of a Flood Risk Assessment should understand whether or not the proposed development will result in an additional risk of flooding either up or downstream will arise as a result of the proposed development. Where this is likely to happen mitigation should be identified (including potentially relocating the proposal) to remove the risk.

Therefore the proposed location of an anaerobic digestion facility should consider:

- The distances from the boundary of the site to residential or recreational areas, waterways, water bodies and other agricultural or urban sites.
- The existence of groundwater, coastal water or nature protection areas in the locality.
- The geological or hydrological conditions in the area.
- The risk of flooding or subsidence on the site.

In addition, the following guidance should also be considered when designing measures to manage surface water runoff:

- Install Sustainable Urban Drainage Systems (SUDS) drainage techniques, such as shallow swales or infiltration trench, to control runoff from any buildings or impermeable surfaces created as part of the development.
- Install rainwater harvesting and retention for use on site.
- Where access tracks need to be provided, permeable tracks should be used, with localised SUDS to control any runoff.

## 12.8 Construction / traffic

Anaerobic digestion facilities will need to accommodate delivery vehicles. This means designing the development to enable delivery vehicles to manoeuvre internally without impacting upon vehicle movement on the highway. Therefore the following issues need to be addressed by the operator of the facility.

- Suitable parking spaces and manoeuvring areas within the site for operational, employees and visitor vehicles.
- Adequate vehicle turning and manoeuvring arrangements within the site during plant operation, to be shown on scaled site plan.
- Waiting area for feedstock lorries within site to prevent lorries "stacking" up and having to park on the public highway causing a potential hazard,
- Avoid the urbanisation of rural locations in the use of kerbing, extensive visibility splays, hard surfacing and lighting.

Small scale anaerobic digestion development may not require substantial numbers of vehicle movements, particularly, as may be the case for on-farm installations, where the feed stock can be largely sourced on-site. In all cases, however, vehicular movements must be carefully managed.

Medium to large scale anaerobic digestion facilities will need to consider site access issues to facilitate delivery of feedstock, usually by road transport, on a regular basis. A large facility may generate significant vehicle movements and there is a need to ensure that the local highway network and site access is able to accommodate the type and number of vehicle movements. A traffic management plan may need to be prepared in order to avoid unnecessary local traffic disruption. The traffic management plan should consider the following guidance:

- Avoid of HGV deliveries during local peak/school traffic periods.
- Use temporary traffic management systems for site access where required.
- Where required use speed limits on all identified routes to reduce potential of traffic accidents.
- The site entrance and access onto the public highway should be designed and constructed to provide safe access and egress to the site. The Council's Highways Department can provide advice regarding such matters.
- Design vehicle approaches to avoiding sensitive areas, such as residential access roads.

- Consider the current (surveyed) and predicted traffic flows on the highways to be used to access the proposed development and understand the impacts of daily movements to and from the site, broken down by vehicle types, over the length of a working day.
- Design the scheme to include adequate visibility splays onto the highway for traffic entering and leaving the site.
- Design and locate signage so as not to be visually intrusive in the local area especially if in a designated landscape.
- Ensure all vehicles leaving the site have clean wheels to avoid spreading of mud or debris on the highway. This may necessitate an onsite wheel wash facility with good drainage and maintenance features.
- Where wheel wash facilities are required, design the site access to be hard surfaced and sweepable between the wheel wash and the public highway.
- The site access should be designed to avoid surface water flowing out onto the public highway.
- Where abnormal loads need to be brought to the site consideration should also be given to this in the traffic management plan. The Council can provide advice for the movement of abnormal loads.

## 12.9 Rights of way & highways

Public Rights of Way include footpaths, bridleways, restricted byways and byways open to all traffic. The fact that planning consent may be granted by the authority does not entitle a developer to obstruct, interfere with or move a Public Right of Way. The Council in its role as local highway authority has a duty to 'Assert and Protect' the highway and has powers to deal with unlawful activity or misuse.

Rights of Way are shown on The Definitive Map and Statement which is the legal record of public footpaths, bridleways and byways. It is recommended that developers consult the Definitive Map before designing proposals for renewable energy schemes. To examine the Definitive Map contact the Countryside Access Team at Cornwall Council.

The Definitive Map and Statement is a conclusive record of what it contains but it is without prejudice to other rights of way that may exist but that are not recorded. Developers are encouraged to make careful inspections of proposed development sites to discover whether there is any evidence of paths or tracks that might be used by the public but that are not shown on the Council's records. If this turns out to be the case then further advice should be sought from the Council Countryside Access Team.

Consider the following guidance:

- Consider the impact of the proposed development on the amenity and health and safety of any right of way that passes though the intended site or that lies within a radius that could be influenced by the development.
- Where rights of way are in the vicinity of the proposed development there are a number of possible solutions;
- The proposed installation may be positioned so that it is far enough away from rights of way so as to have no effect upon them.
- The proposed installation may be designed in such a way so that rights of way remain passing through the installation on their recorded alignments as shown on the Definitive Map. However, so called 'Accommodation' must be done in a manner that is acceptable to the Highway Authority.
- Where proposed installations have an effect on rights of way to the extent that the development could not be carried out without the path being moved from its existing alignment then it will be necessary for the applicant to engage the Public Path Order making process under the Town and County Planning Act 1990.
- Where a developer wishes to re-route a public right of way in association with the development, but a Planning Act Order is not necessary, then it is possible for the provisions of Highways Act 1980 to be used to 'enhance' the development.

During the course of construction it may be necessary for safety reasons to exclude the public from the area by having a Traffic Regulation Order to prevent use of a right of way. Such Orders are dealt with by the Sreeetworks section of the Council.

Mitigation and enhancement measures such as consequential improvements to the rights of way network or the installation of interpretation boards or visitor facilities that give benefit to users of rights

of way should be considered by developers of renewable energy schemes.

## 12.10 Site security/safety/lighting

It is expected that anaerobic digestion facilities should minimise their impact on the landscape and reduce its visual impact. However, anaerobic digestion facilities operate on a continuous basis and during hours of darkness a degree of illumination is needed to ensure a safe working environment. The following guidance should be considered in relation to managing the impact of security and safety measures:

- If security perimeters are required, minimise the use and height of security fencing and, where available, utilise existing existing features, such as Cornish hedges;
- Minimise the use of security lighting. Wherever possible use passive infra-red (PIR) technology and design lighting in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).
- Limit lighting of external facades and restrict lighting of external areas during normal working hours (especially during the winter) to times of vehicle deliveries. Consider the hours that illumination is necessary.
- Where possible, selected lighting circuits will be operated on timer switches/motion detectors to enable lower levels of lighting outside normal operating hours or when lighting is not required.
- The design of lighting should ensure that light is directed downwards towards the ground so as to avoid unnecessary light spill and light trespass off-site.
- Avoid permanent lighting on edge of site particularly at access points that front the public highway.
- Use of planting and bunding to contain lighting effects.
- Direct lighting away from the public highway and any dwellings within the vicinity of the site.
- Where pole mounted CCTV facilities are required, their location, design (including the height above existing boundaries and structures) and colour should be carefully considered to minimise visual and landscape impact. In exposed landscapes such structures should be avoided.

## 12.11 Groundwork's - site profiling, soil storage, re-profiling

In order to ensure that groundworks are appropriately managed and conducted the following guidance should be considered:

- Groundworks should ensure that impacts on sensitive habitats area avoided. This may require the preparation, submission and implementation of a detailed construction specification.
- Keep ground disturbance associated with the installation and use of access tracks to a minimum.
- Where new access routes have to be constructed identify and, where necessary, mitigate any potential impacts on hydrology, drainage and surface water run-off.
- Land due for stripping should be kept vegetated until as close as possible to the time of stripping then harvested.
- Soil stripping is normally scheduled between the drier months of April to September, however, this period may extended where the soil handling machinery is not repeatedly passed over the soil.
- If soil is to be stored it is best to avoid putting soil into store during winter months as the soil could be too wet to be handled without being damaged.
- The storage piles should have slope angles of between 25o and 45o, be sited on dry ground, not in hollows and should not disrupt local surface drainage.
- A soil storage mound should be shaped to shed water before rainfall occurs. Soils should only be stored upon soil of the same type.
- Soil piles should be covered with light coloured, weighted down, tarpaulins which will reduce both water absorption and the amount of viable weed seeds.

*Image: placenorthwest.co.uk*

The construction of anaerobic digestion facilities will have similar impacts to many other construction projects. However, the location of such a construction project in close proximity to a watercourse may present particular challenges and concerns, particularly in relation to pollution caused by the spillage of oils, fuels or lubricants or the disturbance and release of silt, mud or suspended solids into any watercourse.

## 12.12 Emissions odour air quality

Odour is a significant consideration for anaerobic digestion proposals. The greatest impact from odour arises when feedstock is stored or decomposed. The following guidance should be considered in order to manage sources odour:

- Ensure that all waste storage and decomposition is carried out within appropriately housed sections of the facility itself and waste sorting is minimised.
- Provide sufficient distance between the proposed development and residential dwellings to ensure that the impact of odour on neighbouring properties can be effectively managed.
- An odour management plan should be prepared for any site with a risk of odorous emissions and will set out procedures and practices required to minimise the risk of odour, including during periods of scheduled and unscheduled plant maintenance.

Dust can also be an issue at waste management sites with potential nuisance and health impacts. The majority of dust from anaerobic digestion facilities arises from handling and processing operations. Mitigation measures such as reducing open-air storage and introducing water sprinkling can reduce dust, as well as enclosing waste delivery areas. Processes should take place in a negative pressure building so that air is drawn into the building preventing the release of dust.

Emissions to air from anaerobic digestions facilities would normally be controlled through an environmental permit from the Environment Agency. Air Quality Management Areas have been designated in parts of Cornwall due to existing air quality issues. An assessment of the air quality impact should be considered, taking into account any potential for cumulative effects. Early consultation with the Council's Public Protection and Business Support Service is recommended to ensure that proposed emission levels are appropriate.

## 12.13 Pest control

The design and operation of an anaerobic digestion plant should be undertaken in a manner which facilitates and promotes all unloading/ loading and processing of waste within a controlled environment. For larger schemes regular inspections and treatment by pest control specialists may be required. Other measures, such as grates covering drainage systems, can be employed to prevent rodents entering buildings.

# 13 Annex

## 13.1 Annex 1: Landscape Sensitivity to Onshore Wind Energy and Large-scale Photovoltaic Development in Cornwall

To be inserted

## 13.2 Annex 2: Cumulative Impact Guidance for Cornwall – Wind Turbines.

To be inserted

## 13.3 Annex 3: Cumulative Impact Guidance for Cornwall – Solar Farms.

To be inserted

## 13.4 Annex 4: Electricity Generating Capacity Form

Planning applications for renewable energy facilities should be accompanied by the following information.

## 13.5 Annex 4: Electricity Generating Capacity Form

Planning applications for renewable energy facilities should be accompanied by the following information. It is important that projections about the generation capacity of a proposed development are as accurate as possible and use the most up-to-date information available.

| **Installed capacity (kW)[1]** | **Capacity factor[2]** | **Estimated annual production (kWh p.a.)[3]** | **Number of residential properties electricity equivalent[4]** |
|---|---|---|---|
| | | | |

Notes:

1 Installed capacity is the full-load, continuous rating of the energy generation facility under specific conditions as designated by the manufacturer. In other words, this is the power generated when the installation is working at full capacity. Also referred to as peak capacity.

2 Capacity factor is the calculated factor which compares the installation's actual production over a given period of time with the amount of power the installation would have produced if it had run at full capacity for the same amount of time. The capacity factor should take account of the specific equipment and the specific location. It is expressed as a percentage. The Department of Energy and Climate Change provides regional annual energy generation statistics which can assist in projecting an accurate estimation of the capacity factor for each technology, relevant to Cornwall.

3 Estimated annual production of electricity based upon the installed capacity, the capacity factor and the number of hours in a year.

4 Number of residential properties that would be powered by the estimated annual production based upon the U.K. average household consumption of 4,157 KWh/year and the Cornwall average household consumption of 5,159 KWh/year (DECC 2012). The number of U.K. and Cornwall household equivalent should be provided in this box. Average electricity consumption in Cornwall is currently greater than the U.K. average, so the number of typical residential properties in Cornwall powered by a particular source would be lower.

# For more information

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**www.cornwall.gov.uk/renewablespd**

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