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Planning guidance for the development of large scale ground mounted solar PV systems

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Feedback

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1. Introduction / Foreword

Rising energy costs and the support of the Feed in Tariff (FiT) and the Renewable Obligations Certificates have significantly increased the financial viability and attractiveness of installing solar PV panels. These installations may be roof / wall mounted or standalone / ground mounted.

This national guidance provides best practice planning guidance in respect of how large ground mounted arrays are developed setting out planning considerations and requirements.

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. This is a different meaning for the purpose of the FiT where as well as not being

physically attached to a building they also must not be wired to provide electricity to an occupied building ie they are connected directly to the electricity grid.

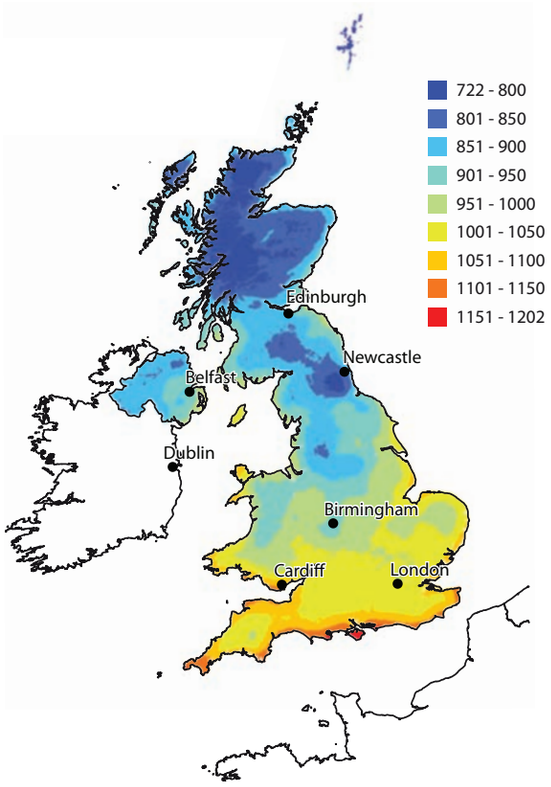

Figure 1 UK Solar irradiation map. Yearly total of global irradiation in kWh/m^2. Averaging period: 1997-2003. Map data courtesy of the Met Office ©

Solar Energy in the UK

The amount of energy that can be harnessed from the sun's radiation is often underestimated. In the UK we receive a vast amount of solar energy, in an average year we receive as much as 60% of the solar energy which is received at the equator. This can be compared to the yearly output of 1,000 power stations.

The map below shows the total average solar irradiation falling on a one square metre surface on the horizontal, measured in kilo-watt hours (kWh). This shows that the sun's rays falling on the ground range from > 1200 kWh / m^2 in the south west of the UK to < 900 kWh / m^2 in northern Scotland.

Renewable Energy Policy Context

At the national level, there is a range of statutory and non-statutory policy drivers and initiatives which are relevant to the consideration of planning applications for Solar Energy. The Climate Change Act 2008 commits the UK to an 80% reduction in greenhouse gases by 2050 and a 34% reduction by 2020 (based on 1990 levels).

The UK Renewable Energy Roadmap provides a series of measures to meet the legally-binding target set in the Climate Change Act 2008. The roadmap envisages that more than 30% of UK electricity should be generated from renewable sources. The Roadmap states that the government believes that solar PV has the potential to form a significant part of the renewable energy generation mix. The Roadmap further states that in November 2012 the UK had 1.4GW of installed solar PV capacity in operation and that analysis indicates that the market could bring forward a total of 7–20GW of solar PV by 2020.

National Planning Policy

The National Planning Policy Framework (NPPF) sets out the national planning policy context for renewable energy. This framework supports a transition to a low carbon future in a changing climate and encourages the use of renewable energy.

The NPPF states that to help increase the use and supply of renewable and low carbon energy, local planning authorities should recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources. The National Planning Policy Framework requires local planning authorities to have a positive strategy to promote renewable or low carbon sources.

The NPPF paragraph 98 states that when determining planning applications for renewable energy developments, local authorities should not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy and also recognise that small-scale projects provide a valuable contribution to cutting greenhouse gas emissions and approve the application if its impacts are (or can be made) acceptable.

The Financial Context

The Feed in Tariff (FiT) provides a financial subsidy towards a number of renewable energy technologies, including solar panels. For Solar photovoltaics, the FiT applies for a period of 20 years. The Renewables Obligation has more recently been used as a financial subsidy for large scale solar panel installations. The Renewables Obligation provides incentives for large-scale renewable electricity generation by making UK suppliers source a proportion of their electricity from eligible renewable sources. It is proposed that the Electricity Market Reform will provide financial incentives for renewable energy from 2014 onwards.

This document relates specifically to the planning policy framework permitted development and fees regulations for England. However many of the planning conisderations are similar for Wales, Scotland and Northern Ireland. The production of specific guidance for these areas is being considered.

2. Commercial scale ground mounted solar PV

Ground Mounted Solar PV projects, over 50kWp, should ideally utilise previously developed land, brownfield land, contaminated land, industrial land or agricultural land preferably of classification 3b, 4, and 5 (avoiding the use of "Best and Most Versatile" cropland where possible).

Land selected should aim to avoid affecting the visual aspect of landscapes, maintain the natural beauty and should be predominantly flat, well screened by hedges, tree lines, etc and not cause undue impact to nearby domestic properties or roads.

Introduction / Background

Large, centralised solar PV power systems, mostly at the multi-megawatt scale, have been built to supply power for local or regional electricity grids in a number of countries including Germany, Switzerland, Spain and Italy. More recently large solar PV installations have been erected in England and Wales.

This guide aims to provide planning guidance in respect of large scale commercial ground-mounted solar PV installations.

Pre-application considerations.

Consultation with the Local Planning Authority and local community is encouraged at an early stage. The local community should be engaged, by the developer, at the pre-design, conceptual stage, ideally utilising a local exhibition / presentation where community views can be sought and recorded.

Environmental Impact Assessment (EIA)

Large scale solar PV arrays are not expressly listed in Schedule 2 to the EIA Regulations 1999; such developments may or may not have a significant effect on the environment, positive or negative, depending on location.

EIA Screening

- As a starting point the proposal should be assessed against the selection criteria in Schedule 3 of the EIA Regulations.
- In general, an EIA is likely to be needed for Schedule 2 developments if the solar PV development is in a particularly environmentally sensitive or vulnerable location.
- In each case it will be necessary to judge whether the likely effects on the environment of that development will be significant in that particular location. In judging whether the effects of a development are likely to be significant it is necessary to have regard in particular to the visual impact of the development on landscape character and how this will be affected by the installation of a solar PV farm development, and also the possible cumulative effect with any existing or approved development.
- This should include situations where there is more than one application for solar PV development which should be considered together. Any views expressed by consultees should be taken into account. Advice should be sought from consultees where there is any doubt about the significance of a development's likely effects on a 'sensitive area' as defined in the EIA Regulations.

Planning Performance Agreements

In order to allow the Local Planning Authority to apply sufficient resources to meet the demand, applicants may wish to engage in a Planning Performance Agreement (PPA) with the Local Planning Authority. The PPA requires developers to make a financial contribution to the Authority who, in return, will utilise these funds to dedicate staff resources towards the planning proposal put forward by the developer. The PPA requires the Authority to engage with the developer at the pre-application stage, assist with public consultation / engagement and engage with the developer throughout the planning application process.

Application requirements

Planning Application Fee

The Local Planning Authority will be able to assist and confirm the level of information necessary to accompany and support any planning application. Should an Environmental Impact Assessment be considered necessary, there may be further requirements that will be determined through a scoping assessment in consultation with the Local Planning Authority.

Information likely to be required includes -

- A location plan (1:1250 metric scale)
- A site/block plan (1:500 metric scale)
- Elevations
- Design and access statement
- A supporting statement
- Fencing specification and details (where applicable)
- Details of connection to electrical grid
- Details of any ancillary works or buildings proposed, including elevations
- An ecological assessment where applicable
- A landscape/visual assessment if the application site lies within, or would impact upon, an Area of Outstanding Natural Beauty; National Park or World Heritage Site (see Appendix A).
- A historic environment statement where applicable (see above).
- Impact assessment on agricultural land where applicable.
- Flood Risk Assessment.
- Completed 'Electricity Generating Capacity' form (see Appendix B).
- Construction Traffic Management Plan (CTMP)
- Application fee where required.

Planning Application Fee

There is no national guidance on the fee category for large scale ground mounted solar PV installations. However, normally such applications fall within Category 5 (erection, alteration or replacement of plant or machinery) of the Town and Country Planning (Fees for Applications

and Deemed Applications) as amended. However, it is suggested that this should be confirmed with the relevant Local Planning Authority.

The latest fees can be calculated online using the Planning Portal Online Fee Calculator and selecting Yes > Full Planning Consent > Calculate> Non-Residential > Erection, alteration or replacement of plant or machinery (entering site area in hectares). Please see details below regarding calculating the site area.

Calculating the Site Area for fee purposes

As a guidance :

- If the solar panel panels are close to a field boundary and there is an existing or proposed fence the planning application area should include these field boundaries.
- If the solar panels are some way away from the field boundaries (e.g.>50m) where a separate fence is proposed the planning application boundary should extend around the proposed solar panel panels with a separate planning application area extending around the fenced area.
- In such instances it would be unreasonable for the application area (and planning application fee) to include relatively large tracts of field where no development is proposed. Where no fence is proposed and solar panels are positioned in the middle of a field well away from the field boundaries the planning application boundary should be drawn around the proposed array and any immediate ancillary works e.g. access tracks.
- It is for the applicant to ensure that all proposed development is included within the boundary of the planning application.

Full Planning Consent

Outline planning permission cannot be granted for a planning application submitted in category 5 of the above fee regulations. Only detailed planning applications will therefore be validated. Some matters, such as the exact dimension / model of solar panel, may be 'reserved' but sufficient detailed information should accompany any planning application to allow the Local Planning Authority to fully determine such an application.

Figure 2 Development of the 5MW Trenouth solar farm, Cornwall. Images courtesy of Inazin.

Planning Application considerations

a) Site Levelling Works

Consideration should be given to the existing site contours. If any site levelling works are proposed to facilitate the development of a solar panel array the extent of these levelling works should be discussed at the pre-application stage and detailed within any planning application.

b) Development in Relation to Current Land Use

Ideally ground mounted large scale PV arrays should utilise previously developed land, brownfield land, contaminated land, industrial land or agricultural land preferably of classification 3b, 4 or 5. Whilst there is no ban prohibiting ground mounted large scale PV arrays on sites classified agricultural 1, 2 and 3a or designated for their natural beauty or acknowledged/recognised ecological/archaeological importance/ interest it is unlikely that planning permission will be granted where there is significant impact on these designations.

Figure 3 The development of a 1.4MW solar farm on land adjacent to the Hendra Holiday Park, Newquay will greatly assist in meeting the electricity demand of this facility. Images courtesy of Hendra Holiday Park.

c) Assessment of the Impact upon Agricultural Land

The National Planning Policy Framework paragraph 112 requires the presence of best and most versatile agricultural land (defined as land in grades 1, 2 and 3a of the Agricultural Land Classification) to be taken into account alongside other sustainability considerations. The NPPF expresses a preference for development to be directed to land outside of this classification (3b, 4 and 5), but paragraph 28 also recognises the need to support diversification of agricultural land that helps to sustain an agricultural enterprise.

This policy position should be taken into account when identifying sites for large scale solar panel development.

When development is proposed on agricultural land it is desirable for the applicant to propose a project end date to demonstrate the temporary nature of the solar farm.

The following steps should be undertaken by the developer when considering locating a large scale solar photovoltaic development on agricultural land. If a planning application is subsequently submitted it should be accompanied by the relevant information detailed in the steps below. Agricultural Land Classification: protecting the best and most versatile agricultural land (TIN049)[1]

d) Ground Maintenance

Vegetation will grow under the solar panels and this will require management, particularly to avoid the site becoming overgrown with noxious weeds and assist with the eventual restoration of the site, normally to agriculture. There are various techniques for managing the vegetation, these include mowing, strimming, spraying or mulching.

Spraying should be avoided wherever possible and mulching large areas is likely to present technical challenges and may add to the landscape / visual impact of a development proposal. Few of these management techniques are regarded as sustainable, particularly on sites up to 15ha, and there is a desire, both in terms of food production and the rural scene, to continue an agricultural use on the site.

During those times of the year when growth requires managing grazing is to be encouraged wherever practicable. Cattle, horses, pigs and goats are likely to be too 'physical' with the solar arrays but sheep, chickens or geese should be acceptable. In order to facilitate grazing within the solar farm it is advised that solar panels are positioned at least 700mm above ground level and all cabling etc is suitably protected.

Figure 5 Construction of a 1.4MW solar farm at the former tin mine site at Wheal Jane, Cornwall. Such sites should generally be considered for such development in preference to agricultural land.

Figure 4 Sheep and cattle grazing under solar panel arrays. Support structures, and the height of panels, would need to be substantial in order to allow cattle grazing and would not ordinarily be recommended. Images courtesy of Steve Edmunds, Mole Valley Renewables.

1 http://publications.naturalengland.org.uk/publication/35012?category=9001

Figure 6 Adequate spacing between rows of panels is necessary to avoid overshadowing. Vegetation will grow between these rows and this vegetation will require management.

Figure 7 Kobern-Gondorf facility solar facility, in Germany, is used as a nature reserve for endangered species of flora and fauna.

Identify agricultural land classification/s of the proposed development site. Readily available maps may not identify whether grade 3 land is 3a or 3b. If the site is grade 3, it should be specifically assessed to establish whether the land meets the criteria for grade 3a or 3b

If grade 1 and 2

1. National Planning Policy would not normally support development on the best agricultural land.
2. The best quality land should be used for agriculture purposes.
3. Clear justification on the benefits a development would have for the land to be taken out of full agriculture use would have to demonstrated.
4. All criteria set out for grade 3 land would need to be considered.

If grade 3a

The developer's proposal should:

1. Provide an explanation of why the development needs to be located on the site and not on land of a lesser agricultural classification within the area.
2. Provide information on the impact of the proposed development on the local area's supply of farming land within the same classification.
3. 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.
4. Consider 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.

If grade 3b, 4 or 5

No additional info required, unless the agricultural practice that the proposal would replace (if that practice cannot be continued with the proposal in situ) makes a special contribution to the environment or local economy.

Figure 8 Steps for developers on agricultural land classification

e) Construction Compound

The development of a large scale solar array will require the delivery and storage of construction materials, plant, machinery and office/ welfare accommodation. It is therefore likely that a temporary construction compound will be required. 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. Topsoil and subsoil should be stripped from such areas and stored on site for replacement following the completion of construction works. Details of such soil stripping, storage and replacement should be contained within any planning application, together with the anticipated life of the construction compound.

f) Soil stripping, Storage and Replacement

The development of a large scale solar installation is likely to require the excavation of soils associated with construction compounds, access roads, cable trenching etc. Where such soil stripping occurs topsoil and subsoil should be stripped, stored and replaced separately in order to minimise soil damage and to provide optimal conditions for site restoration. Any planning application should contain a methodology for soil stripping, storage and replacement and this methodology should subsequently be adhered to during site development.

Figure 9 Soil excavation during cable trenching at the 5MW Trefullock solar farm in Cornwall. Note how topsoil and subsoil are stored on opposite sides of the cable trench in order to avoid the mixing of soil types and facilitate subsequent soil replacement and site restoration.

Figure 10 The construction compound associated with the development of the 5MW Trefullock solar farm in Cornwall.

Case Study 1; Wheal Jane, Truro, Cornwall Ref. PA10 / 03993

Background

The site of the former Wheal Jane Mine is located approximately 5km south west of Truro and 8km north east of Penryn in the heart of one of Cornwall's historic mining areas and within a predominantly rural, rolling landscape characterised by scattered settlements associated with early mining activities and farming. The mining and processing of tin at the site ceased in 1991. A treatment facility located at the site currently treats mine water, removing heavy metals with resultant residues being deposited in a large tailings dam at the site. The site is host to a range of companies that specialise in mining, minerals processing, civil engineering and providing employment for approximately 150 staff. An agreed 'Masterplan Framework' sought to develop the site into an 'earth science cluster', providing renewable energy technologies that would utilise natural resources at the site and provide new office accommodation and related infrastructure.

A planning application was subsequently submitted for the development of a 1.55MW 'solar farm' at the site. This would involve the installation of 5,760 solar panels on a site of 3.88ha with associated inverters, substation and security fencing. The planning application sought planning permission for a period of twenty five years. The proposed was 'Screened' for any Environmental Impact Assessment and a 'positive' screening opinion was concluded. This meant that the planning application had to be accompanied by an Environmental Impact Assessment.

Issues & Mitigation
Landscape & Visual Impact

Views from visual receptors close to the site would be limited to glimpses above and between intervening vegetation. The existing topography would minimise views from the

closest highway. Distant views would be limited and the development would appear as a small feature in such long distance views. Appropriate soft landscaping and habitat creation would integrate the site within the local countryside and appropriate boundary fencing was secured by planning condition.

Ecology

An ecological impact assessment was submitted in support of the planning application. This identified impacts with the potential to arise from both the construction and operational periods particularly vegetation clearance, construction activities, lighting and the operational phase. It was concluded that the proposed development would not have an unacceptable ecological impact, and indeed offered the potential for ecological benefit.

Mineral Safeguarding

The application site lies within the mineral consultation area for the Wheal Jane Mine. The purpose of mineral safeguarding is to prevent the unnecessary sterilisation of mineral resources from inappropriate development. Due to the temporary nature of the proposed development, and the nature of existing and potential future mineral operations on the Wheal Jane Mine Site, the proposed development was considered unlikely to be incompatible with mineral extraction or the underlying mineral resource.

Case update

The Wheal Jane solar farm was the first to be granted planning permission in the UK. The site became operational in summer 2011.

g) Access Tracks

Solar panel facilities which are developed on agricultural land should:

– aim to minimise disturbance to the agricultural land;

– be temporary, capable of removal and 'reversible'; and

– minimise their landscape/visual impact and their impact on the rural scene.

The installation and use of access tracks should therefore be kept to an absolute minimum. One track linking the inverters may be necessary as a minimum to enable exchange of inverters and replacement of heavy machinery. Agricultural vehicles, including tractors, quad bikes and 4WD, should be capable of servicing the facilities on a daily basis without the need to construct access tracks through the site.

A buffer strip of larger than 5 metres between hedges and solar panels is desirable to promote ecological and biodiversity opportunities if it can be achieved.

Figure 11 Close welded mesh panel fencing, as shown here at the Wheal Jane solar farm, generally has a low landscape / visual impact while also being versatile and providing a good level of site security.

h) Security Fencing / Lighting

Applicants will be expected to direct considerable effort towards minimising the landscape/visual impact of solar PV arrays. Whilst there is an acknowledged need to ensure solar PV installations are adequately secured it would be unfortunate if such security measures resulted in an unacceptable landscape/visual impact. Applicants should:

– minimise the use and height of security fencing;

– utilise existing features, such as hedges or landscaping, to screen security fencing;

– use natural features, such as vegetation planting, to assist in site security;

– minimise the use of security lighting. Any lighting should utilise a passive infra-red (PIR) technology and should be designed and installed in a manner which minimises glare, light pollution and impacts on biodiversity, in particular bats (see ecology section).

– ensure that appropriate measures are in place to facilitate continued access by larger mammals, such as badgers and foxes.

In some instances specialist fencing may be necessary in order to prevent access by deer. Such deer fencing can be much less intrusive than other forms of fencing and should be considered where possible.

Planning applications should contain full details and specifications of all security and lighting installations in order to allow an accurate landscape / visual / ecological assessment of the proposal to be made.

Where pole mounted CCTV facilities are proposed the location of these facilities should be carefully considered in order to minimise visual / landscape impact. In exposed landscapes such structures should be avoided where possible.

Figure 12 Any security equipment, such as this CCTV system, should be as discrete as possible in order to minimise its visual and landscape impact.

Figure 13 Photo courtesy of The Green Company

The following text is based upon advice provided by the Devon and Cornwall Police Authority

Risk

Generating electricity from the sun using photovoltaic panels on a commercial scale is a new venture within the UK and will bring with it new risks and challenges to protect the location and panels from criminals. Because this is a new project there is currently no UK crime data to base crime prevention advice on.

Policing experience indicates that placing large quantities of expensive photovoltaic panels in isolated locations without adequate protection will attract criminals and the photovoltaic panels and associated infrastructure will be stolen. The main risk will come from organised gangs who will use heavy duty tools and vehicles to remove large quantities of the panels. Stolen the panels are likely to be moved from the crime scene before re-emerging for sale.

Site

In view of the potential risk when considering suitable locations for solar farms a major consideration from a police view will be how the site can be protected from unauthorised vehicle entry. Full consideration of the natural defences of the site should be taken into consideration for e.g. steep gradient, substantial hedging, rivers etc. Wherever possible the boundary protection of the site should be an appropriate distance from the actual panels to discourage parking a vehicle against the site boundary and manually lifting stolen panels onto a vehicle.

Access to the Site

The solar company / site owner will require vehicular access to the site. The physical security guarding this access must be robust to sustain a high level of attack as these sites will probably be remote and lacking any natural surveillance. Consideration should be given to protecting the access road at two separate locations;

1. at the actual entrance to the site and;
2. away from the specific entrance to keep authorised vehicles a substantial distance from the site.

The security of solar farms must be properly assessed by all those involved in the planning process. All planning applications should therefore include full details of the security proposals within the Design and Access Statement (as required by Department for Communities and Local Government Circular 1 / 2006 paragraph 87)

The security measures to be incorporated at each location will have to be considered on a site specific basis. They will obviously be determined to some degree by, for example, the existing landscape and local planning constraints etc

The basic principle of all crime prevention is to provide layers of defence to whatever is in need of protection.

In the case of solar farms this protection will almost certainly require both the physical element, such as fences or ditches and also the utilisation of appropriate technology such as CCTV.

The advice offered below covers the general crime prevention points which should be considered by any applicant.

Perimeter Security and Access Control

If perimeter fencing is to be used then it should be a proven security fence. The recommendation would be to install fencing which has been tested and approved to current UK Government standards. Fencing which meets the SEAP (Security Equipment Approval Panel) class 1-3 may be the most appropriate. Fencing which is not of a specialist security type is likely to offer at best only token resistance to intruders.

Planting up and alongside any fencing will be acceptable providing there is no detrimental effect upon site surveillance that is available.

The standard for rating bollards, blockers and gates is PAS 68:2007 and PAS 68:2010.

Landscaping techniques such as ditches and berms (bunds) may also be appropriate in some instances. To be effective in stopping vehicles these need to be designed carefully. Police are able to provide further specific advice in relation to the design of such defences upon request. There should be a minimum number of vehicular access points onto site, ideally only one. Clearly such access points will present the most obvious means for the criminal also and therefore will require a robust and adequate defence.

Some thought should also be given to the wider issues of access around any site. If, for instance, the land surrounding the site is under the same ownership can this be made more secure by improving gates etc. Again this provides layers of difficulty for the criminal to overcome.

Electronic Security

There is a huge range of electronic security available. For most sites it is very likely that this will play an important role. In selecting which type of technology to employ a proper assessment on a site specific basis should be undertaken to ensure any system will be fit for purpose.

For CCTV this assessment is commonly called an Operational Requirement (OR) An obvious example would be to establish how effective will the CCTV be at night at these locations.

There will probably be little reward in deploying CCTV or other defence unless it is monitored in some way or can provide an instant alert in some form and also who would then respond to this? CCTV which simply records will probably be of very limited value.

Other Options

The presence of site security personnel in some capacity should be considered including perhaps in terms of some types of response to site alarm activations.

The use of security bolts to secure photovoltaic panels and locked housing to secure inverters etc.

If the individual solar panels can be marked overtly this would reduce the ease with which they could be re sold / re used and thus help act as an additional deterrent and assist in any future identification.

Covert security marking should also be used.

i) Ground Anchors

Solar PV installations which are developed on agricultural ground should be 'reversible', allowing the site to be easily restored to a more intensive agricultural use.

Intrusive development, such as trenching and foundations, should therefore be minimised and the use of mass concrete should be avoided. Where possible Solar PV arrays should be installed using 'pile' driven or screw foundations, or pre-moulded concrete blocks (shoes), and capable of easy removal. The use of shoes may be required for archaeological sensitive areas.

Where 'pile' driven foundations are proposed applicants should consider impacts during construction on nearby noise sensitive properties.

Figure 14 The ground anchors and framework associated with the development of the 1.4MW Benbole solar farm in Cornwall.

Figure 15 Where there are areas of archaeological interest, and therefore a need to avoid ground disturbance, the use of pre-cast concrete anchors should be considered, as shown here at the 5MW Trefullock solar farm in Cornwall.

Figure 16 Where pile driven foundations are proposed consideration should be given to the noise impact at nearby sensitive receptors. Difficult ground conditions, such as those encountered at the 1.4MW Wheal Jane solar farm shown here, may also require drilling.

j) Tracking and orientation

Some solar PV arrays will follow the daily movement of the sun across the sky in order to take maximum advantage of the solar gain. These systems are known as 'trackers' and, although they maximise solar gain, they are expensive to install and maintain. Some solar PV arrays will be static. These are less expensive to install and maintain but, because they do not follow the sun's movement, they are not as efficient as 'trackers'. A compromise is reached with some solar PV arrays which are generally static but can be moved quarterly to reflect seasonal changes in the movement of the sun across the sky. The type of solar PV array installed, and the extent of any 'tracking', will have an impact on the landscape/ visual assessment and the planning application should clearly indicate the type of array proposed.

The impact of 'trackers' on grazing animals such as sheep should be carefully considered to avoid such animals becoming trapped in any moving parts.

The orientation of static solar PV panels should also be a consideration. More recently developers are considering the advantages of varying the orientation of panels throughout the development to balance electricity production over the year and day. Details of this should be set out in any planning application and considered in any landscape impact assessment.

k) Landscape / visual impact

The landscape / visual impact of a solar PV farm is likely to be one of the most significant impacts of such development.

Developers may be attracted to southerly sloping sites, where solar gain is greatest. However such sites may be of high agricultural value and are likely to be more visible within the wider landscape.

Solar PV farms are regarded as a temporary use of land (refer to Duration of Planning Permission at the end of the Guidance) and as such the removal of existing vegetated field boundaries, including hedges will not be permitted as this will irrevocably alter the landscape character of the site.

The development will need to have regard in both its design layout, and future maintenance plans for the retention of growth of vegetation on these important boundaries, including the opportunity for individual trees within the boundaries to grow on to maturity.

The landscape / visual impact must be considered with great care at the pre-application stage. The Local Planning Authority Landscape Officer should be consulted at an early stage and mitigation measures proposed wherever necessary. Guidance to the information which should be provided within a Landscape and Visual Impact Assessment is covered in Appendix A.

Existing hedges and established vegetation, including mature trees, should be retained wherever possible.

Trees and hedges should be protected during construction. The impact of the proposed development on established trees and hedges should be informed by a tree survey (to BS 5837) and / or a hedge assessment as appropriate.

Any buildings required in order to house electrical switchgear, inverters etc should be designed and constructed in order to minimise their landscape and visual impact and construction materials should be selected to reflect the local landscape context. If a pre-fabricated building is used, consideration should be given to the need to screen the building with vegetation.

Figure 17 The 5MW Howton solar farm in Cornwall. Image courtesy of Lightsource Limited.

Cumulative Impact

The Local Planning Authority should maintain a record of all planning applications received in respect of proposals for large scale solar PV installations and a record of all planning decisions. Prospective applicants are advised to contact their Local Planning Authority to review these records at an early stage in order that, where necessary, the issue of cumulative impact for such development can be considered and addressed when preparing any planning application

Careful consideration should be given to the impact of existing or proposed vegetation in order to ensure that any resultant shading of solar panels does not result in the future pruning or felling of such vegetation.

l) Ecology

The nature of impacts on ecology will depend on the ecological characteristics and features of the site and sensitivity to proposed changes. Solar PV arrays could have implications for habitat loss, fragmentation and modification and for displacement of species. However, solar PV arrays may also be capable of delivering environmental gains such as creating habitats through undisturbed grassland for many years, wildflower meadows, taller hedges and woodland etc.

The National Planning Policy Framework sets out the National approach to ecology in the planning process and sets out a number of guiding principles. It will be important to consider impacts that could take place through the construction, operation and decommissioning stages of a scheme.

Design should be informed and influenced by ecological assessments (phase 1 habitat surveys, protected species surveys etc). Issues that may need particular assessment include ground nesting birds, wintering birds, bats, dormice, reptiles and badgers. The use of an advising ecologist throughout the design process can ensure that adverse impacts are mitigated and biodiversity enhancements are maximised. (NB. Protected species surveys are season-dependent so contacting an ecologist at a very early stage is advisable).

The assessment will need to include a 'desk study' for existing ecological records, an evaluation of the likely impacts of the solar farm upon ecological features, specify mitigation to avoid / minimise these impacts and list any further surveys required. The main impacts and mitigation requirements are likely to be:

Lighting – security lighting may affect bats. It is advised that lighting is not used unless absolutely necessary. If lighting is necessary it must be minimised and directed away from hedges / woodland / 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 have the potential to adversely impact upon biodiversity. Cable routes need to be carefully designed in consultation with the consulting ecologist.

Construction – it is advised hedges are fully retained and no new hedge breaks are created. If any hedges/scrub are to be removed, further surveys including for dormice and reptiles may be necessary. Pile driving may affect any badgers nearby; this will need to be informed by a badger survey and a licence may be necessary.

Fencing - it is advised that large buffer strips (at least 4-5m) are left between perimeter fencing and hedges. The fencing must allow badgers, reptiles and other fauna access into the site (whilst retaining grazing sheep) if required to do so in the ecological report.

It is advised a gap to allow small mammals and reptiles access is left around the entire base of the fence, with larger gaps or gates for badgers at suitable intervals.

Enhancement, Management and Monitoring – solar farms have the potential to increase the biodiversity value of a site if the land was previously intensively managed. Sheep grazing or an autumn cut with removal of grass cuttings could increase the botanical diversity of the site. The ecological consultant should specify a suitable management regime for each case, bearing in mind shading by the solar panels. Hedges should be managed appropriately and could be laid to reduce gaps.

Proposed enhancements should build upon and extend existing habitats or create new important habitats eg: cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, wild bird mixes, etc.

It is advised an ecological monitoring programme is developed to monitor impacts upon the flora of the site and upon any particular features (e.g. bats, wintering birds). Results of the monitoring will then inform any changes needed to the management/grazing regime.

Figure 22 A 5m buffer strip between the field boundary and any fencing will allow access for maintenance purposes, minimise damage to the field boundary and provide an access corridor for wildlife.

Checklist for advising on potential nature conservation impacts:

- Could the development site, alone or cumulatively, have impacts on a designated site and its objectives of designation?
- Is the site (habitat/species) sensitive to changes likely to result from a solar array scheme?
- Can the site successfully integrate land uses and deliver environmental benefits?
- Are proposed mitigation measures adequate and likely to be effective?
- Is post-construction monitoring necessary?
- Have impacts been properly assessed in the EIA/Hazard Risk Assessment or other environmental assessment? Do we agree with the conclusions?
- Are there opportunities for environmental enhancement, such as creation of new natural screening features or management of the land/margins for conservation purposes?
- Are enhancement measures appropriate and do they contribute to wider aims in the area, such as Biodiversity Action Plan (BAP) action plans?

Solar PV farms therefore can offer the opportunity to increase biodiversity and hence it is desirable to maximise the environmental benefit to the land where they are located. Recent (September 2011) guidance produced by the German Renewable Energies Agency "Solar parks- Opportunities for Biodiversity" (http://www.unendlich-viel-energie. de/en/details/article/4/solar-parks-opportunities-for-biodiversity-1. html) and the Natural England Technical Information Note TIN101 "Solar parks: maximising environmental benefits" http://publications.

naturalengland.org.uk/publication/32027 offer more detailed advice on this aspect of solar farm development.

m) Historic Environment

The impacts of solar PV developments on the historic environment will require expert assessment in most cases. Solar PV developments may affect heritage assets (sites, monuments, buildings and landscape) both above and below ground. Above ground impacts may include the effects of applications on the setting of Listed Buildings if the setting

is registered as part of the listing and Scheduled Monuments as well as on the Historic Landscape Character. Below ground impacts may include direct impacts on archaeological deposits through ground disturbance associated with trenching, foundations, fencing, temporary haul routes etc. Equally finds may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low level piling is stipulated.

In line with paragraph 128 of The National Planning Policy Framework, all proposals should be as a minimum informed by a consultation with the Historic Environment Record (HER). For many areas, these can be located online using http://www.heritagegateway.org.uk/gateway/advanced_search.aspx (see the 'resources' tab). Alternatively you should contact your local authority for this information.

Where a site on which development is proposed includes or has the potential to include heritage assets with archaeological interest, local planning authorities should require developers to submit an appropriate desk-based assessment and, where necessary, a field evaluation. This should be carried out in consultation with the local authority planning team or historic environment officer who will be able to provide a brief for the required expert assessment or evaluation work.

The results of such assessments will be required as supporting information in advance of the validation of applications, as set out in The National Planning Policy Framework.

Applications should take account of the results of historic environment assessments in their design, for instance through the sensitive planning of installations. Any opportunities to introduce better management of affected assets, or to improve the settings of designated sites, should be identified.

n) Drainage, Surface Water Run-off and Flooding

The Environment Agency has advised that, due to the size of solar PV farms, planning applications will be expected to be accompanied by a Flood Risk Assessment. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not in general be significant and therefore this should not be an onerous requirement.

Where access tracks need to be provided, permeable tracks should be used, and localised SUDS, such as swales and infiltration trenches, should be used to control any run-off where recommended.

Given the temporary nature of solar PV farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses. Culverting existing watercourses/drainage ditches should be avoided. Where culverting for access is unavoidable,

it should be demonstrated that no reasonable alternatives exist and where necessary only temporarily for the construction period.

o) Glint and Glare

Glint may be produced as a direct reflection of the sun in the surface of the solar PV panel. It may be the source of the visual issues regarding viewer distraction. Glare is a continuous source of brightness, relative to diffused lighting. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the sun. Glare is significantly less intense than glint.

Solar PV panels are designed to absorb, not reflect, irradiation. However the sensitivities associated with glint and glare, and the landscape/ visual impact and the potential impact on aircraft safety, should be a consideration. In some instances it may be necessary to seek a glint and glare assessment as part of a planning application. This may be particularly important if 'tracking' panels are proposed as these may cause differential diurnal and/or seasonal impacts.

The potential for solar PV panels, frames and supports to have a combined reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all of the materials used in the construction of the solar PV farm.

p) Community Involvement and Gain

Community Involvement - Community involvement should be considered as an integral part of the development process.

In essence the local community should be engaged, by the developer, at the pre-design, conceptual stage, ideally utilising a local exhibition/ presentation where community views can be sought and recorded. A second exhibition/presentation should be arranged, by the developer, some weeks prior to submission of the planning application. This second consultation should allow sufficient time to seek community views/opinions, and take them into consideration, prior to the submission of any final planning application. Any planning application should detail the exhibitions/presentations, any views/representations received and how any planning application was influenced/amended to accord with such representations. The developer may also wish to undertake an exhibition/presentation following the submission of a planning application.

Figure 23 Solar panel array at Gatwick airport. Image courtesy of Orta Solar.

Figure 24 East Langford 5MW solar farm, Cornwall. Image courtesy of Low Carbon Solar

Figure 26 Howton 5MW solar farm, Cornwall. Image courtesy of Low Carbon Solar Partners.

Community Gain - Opportunities for community benefit should be explored wherever practical. Such opportunities include;

- Establishment of a local Environmental Trust or Community Benefits Trust, with funds being contributed annually by the developer and used for energy conservation measures.
- Local share issue.
- Local or community ownership of panels.
- Investment in Green Infrastructure provision and management, especially at the landscape scale.

Although community benefits are encouraged it should be clear that any offer is not relevant to the consideration of any planning application.

Neither the principle of any undertaking nor the details contained within it can be proposed in order to directly mitigate / remedy a specific planning objection to a proposal.

As such, the requirement for community benefit is not considered to be compliant with the Community Infrastructure Levy Regulations 2010 (as amended) and cannot be required under planning law. Therefore no weight can be given to the inclusion of a community benefit scheme when considering a planning application.

q) Airport Safety

The Civil Aviation Authority (CAA) has developed the following guidance relating to Solar energy.

Interim guidance on the installation of solar panels near UK aerodromes.

r) Electricity Generating Capacity

Planning applications for commercial scale solar PV development should clearly indicate the installed capacity (MW) of the proposed facility.

Although the NPPF states that local authorities should not require applicants for energy developments to demonstrate their overall need for renewable or low carbon energy and also recognise that small- scale projects provide a valuable contribution to cutting greenhouse gas emissions, it is considered that this is useful background information.

While it is accepted that the performance of the solar PV panels may degrade over time the initial installed capacity should be provided. The 'capacity factor' and estimated annual production (MWh p.a.) should also be provided together with the number of residential properties electricity equivalent for UK. A pro forma table, explaining these terms, is attached as Appendix B. This information will allow members of the public, and elected Members, to clearly understand the generating capacity of the proposed facility.

s) Duration of Planning Permission

Solar PV farms should normally be regarded as a temporary use of land. It is therefore likely that planning permissions will limit the duration for which the system can remain in place. Planning permissions will normally;

- Need to be implemented within a period of three years
- Contain a timeframe for the completion of the construction and commissioning of the development
- Be for a temporary period only from the commissioning of the facility.

t) Visitor Attraction / Educational Facility

Applicants may wish to give consideration, where appropriate, to the development and installation of viewing areas, interpretation panels, visitor or educational facilities as part of any development proposal. While it is not anticipated that all solar PV farm proposals would warrant such facilities there may be instances where such development may be appropriate.

Figure 25 The use of interpretation and display boards, such as these examples at Newquay Zoo and the Wheal Jane Solar Farm, to explain the purpose and function of a solar panel array and raise awareness about renewable energy is something that developers may wish to consider.

Appendix A: Guidance on the information which should be provided within a Landscape and Visual Impact Assessment

Solar Farm Screening Response – Cornwall Council Landscape and Urban Design Unit

It is vital that landscape considerations are embedded in the decision making process, as the most significant environmental effect of a development such as this, will be the impact on landscape character and visual amenity.

The question to be addressed is whether this solar farm scheme is likely to give rise to significant environmental effects on the landscape, and thereby whether the Environmental Impact Assessment Regulations apply to the application.

There are a number of elements associated with a solar farm development which have the potential to influence the significance of the impacts on landscape character and visual amenity :

- Gradient of the site and the surrounding landform,
- Extent of the application site,
- Height and layout of the panels,
- Colour of the panel's surrounding frames,
- Treatment of the ground below and between the panels, for example to grow crops, graze livestock, or to lay down mulch to reduce maintenance,
- Perimeter fencing.

The Guidelines for Landscape and Visual Impact Assessment – Second Edition – Landscape Institute and Institute of Environmental Management and Assessment 2002 states in paragraph 7.39 that the two principal criteria in determining significance are :

"the scale or magnitude of effect and the environmental sensitivity of the location or receptor."

The following is an example of how significance maybe determined with reference first to landscape character and then visual impact.

Assessment of the impact on landscape character

Magnitude or scale of effect on the landscape can be described as high, medium or low, adverse or beneficial through the assessment of the

- loss of key elements of the pre-development landscape;
- introduction of elements into the receiving landscape with a resultant effect of changes in overall landscape character.

High magnitude of effect on landscape character - total loss or major alteration to key elements of the pre development landscape, or the introduction of elements considered to be uncharacteristic when assessed within the attributes of the receiving landscape, or the proposal becomes a dominant feature within the scene with the surrounding elements becoming subordinate and the resultant effect is a change in the overall character.

Medium magnitude of effect on landscape character - partial loss of, or alteration to one or more key elements of the landscape pre-development, or the introduction of elements that maybe prominent, or form a visibly recognisable new feature, but may not necessarily be considered substantially uncharacteristic when set within the attributes of the receiving landscape.

Low magnitude of effect on landscape character – minor loss or alteration to one or more key elements of the pre-development landscape, or the introduction of elements which constitute a minor component of the wider landscape, and are not uncharacteristic when set within the attributes of the receiving landscape.

Sensitivity of the landscape as a resource can be defined as high, medium or low, and is dependent on the landscape's

1. Character — what contribution does the site make to the character of the area in its undeveloped state? Is it part of a recognisable pattern of elements / attributes specific to the area? Does the site contribute to the area's sense of place and distinctiveness?
2. Quality — in what condition is the existing landscape?
3. Value — is this landscape valued by people, local community, visitors? Are there special cultural associations? Is the area covered by a landscape, ecological or historic designation? Is the landscape recognised, locally, regionally or nationally?
4. Capacity — what scope is there for change in the existing landscape character?

High importance - a quality landscape with valued features, and positive character which is particularly sensitive to change. A landscape of importance, or rarity on a local, regional or national scale.

Medium importance - generally positive character, but there may have been degradation or erosion of features resulting in areas of more mixed character and reduced overall value. Moderately sensitive to change, although some change maybe tolerated however this maybe detrimental if inappropriately dealt with. A landscape of medium importance or rarity on a regional or local scale.

Low importance – few valued features, the landscape is tolerant of substantial change. An area of low importance and rarity at a local scale.

The levels attributed to sensitivity of the landscape to change and the magnitude or scale of the landscape effect combine in Table 1 to determine significance of effect on landscape character.

Table 1

		Sensitivity Of Landscape		
		High	**Medium**	**Low**
Magnitude of Landscape Effect	**High adverse**	High adverse significance	High / Medium adverse significance	Medium adverse significance
	Medium adverse	High / Medium adverse significance	Medium adverse significance	Medium / Low adverse significance
	Low adverse	Medium adverse significance	Medium / Low adverse significance	Low adverse significance
	Nil	Neutral significance	Neutral significance	Neutral significance
	Low beneficial	Low beneficial significance	Low beneficial significance	Low beneficial significance
	Medium beneficial	Medium beneficial significance	Medium beneficial significance	Medium beneficial significance
	High beneficial	High beneficial significance	High beneficial significance	High beneficial significance

Assessment of the visual impact

Magnitude of visual change can be described as high, medium or low, adverse or beneficial, through the assessment of

1. loss or addition of key elements of the pre-development view;
2. alteration of the overall composition of the wider view looking at the proportion of the view the development occupies,
3. over what percentage of the area will the change in view be apparent,
4. will the change be temporary,
5. to what extent will the scale, massing, layout, colour of materials contrast with the predevelopment view,
6. topography of the site and the surrounding landform
7. distance between the viewer and the development.

High magnitude of effect - total loss, or major alteration to key elements of the existing scenery which are substantially uncharacteristic leading to a detrimental change in visual character. The proposal becomes a dominant feature in the scene to which the other elements become subordinate.

Medium magnitude of effect - partial loss or moderate alteration to some elements of the existing scenery which maybe prominent and readily noticed by the observer, and are uncharacteristic in the overall visual character.

Low magnitude of effect - minor loss or alteration to one or more key elements of the scenery / view. The proposals constitute only a minor component of the wider view and introduce elements which are not uncharacteristic when set in the overall view visual character. Awareness of the proposals would not have a marked effect on the overall quality of the scene.

Nil – unperceivable change to elements within the view or overall visual character.

Sensitivity of visual receptors can be described as high, medium or low and is dependent upon

- the distance from the site, its size, the angle / elevation of the viewpoint, context, weather conditions
- the differing individual receptors and the expectation of the view that brings
- the importance of the view, assessed by the number of people affected, or by its popularity, appealing to locals, visitors, referenced in books, guides and maps.

High importance – viewpoints within a high quality landscape, recognised in published maps and guides. Where a large number of residential properties experience a similar view. Receptors / individuals who have a high interest in their environment and engage in leisure activities associated with the aesthetic experience of the views / general surroundings.

Medium importance – viewpoints within a medium quality landscape. Where a small number of residential properties experience a similar view. Receptors / individuals who have a moderate interest in their environment whilst engaged in outdoor pursuits, sport or recreation.

Low importance – viewpoints within a low quality landscape. Receptors / individuals who have a passing / short interest in their environment for example whilst engaged in other activities such as work or travelling through the area, on an occasional basis.

The levels attributed to sensitivity of the visual effect and the magnitude or scale of that visual effect combine in Table 2 to determine visual significance.

Table 2

		Sensitivity Of Receptor		
		High	**Medium**	**Low**
Magnitude of Visual Effect	**High adverse**	High adverse significance	High / Medium adverse significance	Medium adverse significance
	Medium adverse	High / Medium adverse significance	Medium adverse significance	Medium / Low adverse significance
	Low adverse	Medium adverse significance	Medium / Low adverse significance	Low adverse significance
	Nil	Neutral significance	Neutral significance	Neutral significance
	Low beneficial	Low beneficial significance	Low beneficial significance	Low beneficial significance
	Medium beneficial	Medium beneficial significance	Medium beneficial significance	Medium beneficial significance
	High beneficial	High beneficial significance	High beneficial significance	High beneficial significance

The current Environmental Impact Assessment Regulations (EIA) do not make reference to solar farms, but this should not be reason to automatically decide that an EIA is not required.

Having looked at the EIA Regs, a comparison can be drawn between solar panels and the following two types of development:

– glasshouses – which also alter land cover over potentially large areas, and have associated significant landscape and visual impacts. ("Development (such as greenhouses) on previously uncultivated land is unlikely to require EIA unless it covers more than 5 Ha" EIA circular)

– industrial installations for the production of electricity - where development area exceeds 0.5Ha, and one of the main considerations includes visual impact

Whether the EIA Regs are applied to the application or not, the impact of the proposal on landscape character and visual amenity needs to be examined through a comprehensive Landscape and Visual Impact Assessment. Such an assessment will need to cover the following detail:

1 Description of the development

– The need for the development set within local regional and national strategies;

– The timescale for construction, operation and decommissioning;

– The site's location and overall layout;

– Solar panel design and specification, method of construction / installation;

– Reasonable estimates of quantity and type of traffic which will be generated through construction and operation.

2 Site Description

– Description of the main reasons for the site selection and any alternatives in site design or layout which have been considered.

– Area of proposed land which the panels will occupy, clearly described and indicated on a map or diagram;

– Illustrated description of the land use of the surrounding area;

– Description of the policies plans and designations which are relevant to the proposal;

– Evaluation of the direct, indirect, secondary and cumulative, short medium and long term effects resulting from the existence of the development.

3 Landscape Baseline Conditions

– The current condition of the landscape;

– Local Authorities Landscape Character Assessment to provide the framework landscape character information, supplemented by a study to assess the specific impact of the development;

– Relationship of the site to any designated areas of landscape at a national, regional or local level, and to areas of landscape value or scenic quality.

– Description of all baseline date sources, and methods used to supplement this information;

– The landscape baseline should be evaluated in relation to its sensitivity and importance. The sensitivity evaluation of each landscape element should reflect its quality value, contribution to landscape character and the degree to which the particular element or characteristic can be replaced or substituted.

4 Predictions of Impact

– Assess the scale, or magnitude of change to the landscape and visual elements as a deviation from the baseline conditions for each phase of the proposal. Consideration will need to given to visitor and resident populations, and seasonal variations;

– Provide a Zone of Theoretical Visibility (ZTV) diagram for the development indicating as a minimum 1km, 2km, and 4km radii from the site;

– The methods used to establish the magnitude should be clearly described and be appropriate and reasonable in relation to the importance of the landscape and visual impact;

– Where assumptions or unsupported data has been used in the predictions, these should be highlighted and accompanied by an indication of the reliability / confidence of those assumptions or data;

– Evaluation of the direct, indirect, secondary and cumulative, short medium and long term effects resulting from the existence of the development.

5 Impact Significance

– Clearly describe the judgements which underpin the attribution of significance;

– The assessment of significance should consider the impact's deviation from the established landscape baseline condition, the sensitivity of the landscape and receptors and the extent to which the impact will be mitigated or is reversible;

– The range of factors which are likely to influence the assessment of significance should be clearly identified;

– Provide detail of how these variables will affect the significance of the impacts over the life of the development;

– Identify the significance of impacts that remain following mitigation.

6 Mitigation

– Describe the measures proposed to avoid, reduce and if possible remedy significant adverse impacts on both landscape character and visual amenity;

– Provide an indication of the effectiveness of the stated measures;

– Clear indication of how the mitigation measures will be implemented.

7 Presentation of the Landscape and Visual Impact Assessment

– The document should be clear and logical in its layout and presentation and be capable of being understood by a non–specialist;

– It should be a balanced document providing an unbiased account of the landscape and visual effects, with reasoned and justifiable arguments;

– A glossary of all technical terms and full reference list should be provided;

– Plans, diagrams and visual representations should be provided to assist in the understanding of the development and its impact, and should be clearly labelled with all locations reference in the text.

8 Non Technical Summary

– A stand alone document to be available to a non-specialist reader, to enable them to understand the landscape and visual impacts of the proposal;

– To include a summary description of the development; the aspects of landscape character and visual amenity likely to be significantly affected; the likely significant effects; the mitigations measures to be implemented;

– Include as a minimum the plans, maps and other visual representations which illustrate the location of the application site, the footprint of the development, and the location of key features.

Appendix B: Electricity Generating Capacity

Planning applications for commercial scale solar development should be accompanied by the following information.

Whilst it is acknowledged that the National Planning Policy Framework states that local authorities should not require applicants for energy developments to demonstrate their overall need for renewable or low carbon energy and also recognise that small-scale projects provide a valuable contribution to cutting greenhouse gas emissions, it is considered that this is useful background information.

Installed capacity (MW) [1]	Capacity factor [2]	Estimated annual production (MWh p.a.) [3]	Number of residential properties electricity equivalent [4]

Notes:

1. Installed capacity is the full-load, continuous rating of generating equipment under specific conditions as designated by the manufacturer. In other words, this is the power generated when the equipment is working at full capacity.
2. Capacity factor is the calculated factor which compares the plant's actual production over a given period of time with the amount of power the plant 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.
3. Estimated annual production of electricity based upon the installed capacity and the capacity factor.
4. Number of residential properties that would be powered by the estimated annual production based upon the Great Britain average domestic consumption of 3,300 KWh / year (ofgem factsheet 96, 2011).

Appendix C: EIA Screening Procedures Overview

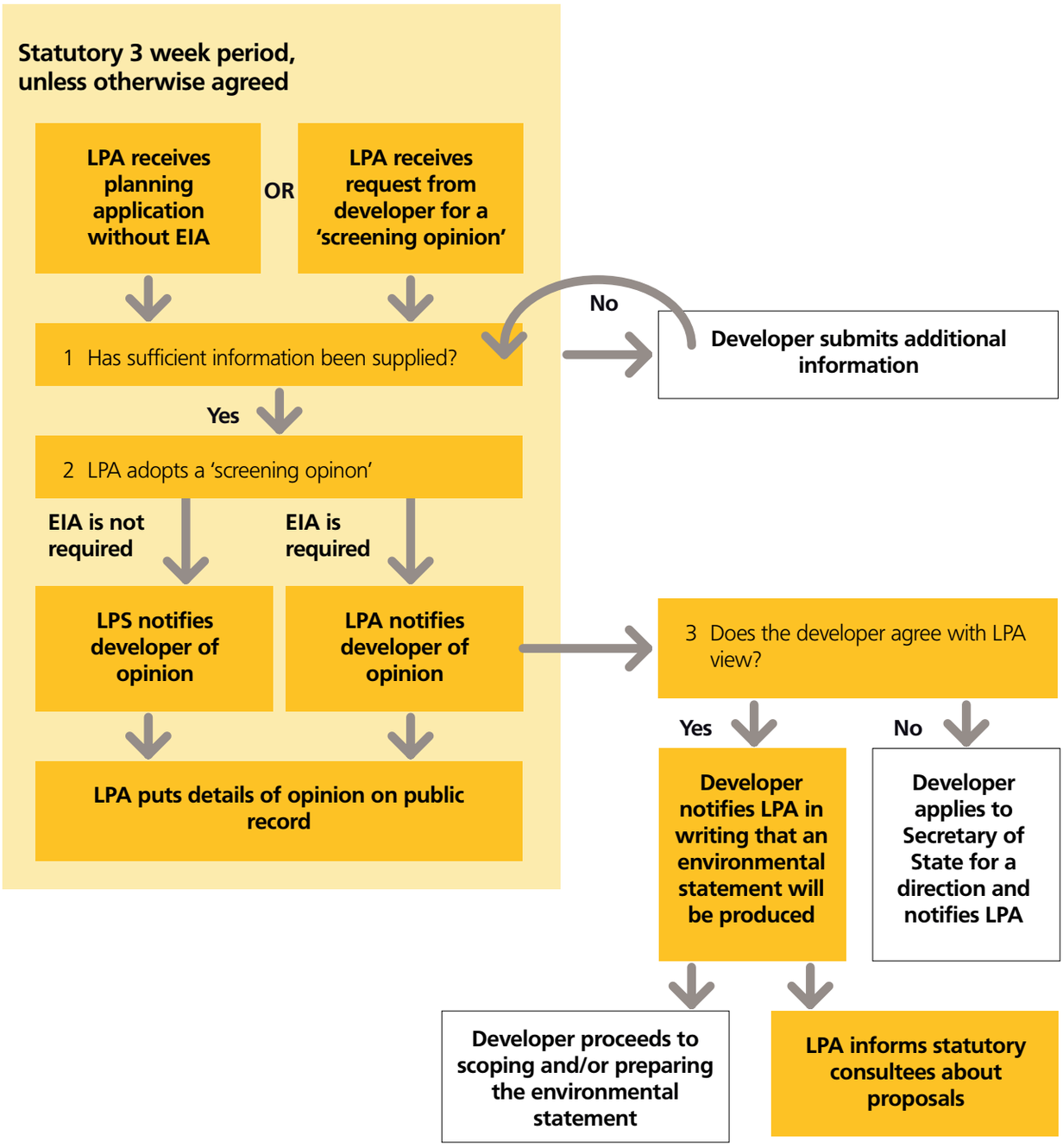

Figure 27 Flow chart 1: Screening precedures overview

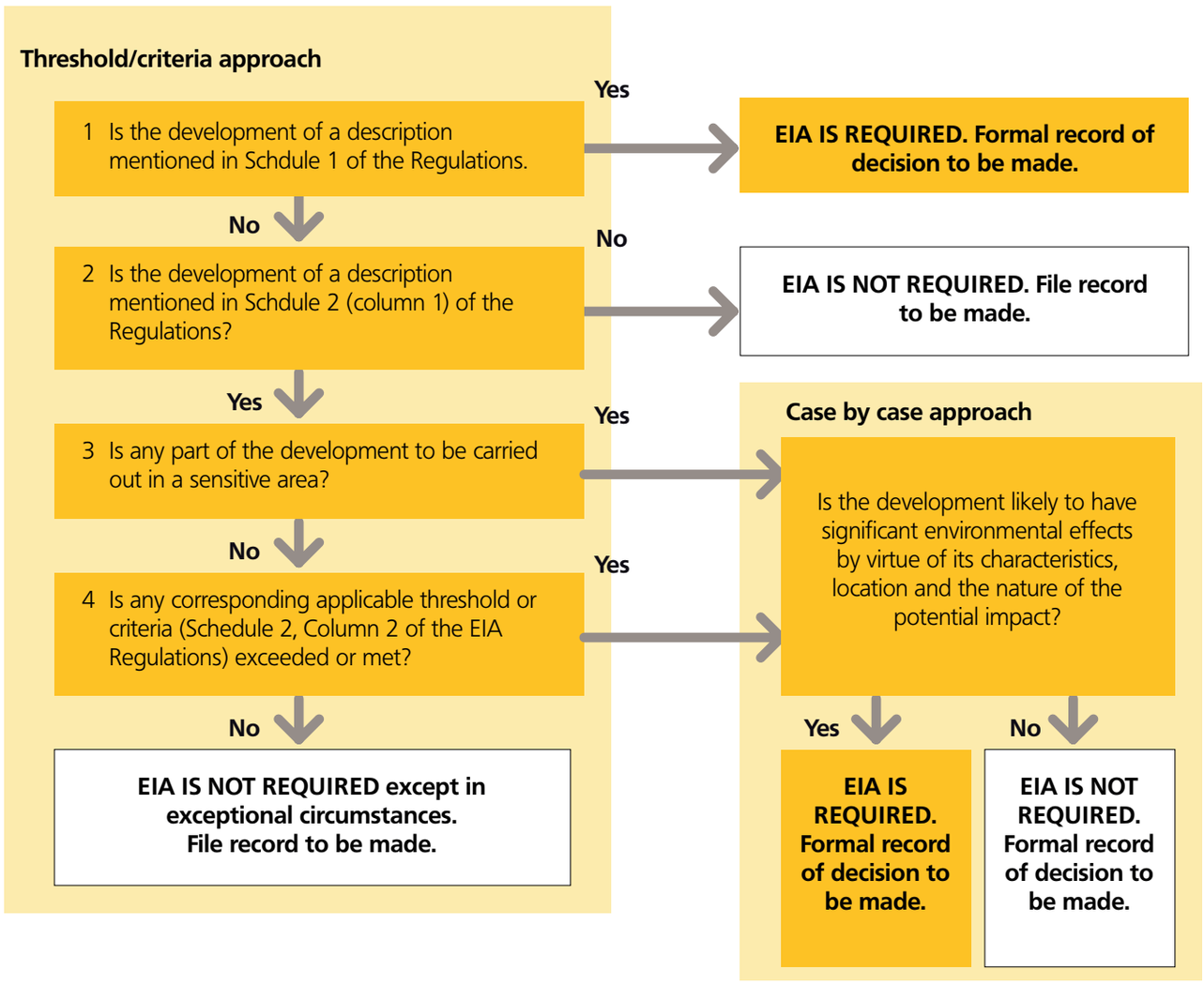

Figure 28 Flow chart 2: The screening decision

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