Solar power

RSPB Briefing, March 2011

Summary

The RSPB supports the use of renewable energy to reduce the UK's greenhouse gas emissions. This briefing summarises our position on all forms of solar energy, but focuses on the impacts of large PV arrays. It suggests ways to avoid, mitigate and enhance potential impacts on birds and other wildlife.

We support deployment of all forms of solar energy, particularly where panels are installed in urban environments and on roofs. We may be concerned over the impact of large photovoltaic (PV) arrays in the non-urban environment that are to be located in or close to protected areas, or close to fresh water features. We will assess these on a case-by-case basis.

Introduction

With climate change threatening catastrophe for people and wildlife, the need to cut greenhouse gas emissions by 80% by 2050 demands nothing short of an energy revolution. The RSPB supports the development of solar power and other forms of renewable energy to help decarbonise the UK's electricity supply and reduce greenhouse gas emissions, but we want the energy revolution to take place in harmony with the natural environment. We have already installed a number of solar panels onto our visitor facilities at key reserves, and are planning a wider roll out as part of a programme to install renewable technologies, including solar PV, on our sites.

Solar energy can make a real contribution to reducing emissions in the UK. It can be used for direct space heating (passive solar) or to heat water for direct use and space heating (solar thermal). Photovoltaic (PV) panels convert solar radiation to electricity. At the domestic/small-scale and when deployed on roofs, these technologies do not pose a significant concern for the RSPB's UK conservation work; we therefore fully support their deployment as a means of delivering low-carbon energy. Sunlight can also be concentrated using mirrors (heliostats) to generate electricity, either by raising steam or using PV. This technology is in use in the US and Spain, but is at an early stage of development. Large-scale PV arrays are a potential concerns in sensitive locations, and are the focus of this briefing.

The UK Feed-In Tariff (FIT) provides a generous financial subsidy for electricity generation using solar PV. The tariff applies to installations with an installed capacity up to 5 MW, and is index linked and guaranteed for 25 years. PV panels typically have an operational life of around 50 years, so could remain in place longer than the FIT. The tariff has attracted interest not only for small roof-mounted PV systems, but also from developers applying for planning permission for large ground-mounted arrays, the largest (5 MW) requiring approximately 15 ha of land. The most attractive tariffs are for sites connected to the national grid before April 2012, so a large number of applications for planning consent may come forward in 2011, mainly in the south and west of England.

The RSPB's policy on solar energy

In principle, we support all forms of solar energy technology. Ideally, we would prefer photovoltaic (PV) arrays to be mounted on roofs, or on previously developed or sealed land with low wildlife value (such as car parks). Large PV arrays mounted in agricultural fields (or other non-urban/unsealed areas) are unlikely to be a concern provided they are developed in suitable locations. Table 1 summarises the different types of solar energy available and our position on each.

Table 1: Types of solar energy and the RSPB's policy position on each.

	Description	RSPB position
Solar photovoltaic (PV) arrays – *the focus of this briefing.*	Large arrays of PV panels mounted on agricultural fields or other unsealed land.	Supportive, unless there are site-specific concerns. Concerns are most likely when located in or close to protected areas, or close to water features where development could pose risks to aquatic invertebrates and waterfowl (see below).
Solar PV (built environment)	Small PV arrays (or single panels) mounted on roof tops, or previously sealed land such as car parks. On S/SW sloping roofs they may be integrated/flush with roofing materials.	Supportive. Possible risks of disturbing roof-nesting/roosting birds and bats. Installation should take place outside the breeding season, and avoid blocking access points.
Concentrated solar	Use of mirrors to concentrate solar energy for thermal or PV electricity generation.	Supportive, as long as our potential concerns are addressed. However, this is an early-stage technology, unlikely to be used on a commercial scale in the UK in the near future.
Solar thermal	Panels used to raise water temperature for space heating and/or hot water supply. Usually roof-mounted.	Supportive. Similar issues to solar PV (built environment). Likely to remain small-scale (i.e. domestic use).
Passive solar	Use of building orientation and design (e.g. large areas of south-facing windows) to reduce space heating loads.	Supportive.

Wildlife impacts

The wildlife impact of a solar array scheme will be largely determined by location.

- If the site is *not valuable* for wildlife – e.g. intensive arable or grassland – the impacts are unlikely to be significant and may be positive.
- Some sites may have strong *potential to become more valuable* for wildlife, e.g. land behind sea walls identified for future managed realignment; land suitable for entry into agri-environment schemes; and strategic parcels of land for landscape-scale conservation initiatives. Realising this potential, however, is not necessarily incompatible with solar power development.
- If the site is already *valuable for wildlife*, and particularly if it is in or near a protected area, the scheme will require greater scrutiny as there is potential for significant impact.

Potential impacts on birds and other wildlife are described below.

(i) Impacts due to land use change

Solar arrays could result in:

- direct habitat loss;
- habitat fragmentation and/or modification; and
- disturbance/displacement of species (e.g. through construction/ maintenance activities).

Where proposals are not within or close to protected areas and functionally linked land, it is unlikely that the RSPB will have major concerns. However, this will depend on the ecological characteristics of the site and its sensitivity to the proposed changes. In all cases, we should seek to ensure implementation of appropriate mitigation and enhancement measures (some suggestions are provided below).

Suitable sites for large PV arrays are limited in terms of climate, topography, access, existing land use (usually lower-grade agricultural land), shading and proximity to grid connections. Therefore, proposed developments are likely to cluster together and potentially give rise to concerns about cumulative environmental impacts. Ideally, cumulative impacts should be assessed at the district or county level, to inform site selection.

It is likely that the least productive land for agriculture (grades 3 and 4) will be targeted for development, raising concerns as these grades are often valuable (or potentially valuable) in nature conservation terms. Conversely, biodiversity gains are possible, particularly where intensively cultivated farmland is converted to lower-intensity grazing or managed for nature. For example, the Kobern-Gondorf PV facility in Germany is used as a nature reserve for endangered species of plants and animals.

In general, experience in Germany, where solar PV is relatively advanced, has been that sensitive sites have been avoided and our BirdLife partner NABU reports some biodiversity benefits and few problems. In Spain, however, BirdLife's partner SEO reports that large arrays have been sited in sensitive locations, causing disturbance to populations of cranes and other birds.

Vegetation will grow under the solar panels and this will require management. Grazing by sheep, chickens or geese should be acceptable, and are preferable to mowing, spraying or mulching. In terms of future management, it is important the current interest is maintained or enhanced in line with national and local planning policies (e.g. Planning Policy Statement 9 in England). So whilst grazing maybe appropriate, there may be more appropriate management options for arable wildlife and farmland birds that could be incorporated.

(ii) Direct impacts on birds

If correctly sited (so as not to impact on sensitive species) and with appropriate land/habitat management and other mitigation measure employed, the deployment of solar might be of benefit to birds in the wider countryside.

There is no scientific evidence of fatality risks to birds associated with solar PV arrays. Heliostats - mirrors used in concentrating solar energy - have been found to cause fatalities through collisions and burns in the US[1]. Heliostats are structurally similar to PV panels and birds can of course strike any fixed object. However PV panels are dark black rather than reflective, as they are designed to absorb rather than reflect sunlight, and there is no firm evidence of bird strikes associated with solar PV.

This lack of evidence might reflect absence of monitoring effort rather than absence of collision risk. Structurally the risk is probably similar to many other man-made features, but PV arrays may be more likely to be developed in sensitive locations. Collision is most likely to be a risk for waterfowl, which may be attracted to PV panels (though there is little evidence for this).

Developments will need to be connected to the grid, and there would be concerns where overhead wires and supports pass through areas used by birds susceptible to collision risk or electrocution.

(iii) Impacts on other wildlife

Insects that lay eggs in water (e.g. mayflies, stoneflies) may mistake solar panels for water bodies due to reflection of polarised light. Under certain circumstances insects have been found to lay eggs on their surfaces, reducing their reproductive success and food availability for birds. This 'ecological trap' could affect the population of these insects[2], so we would have concerns where solar arrays are located close to water bodies used by rare or endangered aquatic invertebrates, or where such insects are an important food source for birds using the locality.

Security fencing around PV arrays could become a barrier to the movement of wild mammals and amphibians,
and represent a collision risk for some bird species. Some solar panels track the sun's

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[1] McCrary, M. D., *et al*. (1986) Avian mortality at a solar energy power plant. *Journal of Field Ornithology*, **57**(2): 135-141

[2] Horváth, G., *et al*. (2010) Reducing the maladaptive attractiveness of solar panels to polarotactic insects. *Conservation Biology* 24:6, 1644-1653

movement, though this is more expensive and not likely to become common in the UK. Moving parts are a potential risk to wildlife and grazing animals.

Loss of habitat for rare arable weeds, invertebrates etc. may be a concern at some sites.

Mitigation and enhancement measures

The following are suggestions of mitigation and enhancement measures that can be adopted by developers to reduce their environmental impact. Mitigation and enhancement should be considered on a case by case basis, and not all of these measures will necessarily be relevant to any particular case.

Mitigation

- Avoid legally protected areas (SAC, SPA, Ramsar sites, SSSI etc.), and other sensitive sites such as IBAs and some freshwater aquatic features.
- Hedgerows between sections may mitigate increased collision risk to waterfowl.
- Landscape features such as hedgerows and mature trees should not be removed to accommodate panels and/or avoid shading.
- All overhead power lines, wires and supports should be designed to minimise electrocution and collision risk (for example, bird deflectors may be necessary).
- Power lines passing through areas where there are species vulnerable to collision and/or electrocution should be undergrounded unless there is adequate evidence that mitigation measures will reduce the risk to an acceptable level.
- Time construction to avoid sensitive periods.
- Time maintenance to avoid sensitive periods (e.g. during the breeding season).
- Ideally sites should be maintained without chemicals, fertilisers and pesticides - the area should be grazed by sheep or managed by mowing.
- Ensure that fencing causes no barriers for mammals and amphibians.
- Any risk to grazing animals or wildlife from moving parts needs to be avoided.
- The land area sealed to water infiltration should be minimised.
- White borders and white dividing strips on PV panels reduce attraction of aquatic invertebrates (Horváth *et al*., 2010).

Enhancement

- Biodiversity gains are possible where intensively cultivated arable or grassland is converted to extensive grassland and/or wildflower meadows between and/or beneath solar panels and in field margins.
- Hedges used to screen security fencing or for landscape mitigation can provide wildlife habitats, particularly if planted with a mix of native species of local provenance.
- Built structures such as control buildings can be designed or adapted to promote access by nesting, roosting or hibernating animals such as birds and bats, e.g. by providing nest boxes, access to loft spaces etc.
- It may be possible for panels to be at a sufficient height for regular cutting or grazing to be unnecessary. Rough pasture could then develop, potentially providing nesting sites

for birds. Alternatively a low growing crop such as linseed could be grown, providing cover and winter food for birds.

- Lower density of PV panels may offer greater scope for environmental gain, depending on the characteristics of the site. However, any indirect land use change impacts will be greater.
- 'Community gain' may provide money for local environmental enhancement such as energy conservation measures and nature conservation.
- Biodiversity enhancement at solar PV sites could contribute to landscape scale conservation, climate adaptation, ecological networks or green infrastructure.
- Planting wild bird seed or nectar mixes, or other cover crops between rows could benefit birds and other wildlife.
- Bare cultivated strips for rare arable plants, and rough grassland margins could also be beneficial.

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