Solar Energy Scotland Briefing

Delivering ecological enhancement in Scotland: solar's role in reversing biodiversity decline

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Solar Energy Scotland

About Us

Solar Energy Scotland is part of Solar Energy UK, which was established in 1978, and works to promote the benefits of solar energy and to make its adoption easy for domestic and commercial users. A not-for-profit association, we are funded entirely by our membership, which includes installers, manufacturers, distributors, large scale developers, investors, and a wide range of associated specialists and consultancies.

Our mission is to empower the Scottish solar transformation. We are catalysing our members to pave the way to deliver 6GW of solar energy capacity by 2030. We represent solar heat, solar power, and energy storage, with a proven track record of securing breakthroughs for all three.

1. Introduction

Scotland is facing twin crises of climate change and biodiversity loss. Tackling these two intrinsically linked challenges will require significant efforts on both a national and local level within Scotland, as well as on a global scale. Scotland's National Planning Framework 4 (NPF4) seeks to address both of these challenges; 'securing positive effects for biodiversity' is set as one of six national outcomes.[1]

In the most recent publication of the State of Nature Report, there was a 15% decline in the average abundance of 407 species which have been closely monitored since 1994.[2]

Recognising the urgency of this issue, the solar industry is strongly committed to playing its part in the restoration of Scotland's natural habitats and reversing biodiversity decline.

Solar farms can be positive for biodiversity, and Scotland's commitment to a solar deployment target can be seen as great news for nature.

While the primary function of solar farm is to deliver clean renewable energy and reduce carbon emissions, well designed and well managed solar farms also bring substantial opportunities to address biodiversity loss. Across the UK detailed analyses of data collected from nearly 90 sites demonstrates positive ecological trends on solar farms. When solar farms are managed with a greater focus on biodiversity enhancement, they can have a positive impact on plant and animal abundance and species richness.[3]

In an effort to increase the deployment of solar in Scotland, Scottish Government has committed to setting a solar deployment ambition of 4-6GW by 2030 (contingent on the agreement of a community benefit framework and the industries ability to support biodiversity). It is expected that this will be re-affirmed in the Scottish Governments Energy Strategy and Just Transition Plan, which will be published later this year.

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1. https://www.gov.scot/publications/national-planning-framework-4/
2. TP26056-SoN-Scotland-summary-report-v5-1.pdf (stateofnature.org.uk)
3. https://solarenergyuk.org/resource/solar-habitat-2024-ecological-trends-on-solar-farms-in-the-uk/

2. Solar farms and biodiversity

Solar farms are temporary structures with long operational lifespans (typically 25-40 years) and minimal ground disturbance. The overall infrastructure footprint of a solar farm is typically less than 2% of the total land area. This means the rest of the land is available for developers to take measures to actively improve the local environment and provide a range of ecological benefits. These include:

- **Establishing wildflower meadows and grasslands.** The areas between panels and around the edges of the site can be used to create new habitats for pollinators, butterflies, and ground nesting birds.
- **Supporting hedgerow growth.** Hedgerow loss is a major concern for countryside management across the UK. New solar projects aim wherever possible to preserve or restore existing hedgerows or deliver new hedgerow growth. These are often required for screening purposes by planning authorities but are in and of themselves a great benefit to wildlife.
- **Promoting wetland habitats and enhancing watercourses.** Effective drainage and water management systems are essential for solar farms. As part of this, they can be designed to incorporate wetland habitats and enhance water courses. These offer a natural drainage solution for the site, which reduces local flood risk and supports terrestrial and aquatic life.

Well designed and well managed solar farms can support a range of ecosystem services including food provision and supporting agricultural practices (e.g. conservation level sheep grazing), increased pollination, water regulation and flood risk mitigation, and reducing carbon emissions both through the generation of clean energy and through habitat enhancement and creation.[4] It is in this context that Solar Energy UK produced a Natural Capital Best Practice Guidance which outlines how solar farms can deliver greater biodiversity enhancements at every stage of a solar farms lifecycle.

The case studies below from solar farms in England and Scotland highlight how appropriate management and design can support biodiversity.

Case Study – Encouraging Threatened Birds at Sawmills Solar Farm

Sawmills is a 6.6 MW solar farm at Ashcombe, near Dawlish in Devon. The solar farm was developed by the team behind Eden Renewables in 2015 with an ambitious biodiversity management plan and is now owned and managed by Foresight.

This solar farm falls within the UK range of the cirl bunting, the UK's rarest resident farmland bird. To enhance the site for this species, hedgerows were managed to increase volume and density and a wild bird seed mix was sown to provide seed through the winter months. These measures appear to have been successful, as cirl buntings have been observed on site in three separate years during annual breeding bird surveys.

The site has also been successful in attracting other birds of conservation concern, including mistle thrushes, song thrushes, linnets, skylarks, and yellowhammers. Overall, the bird diversity observed at the site has nearly doubled since the solar farm was built.

Survey results from Sawmills demonstrate that with appropriate management, solar farms can benefit threatened species as well as our more common wildlife.

4. https://www.gov.scot/publications/national-planning-framework-4/

Case Study – Encouraging Biodiversity at Gailes WasteWater Pumping Station

Construction will soon be underway to install 291kWp solar scheme at Scottish Water's largest wastewater pumping station at Gailes in the South of Irvine. The size of the renewable installation is limited due to the small amount of land available, however by working with experienced ecologists, Scottish Water has been able to assess the existing ecology on the site and identify opportunities to enhance and create habitats onsite e.g. infilling and planting new hedgerows.
The final design will focus on maximising biodiversity whilst maintaining the functionality required for the solar panels. Appropriate measures to monitor biodiversity will also be put in place.
The project at Gailes, which is due to be completed by December 2024, will demonstrate that with collection of appropriate data and thoughtful design of a site-specific biodiversity plan, even small areas of land can produce biodiversity gains.

One of the leading factors in biodiversity decline is the intensive use of land for industrial agriculture. Solar farms built on previous arable land can give land a break from intensive cultivation for extended periods – with minimal or no inputs of pesticides, herbicides, and fertilisers – and can reap big rewards by boosting pollinators, biodiversity, soil health and regeneration and carbon sequestration.

It should be noted that a solar farm can support farmers to both diversify their business and deliver biodiversity gain of their overall operation. Energy from solar farms can also be used in food production processes. Even at its most basic, with conservation level sheep grazing between panel arrays, solar can support farming, clean energy, and nature.[5]

3. Ecological monitoring

Ecological monitoring of solar farms plays an important role in assessing change, identifying the effect and suitability of management practices, and ensuring planning obligations are met. Ecological monitoring also provides a valuable tool to explore the relationship between solar farms and biodiversity, allowing us to understand what effects solar farms are having on our environment. This will become increasingly important as we seek to build more (and larger) solar farms in Scotland to meet the country's energy requirements and climate change obligations.

There is clear commitment from industry to better understand and support ecology on solar farms; with many having undertaken monitoring for many years. To date, the approach to monitoring ecology has varied greatly. This has made it challenging to pool data and fully understand ecology on solar farms at a national and UK wide level.

In 2022, Solar Energy UK in collaboration with Clarkson & Woods, Wychwood Biodiversity and Lancaster University created a standardised approach to monitoring ecology on solar farms. The standardised methodology sets out surveying methods and techniques for assessing biodiversity on solar farms.[6]

This uniform approach allows for data from across the UK to be compiled and analysed; forming a robust, credible evidence base on the ecological trends found on solar farms in that year. The standardised methodology will be reviewed periodically to incorporate feedback and make improvements if necessary.

5. https://solarenergyuk.org/resource/solar-farms-food-security-the-facts/
6. https://solarenergyuk.org/resource/solar-energy-uk-guidance-a-standarised-approach-to-monitoring-biodiversity/

"The solar industry has developed a standardised approach to monitoring ecology on solar farms and encourages all developers to use this."

Case Study - Wildflower Meadow Langenhoe Solar Farm and Pollinator Response

Langenhoe is a 21.5 MW solar farm close to Colchester, constructed in 2015. The site is owned by NextEnergy Solar Fund (NESF) and was selected as one of eight exemplary sites for biodiversity by NextEnergy Capital's (NEC) Biodiversity Team.

Wychwood Biodiversity, NEC and WiseEnergy collaborated to develop and implement a biodiversity enhancement plan with enhanced measures bespoke to the site. These included three wildflower strips, bug hotels, hibernacula, and scrub planting for nightingale (Luscinia megarhynchos) habitat. Three strips were sown with wildflowers in September 2017, totalling 0.5 Ha, using Emorsgate's EM4 for clay soils.

These strips have developed into botanically diverse wildflower areas managed by cutting and collecting every year in September. This measure goes above and beyond standard grassland management to ensure the wildflowers are sustained for the asset's lifetime. The entire Langenhoe site is surveyed annually in alignment with Solar Energy UK methodology, including botany, selected pollinators (bumblebees and butterflies), and breeding birds. Compared to the rest of the site, the abundance of bumblebees and butterflies within the wildflower areas has been significantly greater.

Figure: This shows the results from the 2021 survey, with x 6 higher abundance for bumblebees and x 5 higher for butterflies in the wildflower areas. This indicates that wildflower strips are important foraging habitat for pollinators, and likely to provide valuable habitat for small mammals, birds, and reptiles too.

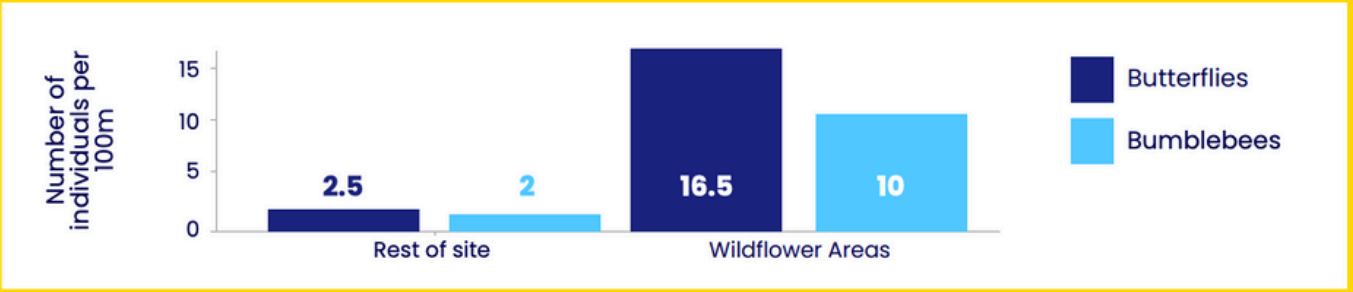

Figure 5: The abundance of butterflies and bumblebees in wildflower areas on Langehoe Solar Farm (2021)

4. Solar habitat studies and results

For the last two years, Solar Energy UK has published a UK wide report providing detailed analyses of ecological trends on solar farms throughout the country. In May 2023, the first Solar Habitat report was released which highlighted ecological trends across 37 sites in the UK (monitored in 2022 using the standardised methodology).[7]

7. https://solarenergyuk.org/resource/solar-habitat-a-look-into-ecological-trends-on-solar-farms-in-the-uk/

In March 2024, Solar Energy UK launched the second iteration of the report, this year, with data collected from nearly 90 sites across 2023. The report looks at relationships between solar farms and four taxonomic groups, botany, birds, invertebrates, and mammals, drawing from both structured and ad-hoc observations[8]

The analysis indicates that when solar farms are managed for biodiversity, they can have an positive impact on plant and animal abundance and species richness. It also shows that the presence of diverse plant and invertebrate species has a positive impact on the abundance of bird species.

Summary of results from Solar Habitat 2024

- **A total of 298 plant species** were recorded across grasslands within 87 solar farms.
- **A total of 99 bird species** and almost 8,000 individuals were recorded across 87 solar farms as part of structured surveys.
- At least 47 invertebrate species and more than 3,000 individuals were recorded as part of structured surveys which focussed on bumblebees and butterflies.
- Ad-hoc/Incidental/non structured observations from 33 sites reported **ten species of mammal** present on solar farms.

A direct comparison of the findings from all the sites between 2022 and 2023 is not possible due to not all the sites being monitored in both years; however, 17 sites that were monitored in both years and show positive relationships between solar and biodiversity. Over time, as more data is accumulated from the same sites year on year, it is anticipated that there will be a greater opportunity to explore longitudinal trends, impacts of management practices over time and changes in biodiversity as sites mature.

Biodiversity Enhancement in Scotland

The planning system has an important role to play in tackling climate change and biodiversity loss. The NPF4 sets out requirements for developments to deliver positive effects for biodiversity in policy 3. Within this, policy 3a states that all development proposals will need to show how they can contribute to the enhancement of biodiversity, including where relevant, restoring degraded habitats. Policy 3b includes a requirement for projects deemed as a national or major application which require an environmental impact assessment will only be supported if able to demonstrate that biodiversity will be in 'demonstrably better state' than without intervention.

8. https://solarenergyuk.org/resource/solar-habitat-2024-ecological-trends-on-solar-farms-in-the-uk/

To support greater understanding and application of the NPF4, Scottish Government released a Draft Planning Guidance for Biodiversity in November 2023. Whilst the guidance is labelled as being in draft (as it was not formally consulted upon), there is an expectation that this should be used in the implementation and delivery of policy 3 under the NPF4. The guidance is considered a 'living' document with stakeholders welcomed to submit feedback at any point.

Whilst the necessity for tailored guidance on biodiversity is evident; further work is needed to ensure the guidance is clear, without ambiguity but also flexible and pragmatic enough to not unreasonably add barriers or disproportionate costs to the generation of renewable electricity. As is currently drafted, the interpretation of the guidance relies heavily on the discretion of the local authority reviewing the solar farm planning application. It also leaves uncertainty as to the level of biodiversity enhancement that developers are expected to provide.

Upon publication of this briefing, no formal consultation process has been undertaken on the guidance, risking expertise from wider industries and individuals (which may have helped shape the requirements in the guidance) being overlooked. Solar Energy Scotland will seek to collaborate with Scottish Government and the wider stakeholders in the Technical Advisory Group to improve the standard and ultimately the application of the guidance.

The NPF4 does not specify a particular approach for demonstrating biodiversity enhancement other than requiring best practice. As a result, and in the absence of a Scottish metric, a range of approaches are being adopted, which has led to a range of outputs depending on the particular methodology used.

To address this, Scottish Government have commissioned NatureScot to develop a biodiversity metric that supports the delivery of NPF4 policy 3b. NatureScot will focus on adapting England's statutory biodiversity metric to better reflect Scotland's different legislative, policy and environmental context. For example, Scotland's topography and habitat distinctiveness can vary greatly from England's. The development of the Scottish metric will include multiple phases of work, consultation, and stakeholder review before being published in 2025.

Biodiversity Net Gain (BNG) in England

On the 12th of February 2024, as a stipulation of the Environment Act 2021, all new planning permissions for any type of development granted in England will have to deliver at least 10% biodiversity net gain. This will be applicable for solar projects under 50MW and will extend to cover Nationally Significant Infrastructure Projects (NSIPs) from November 2025.

In the majority of cases, solar farms will be able to reach the minimum 10%, with many sites being able to offer significantly higher biodiversity net gain. However, this is dependent on the lands previous use. Solar farms are typically built on low grade or ecologically poor agricultural land[9]with a low baseline value for BNG. With appropriate management practices in place, solar farms can often contribute to a significant uplift in habitat improvement and creation.

9. Best and Most Versatile' (BMV) land in England and Wales is presently defined as Grades 1, 2 and 3a (which can best deliver future crops for food and 'non-food' uses such as biomass, fibres, pharmaceuticals etc) and grades 3b, 4 and 5 (which can best deliver low yield crops and grasses). In Scotland Land Capability for Agriculture (LCA) Classification is a seven class system with Class 1 representing high quality land and class 7 being very limited agricultural value.

BNG Metric

The BNG metric was developed as a mechanism to measure biodiversity value. The metric sets our four metrics rules and nine principles to guide its use and application and a set of trading rules determining habitat compensation.[1] These are complemented by working practices which set out guidance and supporting information on the UK Governments website, such as where trading rules do and do not apply, and treatment of habitats within the planning application. These documents frame how the metric should be applied in practice.

Whilst the metric and methodology are reasonably easy to use, further considerations are needed to enable ecologists, developers, and planners to fully assess changes in biodiversity value (losses or gains).

For solar specifically, one of the biggest barriers is understanding how to apply the BNG metric to solar farms. Previous use of the metric has proven challenging due to the poorly understood impacts of panel structures on habitats. Preliminary research undertaken by Clarkson and Woods has shown that habitats such as modified grassland can grow under panels in the majority of cases.

Further issues include:

- The metric does not sufficiently take into account factors beyond habitats.
- The metric relies on quantitative inputs/output. Qualitative information is not fully considered (e.g observations or commentary from ecologists).
- Little reward for creating habitats for specific groups (e.g. hibernacula for Great Crested Newts).
- The metric is subjective e.g. habitat distinctiveness.
- The habitat condition criteria limits recognition of species-based interventions (e.g. provision of artificial nest sites for individual species).
- The metric does not allow for sufficient flexibility to mitigate or offset damage/removal of irreplaceable habitats (e.g. the metric could consider 'replenishable' habitats instead of irreplaceable).

In addition, the lack of a standardised approach for assessing post development habitat features on solar farms within the metric has resulted in inconsistencies in reporting.

Further questions remain on additionality and trading of excess credits to support developments that are unable to reach the minimum 10% BNG requirements.

Research led by Clarkson and Woods, in collaboration with Natural Power and Wychwood Biodiversity is underway to examine the correlation between botanical datasets against the English BNG Metric[10] and UK Habitat Classification System.[11] The findings of this study will offer valuable evidence and insights pertinent to solar farm planning applications, including highlighting some of the wider factors that influence vegetation establishment. Natural England is using the outcomes of this research to produce a case study for applying BNG to solar farm developments, set to be published in 2024.

10. English BNG Metric: https://assets.publishing.service.gov.uk/media/65c60e0514b83c000ca715f3/The_Statutory_Biodiversity_Metric_-_User_Guide_.pdf
11. UK Habitat Classification System: https://ukhab.org/

The English BNG metric will require further review to fully understand its applicability for Scotland. This will include but is not limited to, clarification on how the metric should be interpreted and applied the establishment of different rules or principles to reflect the different habitats in Scotland and determining whether additionality or trading of excess credits might be considered.

5. Local Authorities and biodiversity enhancement/BNG

Solar projects below 50MW in Scotland will be determined by Local Authorities. Local Authorities will be instrumental in the assessment and enforcement of biodiversity enhancement/BNG across the UK, whether mandatory or voluntary. There are concerns that Local Authorities who are already heavily constrained, do not have the resources, skills, or capacity to properly administer and monitor BNG. DEFRA have committed to investing £10.6 million to support Local Authorities in England in recruiting and expanding ecologist teams, whilst welcomed, this is likely to be insufficient to meet the full extent of the requirements to deliver BNG effectively.

At the time of publication, Scottish Government were consulting on how to better resource the Scottish planning system. The consultation proposes introducing a central resource hub which provides Local Authorities with access to specialist and technical skills to support staff in making informed decisions on biodiversity and wider areas.

A balance will always need to be struck between biodiversity enhancement through the application of good practices, and the cost of data collection and administration. Whilst the industry is committed to the delivery of biodiversity enhancement, it should be recognised that ultimately costs that go on to the renewable energy industry will add costs to the consumer. The industry already faces considerable financial pressures from planning fees and existing reporting and monitoring obligations. Further thought is needed to bring in solutions to integrate additional resourcing into the planning system and supporting the data management needs of organisations like NatureScot through general taxation, which could help the industry to maximise environmental benefits while minimising economic strain.

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