

lightsource bp

bp

Solar & Biodiversity

Enhancing local environments

We approach our projects with the entire lifecycle in mind, this means delivering beyond solar.

We are committed to improving the ecosystems of the projects we design because the air we breathe, the water we drink and the food we eat all rely on biodiversity.

What is biodiversity and why is it important to Lightsource bp?

Biodiversity refers to the variety of life on Earth – the number of species of plants, animals and microorganisms and how they interact.

Biodiversity plays an important role in creating a balanced and healthy ecosystem, enabling us to live healthy lives. Almost all cultures are dependent on biological diversity in some way, and as such maintaining biodiversity and boosting ecosystem productivity is vital.

For example:

- Larger number of plant species means a greater variety of crops
- Greater species diversity ensures natural sustainability for all life forms
- Healthy ecosystems can better withstand and recover from a variety of disasters

It's important for humans to recognise that the planet relies on biodiversity where each species, no matter how small, depends on each other and has an important role to play in our balanced and healthy ecosystem.

However, deforestation, increased development, pollution and climate change are all threatening the delicate balance that maintains our ecosystem. At Lightsource bp, we see our solar farms as not only a source of clean and renewable energy, but also an opportunity to maintain biodiversity and boost ecosystem productivity.







How solar farms are improving biodiversity

In mid-summer 2013, a study of biodiversity levels at solar farms in comparison to similar plots of agricultural land was undertaken in the UK[1]. The study leaders selected four solar farms, including one Lightsource bp site, each with a different approach to land management. Two of the solar farms had been seeded with wildflower meadows, and two were pastures with agricultural grasses. Biodiversity was measured using three indicator groups: grassland herbs, bumblebees and butterflies, as these are important markers of wider biodiversity. For each site, a control plot was selected next to the solar farm with the same land use as the solar farm prior to its construction.

The results

The results showed that all the solar farms had higher levels of biodiversity in comparison with the non-solar control plots. The study confirms that with proper land management, solar farms present the opportunity to establish a wide range of habitats designed to increase general biodiversity and support conservation.

The study also underscored inherent features of solar farms that are beneficial to wildlife; they are relatively undisturbed by human activity once constructed and are in place for decades, which is sufficient time for appropriate land management practices to really take effect.

Finding and observations

- All four solar farms showed increased biodiversity in at least one of the three indicators, in comparison with the control plots.
- Sites re-seeded as wildflower meadows showed a significant increase in all three biodiversity indicators (herbs, bumblebees and butterflies); pasture sites showed change in one or two of the indicators.
- All sites displayed a degree of colonisation by herbs – there were more herbs present than originally sown.
- In general, bumblebees and butterflies observed in solar farms were feeding whereas those observed in control plots were in transit. This indicates that herb-rich grasslands have greater value as foraging sites.
- A wide range of wildlife was observed within solar farms, including Brown Hares, small mammals, invertebrates and a number of endangered birds of conservation concern in the UK.

[1] *"Can Solar Farms Deliver Significant Benefits for Biodiversity?"*
GE Parker and C McQueen, August 2013



Our considerations for building solar sites

When building a solar site, we take the following steps to make sure we're creating an asset that benefits the local community and environment:

Custom-designed landscape plans

Our biodiversity and planting plans are prepared by landscape and ecology experts, with feedback from the local community being fed into the design. When putting together a plan for the land management of a site, we conduct a wide range of ecological surveys and assessments, drawing on expert knowledge across the board to create a tailored plan for the site.

Natural screening

When we develop solar farms, we take care to make sure they have a minimal impact on their local surroundings, and this can include using planting to screen views. We prefer to use natural screening techniques where possible, such as planting native hedgerows, shrubs and trees. As well as minimising views, this allows us to better integrate the solar farm into the local area and provide additional habitat.

Preserving existing vegetation

Part of the environmental investigations for our solar farms can involve thorough assessments of the vegetation already in place on site, depending on location. In developing our technical layouts we seek to preserve as much of the existing vegetation as practicable. When it's necessary to remove trees or hedgerows, we usually try to offset this with new planting or habitat creation on site, or through contributions to biodiversity/ecological offset funds.



Seeding

The land under solar farms is protected for decades offering a suitable environment to include other sustainable benefits such as soil stabilization, carbon capture and habitat creation. Carefully curated bespoke seed mixes and other vegetation provide supportive homes for beneficial insects, birds and other wildlife. The plant species are selected based on key factors such as resiliency and benefits to soil health. Wherever possible we work to seed our sites prior to the start of construction. The practice of early seeding assists with soil and vegetation stabilization, along with weed suppression and stormwater management.

Making local species a priority

When creating planting plans for our solar farms, we make sure that we seek to select species of grass, pollinators, trees, hedges and shrubs that are commonly found in or appropriate to the local area, or species that were previously common but have become increasingly rare. By selecting species that are native to the area, we can be sure that they'll acclimate and thrive, as well as be confident that the solar farm will provide a home for native insects, birds and more.

Other ways we enhance biodiversity



Bird and bat boxes

Where appropriate we will install bird, bat and/or owl boxes in the vegetation around the perimeters of our solar farms. These boxes are specifically selected to suit common species in the local area, and hung under the advisement of specialists, to provide additional safe nesting habitats.



Insect hotels

As well as homes for birds and reptiles, our solar farm plans can include insect hotels. These little structures are made from natural materials with plenty of tiny little spaces to encourage and support populations of invertebrates.



Wildlife friendly fencing

Where appropriate we install fencing that allows wildlife to have continued access across our solar farms. Depending on local wildlife, fencing solutions include gaps integrated into or under the fencing for wildlife passage.



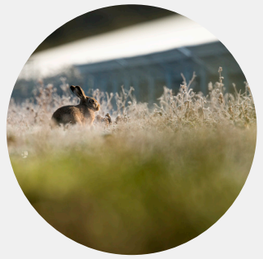
Reptile refugia

Large open spaces can be difficult places to live for lizards and other small reptiles, so to make our solar farms as hospitable as possible, we can create reptile refugia along the margins of our sites. These small piles of logs are completely natural and blend in with the environment, while the little gaps and spaces between the wood provide ideal safe havens for lizards and other reptiles.



Pollinator habitat

Around the world, pollinator habitat has been declining, which is having detrimental effects on food systems. Our sites are seeded with species-rich grass and wildflowers, which contribute to a diverse ecosystem that is pollen-rich. This serves to protect pollinator habitat, cultivate a more biodiverse environment, and in some cases increase the productivity of the neighbouring land. We also work with local bee farmers to host hives at many of our solar farms, further supporting farmland production.



Raised solar panels

The panels on our solar farms are elevated above the ground, providing space beneath for wildlife. Solar farms are ideal for providing protection and shelter – the panels protect from wind, rain and snow, they provide shade in hot weather, and they also give overhead coverage from birds of prey and other predators.

Land management

Lightsource bp doesn't just fund and develop solar projects, we frequently oversee the operations and maintenance of our sites for their entire lifecycle, and that's a responsibility we take seriously.

We're dedicated to creating solar assets that we, our customers and the local communities can be proud of. To do this, we've developed a tried and tested land management strategy to maintain and enhance our sites from day one to decommissioning.

Post-construction

- Construction tidy up – once the installation has been fully constructed and commissioned, we remove all construction equipment and tidy up the site.
- Restoration –when the site is clear, we undertake civil works and seeding of areas of disturbed ground to restore the land to close to its original state.

  For many of our sites, we're seeding pre-construction. The practice of early seeding assists with soil and vegetation stabilization, along with weed suppression and stormwater management, prior to and during construction.
- Planting – during the first planting season following the end of construction, the site and boundaries will be seeded and planted as per the custom planting plan, which can include a mix of new planting and reseeding, where necessary.

Ongoing management

- Land maintenance – some of our sites are grazed by sheep, which eliminates or reduces the need to mow the grass under the panels. Our non-grazed sites are regularly mown by our ground maintenance experts.
- All the sites we provide operations and maintenance for are managed by ground staff and subcontractors, and in some cases we contract out land maintenance to the landowner themselves. We undertake regular vegetation management and upkeep, including trimming trees and hedges, replanting any damaged plants, weed control and more.

Decommissioning

At the end of the site's lifespan, we remove the panels, the posts they're mounted on, and all other equipment and hardware, and work to ensure any disturbed land is restored and reseeded. The posts on which the panels are mounted typically take up less than 1% of the land.

We recycle or reuse as many of the components of our solar farms as possible. Panels are often sold second hand, or recycled by dedicated solar recycling depots. Solar panels typically consist of glass, aluminium, copper, silver and semiconductor materials that can be successfully recovered and reused. By weight, more than 80 percent of a typical solar panel is glass and aluminium – both common and easy-to-recycle materials.

After successful decommissioning, no elements of the solar installation are left on site.



CASE STUDY

Moor Solar Farm, Lincolnshire, UK

Our two Moor Solar Farms in Lincolnshire, UK, are among the solar projects showcasing our bee biodiversity plan. The two solar farms sit within Long Sutton Butterfly and Wildlife Park, alongside the wildlife park's resident water buffalo and ostriches. Combined, the installations have a power output of 2.7MWp.

The solar farms were installed in 2011, on a site that was previously home to an orchard. In 2016, with the encouragement of the farm's landowner, Lightsource bp partnered with a local bee farmer and installed two hives along the site's boundary.

The planting plans for both Moor Solar Farms were designed to enhance the habitat for bees and other pollinators – new apple trees were planted along the west perimeter, and extra hedging and vegetation screening was put in around the rest of the site. The open grassed areas within the sites were planted with a wildflower meadow seed mix including clover, field poppy, cornflower, parsley and more. This mix was specifically selected to provide rich forage for pollinators.





890
human homes powered

100,000+
bees homed

15 hectares (37 acres)
total

CASE STUDY

Wilburton Solar Farm, Cambridgeshire, UK

Wilburton Solar Farm was installed in 2011. Its 19,960 solar panels continue to convert the sun's energy into electricity. The solar array provides a safe, peaceful haven for many species, while generating enough clean electricity to supply over 1,400 households.

Lightsource bp developed a tailored planting plan for the site, as well as a range of other wildlife habitat enhancement measures. The solar farm is now home to a wide range of different species, supported by the new habitats created across the 31-acre site. Species spotted on Wilburton Solar Farm include…

Brown Hare

According to the Hare Preservation Trust, the population of the Brown Hare in the UK has declined by more than 80% over the last 100 years, and in some areas may even be locally extinct. But at Wilburton Solar Farm, the Brown Hare is thriving. Before the installation of the solar farm, the local gamekeeper had only observed three or four Brown Hares on site, but since the solar farm has been established, he has regularly seen more than 50.

English Partridge

The English Partridge has become extremely rare in the UK. Before the solar farm was installed, the local gamekeeper observed between three and five breeding pairs on the farm, and there are now regularly over 20 breeding pairs on the same land – an exciting and substantial increase. The solar farm not only has the ideal habitat with plenty of shelter and insects for the birds to eat, it's also fenced off, protecting the birds from people and dogs, while the panels provide shelter from the weather and birds of prey.

Small Tortoiseshell Butterfly

Banks of wildflowers behind each row of panels harbour an abundance of insect activity, including several species of butterfly. The Small Tortoiseshell is one of the most widely recognised butterflies in Britain. Sadly though, it is experiencing a worrying decline. One theory is that it is being targeted by the parasitic fly, known as Sturmia Bella, which is increasingly migrating from the continent due to the effects of global warming. Wilburton Solar Farm provides valuable habitats for these surviving British icons, whilst helping to address the issue of climate change first hand.

5MW
installed capacity

13 hectares (31 acres)
total

9 hectares (23 acres)
open grassland within the site

2,680 tons
carbon emission saved annually

596 cars
taken off the road equivalent







CASE STUDY

Woolooga Solar Farm, Queensland, Australia

Lightsource bp is establishing an ~200 hectare (ha) conservation area for Koalas and Grey-headed flying foxes alongside our Woolooga Solar Farm. A tailored management plan has been developed which will see on-going measures implemented to provide a positive conservation outcome for the habitat quality of Koala and Grey-headed flying fox. This will be achieved through expanding, improving and maintaining remnant vegetation, including planting over 40,000 trees.

How will the conservation area be managed?

Lightsource bp is investing significantly in the establishment and on-going management of the conservation area, with the aim to expand, improve and maintain the existing vegetation while undertaking extensive revegetation of areas previously cleared for agricultural use. Management measures include:

- *Habitat creation:* 43,500 tubestock comprised of Koala and Grey-headed flying fox feed trees to be planted in Spring 2021 and actively managed for a minimum of 5 years. Tubestock will be grown from seed sourced from trees located within 50 km of conservation area.
- *Access and fencing:* Fauna friendly exclusion fencing will be installed around the perimeter of the offset site to exclude livestock from entering.
- *Weed management:* Weeds will be reduced to less than 5% cover by year 10.
- *Pest management:* Non-native predators and non-native herbivores (livestock) will be reduced by 90% by year 5.
- *Bushfire management:* Bushfire ecology to be managed using prescribed burns as required by respective guidelines.

210MWp
installed capacity

438,000MWh
supplied per year

63,150
human homes powered

350,400 tons
carbon emission saved annually

145,950 cars
taken off the road equivalent

200 hectare (494 acres)
offset site

43,500
new trees to be planted







CASE STUDY

Impact Solar, Texas, USA

Impact solar is a 260MWdc solar farm in Lamar County, Texas. The energy generated through the project will provide bp with carbon free electricity, abating 318,000 metric tons of electricity related greenhouse gases. The project will also provide additional benefits beyond solar, such as ecosystem enhancements, agriculture and habitat conservation.

Multi land-use; ecosystem enhancement and agricultural land use

Impact solar is providing local landowners a reliable, long-term source of income for their land, with solar as a 'new crop' that is also helping rejuvenate the land through various biodiversity initiatives. Wildflowers are supporting native bees and other pollinators, helping protect the declining pollinator population in 12 acres of high-density pollinator gardens where native vegetation will bloom from April through October. Various carefully chosen micro-habitats such as bird and bat boxes, and reptile and amphibian refuges are helping facilitate a thriving and diverse ecosystem.

At the same time more than 700 sheep are grazing amongst the panels, supporting agricultural production and further increasing the ecosystem's productivity and soil health thanks to the nutritional dung discharge. Sheep also attract beneficial insects and combat invasive weeds as they forage.

Protecting riparian woodlands

Riparian ecosystems, located adjacent to rivers and streams, are important for biological diversity. Wildlife use these areas to travel across the landscape for food, cover, and breeding. Within the Impact Solar site boundaries, approximately 50 acres of woodland habitat adjacent to the floodplain of the Bee Bayou will remain undisturbed and in conservation for the 40-year life of the project. This will help encourage wildlife movement throughout the area, protect water quality and reduce soil erosion.

260MWdc
installed capacity

300
local construction jobs created

50
acres of riparian woodlands conserved

41,000
US homes powered per year

68,700
fuel-burning cars taken off the road

318,000
metric tons of carbon emissions saved annually







CASE STUDY

Penn State Powered by the Sun
Pennsylvania, USA

Lightsource bp has built one of Pennsylvania's largest solar projects. Stretching across three locations in Franklin County, the 70 megawatts of solar farms are providing electricity solely to Penn State University, providing 25% of their state-wide electricity requirements across 24 campuses.

Solar grazing

Working in partnership with grazing and ecology experts, Lightsource bp has introduced sheep grazing at Nittany 1, the largest of the three solar projects. A neighboring Amish farmer grazes over 500 sheep among the solar panels, using a rotational system to feed his flock and maintain the land.

Through solar grazing, livestock become natural partners in Lightsource bp's commitment to nurture thriving ecosystems at project sites.

Healthy ecosystems are built from the ground up. Rotational grazing – moving the flock around the site over time in contained "paddocks" – provides a healthy amount of disturbance with ample recovery time. As livestock digest vegetation, they spread manure, cycling nutrients, carbon and water back into the soil. As they forage, sheep naturally combat invasive plant species and strengthen native populations. As they chomp on vegetation, the sheep introduce helpful bacteria and attract beneficial insects as well.

"Fuzz & Buzz"

Each of the three solar farms – Nittany 1, 2 and 3 – were seeded with a specially formulated seed mix aptly named Fuzz and Buzz. Developed by the American Solar Grazing Association (ASGA) in partnership with Ernst Conservation Seeds and Pollinator Service, Fuzz and Buzz was specifically designed for solar sites to support grazing, and biodiverse enough to support a range of pollinators.

In Pennsylvania as well as around the world, habitat loss, disease and environmental contaminants have caused pollinator populations to decline. According to the US Department of Agriculture, three-fourths of the world's flowering plants and about 35 percent of the world's food crops are dependent on pollinators to reproduce, so declining populations have detrimental effects on food systems worldwide.

Living laboratory

Over and above the carbon reduction benefits of the solar farms themselves, Lightsource bp has a wider mission for this project to be a living prototype to maximise the sustainability impacts of solar farming in the US with a comprehensive approach that fosters biodiversity, improves soil health, provides pollinator habitats, and offers a living laboratory for students to learn and innovate. Penn State University students have access to the solar farms to carry out academic research in fields such as agriculture, soil management and applied soil physics, entomology, pollinator research, sustainability and energy.

Our Pennsylvania solar grazing site is also contributing soil samples and other data to several research projects studying the environmental impacts of sheep grazing on solar developments.

70MW
installed capacity

202 hectares (499 acres)
total

12,102 cars
taken off the road equivalent

57,000 tons
carbon emission saved annually



Rotational sheep grazing in action:
We employ a rotational grazing system where moveable fencing provides paddocks, where the sheep are able to graze for a specific period of time. This approach allows the vegetation outside the fenced area a rest period to regrow, creating a healthy ecosystem and enabling grazing and pollinator habitat to co-exist in a solar farm. In fact, the sheep grazing has been shown to promote healthier root systems and soil health.







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