

Example of an area of restored peatland at Dunmaglass Wind Farm, a joint venture between SSE Renewables and Greencoat UK Wind



scottish
renewables

WIND POWER AND PEATLAND

Enhancing unique habitats

INTRODUCTION TO PEAT

More than a fifth of our country is covered by peat, which is home to a wide range of rare, threatened, or declining habitats, plants and animals. Sphagnum mosses, carnivorous sundew, the Large Heath Butterfly and the Bog Sun Jumper Spider, for instance, exist only or very predominantly on peatlands and are all examples of why these habitats are essential for maintaining Scotland's rich biodiversity.

Up to 70% of our drinking water comes from catchments dominated by healthy peatland habitat, which acts as a filter removing pollutants and nutrients from the water as it moves downstream, helping to preserve Scotland's high water quality.

But it's peat's role in tackling climate change which is making headlines. Healthy peatlands remove carbon dioxide from the atmosphere and store it in the soil. Peat is formed when plants die and partially decompose in acidic and waterlogged conditions. Because these plants haven't fully decayed, the carbon which they removed from the atmosphere in their lifetimes remains trapped. As peat traps water, more plants decay, trapping their carbon, too.

Healthy peatlands which are growing in this way are a critical natural carbon store. In fact, it's estimated that there is around 1,600 million tonnes of carbon stored in Scotland's peatlands - the equivalent of 140 years of our current annual greenhouse gas emissions.

It is only when peatlands are in a good condition that all these benefits occur. It is estimated that around 80% of Scotland's resource is degraded as a result of various

historic land management practices such as overgrazing, drainage, peat extraction for horticulture and fuel, and other land uses such as inappropriate forestry, where blanket Sitka spruce forests were planted as a cash crop in the 1980s.

Degraded peatlands produce fewer benefits and may emit more carbon dioxide into the atmosphere than they remove. This means they become a net source of greenhouse gases, making peatland management and restoration a key part of our response to the climate emergency.

This document shows how onshore wind farm developers are working to restore damaged peatland, enhancing its value as a carbon store and protecting important habitats for future generations.

MORE THAN A FIFTH OF SCOTLAND IS COVERED BY PEATLANDS



Sphagnum mosses

A series of peat dams in a reprofiled peat gully on the Farr Estate, south of Inverness.

THE FOUR TYPES OF PEATLAND

Scotland's landscapes are made up of a wide range of soil types and habitats, including four distinct types of peatlands: blanket bogs, raised bogs, fens and bog woodlands.

Blanket bogs occur most commonly in the north Highlands and Western and Northern Isles, in areas with gentle slopes and poor drainage. They are home to some of our rarest and most threatened wildlife and are the largest natural carbon store in Scotland.



Raised bogs, found mainly in the lowlands, occur where water flows sluggishly, resulting in a build-up of plant material which decays slowly in the bog's waterlogged, acidic conditions. These bogs appear as domes, growing to 10 metres or more in height, with the growing dome being 'fed' by rainwater which encourages the continued build-up of plant material. The surface is waterlogged, acidic and lacking in nutrients. Vast areas of raised bogs have been damaged by agricultural, horticultural and forestry practices.



Fens are places where nature and human activity combine to produce a rich and ever-changing habitat which is home to a wide variety of species. The peat is formed and is fed by surface and groundwater - containing nutrients from the underlying geology - as well as rainwater. Fens occur in various places across Scotland, from small fragments to extensive wetland habitats, but intensive agriculture, drainage and mechanisation have resulted in their decline.



Bog woodland is one of Scotland's rarest habitats. It's formed when scattered trees, most commonly Scots Pine, grow across the surface of a bog, although they often struggle to survive as their roots become waterlogged. Some of Scotland's bog woodlands are estimated to be 350 years old.



CASE STUDIES

The following case studies set out a number of examples of positive management and sensitive approaches which illustrate how renewable energy development is contributing to the restoration of Scotland's sensitive peatland, creating new carbon sinks and promoting biodiversity.

SCOTTISHPower RENEWABLES

ScottishPower Renewables currently manages approximately 8,500 hectares of peatland habitat – roughly the same size as the cities of Dundee and Inverness combined. The company has spent £2.5 million on peatland restoration and research over the past 10 years.

Around half of the total peatland area managed by ScottishPower Renewables is unplanted blanket bog, which has typically been historically damaged by a combination of drainage, overgrazing and burning.

Following a review of the pre-existing methods used to restore blanket bogs the company set up further research to develop new techniques which could achieve enhanced restoration over very large areas at a much lower cost.

Peat dams improve the quality of blanket bog habitats by blocking ditches to hold water on site and raise the water table back to natural levels. ScottishPower Renewables developed a technique called 'wave damming' to increase the speed at which peat dams can be constructed and reduce peat disturbance. The new method also reduces the cost of building peat dams from around £2,600 per kilometre to around £350 per kilometre when dams are installed at five-metre intervals.



Aerial view of wave dams installed at a historically-drained blanket bog.



Wave dams installed one year previously at Black Law Windfarm. This picture shows how effective these structures are at holding water, minimising bare peat and demonstrating a dramatic increase in the density of flowering cottongrass.

ASSESSING CARBON PAYBACK

Wind farms which are to be built on peatlands are assessed using the Scottish Government's Carbon Calculator to ensure that the carbon payback is taken into account during decision making. A review by the University of Edinburgh has shown that all wind farms included in a number of studies achieved carbon payback within two years.

Scottish Renewables and statutory environment bodies including NatureScot worked together in 2019 to update a good practice guidance document for wind farm construction. It includes advice on building on peatlands and on the potential re-use of turbine bases where possible.

RWE

RWE has restored around 39 hectares of degraded peatland at its Bad a Cheo 13-turbine wind farm in Caithness, the equivalent of around 40 international rugby pitches. The restoration was achieved using pre-existing peat turves from the wind farm's construction to build dams along almost 10 miles of drains at a cost of around £30,000.

Future Restoration

At the Glen Kyllachy 20-turbine wind farm site south of Inverness RWE will also be completing peatland restoration work during the final stages of site construction. This will involve restoring 53 hectares of 'moderately to heavily-degraded' peat using the ditch-blocking technique, involving both pre-existing materials on site as well as some additional materials for the more heavily-degraded areas. This process will be similar to that which was so successful at Bad a Cheo, though incorporating more recently-improved techniques.



Blanket bog at Forsinard Flows National Nature Reserve.



Blanket bog by Loch Loyal, Sutherland.



A blocked ditch on Blawhorn Moss National Nature Reserve.

Drumclog Plant Ltd using low ground pressure machines to restore peatland at Dunmaglass Wind Farm, a joint venture between SSE Renewables and Greencoat UK Wind Plc.

SSE RENEWABLES

SSE Renewables actively manages 1,688 hectares of peatland habitat - equivalent to an area around the size of the city of Perth - across 10 operational wind farm sites as part of a total of almost 20,000 hectares of land under Habitat Management Plans across Scotland.

Peatland management and restoration is being undertaken using a variety of techniques and approaches. This includes 253 hectares of targeted peatland restoration such as ditch blocking, 390 hectares of livestock reduction on sensitive peatland habitats and 355 hectares of forest removal to reduce the drying-out effect caused by trees. SSE Renewables has also implemented 'no muirburn' policies on 690 hectares of peatland habitat at its wind farm sites. Heather moorland is often burnt to provide fresh growth for game and livestock, but this process can be damaging to peat.



Muirburn damage at Renfrewshire Heights Site of Special Scientific Interest.

At the 33-turbine Dunmaglass Wind Farm Ltd. (a joint venture between SSE Renewables and Greencoat UK Wind Plc), south of Inverness, work has been carried out to improve peatland habitat conditions by blocking hill drains to aid in water retention, which provides the wet conditions required by for blanket bog to thrive. SSE Renewables has also carried out complex peat hag reprofiling, where these eroded parts of the habitat are repaired to prevent further damage and to promote the growth of key peatland species such as cotton grasses and peat-forming sphagnum moss, a key bog ingredient which helps to sequester carbon from the atmosphere and was also used in the First World War as a wound dressing due to its antiseptic properties. Peat hags are created when water flow erodes downwards into the peat, or where a fire or overgrazing has exposed the peat surface to dry out and blow or wash away.



Reprofiled peat hags and peat dams at Dunmaglass Wind Farm, a joint venture between SSE Renewables and Greencoat UK Wind Plc.



Peatland restoration at SSE Renewables' Fairburn wind farm showing an area where hill drains have been blocked, resulting in regrowth of sphagnum mosses.

FUTURE RESTORATION

SSE Renewables has committed to restore a further 330 hectares of peatland habitat across existing operational sites and sites which are currently under construction over the next five years.

The Viking Energy Wind Farm located on Shetland's central mainland has committed an ambitious 260 hectares of peatland restoration which is programmed to commence concurrently with the wind farm's construction phase. The approach to peatland restoration there ranges from the re-establishment of peat, and ultimately blanket bog, in areas where historic erosion has significantly depleted the peat resource; the blocking of erosion gullies through the installation of dams; reprofiling gully edges and peat hags and establishing sheep exclosures to control grazing pressures.

Peatland management during construction

During wind farm construction various methods, processes and procedures are used by all developers to minimise peatland impacts. Construction methods include floating roads laid on top of peat to minimise ground impact which can be removed with limited impact during decommissioning stages, and culverts which are installed to allow continued water flow between areas of peatland habitat separated by wind farm infrastructure.

Peat extracted during site construction is managed under Construction Environment Management Plans and Peat Management Plans, prepared and implemented as part of each site's planning consent conditions. These plans detail the methods and best practice for peat extraction, peat storage, maintenance and reinstatement during construction.



Low ground pressure forwarder removing commercial conifer plantation from Strathy North wind farm.

In addition, there are extensive plans for peatland restoration and management associated with Strathy South wind farm in Caithness, should a variation to its planning permission be consented. On site, SSE Renewables would remove 1,133 hectares of commercial forest to allow the restoration of peatland habitats. Additional peatland restoration and management across 1,535 hectares of the adjacent Caithness and Sutherland Peatland Special Areas of Conservation is also proposed.



Peat pan restoration at the joint venture SSER / Greencoat Duminaglass Wind Farm. Sumps have been created to slow water flow and allow the regrowth of peatland plant species over time.

Building floating roads on peat at Gordonbush Extension Wind Farm.

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Eroding peathag (left) contrasted with reprofiled peat hag (right).