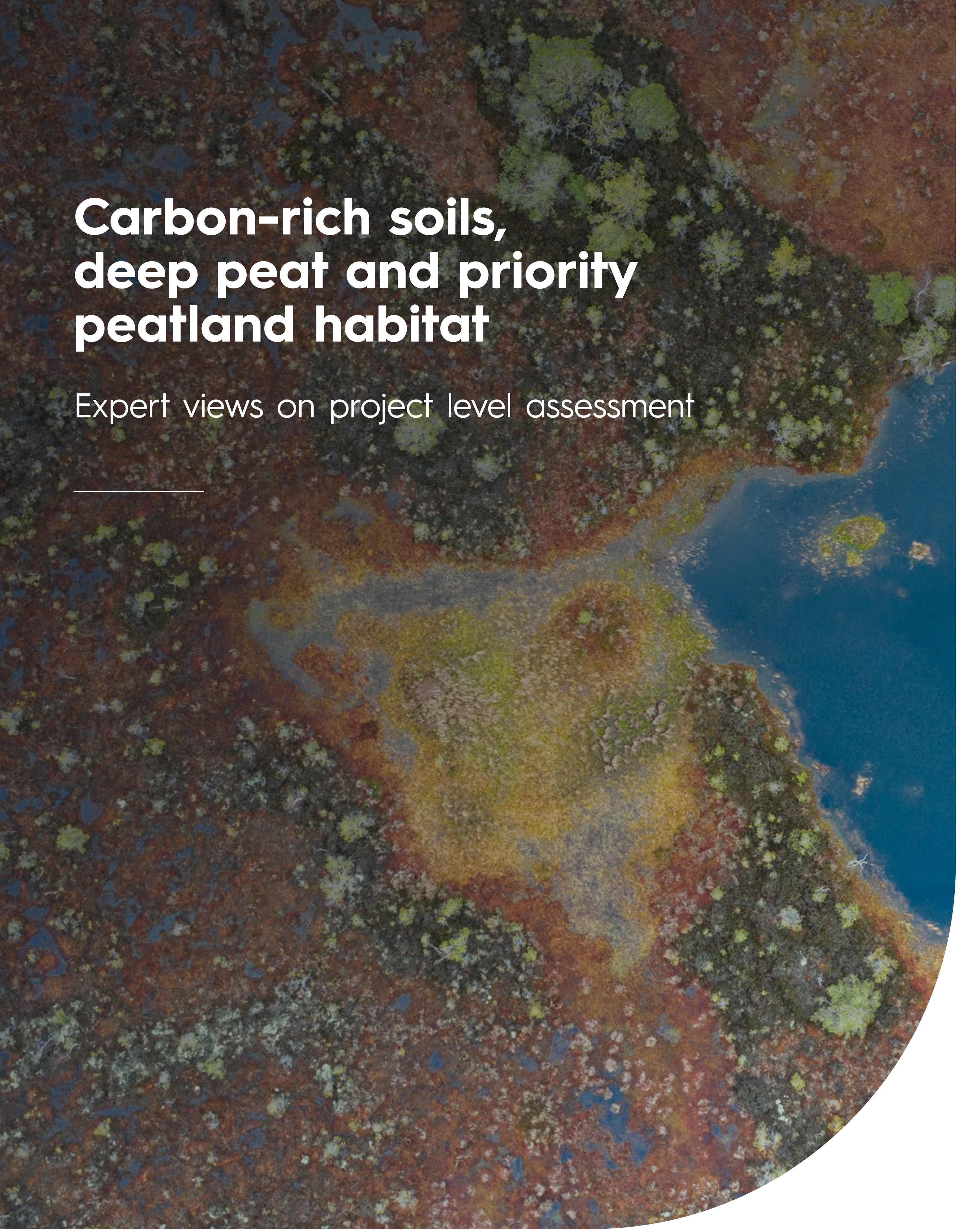
Carbon-rich soils, deep peat and priority peatland habitat

Expert views on project level assessment



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Foreword

Scotland's peatlands are important and rich in diversity. The way in which we interact with these habitats is vital to water supply, biodiversity, climate management, tourism and cultural heritage. Despite this, the peatland resource has been degraded through cultivation, cutting, over grazing, burning, draining and construction. This has led to increased calls for its protection and a drive to reinstate peatlands across Scotland to restore the habitat and CO_2 sequestration needed to meet the challenges of climate change (Scottish Government, 2020a).

The renewables sector has worked with government and statutory bodies to manage peat on sites where projects operate to preserve and enhance the peatland while mitigating impacts of construction on these valuable soils and habitats. The knowledge and care taken has ensured that Scotland has avoided major incidents related to wind farm developments on peatlands.

This discussion document brings together the collective knowledge of an experienced group of industry professionals working across the peatland EIA topics. It is intended to summarise industry's current approach to and understanding of peat habitat, peat soil and carbon assessment in support of wind farm applications. It raises questions where there appear to be ambiguities or inconsistencies in the way stakeholders and regulators engage with applicants during the EIA process. The intention is for this document to stimulate discussion and support industry and stakeholders/regulators in finding common ground in addressing the climate emergency through responsible development in Scotland.

It is clear that the wind farm sector has a key role in Scotland's energy future. It can also play an important role in the protection and enhancement of peatland habitats. As the sector matures, it is critical to make sure that there is a consistent approach and that learning from experience is adopted into assessments and guidance. This is vital to ensuring the renewables sector can grow responsibly, while maximising the opportunity to protect, enhance and manage peatlands.

I thank everyone who has been involved in preparing this document.

Jeremy Sainsbury OBE, political director, Natural Power

Contents

1 Introduction

Introduction

The purpose of this document is to stimulate discussion on the correct approach to assessing development impacts on ***carbon-rich soils, deep peat and priority peatland habitats***. These three headline topics are referred to in Scottish Planning Policy (SPP) 2014 Table 1 as "nationally important mapped environmental interests" (Scottish Government, 2014). The table advises that in such areas development of wind farms may be appropriate in some circumstances. Developers are asked to demonstrate that *"any **significant effects** on the qualities of these areas can be substantially overcome by siting, design or other mitigation".*

The other mapped environmental interest in Table 1 is Wild Land. Wild Land Areas were definitively mapped with boundaries in 2014 by Scottish Natural Heritage (SNH, 2014), but for carbon-rich soils, only predictive mapping completed and published in 2016 by SNH is available to guide developers (SNH, 2016a). As recognised by NatureScot (formerly known as Scottish Natural Heritage or SNH), the map is high level and predictive, and site level surveys are needed to determine whether or not there are in fact carbon-rich soils to be assessed (SNH, 2016b; 2015).

Some damaging confusion has arisen about the scope of the interests advised on in SPP, such as which regulatory body focuses on which interest and how impact assessment is to be addressed. This confusion was highlighted at a recent wind farm local inquiry at which a principal focus was SPP Table 1. Although it is fair to note that the approach of NatureScot seems to be evolving from a focus on the presence of carbon-rich soils into one on peatland habitats. This has been clarified by a recent guidance note on carbon-rich soils, deep peat and priority peatland habitats published by NatureScot (2020d).

National Planning Framework 4 (NPF4) may or may not amend SPP Table 1. Whatever the outcome, Scottish Renewables feels the need, in the interests of its members and all those involved in onshore wind development, to provide some project-level clarity on the right approach to take during proposed development assessment on sites where SPP Table 1 may be engaged.

This document aims to provide an overview of the way industry assesses impacts on peatlands and discusses the principles of environmental and ecological impact assessment best practice in terms of avoidance, minimisation and compensation/enhancement.

It is hoped that this document will stimulate discussion on the topics set out in the conclusions. In summary:

- There is an urgency for industry and all other stakeholders to work towards ensuring that onshore wind development on Scotland's peatlands will contribute to Scotland's biodiversity, thus avoiding unnecessary project level debate on the principle of this win-win outcome.
- It is more important than ever to work towards a consistent approach to the assessment of the impacts of onshore wind development on peatlands by industry, decision makers and consultees in the planning process.
- The authors feel that a reset is required to enable a new start to a collaborative approach by all stakeholders. This is needed to realise the twin aims of renewable energy development and the protection and enhancement of Scotland's peatlands. This will help to effectively combat the climate emergency and achieve net zero. All stakeholders need to set aside past debates and focus on these objectives. If this discussion document stimulates a productive and lasting new approach it will have succeeded.

Peatlands and their importance

Peatlands cover approximately 3% of the world's land area but hold around one third of global soil organic ***carbon*** stores (Parish et al, 2008). ***Blanket bog*** is one of the rarest forms of peatland in the world, comprising approximately 10m ha or 0.023% of global peatland, of which 13% is within Scotland (Lindsay et al, 1988). However, it is the most extensive peatland type in Scotland, covering around 23% of Scotland's land surface (NatureScot, 2020a). Peatlands are now recognised as globally important providers of ecosystem services, including for provision of food and fibre, water supply, climate regulation, biodiversity, recreation and cultural heritage (Lantschner et al, 2011; Bonn et al, 2016). Their importance has been recognised in Scotland by a £250m funding commitment to their restoration over the next 10 years to be delivered via the Scottish Government (SG) funded Peatland ACTION initiative (Scottish Government, 2020a). The value of peatlands has also been recognised by renewable energy developers through restoration funded by wind farm developments (Scottish Renewables, 2020).

Peat is an organic soil comprising the decayed organic matter of wetland plants. It forms under waterlogged conditions where rainfall is high and loss of water through evapotranspiration is low (Marsden and Ebmeier, 2012). This decayed organic matter makes up the carbon store within peatlands. In Scotland, it is estimated that some 1.7bn tonnes of carbon are stored in peatlands, equivalent to 140 years' worth of Scotland's total annual greenhouse gas emissions (SNH, 2019).

Priority peatland habitats comprise: blanket bog, lowland raised bog, lowland fens, and part of the upland flushes, fens and swamps, as listed in the UK Biodiversity Action Plan (UK BAP). Blanket bog is the most widespread of these habitat types in Scotland, so it is blanket bog that is usually of relevance for proposed developments/wind farms and is the peatland habitat that is the main focus in this paper. Blanket bogs in the UK started forming in the early Holocene, with most UK bogs initiating prior to 6,000 years ago under cooler and wetter conditions than at present (Gallego-Sala et al, 2016). Where bogs remain waterlogged and peat forming plant species persist, blanket bog is still considered to be actively forming. In simple terms, a bog that is accumulating organic matter can be considered a ***carbon sink***. A bog that is not losing carbon/peat but is no longer accumulating organic matter can be considered a ***carbon store*** (or carbon reservoir). Finally, a degrading bog can be considered a ***carbon source***. A peatland may change state between sink, store and source through natural processes or as a result of human activity (Harenda et al, 2018).

Peatlands and management

Peatlands have been subject to numerous forms of natural and human induced ***degradation***, including:

- Ploughing and drying to enable afforestation for commercial timber plantations.
- Cutting for fuel (also known as turbary).
- Cutting for the whisky industry.
- Cutting for the horticultural industry.
- Draining to 'improve' ground conditions by reducing the amount of standing water.
- Burning to encourage regrowth of vegetation to support livestock and game.
- Grazing pressures from livestock.
- Development, e.g. built infrastructure.
- Erosion by wind and rainfall (leading to bare peat and gullying), sometimes occurring naturally and sometimes in response to loss of vegetation caused by human activities.

The focus of peatland ***restoration*** is to reverse both natural and human induced degradation of peatlands to maintain the carbon store and peatland function (e.g. biodiversity, water regulation) and, if possible, return peatlands to active sequestration of carbon (i.e. carbon sinks). A bog that actively sequesters can help offset carbon emissions from other sources. Furthermore, the bog species that are associated with a healthy bog (a bog that is not degrading) have high biodiversity value and are recognised as such within the Scottish Biodiversity List (NatureScot, 2020b).

The importance of active blanket bogs

Bog activity refers to the ability of a bog to form peat. Peat formation requires bog forming plant species and waterlogged conditions. Waterlogging, evident as persistent high water tables, limits the decomposition of plant material which instead accumulates at the bog surface and may in the long-term enable average peat accumulation rates of 0.5-1.0mm per year (EU LIFE, 2011). However, while vegetation communities and their condition may provide an indication of activity, measurable peat formation occurs over decades to hundreds of years, averaging c. 1m per 1,000 years under optimum conditions (Charman, 2002), and is also influenced by seasonally variable water tables and long-term climatic conditions. Just as vegetation and water tables vary in their distribution in any individual bog, so may the degree of activity. Some bogs may be both 'active' and 'inactive' depending on location, microtopography and water tables (Harris and Baird, 2019) or may only be active at certain times of the year. Therefore, it is quite possible for a bog to be actively eroding (losing peat) in one location, inactive in another, and an ***active bog*** elsewhere. In doing so, this highlights the value and importance of site-specific, rather than predictive, mapping.

2 Developments and peatlands

Peatlands and their importance

Proposed wind energy developments on peatlands will almost always be subject to statutory ***Environmental Impact Assessment*** (EIA), whereby the 'significance of effects' of a proposal must be objectively evaluated to determine the baseline (pre-development) condition of a site, the potential impacts of development activities on this condition, and opportunities to minimise or mitigate these effects. An outline of the sequence of EIA as it applies to peatlands is shown in **Figure 1**.

Assessments in support of EIA are typically carried out by qualified independent professionals across the range of topics considered relevant following scoping. It is frequently the case that those producing the assessment of effects are chartered through a professional institute, and this usually brings with it the assurance that reports they produce are objective and evidence-based to comply with the chartership standards of their respective institutions. The forms of assessment under each topic are usually outlined in ***scoping opinions*** following a ***scoping report*** issued by a developer. Scoping provides an opportunity for stakeholders to identify critical site characteristics that may constrain development and ultimately lead to a possible objection.

Following scoping, developments are designed taking account of site conditions. If specific site characteristics flag the need for a careful and appropriately cautious approach, then a developer will follow a hierarchy of mitigation. The hierarchy of mitigation is of avoidance first, minimisation if avoidance is not possible, and finally, compensation alongside enhancement, where possible (e.g. as outlined for Ecological Impact Assessment, or EcIA, CIEEM, 2019).

Statutory consultees (such as NatureScot and the Scottish Environment Protection Agency (SEPA)) must review the objective evidence within the EIA provided for a development and weigh the costs and benefits of a proposal before reaching a decision as to the suitability of the site for development. Sites may have numerous 'receptors' or baseline characteristics within the site such as habitats, peat soils, water bodies and animal populations, as well as subjectively evaluated attributes and qualities of place that may only be apparent from outside a site boundary (such as landscape character). Different stakeholders have different institutional positions on what is acceptable in terms of effects and what effects may make a development unsuitable.

Following the declaration of a Climate Emergency by the Scottish Government in April 2019 (Scottish Government, 2019), the Scottish Government set out intentions to outline through the subsequent Energy Statement how low-carbon energy could contribute to Scotland achieving 'net zero' by 2045. The Annual Energy Statement for 2020 (Scottish Government, 2020b) acknowledges "the urgent response of the renewable energy sector to contribute to Scottish Government's climate change targets" with 40 onshore wind farm applications under consideration at the time of publication (December 2020) and an anticipated 58 further applications over the two years from 2020 to Q4 2022.

As a low-carbon energy source, the potential benefits of onshore wind farms are clear in terms of achieving emissions reduction across the energy mix. However, when wind farms are located on peatlands, which can be carbon stores, their siting in these locations has become a contentious issue within the planning environment. This is clear from the numerous forms of guidance issued on behalf of the Scottish Government since 2007, summarised in the table on page 8.

Figure 1.

Peatlands and development: an overview of guidance to developers

SCOPING & PRE-APPLICATION ADVICE

DEVELOPER liaises with consultees and submits **scoping report** informed by review of CPP map (including predicted presence of Class 1 and Class 2 CPP) and proposes assessments required to address potential for likely significant effects.

↓

Stakeholders/consultees provide **scoping opinions** on proposed assessments, including requests for additional surveys if missing from scoping report.

This flowchart provides an outline of the various ways in which peatlands are assessed in EIA in Scotland and an interpretation of the potential reasons for objection to a submission in relation to the peatland topic.

ENVIRONMENTAL IMPACT ASSESSMENT

Ecology (biodiversity)

- DEVELOPER **completes ecological impact assessment (EcIA)** informed by CIEEM Guidelines and NatureScot scoping opinion.
- Phase 1 habitat and NVC survey undertaken to generate site scale maps to compare with layout.
- **Assess importance** e.g. naturalness, rarity, geographic context of habitats (Local to International).
- **Assess likely significance** of effects on habitats.

DEVELOPER completes Phase 1 & Phase 2 peat depth surveys to identify peat and support layout design.

Peat

- DEVELOPER completes peat management plan (PMP) informed by SEPA scoping response and 2012 guidance.
- Enhanced plans may include habitat restoration measures within or additional to the PMP.

Soil carbon

- DEVELOPER completes carbon calculation (CBA) using current version of online tool.
- CBAs use a standard SG online tool with inputs from Developer across a range of topics (not exclusively peat related).

Peat stability

- DEVELOPER completes peat landslide hazard and risk assessment (PLHRA) using 2017 guidance.
- Methodology varies by consultant but usually follows a range of recommended approaches from the guidance.

CONSULTATION

NatureScot

- NatureScot review EcIA using CIEEM guidelines.
- If in doubt, NatureScot may request further information or undertake site visit for independent assessment of peatland condition.

NB: Use of CPP maps as a basis for objection is not consistent with CIEEM guidance and CPP should not outweigh site specific habitat data.

SEPA

- SEPA review PMP for adequacy of peat survey data, consistency of excavation and re-use calculations, and if re-uses of peat are appropriate.
- SEPA may request further information, layout changes to reduce impacts, or waste application.

SEPA

- SEPA may review CBA to determine if inputs represent site conditions as reported in the EIAR.

Energy consents unit (ECU)

- ECU audit PLHRA to determine suitability of approach and mitigation given calculated risks.
- PLHRA may be accepted, accepted following minor clarifications or may require resubmission to address significant shortcomings.

POTENTIAL REASONS FOR OBJECTION

NatureScot may object if:

- EcIA does not follow CIEEM guidelines or they require further information for determination;
- Independent NatureScot assessment considers there are likely significant effects on peatland habitats which cannot be overcome by siting, design or other mitigation.

SEPA may object if:

- Peat survey data is insufficient for assessment;
- Calculations are inconsistent;
- Excavation & re-use proposals are not aligned with good practice;
- There is surplus peat that cannot be reused on site and requires a waste license.

SEPA may object if:

- Inputs to CBA do not reflect proposed infrastructure and construction as defined in the EIAR.

ECU may require resubmission if:

- Peat survey data is insufficient for assessment;
- If assessment of likelihood, consequence or risk is poorly explained or implemented;
- If calculated risks are MEDIUM or higher for sensitive receptors.

The flowchart separates out the key EIA topics that are relevant to peat and notes the role of each statutory consultee in scoping and reviewing EIA for proposed developments.

Below is a summary of 'guidance history', illustrating the iterative development of guidance since 2006 when the first Chartered Institute of Ecology and Environmental Management (CIEEM) Ecological Impact Assessment (EcIA) guidance was issued (IEEM, 2006). The guidance history demonstrates that 'good practice' has evolved continuously, often on application timescales, such that by the time of submission of an application, guidance and scoping opinions issued at the outset of a project may have been superseded.

The remainder of this document provides a summary of the different types of assessment of impacts on peat submitted by applicants and our understanding of the responsibilities of key stakeholders in reviewing these EIA submissions. This summary represents the authors' views on how developers should interact with stakeholders to achieve the right balance between low-carbon energy development and protection of Scotland's peatland resource, both being key elements of the Scottish Government's strategic approach to attaining 'net zero'. Subsequent sections then provide the industry view on what is required for each EIA topic, including the industry expectation of what is and is not likely to be acceptable in terms of likely ***significant effects***.

Guidance history

A considerable volume of guidance has been generated in support of peatland assessments and wind farms. All of the major guidance has been iterated at least once, with the exception of the "Guidance on the assessment of peat volumes…" which is now noted as superseded, though no update has been forthcoming.

2006 - IEEM EcIA, 1st Ed (CIEEM)

2007 - Peat landslide hazard and risk assessment: best practice guide (Scottish Government)

2008 - Calculating carbon savings from wind farms on Scottish peatlands: a new approach 1st Ed (Scottish Government)

2010 - Regulatory position statement - developments on peat (SEPA)

2011 - Developments on peatland: site surveys 1st Ed. (SEPA et al.)

2012 - Guidance on the assessment of peat volumes, reuse of excavated peat and the minimisation of waste (SEPA, SNH, SR)

2016 - Carbon and peatland 2016 map (SNH)

- Calculating carbon savings from wind farms on Scottish peatlands: a new approach (web-based tool) (Scottish Government)
- CIEEM EcIA Guidelines, revised (CIEEM)
- Identifying natural heritage issues of national interest in development proposals (SHN)

2017 - Developments of peat and off-site uses of waste peat (SEPA)

- Peat landslide hazard and risk assessment: best practice guide, 2nd Ed. (Scottish Government)
- Peat survey, 2nd Ed. (Scottish Government et al.)

2018/2019 - CIEEM EcIA Guidelines, revised (CIEEM)

2020 - A NatureScot webinar on "Developments on peatland" stated that NatureScot rarely object to proposals on peatland unless the peatlands are deemed to be of "national interest". The criteria for national interest are based on JNCC SSSI guidelines for candidate blanket bog SSSI.

- Advising on carbon rich soils, deep peat and priority peatland habitat in development management (NatureScot, November 2020)

3 Definitions and responsibilities

Glossary

To provide context to the subsequent commentary on EIA assessments for peatlands, a glossary of key terms has been provided at the end of this discussion document. Terms within the glossary are highlighted as bold, italicised text and are limited to key terms relevant to the discussion.

Regulator and stakeholder responsibilities

Due to the potential for overlap in responsibility for review of EIA content related to peat, NatureScot and SEPA agreed joint working arrangements on planning consultations, detailed in table form in an SNH Instruction: Guidance Note (SNH, 2018). Table 1 reproduces this content.

Table 1. SNH and SEPA's roles in relation to carbon-rich soils, deep peat and priority peatland habitat (reproduced from SNH, 2018).

SNH (now NatureScot)	SEPA
Groundwater Dependent Terrestrial Ecosystems (GWDTE) which are the qualifying interest of protected areas, or which could affect the qualifying interest of protected areas.	Groundwater Dependent Terrestrial Ecosystems in the wider countryside, or within protected areas but not a qualifying interest.
Peat landslide risk assessments, where the risks could affect protected areas or areas of carbon-rich soils, deep peat and priority peatland habitat.	Peat landslide risk assessments where these could affect the water environment or are relevant to one of the other SEPA interests on this table (e.g. could be relevant to consideration of impact on GWDTE).
	Carbon calculator and carbon emissions.
UK BAP priority peatland habitat.	Fens (which are GWDTEs), outside protected areas.
Carbon-rich soils, deep peat and priority peatland habitat map.	Peat re-use and waste management.
Habitat Management Plans, Peat Management Plans, Construction Method Statement or Construction Environmental Management Plans where these are required to mitigate effects on one of the other SNH interests listed on this table (i.e. a protected area, UKBAP priority peatland habitat).	Habitat Management Plans, Peat Management Plans, Construction Method Statement or Construction Environmental Management Plans where these are required to mitigate effects on one of the SEPA interests listed in this table (i.e. GWDTE, the water environment, waste management, etc.).

It should be noted that although peat landslide risk assessments may be considered by both NatureScot and SEPA, Energy Consents Unit's (ECU) designated technical checkers are responsible for reviewing quality and reliability of these risk assessments submitted under the 2017 guidance (see 'Peat Instability' section).

4 Identifying peatlands within a site proposed for development

In order to evaluate whether a proposed development may impact peatlands, the first step is to understand how much peat is present within the site boundary and to avoid it wherever possible.

Guidance overview

The first explicit guidance on identifying peat in relation to developments was prepared by SEPA in 2011 (SEPA et al, 2011). It provided recommendations on peat sampling methods and sampling density to assist developers in identifying the distribution and thickness of peat across a site to inform layout planning. This guidance was revised in 2017 (SG, SNH & SEPA, 2017) and provided more explicit recommendations on requirements at the scoping and EIA phases of project development.

What is required?

In summary:

- A desk study, referring to the Carbon and Peatland 2016 Map and British Geological Survey superficial mapping layers, should be used to determine if carbon-rich soils, deep peat and priority peatland habitats are likely to be present.
- If the desk study indicates the likely presence of peatlands, scoping should be supported by a 100m grid across a full site to demonstrate the distribution and depth of peat and inform a scoping layout. This is generally referred to as a Phase 1 peat depth survey.
- EIA and assessment of effects should be supported by a detailed probing survey, typically involving a 10m grid within infrastructure footprints and 50m interval surveys along tracks with 10m offsets (to provide a corridor of data). This is generally referred to as a Phase 2 peat depth survey.
- A subsample of probe locations should be cored rather than probed in order that the character of peat (its humification and consistency) can be assessed to inform decisions on handling and end-use. Coring may also provide useful information on the substrate character (e.g. presence of clay) and help prevent overestimation of peat depths.
- At both stages, data should be interpolated to generate a continuous peat depth map across the full area considered to have the potential for infrastructure (provided that the density of data is sufficient to support interpolation).

If the scoping survey identifies no peat or a very limited extent of peat, or if the scoping layout is able to avoid the peat that is present, then there may not be a need to undertake Phase 2 probing. If peat is present and infrastructure is likely to overlap with it, then potential impacts must be determined through a series of assessments detailed in the sections below.

What do regulators/stakeholders look for with respect to infrastructure and peat?

All stakeholders responsible for review of peat assessments may comment on the adequacy of peat depth surveys. For these peat assessments to be robust, probing must cover the full infrastructure footprint with sufficient detail across a site to demonstrate whether the layout has been designed to account for avoidance of the deepest peat. Probing must also be to the full depth of the peat deposit and, ideally, the technique for generating a peat depth model from the probing data should be justified.

However, it is not always the case that all sites require full Phase 1 and Phase 2 probing. For example, a site that demonstrably lacks peat from reconnaissance survey or Phase 1 survey, or a site in which peat is avoided, may not need a more detailed subsequent survey. It is for the applicant to justify any deviation from the guidance through dialogue and agreement with stakeholders.

The Carbon and Peatland 2016 Map

Separately to SEPA, NatureScot prepared a map showing the predicted presence and quality of peatlands across Scotland, referred to as the Carbon and Peatland 2016 Map (SNH, 2016a). The map had two intended purposes (SNH, 2016b):

- To enable planning authorities to map ***carbon-rich soils, deep peat*** and ***priority peatland habitat*** in a consistent manner for the preparation of spatial frameworks for onshore wind farms and meet the requirements of Table 1 in SPP.
- To identify the nationally-important resource.

Importantly, NatureScot has stated in a number of documents that "the map cannot (and should not) be used in isolation to determine the impacts of a specific development proposal on peat. This should be based on a detailed, site specific survey of peatland habitats and peat depths across the site using existing methods" (SNH, 2016b; 2015).

The "existing methods" for determining peat depth are defined above, while the methods for determining the presence of peatland habitats are considered under 'Peatland habitats' below. Site-specific peat depth data and habitat data exceed both the resolution and reliability of the data used to generate the CPP map, and there is no good reason to use the map once site specific surveys have commenced. Further, since the map provides no measure of potential impact or effect of a proposal on a peatland (other than the fact of overlap), the map has no further value to the EIA process in its current form and intended use.

While the CPP map provides a helpful initial steer on potential peatland condition prior to scoping, it grossly simplifies ground conditions as a function of the coarse data used to produce it. As such, it is assumed that site-specific survey data and EIA should take precedence over the CPP map as a measure of the presence and depth of peat and nature and quality of habitats. It is not expected that the CPP map categories (***Class 1*** and ***Class 2*** specifically) be considered as a de facto ban on development. Furthermore, it is expected that layout design that is sensitive to all on-site and off-site receptors (both peatland and others, e.g. water, avian, landscape) should be considered on its own merits through the factual data presented in the EIA. Where stakeholders differ in their interpretation of these factual data, evidence-based dialogue should form the basis of resolving differences, be that through changes in layout, reduction in scale of development, or, as a last resort, withdrawal of an application.

In acknowledging that NatureScot rarely object to wind farm applications on peatland, in a webinar on 'Developments and Peatland' given in April 2020 (NatureScot, 2020c), NatureScot noted that *"we rarely object – only if the peatland [is] of 'national interest' (a subset of 'nationally important')".*
A clarification was provided to the issue of ***national interest*** and its distinction from ***national importance*** as follows: *"it is of National Interest, then it means it satisfies the quality criteria for being a Site of Special Scientific Interest".* This is considered further in the 'Peatland Habitats' below.

5 Peat management and the carbon calculator

Once the presence of peat has been established, the impacts on peat must be considered in terms of the amount of peat soil disturbed and the potential consequences for carbon storage. This is a key step in weighing the costs and benefits of a low-carbon energy generation scheme.

Impacts on peat soil

Overview of guidance

Impacts on peat soils have mainly been considered in two sets of guidance: 'Development on Peatland Guidance - Waste' (SEPA, 2010) and 'Guidance on the Assessment of Peat Volumes, Reuse of Excavated Peat and the Minimisation of Waste' (Scottish Renewables, SEPA, 2012). The former documented a hierarchical approach to the management of peat generated as a 'waste' by-product of construction, such as through excavation. The latter and more comprehensive document provided more detail and required peat excavation volume to be fully calculated and appropriate end-uses identified to minimise oxidative loss of peat soils and embedded carbon.

What is required?

Assessment typically comprises the following steps:

- **Calculation of the total volume of peat to be excavated**: as a function of the footprint of the infrastructure and associated excavation, and the proportion of excavation that is temporary and permanent. Volumes must be calculated for both ***acrotelmic*** and ***catotelmic*** peat (which may have different end uses, if the latter comprises amorphous peat, this may pose difficulties for handling and reuse). Floating tracks, in which geotextile running surfaces are placed on top of the peat without the need for excavation, are often specified to minimise ***peat excavation***. Though this is usually on peats >1.0 m in depth and only where slope gradient makes this possible (floating tracks may experience displacement on moderate and steep slopes and are therefore not suitable).
- **Calculation of the total volume of peat to be reinstated in areas of temporary excavation**: usually for temporary laydown areas (e.g. 'blade fingers'), construction compounds or borrow pits. All excavated peat is locally stored during the construction phase and reinstated shortly after.
- **Calculation of the total volume of peat to be reused**: any peat leftover after reinstatement of temporary excavations is generally ***reused*** in either landscaping (i.e. visually 'tying in' infrastructure margins such as tracks and hardstandings to the surrounding peatland) or ***restoration*** (e.g. infilling cuttings, restoring borrow pits, infilling gullies).

The resulting calculations and assessment are referred to as a ***peat management plan (PMP)***, and these assessment reports are reviewed by SEPA as the statutory consultee. In some cases, where a significant habitat management proposal is integrated with management of the peat soils, an enhanced ***peat and habitat management plan*** may be submitted. The 2012 guidance has not been updated, and it is noted that *"it does not reflect current legislation, good practice or controls"* (Scottish Government, 2020c). In lieu of revised guidance, SEPA has typically issued additional guidance or expectations in scoping responses to scoping opinions produced for individual proposed developments.

What do regulators/stakeholders look for in a PMP?

On the basis of the guidance to developers and on the case history of stakeholder responses, the wind farm industry understands that PMPs are likely to be considered acceptable forms of assessment and impact mitigation if:

1. The underlying peat depth data is sufficiently representative to support the calculations presented.
2. There is evidence to demonstrate that the hierarchical approach to peat management has been adopted i.e. avoidance, minimisation, mitigation and enhancement.
3. The peat mass balance is neutral i.e. all the peat that is likely to be excavated can be reused and that the proposed forms of reuse are both credible and environmentally acceptable.

What is unlikely to be acceptable are forms of reuse that lead to oxidative loss of peat and deterioration of function of a peatland from that of being a *carbon sink* to a *carbon store* or from a *carbon store* to a *carbon source*. Equally important are hydrological and ecological compartmentalisation, and there may be a requirement to demonstrate how this is minimised or avoided.

WHAT IS DEEP PEAT?

In a recent public local inquiry, it became clear that there is a lack of consistent definition of 'deep peat', and that at present, NatureScot use the term 'deep peat' to describe all peat, regardless of depth. The concept of 'deep peat' is an important one, since the implication of its use as a constraint is that development may be more acceptable on 'shallow peat' than on 'deep peat'.

- In Scotland, the generally accepted definition of peat is a soil layer more than 50cm deep from the soil surface which has an organic matter content of more than 60% (SG, 2020e).
- Soils with high organic content less than 50cm thick are termed peaty soil (SG, 2020e).
- Forestry Commission Scotland define deep peat as "soil with a peat layer greater than 50cm" (Forestry Commission Scotland, 2015).
- Deep peat is defined by the Soil Survey of Scotland in its 1:250,000 soil maps as peat greater than 1.0m thick (Bruneau & Johnson, 2014).
- Scottish Government et al (2011) defined 'deep peat' as >1.5m in their 2011 guidance on peat depth survey.
- BGS superficial geology or drift maps only present peat deposits of >1.0m in depth (Finlayson et al, 2020).
- Scottish Government guidance for peat landslide assessment and carbon calculation define deep peat as >1.0m (following JNCC Report No. 445) (SG, 2017, 2020d).

A definition of 'deep peat' of >0.5m leaves no room for discussion of 'shallow peat' within discussion of peat depth variability across an area of interest without the use of ever greater superlatives (such as 'very deep peat', 'extremely deep peat' etc). Given that deeper peats contain more carbon and often the best ecological resource and hydrological function, further thought should be given to a consistent definition across both industry and stakeholder organisations.

6 Impacts on carbon

Overview of guidance

While the guidance above deals with peat as a soil and soil as a proxy for carbon, the assessment of impacts on the carbon store itself is not the focus of the PMP. Carbon is instead considered in the Scottish Government's ***carbon calculator*** alongside all aspects of a development that may have carbon implications (Scottish Government, 2020d). The carbon calculation tool has evolved to become a web-based assessment in which inputs are entered by applicants and outputs generated by the tool, producing a ***carbon balance assessment*** (CBA). The output calculates a 'payback period' for a scheme. For wind farms, the carbon lost or generated as a result of construction and related activities is compared with the carbon saved by the scheme's input of low-carbon energy to the UK energy mix. Typically, a wind farm on peat may take a few years to 'payback' the carbon that is used or lost in its construction. This has the benefit of standardising the approach taken to carbon calculation (in what is potentially a very complex subject matter) and enabling like-for-like comparison across sites.

What do regulators look for in a carbon balance assessment?

Although SEPA is the designated statutory consultee for carbon calculation assessments, audit of submissions is not a requirement. It is not clear under what circumstances an assessment is subject to audit. It is assumed that submissions that report outcomes that are out of keeping with what might be considered reasonable for comparable sites and developments might merit audit by SEPA.

7 Peatland habitats and habitat management

As well as the peat soil and carbon stored within it, peat habitats have considerable environmental value and impacts upon them. The value and impacts must be determined to understand the potential costs of a scheme and whether there are opportunities for enhancement. While peatlands are generally defined by their habitats alone, in practice, both peat soils and habitats are required to provide the highest-quality resource.

Overview of guidance

Ecological receptors, including peatland habitats, are assessed following CIEEM best practice guidelines for ***Ecological Impact Assessment (EcIA)***. The most recent version is CIEEM, 2018 v1.1 (CIEEM, 2019). The CIEEM EcIA guidelines are well established, with the original version first published in 2006. The guidelines provide a common framework for users of EcIA, with a scientifically rigorous, objective and transparent approach to assessing the potential impacts of developments. The CIEEM EcIA guidelines are intended for use by ecologists undertaking EcIA, as well as regulators and decision makers, including competent authorities. A wide range of regulators contributed to and endorse the use of CIEEM EcIA guidelines, including NatureScot and SEPA.

What is required?

EcIA typically comprises the following main steps:

1. Scoping

Scoping is an iterative process that helps determine the matters to be addressed within the EcIA. A key element of scoping is consultation with regulators. This usually includes receiving advice on required baseline ecological surveys.

2. Establishing the Baseline

Establishing the ecological baseline involves collecting up-to-date, site specific, empirical information using recognised standard methods and guidance to inform the EcIA assessment and the design process. This usually includes:

- ***Phase 1 Habitat survey;***
- ***National Vegetation Classification (NVC***) survey;
- And more recently, is accompanied by a ***Peatland Condition Assessments (PCA)***.

3. Evaluating the Importance of the Resource

Ecological receptors can be important for a variety of reasons, and the rationale used to define their importance should be explained transparently within an EcIA (CIEEM, 2019). Importance may, for example, relate to the quality or extent of designated sites or habitats, habitat/species rarity, the extent to which they are threatened throughout their range, or their rate of decline.

The EcIA guidelines require assessment of ecological or nature conservation importance relative to a geographical framework (e.g. international through to local) together with criteria and examples of how to place a site or study area (defined by its ecological attributes) into these categories.

EVALUATING IMPORTANCE

Various characteristics contribute to the potential importance of ecological receptors within a study area. CIEEM EcIA guidelines provide an extensive but not exhaustive list of features for consideration during importance evaluation, including naturalness; habitats that are rare or uncommon; habitat diversity; relative size of habitat or species population; and rich assemblages of plants and animals. EC Annex 1 habitat criteria and Scottish Biodiversity Lists (SBL) are also taken into consideration when evaluating the importance of a habitat.

It is generally straightforward to evaluate sites or species populations designated for their international or national importance (as criteria for defining these already exist e.g. SSSI, SAC or SPA selection criteria). However, for sites or populations of regional or local importance, criteria may be harder to define and CIEEM Guidance provides some examples for this.

4. Impact Assessment

The potential impacts of a proposed development on a particular receptor are considered in terms of their predicted magnitude, extent, duration, frequency and timing, reversibility, sensitivity and whether the impact would likely be positive, negative or neutral.

In an EcIA with peatland habitats the following impacts are usually considered:

- The direct ***land-take*** of the proposed development on the peatland habitat. This is calculated from the footprint of the infrastructure in relation to the peatland habitats from the Phase 1 Habitat and/or NVC mapped data.
- Consideration of ***severance/fragmentation*** on the peatland habitat.
- Consideration of ***indirect impacts*** on the peatland habitat, e.g. through changes in drainage and pollution pathways.

The key outcome of EcIA is an assessment of whether a proposed development is likely to have ***significant effects***. A significant effect is an effect that either supports or undermines biodiversity conservation objectives for important receptors and *"encompasses impacts on the structure and function of defined sites, habitats and ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)...with reference to an appropriate geographic scale."* (CIEEM, 2019):

- Where a proposed development is assessed as likely to have significant effects, and these effects are likely to be negative, regulators and competent authorities may object to particular aspects of a proposal or require further information or assessment, mitigation or compensation to offset these likely significant effects.
- Where a proposed development is assessed as not likely to have significant effects, regulators and competent authorities may be more likely to accept predicted negative but non-significant effects in association with a proposed development.

Under both scenarios, the developer is expected to demonstrate transparently that they have tried to avoid and reduce predicted negative effects. This is usually considered under the title of mitigation.

5. Mitigation

The mitigation hierarchy in consideration of predicted impacts and effects is well established (e.g. CIEEM, 2019; IEEM, 2006), namely avoidance first, followed by minimisation (or reduction) and finally, by compensation along with enhancement.

- *Avoidance* can be achieved through careful design by avoidance of the whole or part of a potentially important receptor. Where this is not possible because of fundamental design requirements, avoidance can still potentially be achieved by avoiding more sensitive features within a site. An example might be moving infrastructure away from blanket bog habitats onto less sensitive habitat types. Avoidance can also be achieved by avoiding the best quality habitat, such as avoiding blanket bog in a near-natural or active condition and only siting infrastructure on degraded bog. It is clear that vegetation surveys, peat depth surveys and PCA all have a role to play in informing the avoidance of predicted negative impacts and resultant effects.
- *Minimisation* may take many forms, with each subsequent infrastructure layout iteration being designed, where possible, to reduce potential negative habitat impacts and to minimise ecological impacts on habitats through targeted, receptor specific, measures (e.g. careful drainage, habitat reinstatement). There are often many competing constraints that developers have to consider at this stage.

Where significant residual negative effects are predicted despite the mitigation proposed (through avoidance and minimisation), these should, where possible, be offset by appropriate compensation (CIEEM, 2019).

Peatland habitat restoration techniques are now well established (Lindsay et al, 2016) and can fall under compensation and enhancement, and, in some cases, minimisation measures in EcIA. Peatland restoration, under the auspices of the mitigation hierarchy has the potential to provide measurable ecological benefits to large areas of degraded peatland habitat.

What do regulators look for in EcIA?

The key regulator that responds in relation to peatland habitats is NatureScot.

Broadly, NatureScot considers the type and condition of peatland habitat in the Study Area with respect to the Phase 1 and NVC report. In the author's experience NatureScot responses generally refer to whether there appears to be adequate avoidance of peatland habitats, preferring likely predicted impacts on other habitat types, such as acid grassland. In relation to best practice guidance, demonstrating the use of the Phase 1 Habitat, NVC and PCA maps to avoid peatlands, particularly those in better condition whenever possible, is an important part of the design process. NatureScot's responses also tend to be more favourably disposed to a proposed development if there is substantial peatland restoration planned, usually defined or outlined within a habitat management plan, because this can be secured through a planning condition.

The way NatureScot has responded to wind farm developments on peatland habitats has changed recently, which has resulted in some confusion for industry professionals. For example:

- NatureScot's responses in regard to peatland habitats have recently referred to the Carbon and Peatland 2016 Map, sometimes giving objections that appear to be based on the predicted presence of Class 1/Class 2 peatlands on these maps (which shows what may be there) rather than in response to the empirical, detailed, site-specific surveys and EcIA (which show what is actually there). This can appear to be at odds with the guidance on the use of the Carbon and Peatland 2016 Map.
- NatureScot's responses may comment on peatland habitats in terms of 'National Interest', a term not used in EcIA, but defined according to the recent NatureScot Guidance note as relating to *"peatland of the highest quality"* (NatureScot, 2020d). As stated in a NatureScot webinar (NatureScot 2020c) 'National Interest' relates to habitats which meet SSSI selection criteria. NatureScot may conduct site visits to proposed turbine locations, post submission of applications, in order to consider the peatland habitats with reference to SSSI selection criteria.
- Consideration of the SSSI selection criteria has not, to date, routinely been requested at the scoping stage and does not form part of a usual baseline survey or standard guidance for consultants. An outline of the method NatureScot use to consider the SSSI selection is provided in the recent NatureScot guidance note (2020d). Alongside very specific bog-moss species, the SSSI selection criteria also consider aspects of peatlands such as microforms and macroforms which do not fully relate to the NVC baseline surveys required for EcIA.
- Aspects of NatureScot's guidance (2020d) do not appear to accord with CIEEM EcIA guidance in relation to evaluation of impacts and likely significant effects, although it does reference the EcIA guidance.

To move forward it would be useful to establish (perhaps through a round-table discussion) an agreed approach from all parties that takes into account aspects such as avoidance, minimisation and mitigation (as detailed in Table 1 of SPP and CIEEM guidance) and assessment of impacts and any likely significant effects on peatland habitats (i.e. through CIEEM's EcIA best practice guidelines) as well as aspects such as clarity/agreement on methods (e.g. for considering SSSI selection criteria in a robust manner).

8 Peat instability

Peat landslides have the potential to give rise to major volume losses of peat soil and their associated habitats and stored carbon, as well as impact other environmental receptors such as watercourses and aquatic habitats; drinking water supplies; and public infrastructure. As such, assessment of the potential for a proposed development to cause peat landslides has been a requirement for all S36 wind farm applications on peat since 2007 and is generally considered good practice for all wind farms in peatlands.

Overview of guidance

Guidance in relation to ***peat instability*** or ***peat landslides*** was prepared by the Scottish Government (SG) in 2007 (Scottish Government, 2007) following a well-publicised peat landslide at a wind farm site in Derrybrien (Lindsay and Bragg, 2005) and multiple landslides in County Mayo (Dykes and Warburton, 2008) and Shetland (Mills et al, 2007), which all occurred in 2003. The guidance was prepared to help developers account for ground instability risks in peatlands in recognition that construction activities and modification to drainage might have the potential to lower stability and cause future landslide events. The guidance is detailed in 'Peat Landslide Hazard and Risk Assessments: A Best Practice Guide' (Scottish Government, 2007) and requires developers to undertake a peat landslide hazard and risk assessment (PLHRA), generally reported as an Appendix to the Geology chapters of the EIA. SG appoint a designated checker to review the submitted reports against the guidance and ensure the assessments are robust and that the proposed mitigation measures reflect landslide site conditions. The guidance was revised in 2017 following 10 years of application (Scottish Government, 2017).

While peat landslides have been reported in association with wind farms, this has typically been in Ireland and Northern Ireland rather than in Scotland, where both natural and human induced peat landslide events have very rarely been reported.

What is required?

A PLHRA requires that a developer determines the risks associated with construction induced peat landslides. In risk approaches, risk is a product of the likelihood of an event (the peat landslide) and the consequences should it occur (e.g. habitat loss, pollution of watercourses).

The likelihood of a peat landslide can be estimated using a variety of judgement-based and analytical approaches that describe variations in ground conditions (e.g. peat depth, slope angle, drainage) across a site. This likelihood can be calculated for pre-development conditions (natural, or the baseline) and for post-construction ground conditions where the effects of built infrastructure are included in the calculations.

The consequences vary depending on the receptors exposed to landsliding. Damage to high-value receptors, such as designated watercourses, would typically be regarded as of higher consequence than damage to low value set-aside agricultural land. The output of a PLHRA would typically show which parts of a site have the highest natural (baseline) likelihood of a peat landslide and which parts of a proposed layout overlap with these and the associated calculated risk. Where the risks are low, general good practice and construction control measures may be sufficient to maintain or further reduce low risks. Where risks are medium or high, there may be a need to micro-site infrastructure to reduce risk or to specify more stringent controls to prevent landslide occurrence.

What do stakeholders look for in a PLHRA?

ECU's designated checkers are the designated reviewers of PLHRAs submitted under the guidance, and they produce a detailed checking report in response. These reports clearly document any shortcomings and provide outline advice on requirements to address them. Where a checking report recommends resubmission, the PLHRA is generally considered an insufficient assessment (equivalent to an objection in other EIA topics, though this is not ECU's role). Where a checking report requires minor revisions or clarification, this is equivalent to a holding objection. Where a checking report indicates a PLHRA to be satisfactory, this is equivalent to no objection.

Other related topics

Previous sections have considered the primary peatland topics of peat soil, embedded carbon, peat habitats and peat stability. However, other aspects of EIA are also relevant to peatland function. These include hydrology, ***groundwater dependent terrestrial ecosystems*** (GWDTEs) and wider ecology (e.g. avian, aquatic and invertebrate).

Good hydrological function is key for blanket bogs to remain wet and encourage the formation or retention of habitats associated with active bogs and peat accumulation. Management of ***bog hydrology*** is typically (but not exclusively) considered within the geology, hydrology and hydrogeology chapters of EIA reports and their associated appendices, and so can fall outside the scope of PMPs, PLHRAs and EcIA. Management may include minimising water table drawdown through construction techniques, maintaining drainage pathways across infrastructure and avoiding pollution of natural drainage networks by ingress of sediments generated during construction activities. In some cases, maintenance of natural drainage pathways, such as peat gullies or flushes, may be dealt with through construction design by enabling cross-drainage under tracks in the form of culverts or porous fill.

The potential for GWDTE may be considered as part of habitat surveys undertaken for EcIA, but management of water flows and water chemistry to minimise or prevent impacts is also typically (but not exclusively) reported in geology, hydrology and hydrogeology chapters of EIA reports. The distinction between surface water dependent and groundwater dependent ecosystems is important to ensure GWDTEs are correctly identified, and that water management is effectively targeted.

Wider ecological communities may also be affected by construction induced changes in habitats and water tables, with specialist species having very particular habitat requirements. It is outside the scope of this brief document to consider this further other than to note that minimising impacts on habitat or improving habitat (where possible) should be considered the primary objective with regard to these receptors.

An additional consideration is that of net benefits for biodiversity. There is an expectation in recent guidance (e.g. CIEEM, 2019) that proposed developments should not be solely focussed on avoiding and minimising impacts, but also towards delivering net benefits through biodiversity enhancement measures. The existing NatureScot and SEPA guidance does not articulate this consideration. By way of example, if a proposed development is predicted to result in the loss of 10ha of degraded blanket bog, but will restore 100ha of degraded blanket bog, how should that influence statutory consultee deliberations and the consenting process?

9 Conclusions

Conclusions: working together to address the climate emergency

It is clear from the amount of guidance that has been generated with respect to peat and from stakeholder responses to submitted EIA reports that Scotland's peatlands are afforded a high value. This is well understood by the wind industry. It is also a matter of fact that much of the UK's onshore wind resource is focused in the uplands, particularly in the Scottish uplands. As a consequence it is inevitable that applications will continue to be submitted in peatland areas if Scottish Government climate change targets are to be met.

Safeguards to the integrity of peatlands have been put in place by the development of guidance, and this guidance is presumably intended to enable developers to responsibly develop sites with peat cover and peatland habitats. However, what is also clear from the preceding text is that the approach to consultation varies considerably from one topic to another, ranging from detailed reports responding to submissions (e.g. for PLHRA), to letter responses (PMP and EcIA) and sometimes to no response at all (CBA).

Further, the growing body of industry experience is that there are often pronounced inconsistencies in the approach to consultation from one part of Scotland to another, with detailed objections for some sites and almost no commentary accompanying objections/consultation responses for others. There is a perception that a consultation outcome may be 'luck of the draw' based on the specific case officer or authority responding to part of an EIA submission, rather than the result of a systematic, objective and transparent process.

The ideal from the industry's perspective would be robust narrative to accompany any objection to an EIA topic, and a narrative that is consistent across Scotland and in line with well-defined stakeholder/regulator positions on key topics. Given the Climate Emergency, and the key role that renewable energy will play in combating it, it is neither responsible nor acceptable to require the renewable energy industry to guess where development may take place in Scotland's peat uplands.

Further, there is a strong case for a coming together of industry and stakeholders to explore how renewable energy can coexist with and enhance Scottish Biodiversity. This could include the extension of restoration proposals attached to wind farms to areas outside application boundaries where permissible; incentivisation of forest-to-bog restoration where turbines are proposed within coniferous monocultures (typically afforded a CPP Class 5 category in areas that may formerly have been considered Class 1 or 2), and cross-sector research into ensuring the best outcomes for peatland habitats that have accommodated development. The authors would encourage a more collaborative approach to development in keeping with the requirement for both renewable energy and protection and enhancement of peatlands to combat the Climate Emergency.

10 Glossary of terms and references

The terms generally appear as ***bold and italicised*** in their first instance in the text.

Acrotelm: the upper, less decomposed layer of peat within which the water table seasonally varies, which displays active root growth and through which a majority of water movement in a peatland occurs.

Active peatlands (or bog): areas where peat is currently forming and accumulating (Ramsar Convention, 1971).

Blanket bog: one of four peat-forming habitats considered to be a peatland, found across many of Scotland's uplands and occupying up to 23% of Scotland's land surface.

[Soil] **Carbon**: solid terrestrial organic matter and inorganic carbon stored within a soil.

Carbon and Peatland 2016 Map: a publicly available map (the '2016 CPP map') showing the predicted distribution of carbon and peatland classes across Scotland (SNH, 2016a)

Carbon Balance Assessment (CBA): an assessment used in EIA to account for the costs and savings associated with construction and operation of a proposed wind farm.

Carbon balance: in the context of wind farms, a carbon balance refers to carbon neutral or 'net zero' carbon emissions when costs and savings from wind farms are taken into account. If a wind farm achieves payback (savings that achieve 'net zero') within its design life, then the scheme may be considered carbon positive, delivering a new environmental benefit.

Carbon calculator: an online tool developed by the Scottish Government to assess the carbon impact of wind farm developments by comparing the costs of development with the carbon savings attributable to the wind farm (Scottish Government, 2020d).

Carbon-rich soil: any soil with a surface organic layer (the O horizon as defined in the Scottish soil classification), including peaty soils and peat soil (SNH, 2016b).

Catotelm: the lower, more decomposed and permanently saturated layer of peat within which the majority of the soil carbon store is located.

Class 1: a 2016 CPP map class showing "Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas likely to be of high conservation value. Comprising 'peat soil' and 'peatland' vegetation" (SNH, 2016a).

Class 2: a 2016 CPP map class showing "Nationally important carbon-rich soils, deep peat and priority peatland habitat. Areas of potentially high conservation value and restoration potential. Comprising 'peat soil with occasional peaty soil' and 'peatland [vegetation] or areas with high potential to be restored to peatland" (SNH, 2016a).

Deep peat: a carbon-rich soil with a surface peat layer of greater than 0.5m thickness (in the context of the 2016 CPP map) or a peat layer of greater than 1m thickness (in the context of the Scotland Soil Classification).

Degradation: the deterioration in quality and function of a peatland through land management practices, construction activities or natural weathering and erosion.

Ecological Impact Assessment (EcIA): an assessment used in EIA to identify the importance, sensitivity and likelihood of significant effects on ecosystems exposed to wind farm construction.

Environmental Impact Assessment (EIA): an assessment of a project carried out under the EIA regulations (CIEEM, 2018).

Indirect impacts: secondary impacts of construction consequent of direct impacts, e.g. a lagged change from wetter to drier vegetation adjacent to infrastructure, the direct impact of which may be a drawdown in water tables.

Land-take: the physical loss or displacement or surface habitat directly caused by the construction of infrastructure in its place, measured in area (square metres or hectares).

National Interest: in this context, a subset of 'nationally important' carbon-rich soils, deep peat and priority peatland habitats in which the peatlands may satisfy the quality criteria for being a Site of Special Scientific Interest (as defined in published JNCC guidelines) (NatureScot, 2020c).

Nationally Important (carbon-rich soils, deep peat and priority peatland habitats): Classes 1 and 2 on the 2016 CPP map and nationally important mapped environmental interests in SPP Table 1.

NVC Communities: combinations or communities of usually two or more specific plant species defined by the frequency and abundance of the individual species (Rodwell, 2006).

Peat excavation: the removal of peat to facilitate construction of wind farm infrastructure, either permanently (e.g. for foundation bases) or temporarily (e.g. for temporary construction compounds).

Peat instability/landslides: large-scale mass movement of peat deposits, which typically occurs naturally under extreme weather conditions but has been observed to occur in association with construction and other land management practices.

Peat Landslide Hazard and Risk Assessment (PLHRA): an assessment used in EIA to account for the potential of wind farm construction activities to cause peat landslides.

Peat Management Plan (PMP): an assessment used in EIA to account for the appropriate excavation and reuse of peat displaced as a result of wind farm construction.

Peat reuse: the placement of excavated peat either at its point of origin or elsewhere, either in support of landscaping infrastructure (to visually tie it into the landscape) or for restoration.

Peat: dead and partially decomposed plant remains that have accumulated under waterlogged conditions (Ramsar Convention, 1971).

Peatland Condition Assessment (PCA): a technique for classifying areas of semi-natural and disturbed peatland to identify appropriate forms of conservation management.

Peatland: an ecosystem with a peat deposit that may currently support a vegetation that is peat-forming, may not, or may lack vegetation entirely (Ramsar Convention, 1971).

Phase 1 Habitat Surveys: a standard national habitat classification scheme of broad habitat types based on plant species presence and informed by some abiotic indicators such as apparent peat depth, soil type and agricultural practices.

Priority peatland habitat: blanket bog, lowland raised bog, lowland fens or uplands flushes, fens and swamps (part only) (SNH, 2016b).

Restoration: in the context of this document, the use of excavated peat to assist recovery of already degraded peatland. It may also refer to other restoration techniques that do not require excavated peat, e.g. ditch blocking and reprofiling, seeding of bare peat areas.

Scoping opinion: a report collated by a planning authority from responses to the scoping report for all consulted regulators/stakeholders, and an opportunity to ensure an applicant undertakes EIA at an appropriate level of detail and in alignment with good/best practice.

Scoping report: an opportunity for an applicant to identify potential environmental impacts of a proposed development to obtain advice from regulators/stakeholders on the suitability of a proposal and the assessments required to demonstrate whether it is suitable for a specific site.

Scottish Biodiversity List (SBL): is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland, under the Nature Conservation (Scotland) Act 2004. The SBL therefore supersedes the UK BAP list of species and habitats (CIEEM, 2017). Nevertheless, since the definitions of SBL habitats are largely based on UK BAP definitions, these are still referred to and were used to define the priority peatland habitats for the Carbon and Peatland map.

Severance/fragmentation: the compartmentalisation of a receptor, e.g. by construction of a track that bisects the resource, and generally judged to be negative where it impacts ecosystem function (e.g. drainage, migration).

Significant effects: an effect that either supports or undermines biodiversity conservation objectives for 'important ecological features' or for biodiversity in general, and an effect that should be given weight in judging whether to authorise a project (CIEEM, 2018).

SSSI: a formal conservation designation (Sites of Special Scientific Interest) describing areas of land or water that NatureScot consider best represent Scotland's natural heritage in terms of plants, animals, geology or geomorphology (or combinations of these) (NatureScot, 2020).

UKBAP: The UK BAP was the UK Government's 2004 response to the Convention on Biological Diversity, to which the UK was a signatory. Action plans for the most threatened species and habitats (called 'UK BAP species and habitats') were set out to aid recovery. Following the publication of the Convention on Biological Diversity's 'Strategic Plan for Biodiversity 2011-2020' (Convention on Biological Diversity, 2010), its commitment to 20 'Aichi targets', agreed at Nagoya Japan in October 2010, and the launch of the European Biodiversity Strategy in May 2011 the UK Government has changed its strategic thinking with regard to biodiversity conservation (which is also now a devolved matter in Scotland).

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