# Technical Appendix 4.1: Legislation, Planning Policy and Guidance

## Windburn Wind Farm


### Windburn Wind Farm Limited

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# 1.0 Introduction

This Technical Appendix provides a summary of specific relevant legislation, planning policy and guidance for each technical discipline considered in the Environmental Impact Assessment (EIA) Report, as follows:

- EIA;
- Landscape and Visual Amenity;
- Ecology;
- Ornithology;
- Hydrology, Hydrogeology, Geology and Soils;
- Cultural Heritage and Archaeology;
- Site Access, Traffic and Transport;
- Noise;
- Socio-economics and Land Use; and
- Other Environmental Issues.

The planning policy and legislation is covered in **Chapter 4: Renewable Energy and Planning Policy** of the EIA Report and is not repeated here.

# 2.0 EIA

## 2.1 Legislation

The relevant EIA legislation is set out in **Chapter 5: Environmental Impact Assessment** of the EIA Report and is not repeated here.

## 2.2 Guidance

This assessment is carried out in accordance with the principles contained within the following documents:

- Scottish Government Web Based Guidance Onshore wind turbines (First published in February 2011 and last updated in May 2014);
- Planning Advice Note (PAN) 1/2013 Environmental Impact Assessment (2013);
- Institute of Environmental Management and Assessment (2004) Guidelines for Environmental Impact Assessment;
- Planning Circular 1/2017: Environmental Impact Assessment regulations; and
- Scottish Natural Heritage (SNH) (2018) Environmental Impact Assessment Handbook: Guidance for Competent Authorities, Consultation bodies and others involved in the Environmental Impact Assessment Process in Scotland (5th Edition).

# 3.0 Landscape and Visual

## 3.1 Legislation

The landscape and visual assessment has been undertaken in accordance with the following legislation:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (hereafter referred to as 'the EIA Regulations');

## 3.2 Policy

The following planning policy documents that are of particular relevance to the Landscape and Visual Amenity Chapter are:

- Scottish Government, (2014). Scottish Planning Policy (SPP);
- Scottish Government, (2014). National Planning Framework 3 (NPF3);
- Scottish Government, (2017). Scottish Energy Strategy: The future of energy in Scotland;
- Scottish Government, (2023). National Planning Framework 4 (NPF4);
- Scottish Government, (2022). Onshore Wind Policy Statement 2022;
- Scottish Government, (2017). Scottish Energy Strategy: The future of energy in Scotland;
- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan Supplementary Guidance – Onshore Wind Energy;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2; and
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2 Supplementary Guidance – Draft Renewable and Low Carbon Energy.

## 3.3 Guidance

Other documents and guidance reviewed and applied in the landscape and visual assessment are outlined below (see also 'References' Section at the end of the Landscape Chapter):

- Landscape Institute and the Institute of Environmental Management and Assessment, (2013). Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3);
- Landscape Institute, (2019). Technical Guidance Note 06/19 Visual representation of development proposals;
- NatureScot, (2021). Assessing the cumulative landscape and visual impact of onshore wind energy developments;
- NatureScot, (2020). Assessing impacts on Wild Land Areas - technical guidance;

- SNH , (2018). A Handbook on Environmental Impact Assessment, Appendix 2: Landscape and Visual Impact Assessment, Version 5;
- SNH, (unpublished, 2018). Guidance for Assessing Effects on Special Qualities and Special Landscape Qualities. Working Draft 11;
- SNH, (2017). Visual Representation of Wind Farms, Version 2.2; and
- Landscape Institute, (2019). Technical Guidance Note 06/19 Visual representation of development proposals;
- SNH, (2017). Siting and Designing Wind Farms in the Landscape, Version 3;
- SNH, (2015). Spatial Planning for Onshore Wind Turbines – natural heritage considerations, Guidance;
- SNH, (2015). Good Practice During Windfarm Construction, Version 3;
- SNH, (2015) Constructed Tracks in the Scottish Uplands, 2nd Edition;
- SNH, (2009). Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage; and
- Scottish Government, (2003). Planning Advice Note (PAN) 68: Design Statements.

# 4.0 Ecology

## 4.1 Legislation

The ecological assessment has been undertaken with reference to the following legislation:

- The EC Habitats Directive (Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora);
- The Wildlife and Countryside Act 1981 (as amended in Scotland);
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Nature Conservation (Scotland) Act 2004;
- The Conservation (Natural Habitats, &c.) Regulations 1994 (the Habitats Regulations) (as amended in Scotland);
- The Protection of Badgers Act 1992 (as amended by the Nature Conservation (Scotland) Act 2004); and
- The Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003.

## 4.2 Policy

The following planning policy documents that are of particular relevance to the Ecology Chapter are:

- National Planning Framework (NPF4), February 2023, Scottish Government;

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;
- The Tayside Biodiversity Action Plan (2016 - 2026); and
- The Clackmannanshire Council Biodiversity Action Plan.

### 4.2.1 Other Relevant Policy

- Planning Advice Note (PAN) 60: Planning for Natural Heritage (Scottish Government, 2008) provides details on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and encourages developers and planning authorities to be positive and creative in addressing natural heritage issues.

## 4.3 Guidance

Other documents and guidance reviewed and applied in the ecological assessment are outlined below (see also 'References' Section at the end of the Ecology Chapter):

- The Scottish Biodiversity List (SBL) (Scottish Government, 2020) is a list of animals, plants and habitats that the Scottish ministers consider to be of principal importance for biodiversity conservation in Scotland. Both scientific and social criteria have been used to define the SBL. Scientific criteria include all Priority Species and Priority Habitats included in the now superseded UK Biodiversity Action Plan (BAP) (UK Biodiversity Partnership, 2007 et seq.), which occur in Scotland. Social criteria are based on the results of an omnibus survey of the Scottish public carried out in 2006, and includes some common species and habitats. The Ecology Chapter only considers those listed using scientific criteria;
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Chartered Institute of Ecology and Environmental Management (CIEEM) (CIEEM, 2018);
- Scottish Natural Heritage (SNH) general pre-application/scoping advice to developers of onshore wind farms (SNH, 2018);
- Bats and onshore wind turbines: survey, assessment and mitigation (SNH et al., 2019);
- Planning for development: What to consider and include in deer assessments and management at development sites. Version 2 (SNH, 2016a);
- Guidance on Assessing the Impacts of Development Proposals on Groundwater Abstractions and Groundwater Dependent Terrestrial Ecosystems (GWDTEs) (Scottish Environment Protection Agency (SEPA), 2017); and
- CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management,Winchester; and
- Good Practice during Wind Farm Construction (SNH, 2019).

# 5.0 Ornithology

## 5.1 Legislation

The ornithology assessment has been undertaken in line with the following European legislation:

- EU Directive 2009/147/EC on the Conservation of Wild Birds ('Birds Directive');
- EU Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) ('Habitats Directive'); and
- EU Environmental Impact Assessment Directive 2014/52/EU.

The following national legislation, which has been amended as a consequence of EU exit (Scottish Government, 2019; 2020), is also considered as part of the ornithology assessment:

- The Wildlife and Countryside Act 1981 (as amended);
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (The Habitats Regulations) which transposes the Habitats Directive into UK law;
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011; and
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended).

## 5.2 Policy

The following planning policy documents that are of particular relevance to the Ornithology Chapter are::

- National Planning Framework 4;
- UK Post-2010 Biodiversity Framework (2012);
- Scottish Government (2017). Planning Advice Note 1/2013- Environmental Impact Assessment, Revision 1.0;
- Scottish Biodiversity Strategy to 2045. Tackling the Nature Emergency in Scotland (2022); and
- Onshore Wind Policy Statement 2022;
- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;
- The Tayside Biodiversity Action Plan (2016 - 2026); and
- The Clackmannanshire Council Biodiversity Action Plan.

## 5.3 Guidance

The ornithological assessment is carried out in accordance with the principles contained within the following documents:

- CIEEM (2018). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine version 1.1*. Chartered Institute of Ecology and Environmental Management, Winchester;

- European Commission (2010). Natura 2000 Guidance Document *Wind Energy Developments and Natura 2000*'. European Commission, Brussels;
- Goodship, N.M. and Furness, R.W. (2022). Disturbance Distances Review: *An updated literature review of disturbance distances of selected bird species*. A report from MacArthur Green to NatureScot.
- NatureScot (formerly Scottish Natural Heritage, SNH) (2020). *General pre-application and scoping advice for onshore wind farms*. Guidance;
- NatureScot (2020). *The Effect of Aviation Obstruction Lighting on Birds at Wind Turbines, Communication Towers and Other Structures*. NatureScot Information Note;
- Pearce-Higgins, J.W. (2021). *Climate Change and the UK's Birds*. British Trust for Ornithology Report, Thetford, Norfolk;
- Scottish Government (2020) Scottish Biodiversity List. Available at: https://www.nature.scot/doc/scottish-biodiversity-list;
- SNH (2000). *Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action*. SNH Guidance Note;
- SNH (2009). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees;
- SNH (2016). *Assessing connectivity with Special Protection Areas (SPAs). Version 3*;
- SNH (2016). *Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees Version 2;*
- SNH (2017*). Recommended Bird Survey Methods to inform impact assessment of Onshore Windfarms;*
- SNH (2018). *Assessing significance of impacts from onshore windfarms on birds out with designated areas. Version 2*;
- SNH (2018). *Assessing the cumulative impacts of onshore wind farms on birds.* SNH Guidance Note;
- SNH (2018). *Environmental Impact Assessment Handbook – Version 5: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland*;
- SNH (2018). *Avoidance Rates for the onshore SNH Wind Farm Collision Risk Model*;
- Scottish Renewables (2019) Good Practice during Wind Farm Construction. Version 4;
- Scottish Executive Rural Affairs Department (2000). *Habitats and Birds Directives, Nature Conservation; Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ("the Habitats and Birds Directives"). Revised Guidance Updating Scottish Office Circular No 6/1995*; and
- Stanbury, A., Eaton, M., Aebischer, N., Balmer, D., Brown, A., Douse, A., Lindley, P., McCulloch, N., Noble, D., and

Win, I. (2021). Birds of Conservation Concern 5: The population status of birds in the UK, Channel Islands and Isle of Man and second ICUN Red List assessment of extinction risk for Great Britain. *British Birds* 114: 723-747.

# 6.0 Hydrology, Hydrogeology, and Geology

## 6.1 Legislation

This assessment is carried out in accordance with the principles contained within the following legislation:

- EC Water Framework Directive (2000/60/EC);
- EU Drinking Water Directive (98/83/EC);
- The Environment Act 1995;
- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations, 2017;
- Environmental Protection Act 1990;
- Surface Waters (Fishlife) (Classification) (Scotland) Amendment Regulations 2003;
- The Flood Risk Management (Scotland) Act 2009;
- Water Environment and Water Services (WEWS) (Scotland) Act 2003 (WEWS Act);
- The Water Supply (Water Quality) (Scotland) Regulations, 2001;
- The Water Environment (Controlled Activities) (Scotland) Amendment Regulations, 2013 (Controlled Activities Regulations (CAR));

- Water Environment and Water Services (WEWS) (Scotland) Act 2003 (WEWS Act);
- Private Water Supplies (Scotland) Regulations 2006;
- The Public Water Supplies (Scotland) Regulations 2014; and
- The Water Intended for Human Consumption (Private Supplies) (Scotland) Regulations 2017.

## 6.2 Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

National Planning Framework 4 (NPF4) adopted by the Scottish Government on 13 February 2023 provides planning guidance and polices regarding sustainable development, tackling climate change and achieving net zero. Policy's relevant to the Hydrology, Hydrogeology and Geology Chapter include:

- Policy 2 (Climate Mitigation and Adaptation);
- Policy 5 (Soils);
- Policy 20 (Blue and Green Infrastructure); and
- Policy 22 (Flood Risk and Water Management).

## 6.3 Guidance

Other documents and guidance reviewed and applied in the Hydrology, Hydrogeology and Geology assessment are outlined below (see also 'References' Section at the end of the Hydrology, Hydrogeology and Geology Chapter):

### 6.3.1 Planning Advice Notes (PANs), published by the Scottish Government, including;

- PAN 50 Controlling the Environmental Effects of Surface Mineral Workings;
- PAN 61 Planning and Sustainable Urban Drainage Systems; and
- PAN 69 Planning and Building Standards Advice on Flooding.

### 6.3.2 SEPA Pollution Prevention Guidance Note (PPG) and Guidance for Pollution Prevention (GPP)

- GPP01 Understanding your environmental responsibilities – good environmental practices;
- GPP02 Above Ground Oil Storage Tanks;
- GPP03 Use and Design of Oil Separators in Surface Water Drainage Systems;
- GPP05 Works and Maintenance in or near Water;
- PPG06 Working at Construction and Demolition Sites;

- PPG07 Safe Storage – The Safe Operation of Refuelling Facilities;
- GPP08 Safe Storage and Disposal of Used Oils;
- GPP13 Vehicle Washing and Cleaning;
- GPP21 Pollution Incident Response Planning; and
- GPP22 Dealing with Spills.

### 6.3.3 Construction Industry Research and Information Association (CIRIA) Publications

- C532 Control of Water Pollution From Construction Sites (2001);
- C648 Control of Water Pollution from Linear Construction Projects – Technical Guidance (2006);
- C741 Environmental Good Practice on Site (2015);
- C753 The Sustainable Urban Drainage Systems (SUDS) Manual (2015); and
- Ground Engineering Spoil: Good Management Practice R179 (1997).

### 6.3.4 SEPA Publications

- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – River Crossings;
- SEPA, 2010, Engineering in the Water Environment: Good Practice Guide – Sediment Management;
- SEPA, 2017, Guidance: Development on Peat and Off-site Uses of Waste Peat;
- Groundwater Protection Policy for Scotland, Version 3 (2009);
- SEPA, 2017, Land Use Planning System Guidance Note 4, Version 9;
- SEPA, 2018, Land Use Planning System SEPA Guidance Note 2a, Version 2;
- SEPA, 2015, Land Use Planning System SEPA Guidance Note 2e, Version 1;
- SEPA, 2017, Land Use Planning System SEPA Guidance Note 31, Version 3;
- SEPA, 2015, Position Statement – Culverting of Watercourses, Version 2.0;
- SEPA, 2010, Regulatory Position Statement – Developments on Peat;
- Guidance on Assessing the Impacts of Development on Groundwater Abstractions, 2024; and
- Guidance on Assessing the Impacts of Development on Groundwater Dependent Terrestrial Ecosystems, 2024.

### 6.3.5 Other Guidance

- Constructed Tracks in Scottish Uplands 2nd Edition. Scottish Natural Heritage (now NatureScot), 2013 ;

- Proposed Electricity Generation Developments: Peat Landslide Hazard Best Practice Guide. Scottish Government, 2017;
- Guidance on Development on Peatland - Peatland Survey. Scottish Government, 2017; and
- Good Practice during Windfarm Construction. A joint publication by Scottish Renewables, Scottish Natural Heritage (now NatureScot), Scottish Environment Protection Agency, Forestry Commission Scotland and Historic Environment Scotland, 2024.

# 7.0 Cultural Heritage and Archaeology

## 7.1 Legislation

The principal relevant legislation comprises:

- The Ancient Monuments and Archaeological Areas Act 1979;
- Scottish Statutory Instrument No. 101 The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997; and
- The Historic Environment (Amendment) (Scotland) Act 2011.

## 7.2 National Policy

The Scottish Government and Historic Environment Scotland (HES) have issued several statements of policy with respect to dealing with the historic environment in the planning system:

- National Planning Framework 4;
- Onshore Wind Turbines: Planning Advice (2014);
- Historic Environment Circular 1 May 2016;
- Our Past, Our Future (2023);
- Historic Environment Policy for Scotland (HEPS) May 2019; and

- Planning Advice Note 2/2011: Planning and archaeology.

## 7.3 Local Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

## 7.4 Guidance

Four relevant pieces of guidance have been published by HES, by HES in conjunction with NatureScot, and by the professional archaeological body the Chartered Institute for Archaeologists. These publications are:

- Historic Environment Scotland guidance on Managing Change in the Historic Environment: Setting 2020;
- A Guide to Climate Change Impact: On Scotland's Historic Environment (2019);
- Chartered Institute for Archaeologists Standard and Guidance for Historic Environment Desk Based Assessment 2014; and
- Scottish National Heritage (SNH) and Historic Environment Scotland Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment Process in Scotland 2019.

# 8.0 Noise

## 8.1 Legislation

In the UK, noise and vibration and nuisance are controlled using:

- the Environmental Protection Act 1990 (EPA); and
- the Control of Pollution Act 1974 (CoPA).

## 8.2 National Policy

### 8.2.1 National Planning Framework (NPF) 4

NPF4 (Scottish Government, 2023) sets out the national spatial strategy for Scotland which reflect Scottish Ministers' priorities for operation of the planning system and for the development and use of land with the objective of playing a key role in delivering on the United Nations Sustainable Development Goals. It states, in the Energy section that local development plans should seek to realise their area's full potential for electricity from renewable, low carbon and zero emission sources. Policy 11 supports development proposals for all forms of renewable energy, including wind farms. It further states in Policy 11 that any such development will require project design and mitigation to demonstrate how impacts such as residential amenity have been addressed.

### 8.2.2 Planning Advice Note (PAN) 1/2011

PAN 1/2011, 'Planning and Noise' (Scottish Government, 2011) states that there are two sources of noise from wind turbines, the mechanical noise from the turbines and the aerodynamic noise from

the blades. The document states that *"good acoustical design and siting of turbines is essential to minimise the potential to generate noise".*

The document (at paragraph 29) refers to web-based Scottish Government planning advice on renewable technologies for onshore wind turbines; however, no other guidance or reference to wind turbine noise is made within PAN 1/2011.

### 8.2.3 Onshore Wind Turbines Scottish Government Planning Advice

The web-based Scottish Government planning advice for onshore wind turbines (last updated 28 May 2014) also refers to the two sources of noise generated by wind turbines (as per PAN 1/2011) and states:

*"The Report, 'The Assessment and Rating of Noise from Wind Turbines' (Final Report, Sept 1996, DTI) (ETSU-R-97) describes a framework for the measurement of wind farm noise, which should be followed by applicants and consultees, and used by planning authorities to assess and rate noise from wind energy developments, until such time as an update is available. This gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable burden on wind farm developers, and suggest appropriate noise conditions".*

The web-based guidance also refers to the Institute of Acoustics (IOA) 'Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' (hereafter referred to as the IOA GPG), stating that *"the Scottish Government accepts that the guide represents current industry good practice"*.

## 8.3 Local policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

## 8.4 Guidance

### 8.4.1 Construction Noise Guidance

#### 8.4.1.1 BS5228-1:2009+A1:2014

BS5228-1:2009+A1:2014 sets out a methodology for predicting noise levels arising from a wide variety of construction activities and it contains tables of sound power levels generated by mobile and fixed plant.

Annex E of BS5228-1:2009+A1:2014 gives several examples of acceptable limits for construction noise, the most simplistic being based upon the exceedance of fixed noise limits. In this respect, Section E.2 of the standard states: *"Noise from construction sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut".*

The assessment of construction noise associated with the proposed development is based on the following fixed limit from BS5228-1:2009+A1:2014, which is applicable for rural areas away from main road traffic and industrial noise and outside living rooms during the daytime period:

- Noise levels, between 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary, should not exceed 70dB(A).

### 8.4.2 Construction Traffic Noise Guidance

#### 8.4.2.1 Design Manual for Roads and Bridges

Noise generated by construction traffic is assessed following the guidance within Part 7 of DMRB. DMRB states that *"a change in noise level of 1dB is equivalent to a 25% increase or 20% decrease in traffic flows, assuming all other factors remain unchanged".*

DMRB also provides advice on the magnitude of effects associated with increases in total traffic flows and associated noise levels. Paragraph 3.37 of DMRB states that *"a change in road traffic of 1dB LA10,18h in the short term (e.g. when a project is opened) is the smallest that is considered perceptible".*

### 8.4.3 Operational and Cumulative Noise Guidance

#### 8.4.3.1 ETSU-R-97

ETSU-R-97 sets out the findings of the Working Group on Noise from Wind Turbines, which was set up in 1993 by the (former) Department of Trade and Industry (DTI) to consider the available methods of noise assessment for wind farms and to derive a method and criteria suitable for future assessments.

ETSU-R-97 recommends that acceptability of wind farm noise should be assessed relative to existing background noise levels, so that both the outdoor amenity and the sleep of local residents are protected. It suggests that noise from wind turbines should be limited to 5dB above the background noise (LA90) at all times. It does however also suggest absolute lower fixed limits of between 35 and 40dB LA90 for daytime (07.00 – 23.00) and 43dB LA90 for night-time (23.00 – 07.00). The absolute lower night-time fixed limit of 43dB LA90 is derived from the sleep disturbance criteria referred to in (the now superseded) PPG 24 (Department for Communities and Local Government, 1994), with an allowance of 10dB for attenuation through an open window and a 2dB correction to convert an LAeq value to LA90.

An increased noise limit of 45dB LA90 (or background noise plus 5dB) is suggested for both daytime and night-time periods for properties where the occupier has financial involvement in the wind farm.

The limits are derived by plotting a best fit line through a graph of the measured background noise levels and the corresponding average wind speeds. The ETSU-R-97 limits are then defined as 5dB above the average background noise level at each wind speed (as defined by the best fit line), or the absolute lower fixed limit, whichever is the highest.

An additional 'simplified' assessment is also presented within ETSU-R-97 (page 66), whereby if an appropriate fixed noise limit can be achieved regardless of the wind speed, then this is considered sufficient for the protection of residential amenity without the measurement of background noise levels. In this regard, ETSU-R-97 states the following:

*"If the developer can demonstrate that noise conditions would be met even if there was no increase in background noise with speed until quite high wind speeds, then a simplified approach can be adopted. We are of the opinion that if the noise is limited to an*

*LA90,10min of 35dB up to wind speeds of 10m/s at 10 height, then this condition alone would offer sufficient protection of amenity and background noise surveys would be unnecessary. We feel that, even in sheltered areas when the wind speed exceeds 10m/s on the wind farm site, some additional background noise will be generated which will increase background noise levels at the property."*

All noise limits in ETSU-R-97 are expressed in terms of a 10-minute LA90 noise level. This approach has been adopted to avoid extraneous transitory events unduly affecting the noise generated by wind farms when attempting to measure their noise emission level.

#### 8.4.3.2 Institute of Acoustics Good Practice Guide to ETSU-R-97

The Scottish Government has formally endorsed the IOA GPG and the current (web-based) Scottish planning advice recommends that it is used for the assessment of wind turbine noise.

The IOA GPG does not replace the limits within ETSU-R-97, but it does provide good practice guidance on the use of the ETSU document in relation to background noise surveys and on the prediction of wind turbine noise. This is on the proviso that the appropriate input parameters and correction factors are used for the prediction of wind turbine noise, as follows:

- Downwind propagation;
- A receptor height of 4m;
- Atmospheric conditions of 10°C and 70% humidity;
- A ground absorption factor of G = 0.5; and
- Turbine noise emission levels which include a margin for uncertainty.

#### 8.4.3.3 ISO 9613-2:1996 Prediction Method

The noise generated by the operation of a wind farm is predicted in accordance with ISO 9613-2:1996 (International Organisation for Standardisation, 1996), as recommended by the IOA GPG and as shown below:

**Predicted Octave Band Noise Level = Lw – Ageo – Aatm – Agr – Abar - Amisc**

*(Where Lw is the octave band Sound Power Level (SWL) in decibels (dB) and A represents the various attenuation factors, also in dB)*

The attenuation factors indicated in the above formula are detailed as follows:

**Ageo** is the attenuation due to geometric divergence. This is the reduction in noise levels caused by the spherical spreading of the noise over distance from the point source. The attenuation factor, therefore, increases as the distance from the noise source increases.

**Aatm** is the absorption of the noise by the atmosphere as sound energy is converted to heat. The level of absorption varies depending on the distance from the source and the atmospheric conditions (temperature and humidity). ISO 9613-1:1993 (International Organisation for Standardisation, 1993) provides appropriate air attenuation factors for differing atmospheric

conditions. In line with the IOA GPG, atmospheric conditions of 10°C and 70% humidity are used within the propagation model *"to represent a reasonably low level of air absorption"*.

**Agr** is the ground factor and represents the reduction in noise levels due to the absorption of sound energy by ground cover. The level of reduction will vary significantly depending on the absorptive qualities of the ground cover. ISO 9613-1:1993 provides advice on appropriate attenuation factors based on a range of cover from hard ground (G = 0) to soft absorbent ground (G = 1). A ground factor of 0.5 is assumed in the predictions of operational wind turbine noise. This is in accordance with the IOA GPG (paragraph 4.3.4), which recommends that a ground factor of 0.5 is used for turbines with warranted Sound Power Levels (SWLs) or with emission levels which include a margin for uncertainty.

**Abar** relates to the attenuation due to the screening and reflection effects provided by obstacles between the source and receiver. The level of attenuation will vary depending on the degree by which the line of sight between source and receiver is affected and the frequency considered. In relation to wind farms, local topography would provide the largest influence on barrier effects; however, within the operational noise model, attenuation attributable to local topography is not included.

The predicted (LAeq) noise levels for all turbines are totalled to provide an overall A-weighted noise level. A further correction of 2dB is subtracted to convert the LAeq level to the LA90 as required for the ETSU-R-97 assessment. This is reiterated in the IOA GPG (at paragraph 4.25) which states:

*"To obtain the LA90 parameter required by ETSU-R-97, it is necessary to apply a correction to the prediction results. Based on recent research, the assumption described in ETSU-R-97 in this regard continues to remain valid. A correction of -2dB is commonly applied."*

#### 8.4.3.4 Institute for Environmental Management and Assessment (IEMA) Guidelines

The noise assessment has also been undertaken with reference to the 'Guidelines for Environmental Noise Impact Assessment' (2014), produced by IEMA.

# 9.0 Traffic and Transport

## 9.1 Legislation

- Road Vehicles (Authorisation of Special Types) (General) Order 2003; and
- The Roads (Scotland) Act 1984.

## 9.2 Policy

### 9.2.1 National Planning Framework (NPF4)

The National Planning Framework (NPF) is a long-term plan for Scotland that sets out where development and infrastructure is needed in the country. NPF4 sets out the Government's plan looking forward to 2045 that will guide spatial development, set out national planning policies, designate national developments and highlight regional spatial priorities. It is part of the development plan, and so influences planning decisions across Scotland.

Policy 11: Energy within the RDNPF4 notes that:

"Development proposals for all forms of renewable, low-carbon and zero emissions technologies will be supported. These include:

- wind farms including repowering, extending, expanding and extending the life of existing wind farms;
- energy storage, such as battery storage and pumped storage hydro.
- In addition, project design and mitigation will demonstrate how the following impacts are addressed:
- impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;
- public access, including impact on long distance walking and cycling routes and scenic routes;
- impacts on road traffic and on adjacent trunk roads, including during construction; and
- cumulative impacts.

NPF4 puts the climate and nature crises at the heart of the Scottish planning system and was adopted in February 2023.

### 9.2.2 Planning Advice Note (PAN) 75 – Planning for Transport

PAN 75 notes that:

Planning Advice Note (PAN) 75: Planning for Transport provides advice on the requirements for Transport Assessments. The document notes that:

"… transport assessment to be produced for significant travel generating developments. Transport Assessment is a tool that enables delivery of policy aiming to integrate transport and land use planning."

All planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail will be proportionate to the complexity and scale of the impact of the proposal...For smaller developments the information on transport implications will enable local authorities to monitor potential cumulative impact and for larger developments it will form part of a scoping exercise for a full

transport assessment. Development applications will therefore be assessed by relevant parties at levels of detail corresponding to their potential impact."

### 9.2.3 Local Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

## 9.3 Guidance

### 9.3.1 Transport Assessment Guidance (2012)

Transport Scotland's (TS) Transport Assessment Guidance was published in 2012. It aims to assist in the preparation of Transport Assessments (TA) for development proposals in Scotland such that the likely transport impacts can be identified and dealt with as early as possible in the planning process. The document sets out requirements according to the scale of development being proposed.

The document notes that a TA will be required where a development is likely to have significant transport impacts but that the specific scope and contents of a TA will vary for developments, depending on location, scale and type of development.

### 9.3.2 Onshore Wind Turbines; Online Renewables Planning Advice (May 2014)

The most recent Scottish Government advice note regarding onshore wind turbines was published in 2014. The advice note identifies the typical planning considerations in determining applications for onshore wind turbines including landscape impact, impacts on wildlife and ecology, shadow flicker, noise, ice throw, aviation, road traffic impacts, cumulative impacts and decommissioning.

In terms of road traffic impacts, the guidance notes that in siting wind turbines close to major roads, pre-application discussions are advisable. This is important for the movement of abnormal indivisible loads during the construction period, ongoing planned maintenance and for the decommissioning phase.

# 10.0 Socio-Economics, Tourism, Recreation and Land Use

## 10.1 Policy

### 10.1.1 National Planning Framework 4

Policy 11: Energy, notes that "Development proposals will only be supported where they maximise net economic impact, including local and community socio-economic benefits such as employment, associated business and supply chain opportunities"; and project design and mitigation should demonstrate "public access, including impact on long distance walking and cycling routes and scenic routes".

### 10.1.2 Local Planning Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

## 10.2 Guidance

This assessment is carried out in accordance with the principles contained within the following documents:

- Scottish Natural Heritage (2018) Environmental Impact Assessment Handbook;
- Scottish Government (2019) Good Practice Principles for Community Benefits from Onshore Renewable Energy Developments;
- Scottish Government (2019) Good Practice Principles for Shared Ownership of Onshore Renewable Energy Developments;
- Scottish Government (2016) Draft Advice on Net Economic Benefit and Planning;
- SNH (2019) Good Practice During Wind Farm Construction; and
- Tourism Scotland 2020 and Key Facts on Tourism in Scotland 2019.

# 11.0 Aviation

## 11.1 Policy

### 11.1.1 National Planning Framework 4

Policy 11: Energy, notes that *"project design and mitigation will demonstrate how the following impacts are addressed: (iv) impacts on aviation and defence interests including seismological recording"*.

### 11.1.2 Local Planning Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
  - Policy SC14 - Renewable Energy
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;
  - Policy 33 – Renewable and Low Carbon Energy

## 11.2 Guidance

- CAA, CAP 393: Air Navigation Order 2016 and Regulations, March 2019;
- CAA, CAP 670: Air Traffic Services Safety Requirements, Part B, Section 4, June 2019;
- CAA, CAP 738: Safeguarding of Aerodromes, 2006;
- CAA, CAP 764: CAA Policy and Guidelines on Wind Turbines, February 2016;
- CAA, Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150m Above Ground Level, 2017; and
- NATS wind farm assessment criteria.

# 12.0 Other Environmental Issues

## 12.1 Policy

The following policy documents have been referred to in undertaking the assessments.

### 12.1.1 National Planning Framework (NPF4)

National Planning Framework 4 (2023), Policy 11, part e, states that:

*"project design and mitigation will demonstrate how the following impacts are addressed:*

i*. impacts on communities and individual dwellings, including, residential amenity, visual impact, noise and shadow flicker;"*

### 12.1.2 Local Planning Policy

Adopted Local Development Plans:

- Clackmannanshire Council, (2015). Clackmannanshire Local Development Plan;
- Perth and Kinross Council, (2019). Perth and Kinross Local Development Plan 2;

## 12.2 Guidance

### 12.2.1 Scottish Government Guidance

The Scottish Government's online information on onshore wind turbines, states that *"under certain conditions of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow on neighbouring properties. When the blades rotate, the shadow flicks on and off, the effect is known as "shadow flicker". It occurs only within buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site."*

The Scottish Government's advice states that where shadow flicker could be a problem, *"developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters) "shadow flicker" should not be a problem. However, there is scope to vary layout/reduce the height of turbines in extreme cases".*

### 12.2.2 Planning and Best Practice

Planning guidance in the UK requires developers to investigate the impact of shadow flicker. This guidance does not specify how to assess the impact, or how to assess the significance of the impact. In Scotland current guidance is available in the Scottish Government Specific Renewables Advice Sheet on *"Onshore Wind Turbines"* (last updated May 2014) which replaced Planning Advice Note (PAN) 45, which is now revoked.

Onshore Wind Turbines (2014), states that:

*"Under certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as "shadow flicker". It occurs only within buildings where the flicker appears through a*

*narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the potential site.*

*Where this could be a problem, developers should provide calculations to quantify the effect. In most cases however, where separation is provided between wind turbines and nearby dwellings (as a general rule 10 rotor diameters), "shadow flicker" should not be a problem. However, there is scope to vary layout / reduce the height of turbines in extreme cases"*.

In England, the National Planning Policy Framework (NPPF), Planning Practice Guidance identifies that: *"Only properties within 130 degrees either side of north, relative to the turbines can be affected at these latitudes in the UK – turbines do not cast long shadows on their southern side."*

Guidance from Northern Ireland in Best Practice Guidance to PPS18: Renewable Energy (Department for the Environment, 2009) states that:

*"At distance, the blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a very weak effect is observed at distance from the turbines.*

*Problems caused by shadow flicker are rare. At distances greater than 10 rotor diameters from a turbine, the potential for shadow flicker is very low. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. Where shadow flicker could be a problem, developers should provide calculations to quantify the effect and where appropriate take measures to prevent or ameliorate the potential effect, such as by turning off a particular turbine at certain times.*

*It is recommended that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year or 30 minutes per day".*

The above criteria are widely accepted in shadow flicker analysis for wind farms. Additionally, the 10 rotor diameter rule has been widely accepted across different European countries, and is deemed to be an appropriate assessment area, although there is potentially a need to take into consideration areas at different latitudes.

### 12.2.3 Scottish Government Onshore Wind Policy Statement (2002)

Onshore Wind Policy Statement (2022) contains no specific guidance on assessment methodology for shadow flicker.

### 12.2.4 Department of Energy & Climate Change Guidelines (2011)

A report on shadow flicker from the Department of Energy & Climate Change (DECC) indicates a general rule of ten rotor diameters should be used for separation distance from a wind turbine position to a dwelling.



# 13.0 References

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