RWE

Clachaig Glen Wind Farm

Environmental Impact Assessment Report

Volume 2a

Main Report

Chapter 16: Aviation Safeguarding

16. Aviation Safeguarding

16.1 Introduction

16.1.1 Wind turbines have the potential to affect civil and military aviation. This chapter explains the methodology used to undertake the aviation safeguarding assessment, lists the aviation references used and describes the aviation baseline condition, consultation results and mitigation measures to be applied if required.

16.1.2 The Aviation Chapter has been written by Cdr John Taylor RN (Ret) of Wind Power Aviation Consultants Ltd (WPAC). He has over 35 years' experience as an Air Traffic Controller, Fighter Controller and Aviation Regulator and was head of Air Traffic Control for the Royal Navy. His responsibilities included responding to wind farm consultations on and offshore. Since 2008 his company has provided advice on the interaction between wind turbines and aviation, including assessing over 3,000 wind turbine proposals and giving evidence at over 20 Inquiries and Appeals in England and Scotland. He has also advised a number of Local Authorities in England and Wales on this issue. His team at WPAC includes experts on radar propagation and modelling and low flying operations. For further information on technical competence, see Appendix 1.1: Technical Competence of Project Team (EIAR Volume 3).

16.2 Legislation, Policy and Guidance

16.2.1 There are a number of aviation publications relevant to the interaction of wind turbines and aviation containing guidance and legislation which cover the complete spectrum of aviation activity in the UK as shown below:

- Civil Aviation Publication (CAP) 764 Civil Aviation Authority (CAA) Policy and Guidance on Wind Turbines Version 6, Feb 2016 (CAA, 2016),
- CAP 168 Licensing of Aerodromes, Version 11 March 2019 (CAA, 2019),
- CAP 670 ATS Safety Requirements Version 3 June 2019 (CAA, 2019),
- CAP 774 UK Flight Information Services, Ed 3 May 2017 (CAA, 2017),
- CAP 738 Safeguarding of Aerodromes Version 2 Dec 2006 (CAA, 2006),
- CAP 793 Safe Operating Practices at Unlicensed Aerodromes Ed 1 July 2010 (CAA 2010),
- CAP 493 Manual of Air Traffic Services Part 1 Ed 7.0 2017 (CAA, 2017),
- CAP 393 The Air Navigation Order 2016 and Regulations (CAA, 2016),
- CAP 660 Parachuting Ed 5 March 2020 (CAA, 2020),
- Military Aviation Authority Regulatory Article 2330 (Low Flying) (MAA) (Ministry of Defence (MOD), 2019),
- UK Military Aeronautical Information Publication (MIL AIP) (MOD, 2020),

- UK Aeronautical Information Publications (AIP) (NATS, 2020a),
- CAA 1:250,000 and 1:500,000 VFR Charts (NATS, 2019, 2020b), and
- 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 (CAA, 2017).

16.3 Methodology

Scope and Study Area

16.3.1 The assessment of the effects of the Proposed Development will be based upon the guidance laid down in the CAA publication 'CAP 764 Policy and Guidelines on Wind Turbines Version 6' (2016), with the consultation criteria for aviation stakeholders defined in Chapter 4 of the publication. These distances inform the size of the study area and include:

- Airfield with a surveillance radar – 30km,
- Non radar licensed aerodrome with a runway of more than 1,100 metres – 17km,
- Non radar licensed aerodrome with a runway of less than 1,100 metres – 5km,
- Licensed aerodromes where the turbines would lie within airspace coincidental with any published Instrument Flight Procedure (IFP),
- Unlicensed aerodromes with runways of more than 800 metres – 4km,
- Unlicensed aerodromes with runways of less than 800 metres – 3km,
- Gliding sites – 10km, and
- Other aviation activity such as parachute sites and microlight sites within 3km – in such instances developers are referred to appropriate organisations.

16.3.2 CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all wind turbine developments will be approved or within which they will always be objected to. These ranges are intended as a prompt for further discussion between developers and aviation stakeholders which will be reported upon in this EIAR.

16.3.3 It is also necessary to take into account the aviation and air defence activities of the MOD, as safeguarded by the Defence Infrastructure Organisation (DIO). The types of issues that are addressed in this chapter include:

- MOD Airfields, both radar and non-radar equipped,
- MOD Air Defence Radars,
- MOD Meteorological Radars, and,
- Military Low Flying.

16.3.4 It is necessary to take into account the possible effects of wind turbines upon the National Air Traffic Services En Route Ltd (NERL) communications, navigation and surveillance systems, which are a network of primary and secondary radars and navigation facilities around the country.

16.3.5 As well as examining the technical impact of wind turbines on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in 'CAP 168 Licensing of Aerodromes' (CAA, 2019) to determine whether a proposed development will breach obstacle clearance criteria.

Approach to Assessment

16.3.6 The assessment of potential effects has been undertaken by identifying whether impacts on aviation and radar are anticipated.

16.3.7 The assessment does not determine significant or non-significant effects, but whether there is an effect or no effect. This chapter therefore does not follow the standard EIA methodology as set out in Chapter 2 of this EIAR: Approach to EIA.

16.3.8 The radar calculation results shown in this chapter have been produced using specialist propagation prediction software (Rview Version 5). Developed over a number of years, it has been designed and refined specifically for the task. RView uses a comprehensive systems database which incorporates the safeguarding criteria for a wide range of radar and radio navigation systems. RView models terrain using the Ordnance Survey (OS) Terrain 50 digital terrain model, which has a post spacing of 50 metres (m) and has a root mean square (RMS) error of 4m. The results are verified using the Shuttle Radar Topography Mission (SRTM) dataset, a separate smoothed digital terrain model with data spacing of 3 arc seconds. By using two separate and independently generated digital terrain models, anomalies are identified, and consistent results assured. Rview models the refractive effects of the atmosphere on radio waves and the First Fresnel Zone. A feature of RView is that as well as performing calculations in the manner believed to be most appropriate, it also allows comparison with results from simpler models. For example, RView can perform calculations using the true Earth Radius at the midpoint between the radar and the wind turbine, or the simplified 4/3 Earth Radius model. If needed, Rview is also capable of modelling a range of atmospheric refractive conditions. RView models the trajectory of radar signals at different elevations enabling modelling of both volume surveillance and pencil beam radars, as well as the effects of angular sterilisation as applied, for example, in Met Office radars.

Summary of Consultation

16.3.9 A number of relevant aviation stakeholders were consulted at the EIA Scoping stage for comment on the methodology outlined. The full results of the responses received in the EIA Scoping Opinion (October 2020) are attached as Appendix 5.2: EIA Scoping Opinion (EIAR Volume 3). However, once the site layout and turbine sizes were confirmed, the aviation stakeholders that were identified using the methodology defined in this section were re-consulted and Table 16-1 presents a summary of those responses.

Table 16-1 Summary of Consultation Responses in Relation to Aviation

Consultee	Summary Response	Comment / Action Taken
Glasgow Prestwick Airport (GPA)	GPA have yet to respond to the consultation request submitted on 24/06/21 however, at EIA Scoping stage they stated*: "GPA may require an assessment to be undertaken by the Developer of the proposed windfarm against our published Instrument Flight Procedures (IFPs) (both conventional and RNAV) – to satisfy ourselves that the turbine tip heights have no impact on our existing published IFPs."*	Potential effects on GPA assessed within this chapter
Highlands and Islands Airports Ltd (HIAL)	HIAL requested that an Instrument Flight Procedure (IFP) check be undertaken by a licensed IFP design company to confirm that no procedures would be affected.	A formal IFP check was instructed and undertaken by Cyrrus Ltd in relation to the previous site design. The check was updated and the information presented to HIAL on 08 July 2021 which demonstrated there would be no effect on the procedures. HIAL responded on 09 July 2021 stating they "*are content".*
MOD DIO	DIO responded under their reference 10036239 dated 16 July 2021 stating: "*I am writing to tell you that subject to the conditions detailed at Appendix A, the MOD has no objection to the proposed development*"	Appendix A refers to the requirement for an aviation lighting scheme for the Proposed Development, which has already been submitted and approved, and a requirement to inform the MOD of the site details prior to construction.
NERL	*The proposed development has been examined from a technical safeguarding aspect and does not conflict with our safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal*	No further action necessary

16.4 Baseline Environment

16.4.1 The Proposed Development is located in an area relatively remote from any significant aviation facilities, as shown in Figure 1.1: Site Boundary Plan (EIAR Volume 2b). It is located under unregulated airspace and is a significant distance from any large commercial airports or military aviation facilities. Each radar system identified in Section 16.3 will be explored in more detail below.

Radar Equipped Licensed Aerodromes

16.4.2 There are no civil licensed radar equipped aerodromes within 30km, the closest is Glasgow Prestwick Airport (GPA), 67km to the east.

Non-Radar Equipped Licensed Aerodromes

16.4.3 There are no non-radar equipped licensed aerodromes within 17km, however, the closest being is at Campbeltown, 20km to the south.

Unlicensed Aerodromes

16.4.4 There are no known unlicensed aerodromes within consultation distance. The closest facility of note is the private airstrip on Gigha, over 9km to the north west. There is no requirement to consult with the operator of Gigha airstrip.

16.4.5 An online search for private airfields has also been conducted and none are identified within consultation distance, however, not all private strips are listed in publications or marked on charts.

Ministry of Defence

16.4.6 ATC Radars - the closest MOD radar equipped airfield is at the dormant airfield at West Freugh, 90km to the south. The radar is used mainly for range control in Luce Bay and the approaches.

Air Defence Radar

16.4.7 The closest radar is at Benbecula, North Uist, over 250km to the north.

16.5 Assessment of Effects

Radar Equipped Licensed Aerodromes

16.5.1 Radar line of sight (RLOS) modelling has been undertaken against the GPA radar, with the results in Table 16-2. These results show that none of the turbines will be visible to the radar and consultation is not required.

Table 16-2 Radar Line of Sight (RLOS) Results Glasgow Prestwick Radar (metres above ground level)

Turbine	RLOS	Turbine	RLOS	Turbine	RLOS
T1	377.8	**T5**	360.6	**T10**	542.1
T2	331.1	**T6**	397.7	**T11**	543.1
T3	406.7	**T7**	413.4	**T13**	489.7
T4	459.7	**T8**	437.5	**T14**	573.8

16.5.2 At a distance of 63km and with the highest turbine tip height of 1507ft above mean sea level (AMSL), the site is well beyond any Instrument Flight Procedure safeguarding requirements and will have no effect on the published Terminal Arrival Area minimum altitudes, which in this location is 3900ft AMSL.

Non-Radar Equipped Licensed Aerodromes

16.5.3 **Campbeltown Airport** - An Instrument Flight Procedure (IFP) report was produced by Cyrrus Ltd, a CAA licensed procedure design company, and provided to HIAL on 21 September 2020 which confirmed that no procedures would be affected by the Proposed Development. The report was updated in July 2021 to take into account the finalised design and layout of the Proposed Development which also confirmed that no procedures would be affected. HIAL acknowledged receipt of the report stating they were content and with the report and they will have no objection to the Proposed Development.

Ministry of Defence

16.5.4 **West Freugh Airfield** - for completeness, radar modelling was undertaken which confirmed that the turbines will be screened by terrain. It is clear that there is no possibility of the Proposed Development affecting the West Freugh radar or any other MOD ATC radars. This was confirmed by the MOD DIO response of 16 July 2021 stating they had no objection to the Proposed Development.

Air Defence Radar

16.5.5 There are no affected air defence radars. Radar modelling has been undertaken which shows that the closest radar at Benbecula, North Uist, will not be affected as the turbines are all screened by terrain and earth curvature. This was also confirmed by the MOD response of "*no objection*".

NATS En Route Ltd (NERL)

16.5.6 The closest NERL radars are at Lowther Hill and Tiree. Radar modelling shows that the site is screened by terrain from Tiree and mainly screened by terrain from Lowther Hill. This is confirmed by NERL who were consulted about the Proposed Development and responded by email on 5 July 2021 under Reference SG20022 stating: "*The proposed development has been examined from a technical safeguarding aspect and does not conflict with our*

safeguarding criteria. Accordingly, NATS (En Route) Public Limited Company ("NERL") has no safeguarding objection to the proposal."

16.6 Mitigation and Monitoring

Aviation Lighting

16.6.1 There are no radar effects that require mitigation for this scheme and there are no physical safeguarding issues or effects on Instrument Flight Procedures. However, the Proposed Development will need to be illuminated with CAA and MOD compliant aviation lighting, in line with the specifications detailed in Appendix 16.1: WPAC Aviation Lighting and Mitigation Report (EIAR Volume 3). A detailed lighting assessment has been undertaken which assessed which turbines will need to be illuminated with the lighting layout shown in Table 16-3 below.

Table 16-3 Lighting Layout

Turbine No	Easting	Northing	Tip Height (m)	ANO Lights	MOD Lights
1	172042	643025	185	Yes	Yes
2	173055	642867	185	Yes	Yes
3	171741	642693	185		
4	171316	642438	185	Yes	Yes
5	172701	642602	185		
6	171789	642110	185		Yes
7	172417	642250	200	Yes	Yes
8	171178	642039	185		
10	170883	641708	200	Yes	Yes
11	171426	641475	200	Yes	
13	172149	641498	200	Yes	Yes
14	171113	641187	200	Yes	Yes

16.6.2 Full details of the lighting layout, mitigation options and calculations showing the luminous intensity that will be experienced by the human eye at selected viewpoints is contained within Appendix 16.1: WPAC Aviation Lighting and Mitigation Report (EIAR Volume 3).

16.7 Residual Effects

16.7.1 In an aviation context there are no residual effects except those associated with aviation lighting.

16.8 Cumulative Effects

16.8.1 With the exception of aviation lighting, which is addressed in Chapter 7: Landscape and Visual of this EIAR (Volume 2a), there are no cumulative effects associated with the Proposed Development.

16.9 Summary of Assessment

16.9.1 In aviation terms, the Proposed Development has no effects at all on any aviation stakeholders. The turbines will not be visible to any radars and all aviation stakeholders have responded stating they have no objections to the Proposed Development. Aviation lighting will be required and this issue is detailed in Appendix 16.1: WPAC Aviation Lighting and Mitigation Report (EIAR Volume 3).

16.10 References

- Civil Aviation Authority (2006) Civil Aviation Publication 738 Safeguarding of Aerodromes Version 2.
- Civil Aviation Authority (2010) Civil Aviation Publication 793 Safe Operating Practices at Unlicensed Aerodromes Ed 1.
- Civil Aviation Authority (2016) Civil Aviation Publication 764 Policy and Guidance on Wind Turbines Version 6.
- Civil Aviation Authority (2016) Civil Aviation Publication The Air Navigation Order 2016 and Regulations.
- Civil Aviation Authority (2017) 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.
- Civil Aviation Authority (2017) Civil Aviation Publication 774 UK Flight Information Services, Ed. 3.
- Civil Aviation Authority (2017) Civil Aviation Publication 493 Manual of Air Traffic Services Part 1 Ed. 7.0.
- Civil Aviation Authority (2019) Civil Aviation Publication 168 Licensing of Aerodromes Version 11.
- Civil Aviation Authority (2019) Civil Aviation Publication 670 ATS Safety Requirements Version 3.
- Civil Aviation Authority (2020) Civil Aviation Publication 660 Parachuting Ed. 5.
- Military Aviation Authority (Ministry of Defence) (2019) Regulatory Article 2330 (Low Flying).
- Ministry of Defence (2020) UK Military Aeronautical Information Publication (MIL AIP).
- National Air Traffic Services Ltd (2019) CAA 1:250,000 VFR Charts.

- National Air Traffic Services Ltd (2020a) UK Aeronautical Information Publications (AIP).
- National Air Traffic Services Ltd (2020b) CAA 1:500,000 VFR Charts.

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