Chapter 14 Aviation

Contents

14.1. Executive Summary 1
14.2. Introduction 1
14.3. Legislation, Policy and Guidelines 2
14.4. Consultation 4
14.5. Assessment Methods and Significance Criteria 6
14.6. Baseline Conditions 7
14.7. Potential Effects 7
14.8. Mitigation 7
14.9. Residual and Cumulative Effects 8
14.10. Summary 8

List of Abbreviations

Abbreviation	Description
MOD	Ministry of Defence
NATS	National Air Traffic Services
CAA	Civil Aviation Authority
ANO	Air Navigation Order
CAP	Civil Aviation Publication (UK CAA)
ICAO	The International Civil Aviation Organization
AGL	Above Ground Level
TMZ	Transponder Mandatory Zone
ATS	Air Traffic Service

14. Aviation

14.1. Executive Summary

14.1.1. The Proposed Development is remote from all aerodromes. The nearest significant aerodrome is Inverness Airport over 63km to the north-east.

14.1.2. No aviation impacts are anticipated for all phases of the Proposed Development; commissioning, operation and decommissioning.

14.1.3. The Aviation Stakeholders consulted as part of the EIA Report were National Air Traffic Services (NATS), Highlands and Islands Airport Limited (HIAL) and the Civil Aviation Authority (CAA). No concerns were raised during the scoping submission or within further consultations. The Applicant has also independently assessed the potential effects, with no anticipated aviation impacts.

14.1.4. The site is beyond the limits of physical safeguarding surfaces for all aerodromes. There are also no potential impacts to key military or civil radar installations. The site lies within an area identified as of low priority for military low flying and is beyond the limits of safeguarding areas for any navigational aids or radio communication stations.

14.1.5. The CAA and all other aviation stakeholders have approved a lighting scheme consisting of visible spectrum and Infra-red lighting.

14.2. Introduction

14.2.1. This chapter considers the potential effects of the Proposed Development on existing and planned military and civil aviation activities, including those resulting from impacts to radar. Other potential effects can result from the physical presence of the turbines as obstacles, and effects on navigational aids and radio communication stations.

14.2.2. Radio waves are used in a variety of surveillance and communication systems within aviation, and any large structure has the potential to interfere with their broadcast and reception. The potential of a structure to affect the propagation of radio waves is principally dependent upon the size, shape and materials of construction. The blade rotation can cause turbines to show up on radar, which are specifically designed to detect movement. Whilst turbines can impact radar, whether or not this generates significant operational effects depends upon both the use of the radar and of the airspace above the Proposed Development.

14.2.3. The potential effects are highly dependent on the location of the wind farm and on the positions of the individual turbines. In some cases, there are no significant consequences and no mitigation is required, whilst in other cases the turbine specification or layout must be designed to accommodate local infrastructure. Mitigation is often available and appropriate to manage impacts.

14.2.4. There are no significant aviation impacts during the construction or decommissioning phases of the Proposed Development. This is because the turbines are viewed as temporary obstacles, for which processes are in place to advise airspace users. There are no radar impacts when the rotors are not turning. The usual visible lighting of the cranes and notification of their use, as tall structures will be necessary. The primary consideration in terms of impacts and any requirement for mitigation, arises from the operational phase of the development. The remainder of this chapter addresses only the operational phase.

14.2.5. This Chapter has been prepared by Ian Fletcher, B.Eng, of Wind Business Support Ltd; a company specialising in the wind energy aviation sector since 2002.

14.3. Legislation, Policy and Guidelines

14.3.1. The relevant sections of key policy and guidance documents are described below, which together place a responsibility on the Scottish Ministers and the Applicant to assess potential impacts on aviation.

Legislation

Article 222 of the Air Navigation Order (2016)

14.3.2. The treatment of land-based obstacles to air navigation is covered by existing legislation. Obstacles located close to licensed aerodromes are covered under Section 47 of the Civil Aviation Act 1982. This does not apply in this case because the Proposed Development is remote from all aerodromes. Government aerodromes are similarly covered under the Town & Country Planning Act (General Permitted Development) Order 2000. Article 222 of the ANO 2016 details the requirement for the lighting of land-based tall structures located outside of the safeguarded areas of licensed and government aerodromes.

14.3.3. Onshore Obstacle Lighting Requirement ICAO regulations (ICOA Annex 14, Volume I. Aerodrome Design and Operations) and article 222 of the ANO 2016 require that structures away from the immediate vicinity of an aerodrome, which have a height of 150 m (492 ft) or more AGL are:

1. Fitted with medium intensity steady red lights* positioned as close as possible to the top of the obstacle, and also equally spaced at intermediate levels, so far as practicable, between the top lights and ground level with an interval not exceeding 52 m;
2. Illuminated at night, visible in all directions and any lighting failure is rectified as soon as is reasonably practicable;

14.3.4. Under Article 222 of the Navigation Order (ANO), the lighting requirements can be changed under provisions given in section 6 which states, “A permission may be granted for the purposes of this article for a particular case or class of cases or generally”.

Planning Policy

14.3.5. The most relevant sections of the of National Planning Framework 4 (NPF4) and the Scottish Onshore Wind Policy Statement are highlighted below, with further details provided in Chapter 5 of the EIA Report.

National Planning Framework 4 (February 2023)

14.3.6. NFP4 states, under Policy 11 concerning development proposals for all forms of renewables, that project design and mitigation will demonstrate how “impacts on aviation and defence interests and seismological recording” are addressed.

Scottish Onshore Wind Policy Statement (OWPS) (2022)

14.3.7. Under Chapter 6, Onshore Wind and Aviation Considerations, it is noted wind turbines have the potential to impact aviation operations, including, but not limited to, impact on aviation radar.

14.3.8. The document recognises recent progress stating that bespoke solutions which alleviated specific, individual objections have been deployed successfully over the last decade or more, releasing significant volumes of renewable generation. However, the pace of deployment necessitated by the climate emergency means we must find a way to alleviate these impacts in an effective, efficient and timely manner. It is also important that solutions are cognisant of the cost of deploying renewable energy, particularly given the need to focus on both security of supply and low-cost generation, given the current international and economic situation.

14.3.9. Beyond the above statement of need, the document sets out the structure and aims of Industry and Government groups set up to address the issues of radar impacts and aviation lighting; specifically the Onshore Wind Aviation Radar Delivery 2030 group and the Aviation Lighting Working Group.

14.3.10. The Aviation Lighting Working Group has developed draft guidance focussed on delivering consistent methods, practices and recommendations to aid in assessing aviation obstacle lighting impacts. The draft guidance is out to consultation with relevant stakeholders.

Planning Circular 2/03: Safeguarding of Aerodromes, Technical Sites and Military Explosives Storage Areas (revised March 2016)

14.3.11. This Circular summarises the Scottish Ministers' understanding of the general effect of the relevant primary or secondary legislation.

14.3.12. It contains four annexes. Annexes 1 and 2 describe the formal process by which planning authorities should take into account safeguarding, including in relation to wind energy developments. Annex 3 lists officially safeguarded civil aerodromes and Annex 4 lists planning authority areas containing civil en-route technical sites for which separate official safeguarding maps have been issued.

14.3.13. The Circular also refers planning authorities, statutory consultees, developers and others to Civil Aviation Authority (CAA) CAP 764 (CAA Policy and Guidance on Wind Turbines), which is discussed further under Guidance below, and Met Office guidelines.

CAA Policy Statement: Lighting of Onshore Wind Turbine Generators in the United Kingdom with a maximum blade tip height at or in excess of 150 m Above Ground Level (June 2017)

14.3.14. This policy statement highlights and clarifies the requirements set out in the Air Navigation Order, for the lighting of onshore turbines.

14.3.15. Lights should be operated by an acceptable control device (e.g., photocell, timer, etc.) adjusted so the lights will be turned on whenever illuminance reaching a vertical surface falls below 500 LUX. The control device should turn the lights off when the illuminance rises to a level of 500 LUX or more.

14.3.16. If the horizontal meteorological visibility in all directions from every wind turbine generator in a group is more than 5 km, the intensity for the light positioned as close as practicable to the top of the fixed structure required to be fitted to any generator in the windfarm and displayed may be reduced to not less than 10% of the minimum peak intensity specified for a light of this type.

14.3.17. In practice the CAA considers every Proposed Development on a case by case basis, taking into account the specific environment, including the existing developments and lighting as well as the benefits of reduced lighting schemes where light pollution is an issue. Where supported by appropriate studies and consultations the CAA may agree to a variation to the lighting requirements specified in the ANO, under provisions given in the Air Navigation Order (ANO) Article 222 section 6, described in Section 14.3.3 above.

Guidance

14.3.18. Recognisance has been taken of the following best practice guidance.

CAP 764: CAA Policy and Guidance on Wind Turbines (Feb 2016)

14.3.19. CAA guidance within CAP 764, sets out recommended consultation and assessment criteria for the impacts of wind turbines on all aspects of civil aviation.

14.3.20. The CAA involvement in the Wind Farm Pre-Planning Consultation Process ceased on 25 December 2010. CAP 764 now states that "developers are required to undertake their own pre-planning assessment of potential civil aviation related issues."

14.3.21. Within CAP 764 the CAA provides a chapter describing the "wind turbine development planning process", within which the main civil aviation stakeholders and their interests are listed and described in brief. Table 1 within the guidance document provides an overview of considerations and the following paragraphs detail what developers will need to consider, conducting associated consultations as appropriate.

14.3.22. The CAA observes in section 2.36 that impact on communications, navigation and surveillance infrastructure alone is not sufficient to support an objection; rather those impacts need to have a negative impact on the provision of an air traffic service.

14.3.23. The CAA notes in section 5.25 of CAP 764 that "it is incumbent upon the Applicant to liaise with the appropriate aviation stakeholder to discuss – and hopefully resolve or mitigate – aviation related concerns without requiring further CAA input. However, if these discussions break down or an impasse is reached, the CAA can be asked to provide objective comment".

14.3.24. Section 5.26 of CAP 764 states that "the CAA will not provide comment on MOD [Ministry of Defence] objections or arguments unless such comments have been requested by the MOD."

14.4. Consultation

14.4.1. Aviation stakeholder responses were received from NATS, the MOD, Highland and Islands Airports Ltd (HIAL), Glasgow Airport and Edinburgh Airport, as detailed in the table below.

14.4.2. There were no objections from any of the stakeholders.

14.4.3. HIAL did state that, in relation to Inverness Airport, an optical line of sight assessment against the Inverness PSR (Primary Surveillance Radar) would be required, with a potential requirement for an RF (Radio Frequency) line of sight if the results of the optical line of sight are marginal.

14.4.4. The MOD stated that to address low flying it would be necessary for the Proposed Development to be fitted with MOD accredited lighting in accordance with the requirements of the Civil Aviation Authority, Air Navigation Order 2016. Note that this is a statutory requirement for the Proposed Development because the tip heights exceed 150m and hence the MOD requirement places no additional obligations on the Applicant.

Table 14.1 – List of Consultee Responses

Consultee	Consultation Response	Applicant Action
MOD (3rd March 2022) .	To address low flying it would be necessary for the development to be fitted with MOD accredited lighting in accordance with the requirements of the Civil Aviation Authority, Air Navigation Order 2016	The aviation lighting will meet the requirements set out in the MOD response. More details on the lighting are set out in 'Aviation Obstruction Lighting' within the Mitigation section below.
HIAL (7th March 2022)	With regards to the stated Assessment Methodology; in relation to Inverness Airport, HIAL agrees the scope of the assessment methodology is sufficient, as the proposal is more than 30NM from Inverness but less than 40NM. An optical line of sight assessment against	A radar line of sight assessment has been conducted against the Inverness PSR, finding no impacts with a good margin. The assessment report will be submitted to HIAL directly in parallel with the submission of

	the Inverness PSR would be required in the first instance as the development is within the declared operational range of the radar. An RF line of sight may be requested if the results of the optical line of sight are marginal.	the application for the Proposed Development. .
NATS (24th February 2022)	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 action required.
Glasgow Airport (7th March 2022)	This proposal is located outwith our consultation area.	No action required.
Edinburgh Airport (28th February 2022)	In respect of the above, I can confirm the location of this development falls out with our Aerodrome Safeguarding zone for Edinburgh Airport therefore we have no objection/comment	No action required.
AVIATION LIGHTING CONSULTATIONS		
HIAL (10th November 2022)	I can confirm our approval of your Aviation Obstacle Lighting Design for Proposed Development	No action required
MOD (11th November 2022)	After reviewing the application documents, I can Confirm the MOD are content with the amended lighting scheme as long as it is also IAW CAA Directive.	No action required. The CAA directive referred to is the Air Navigation Order
Police Scotland (4th November 2022)	No issues with this to affect our Police Operations	No action required
Scottish Air Ambulance (7th November 2022)	This will not affect our Air Ambulance operation.	No action required
CAA (12th June 2023)	The CAA approved the proposed lighting scheme and stated, “We have considered the report carefully and take note of the intent to address concerns relating to adverse visual impacts of aviation lighting on non-aviation receptors while ensuring that the lighting installed on the turbines meets air safety requirements”.	A final lighting design must be submitted to and approved by the CAA prior to wind farm construction

14.5. Assessment Methods and Significance Criteria

14.5.1. The objective is for the Proposed Development to have no significant residual impacts on aviation operations. This in turn requires an assessment of impacts on infrastructure, noting that impacts on infrastructure does not automatically lead to impacts on operations. This determination of impacts and their acceptability is addressed through consultation with all relevant stakeholders within the consenting process. The task of the applicant is to independently assess the potential effects and, where significant effects may occur, to enter a dialogue with the affected stakeholders prior to submission as far as is possible. Whilst the aim of this pre-submission dialogue is to elicit the approval of all stakeholders, typically solutions are identified but do not reach full maturity in terms of the assessment by the stakeholders and the contracting of mitigation where required. The stakeholders consider dialogue a higher priority and more meaningful once design iterations are completed and a live application exists.

14.5.2. The significance of impacts is ultimately determined, in the first instance, by the aviation stakeholder. This results in a response that either approves the Proposed Development, or raises an objection on specified grounds.

14.5.3. All assets within the study area must be identified and assessed, noting that in many cases this identifies no impacts.

14.5.4. The study area includes all potentially sensitive receptors. This covers assessment to the limit of range of relevant radars in the area, up to 200km in the case of NATS En-route primary radars and MOD air defence primary radars. Beyond this range the curvature of the earth prevents impacts. Broadly, the distances over which potential civil aviation conflicts have been assessed has been in accordance with the Civil Aviation Authority (CAA) guidance CAP 764 (CAA, 2016), as follows;

- within 30 km of an aerodrome with a surveillance radar facility. The distance can be far greater than 30 km depending upon a number of factors including the type and coverage of the radar and the particular operation at the aerodrome;
  (this is up to 111km for some aerodromes)
- Within airspace coincidental with any published Instrument Flight Procedure (IFP) to take into account the aerodrome's requirement to protect its IFPs;
  (taken to be up to 60km)
- Within 17 km of a non-radar equipped licensed aerodrome with a runway of 1100 m or more;
- Within 5 km of a non-radar equipped licensed aerodrome with a runway of less than 1100 m;
- Within 4 km of a non-radar equipped unlicensed aerodrome with a runway of more than 800 m;
- Within 3 km of a non-radar equipped unlicensed aerodrome with a runway of less than 800 m.

14.5.5. In addition to which the following assessment distances have been applied;

- 60 nautical miles, which is 111km, for military air traffic control primary surveillance radars;
- 20nm, which is 37km, of military Precision Approach Radars;
- 30 km for Meteorological Office rainfall radars;
- 10 km for secondary surveillance radars, aeronautical navigation aids and radio communication stations;
- 30 km for military aerodromes with no radar;

14.5.6. An initial assessment was conducted to identify the assets and stakeholders potentially affected by the Proposed Development. This desk based assessment included a review of the following:

- Airspace environment:
  - proximity to all aerodromes;
  - airspace class - Proximity to ATS routes;
  - TMZs, Areas of Intense Aerial Activity, Control Areas, restricted areas etc; and
  - proximity to military training areas.
- Checks for physical obstruction
  - through an infringement of obstacle limitation surfaces; and
  - potential for penetration of Instrument Flight Procedure safeguarding surfaces.
- Radar Line of Sight analysis for the following radars:
  - NATS En-route primary and secondary radar;
  - civil and military aerodrome air traffic control radar;
  - military precision approach radar;
  - military Air Defence radar; and
  - weather radar.
- Proximity to other technical sites:
  - navigational aids such as beacons; and
  - air-ground-air comms stations operated by NATS En-Route.

14.6. Baseline Conditions

14.6.1. There are no anticipated aviation impacts and hence no objections are anticipated. The Proposed Development is remote from all aerodromes. The nearest significant aerodrome is Inverness Airport over 63km to the north-east. There are also no potential impacts to key military or civil radar installations. The site lies within an area identified as of low priority for military low flying. The Proposed Development is well beyond the limits of safeguarding areas for any navigational aids or radio communication stations.

14.7. Potential Effects

14.7.1. No aviation impacts are anticipated, reflected in the no objection responses to the scoping submission. Without impacts there are no cumulative issues and no residual impacts.

14.7.2. The above applies to all phases of the development; commissioning, operation and decommissioning.

14.8. Mitigation

14.8.1. As a form of standard mitigation, the turbines will be fitted with aviation obstacle lighting, to meet the requirements of both the CAA and the MOD.

14.8.2. A lighting design was proposed to all relevant aviation stakeholders for approval or comment. All parties, including the CAA and the MOD, have approved the reduced lighting design. Details of the approved design are as follows (outlined in **Appendix 14.1**):

- Medium intensity steady red (2000 candela) lights on the nacelles of turbines 1, 2, 7 and 8 (4 in total);
- a second 2000 candela light on the nacelles of the above turbines to act as alternatives in the event of a failure of the main light;
- the lights on these turbines to be capable of being dimmed to 10% of peak intensity when the visibility as measured at the wind farm exceeds 5km; and
- infra-red lights to MoD specification installed on the nacelles of all eight turbines.

14.8.3. There is no requirement for intermediate level lights to be fitted on the turbine towers.

14.9. Residual and Cumulative Effects

14.9.1. There are **no anticipated residual or cumulative effects** upon aviation.

14.10. Summary

14.10.1. No aviation impacts are anticipated for all phases of the development; commissioning, operation and decommissioning.

14.10.2. All the relevant consultees responded to the scoping submission with no concerns. This remains the anticipated response for this full submission. The Applicant has also independently assessed the potential effects, with no anticipated aviation impacts.

14.10.3. The CAA and all other aviation stakeholders have approved a lighting scheme consisting of visible spectrum and Infra-red lighting.

References

Civil Aviation Authority (Feb 2016), ‘CAP 764: CAA Policy and Guidelines on Wind Turbines’.

Civil Aviation Authority (Jun 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 (Feb 2021), ‘CAP 393: The Air Navigation Order 2016 (ANO) and Regulations’.

Scottish Government (revised March 2016), ‘Planning Circular 2/03: Safeguarding of Aerodromes, Technical Sites and Military Explosives Storage Areas’.

Scottish Government (2023), ‘National Planning Framework 4. Available at: https://www.gov.scot/publications/national-planning-framework-4/

Scottish Government (Dec 2022), ‘Onshore wind: policy statement’. Available at: https://www.gov.scot/publications/onshore-wind-policy-statement-2022/