

## 13 AVIATION AND ELECTROMAGNETIC INTERFERENCE

### 13.1 Background Information

- 13.1.1 Wind turbines can potentially interfere with systems that use electromagnetic waves as the transmission medium, including, but not limited to, radar systems used for aviation safeguarding and electromagnetic communications systems.
- 13.1.2 Wind turbines can potentially interfere with aviation operators by either physically affecting the safeguarding of an aerodrome by the close proximity of the turbines or through interference with the Air Traffic Control (ATC) radars that direct aircraft in flight. RES consulted with all relevant organisations which could be affected by the proposed wind farm. This consultation and conclusions of such is summarised below.
- 13.1.3 Wind turbines can potentially cause interference to multiple forms of electromagnetic communication systems, including point to point electromagnetic links, air <-> ground communication systems and others. This interference can be by the reflection, scattering, diffracting and blocking of the electromagnetic signal. RES has consulted with relevant operators of these systems. This consultation and conclusions of such is summarised below.

### 13.2 Aviation

#### *Introduction*

- 13.2.2 This section of the chapter considers the likely significant effects on aviation and radar associated with the construction, operation and decommissioning of the proposed wind farm.
- 13.2.3 The assessment of potential effects on aviation considers technical acceptability, based on air navigation safety, rather than following a strict EIA process of assessing the significance of effects. Such effects often require the implementation of technical mitigation solutions to ensure continued safe operation in the presence of a wind farm. The assessment of effects on these receptors is therefore one of technical analysis and consultation and seeks to identify whether the effect is likely to be 'acceptable' or 'not acceptable' to air navigation services provision.

#### *Statement of Competence*

- 13.2.4 An aviation assessment was conducted by Sam Johnson of RES. Sam is the Senior Aviation Manager at RES, with an MMath in Mathematics. Sam has over 20 years' experience in the radar industry with over 15 years specifically in the area of wind farms. Sam is a member of the Renewable UK Aviation Working Group and is Chair of Aviation Investment Fund Company Limited (AIFCL).

#### *Guidance*

- 13.2.5 This assessment has been prepared with reference to Civil Aviation Authority (CAA) Publication (CAP) 764, Policy and Guidelines on Wind turbines (CAA, 2016). This is the primary guidance in relation to the assessment of wind turbines on aviation in the UK.

#### *Scope of Assessment*

##### **Effects Scoped Out**

- 13.2.6 Interference with surveillance systems and radar can occur when wind turbine blades are moving. Therefore, potential effects during construction are not assessed.
- 13.2.7 Upon decommissioning, the Ministry of Defence Geographic Centre (AIS Information Centre) would be informed of the removal of wind turbines. Following this, no decommissioning effects are expected and are not considered further.

##### **Effects Assessed in Full**

- 13.2.8 The assessment identifies and considers the potential effects that the proposed wind farm may have on civilian and military aviation and air safeguarding and, if required, the mitigation measures proposed to prevent, reduce or offset any potential adverse effects where possible.
- 13.2.9 In relation to military and civil aviation assets it considers potential impacts on any military Air Traffic Control (ATC) Radars, the NATS En Route Ltd (NERL) radars and nearby airports, and the potential mitigation measures identified to address these.
- 13.2.10 The assessment is based on an evaluation of existing data sources and desk studies, as well as consultation with key stakeholders.
- 13.2.11 The effects of wind turbines on aviation interests are well known, but the primary concern is one of safety. The two principal scenarios that can lead to effects on the operations of aviation stakeholders are:
- physical obstruction: wind turbines can present a physical obstruction at or close to an aerodrome or in the military low flying environment, which itself presents a health and safety risk or otherwise requires changes to flight routes in the area which brings about other operational effects; and
  - radar/air traffic services (ATS): wind turbine clutter appearing on a radar display can affect the safe provision of ATS as it can mask unidentified aircraft from the air traffic controller and/or prevent them from accurately identifying aircraft under control. In some cases, radar reflections from wind turbines can affect the performance of the radar system itself.
- 13.2.12 In this context, the scope of the assessment is to consider the impact of the proposed wind farm on aviation stakeholders, including en route, airports and other airfields, radar systems and air space users. This assessment also considers civil and military stakeholder aviation obstruction lighting requirements.
- 13.2.13 As standard, the Ministry of Defence (MOD) and the Defence Geographic Centre (AIS Information Centre) would be provided with the following information for incorporation on to aeronautical charts and documentation:
- the date of commencement of the proposed wind farm.
  - the exact position of the wind turbine towers in latitude and longitude;
  - a description of all structures over 300 feet high;
  - the maximum extension height of all construction equipment;
  - the height above ground level of the tallest structure; and
  - details of a visible and/or infrared aviation lighting scheme.

### **Baseline Characterisation**

#### **Study Area**

- 13.2.14 Consideration is given to aviation infrastructure that is within operational range of the proposed wind farm. Operational range varies with the type of infrastructure but broadly includes regional airports operating radar up to 40 km of the proposed wind farm, non-radar aerodromes within 17 km, parachute drops zones within 3 km, and military radar and en route radar systems up to 100 km from the proposed wind farm (dependent on operational range).

#### **Desk Study**

- 13.2.15 The applicant has a dedicated aviation manager who has provided input to the proposed wind farm since its inception. This has included:
- civil and military radar line of sight (LoS) analysis;
  - review of relevant aviation charts; and
  - review of military low flying charts.

### Significance Criteria

13.2.16 Significance criteria for aviation impacts are typically difficult to establish; they are not strictly based on the sensitivity of the receptor or magnitude of change but on whether the industry regulations for safe obstacle avoidance or radar separation (from radar clutter) can be maintained in the presence of the wind turbines.

13.2.17 Any anticipated impact upon aviation stakeholders which results in restricted operations is therefore considered to be of significance.

### Assessment Limitations

13.2.18 No limitations have been identified that would affect the findings of the assessment, based on the information available at the time of writing.

### Consultation

**Table 13.1 Consultation Responses relating to Aviation**

Consultee and Date	Scoping / Other Consultation	Issue Raised	Response / Action
Defence Infrastructure Organisation (24/05/2022)	Pre Planning	The Defence Infrastructure Organisation (DIO) indicated that the MOD may have concerns about the proposal.  The DIO indicated that the height of the development and the location proposed may have an impact on low flying operations.	The MOD Low Flying team would be consulted to agree a suitable aviation lighting scheme if deemed necessary.
NATS Clee Hill (14/04/2022)	Pre Planning	A NATS En-Route Technical and Operational Assessment (TOPA) was commissioned that identified line of sight radar visibility to the Clee Hill en-route radar that may impact operations at the London Area Control Centre.	There is ongoing dialogue with NATS to identify a suitable radar mitigation.
Cardiff Airport (14/04/2022)	Pre Planning	A NATS Airport TOPA was commissioned that identified line of sight radar visibility to the Cardiff Airport primary radar.	There is ongoing dialogue with NATS and Cardiff Airport to identify a suitable radar mitigation.
Bristol Airport (14/04/2022)	Pre Planning	A NATS Airport TOPA was commissioned that identified line of sight radar visibility to the Bristol Airport primary radar.	There is ongoing dialogue with NATS and Bristol Airport to identify a suitable radar mitigation.

### Baseline

#### Civil Airports

13.2.19 The proposed wind farm is approximately 35 km north-east of the Cardiff Airport primary radar and approximately 40 km north-west of the Bristol Airport primary radar.

13.2.20 A planning condition has been agreed with Cardiff Airport, as below:

*No turbines shall be erected until a scheme for the mitigation of impact of the wind turbines on the operation of Cardiff Airport primary surveillance radar (the “radar mitigation scheme”) has been submitted to and approved in writing by the Local Planning Authority. The development shall thereafter be operated fully in accordance with the approved radar mitigation scheme throughout the operational life of the development.*

13.2.21 Discussions are ongoing to agree a suitable mitigation with Bristol Airport.

#### **NERL**

13.2.22 The proposed wind farm is approximately 86 km south-west of the NERL Clew Hill radar.

13.2.23 No response has yet been received via scoping but NERL has indicated that the proposed wind farm would have an unacceptable impact upon the Clew Hill en-route radar that may impact operations at the London Area Control Centre.

#### **Military Aviation**

13.2.24 No response has yet been received via scoping but previous liaison with the DIO indicates that there would be a requirement for the proposed wind farm to agree a suitable scheme of visible and/or infrared lighting to assist military aircraft in avoiding the proposed wind turbines.

#### **Mitigation and Residual Effects**

##### **Predicted Operational Effects**

13.2.25 Wind turbines have the potential to impact the performance of air traffic control radars. These impacts include:

- The creation of “false” targets, whereby the wind turbines present on the radar display. Multiple false targets can lead to the radar initiating false aircraft tracks.
- False returns can also cause track seduction, i.e. real aircraft tracks are ‘seduced’ away from the true position as the radar updates the aircraft track with the false return. This can lead to actual aircraft not being detected.
- Shadowing whereby the aircraft is not detected by the radar as it is flying within the physical ‘shadow’ of the wind turbine.

#### **Aviation & Radar**

13.2.26 Prior to mitigation, it is considered that the proposed wind farm could affect the operation of the NERL Clew Hill radar and both primary radars at Cardiff and Bristol Airports.

#### **Proposed Mitigation**

##### **Aviation & Radar**

13.2.27 There are a number of mitigation options available to alleviate problems caused by wind turbines to aviation and radar. Mitigation solutions are highly specific to the effect in question. Consultation with relevant consultees is key to establishing the appropriate method of mitigation. A Radar Mitigation Scheme (RMS) would be agreed with Cardiff and Bristol Airports for their primary radars, and with NATS for the NERL Clew Hill radar that would remove or reduce the impact of the proposed wind farm to an acceptable level. The RMS would be agreed prior to the proposed wind farm becoming fully operational.

13.2.28 An infrared lighting scheme would be agreed with the DIO prior to the proposed wind farm becoming fully operational.

#### **Summary**

13.2.29 The proposed wind farm would potentially impact the NERL radar at Clew Hill and primary radars at Cardiff and Bristol Airports. It is expected that the impacts can be mitigated with a suitable mitigation scheme that could be secured through an appropriately worded suspensive planning condition.

13.2.30 A planning condition has been agreed with Cardiff Airport, as below, and it is hoped that similar wording can be agreed with NERL and Bristol Airport:

*No turbines shall be erected until a scheme for the mitigation of impact of the wind turbines on the operation of Cardiff Airport primary surveillance radar (the “radar mitigation scheme”) has been submitted to and approved in writing by the Local Planning Authority. The development shall thereafter be operated fully in accordance with the approved radar mitigation scheme throughout the operational life of the development.*

13.2.31 Infrared lighting would be agreed with the DIO for the MOD low flying requirements.

### 13.3 Electromagnetic Interference

13.3.1 Wind Turbines can potentially cause interference to multiple forms of electromagnetic communication systems. However, the most common case where turbines and electromagnetic communication systems interact is point-to-point electromagnetic links. These links generally involve two transmitters sending and receiving information to/from one another over tens of kilometres. Should any part of a wind turbine obstruct this “path”, interference can occur.

13.3.2 Other forms of communications systems are generally only impacted if the transmitter/receiver is close to turbines. It is thus considered that any such operations would be identified by consulting the operators of any telecommunications masts on or near the wind farm.

13.3.3 For point-to-point links, it is necessary to determine what operators have links running through the area of the wind farm.

13.3.4 To identify point to point link operators, the Ofcom Spectrum Information Portal service was used. This is a web-based directory of operations. Using this, all links running through or near the site were identified, as were their operators. These operators were all contacted.

13.3.5 Additionally, Joint Radio Company (JRC) and Atkins were also contacted, as these operators are known to have operations that due to confidentiality are not listed on the Spectrum Information Portal.

13.3.6 A summary of these consultations is provided in **Error! Reference source not found.** below.

13.3.7 For all operators other than JRC, who are acting with and on behalf of National Grid Electricity Distribution (NGED), all responses received were a simple confirmation of no objection.

13.3.8 For JRC/WPD (now NGED) operations it was determined that a solution would be required for the proposed Mynydd Maen Wind Farm to operate without impacting the operations of JRC/NGED in this area.

13.3.9 In discussion with JRC/NGED, it was agreed that a detailed solution would be developed post-consent. In relation to this, a potential planning condition was discussed, subjective to the approval of the planning authority. The form of words discussed with JRC/NGED is as follows:

- a. No construction shall commence until a scheme for the mitigation of impacts on telecommunication operations within the site (operated by WPD) has been submitted to and approved in writing by the Local Planning Authority. The agreed scheme shall be implemented in full at the cost of the developer prior to the commencement of construction. Reason: To protect existing telecommunication links within the site.”

**Table 2: Electromagnetic Communications Consultation Summary**

Operator/Organisation	Identified By	Response & Status
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Airwave Solutions Limited	OFCOM Spectrum Information Portal	Report received from Airwave Solutions 26/01/2022. This report stated that there was no objection to the wind farm. The report detailed the only nearby operation, which was seen to be significantly outside the area of Mynydd Maen Wind Farm. On 02/06/2023, the final turbine coordinates were passed to Airwave Solutions. On 29/06/23, a response was received, wherein no objection was raised.
Arqiva Limited	OFCOM Spectrum Information Portal	Statement of no objection to final turbine coordinates received on 05/06/2023.
Atkins/Dwr Cymru	Contacted as standard	Statement of no objection to final turbine coordinates received on 18/05/2023.
BRITISH TELECOMMUNICATIONS PUBLIC LIMITED COMPANY	OFCOM Spectrum Information Portal	Statement of no objection to final turbine coordinates received on 07/06/2023.
EE Limited	OFCOM Spectrum Information Portal	Initial discussion with EE was started on 12/10/2021. Following communication, new contact details were provided for RES to send wind farm details to. All contact details provided were sent site information on  13/10/2021 10/11/2021 22/12/2021 18/12/2022 and the final frozen coordinates were sent on 02/06/2023.  No objection was received to any of these communications. It is RES' understanding that there is no objection.
Mobile Broadband Network Limited	OFCOM Spectrum Information Portal	Statement of no objection to final turbine coordinates received on 08/06/2023.
Vodafone Limited	OFCOM Spectrum Information Portal	Statement of no objection to final turbine coordinates received on 08/06/2023.
JRC Limited/WPD Telecoms Limited	Contacted as standard	See points 13.3.7 to 13.3.9 above.