

# 13 Electromagnetic Interference, Aviation and Shadow Flicker

- 13.1.1 This section presents a summary of the results of the assessment that has been undertaken into potential impacts from the proposed development upon aviation, MoD interests, communication operations and existing site infrastructure.
- 13.1.2 This section also presents the assessment of the potential impacts of shadow flicker arising from the proposed development.
- 13.1.3 These assessments were undertaken using two main desktop study methods, GIS searches using published constraints data and consultation with statutory bodies and network operators.
- 13.1.4 The areas that were covered in this assessment included;
- ATC and defence radar;
  - low flying near Aerodromes;
  - Military low flying activities;
  - Microwave communications & mobile phone networks;
  - Television broadcast interference;
  - Radio broadcast interference;
  - Private network communications; and
  - Buried physical infrastructure within the site boundary (i.e. pipelines, cables etc).
- 13.1.5 Natural Power has considered the potential for the proposed development to have an impact on these infrastructure interests and found that a significant adverse impact is unlikely. This is primarily due to the remote nature of the location in which the site is found, which is neither near, or directly in between large population centres or industrial areas.
- 13.1.6 The shadow flicker assessment determined that there are no residential dwellings within ten rotor diameters (900 m) of the turbines. On this basis, it is considered that the proposed development will not cause an impact that will be significant.

## 13.2 Introduction

### Site Overview

- 13.2.1 The proposed development is located approximately 42km to the west of Pitlochry and 25km south of Dalwhinnie in Perth and Kinross. The site lies to the east of Loch Erich and to the north of Loch Rannoch on the Talladh-a-Bheith Estate. The site location is remote and characterised by a lack of infrastructure in and around the site boundary.
- 13.2.2 The proposed development comprises 24 turbines with a 125 m tip height spread across the moorland topography with a spread of elevation at turbine locations from 395 – 535m AOD. The site is in a remote setting

amongst the Grampian Mountains and there are no settlements or significant population centres within 10 km, indeed the nearest significant aerodrome is Dundee Airport at approximately 85 km from the site.

### 13.3 Aviation & MoD Assessment

#### Baseline Conditions & Methodology

- 13.3.1 Wind turbines have the capacity to impact aviation interests in a variety ways, the probability of a conflict arising between wind energy developments and aviation concerns is primarily dependent upon the geographical location of the site.
- 13.3.2 Turbines can adversely impact aviation safeguarding, particularly when sited in close proximity to the flight approach to an aerodrome, when located adjacent to a military aircraft low altitude flying area, and when located within the line of sight of a radar installation.
- 13.3.3 Air Traffic Control (ATC) radar systems use radio waves to detect and track aircraft travelling through controlled airspace by analysing the signal that bounces back off of the aircraft fuselage. Wind turbines, due to their size, structure and often hill top locations have the capacity to also return signals back to the radar transceiver, resulting in false aircraft plots or potentially radar clutter. Less sophisticated ATC radar systems are unable to distinguish between aircraft and turbines due to the dynamic nature of the turbine signal caused by the spinning blades (at a frequency distinct from the radar) and yawing of the nacelle.
- 13.3.4 This effect manifests as clutter on the radar operator's screen as the radar intermittently receives signals from the wind farm, compromising the system's ability to track target aircraft. Aircraft could also potentially be lost in the radio wave shadow that can be cast where turbines on a hill sit in the line of sight between the radar station and the aircraft.
- 13.3.5 Turbines can also impact military radar in fundamentally the same way, although military radar may be used for surveillance and observation of potentially hostile aircraft as well as to monitor military aviation operations.
- 13.3.6 The assessment methodology used in this section is more objective (than in other ES sections) due to its technical nature whereby potential impacts can be considered as more certain or ruled out from the assessment.

#### Desk Top Assessment

- 13.3.7 In order to assess the potential impact of the proposed development upon aviation and Ministry of Defence (MoD) infrastructure, the first step in this process was to undertake a desk top assessment utilising GIS software to plot the proposed turbine positions against self-assessment aviation safeguarding maps (available online on the DECC website<sup>1</sup>). These are produced and issued by the relevant aviation stakeholders. This visually demonstrates the potential for the proposed development to have an impact upon aviation interests.

The results of the desk top assessment have been plotted onto a map and can be reviewed on Figure 13.1. No impact was predicted by the assessment.

- 13.3.8 Further information regarding aviation safeguarding can be found in;
- CAP 764 - CAA Policy and Guidelines on Wind Turbines' (CAA Jan 2012);

<sup>1</sup> <https://restats.decc.gov.uk/cms/aviation-safeguarding-maps/>

- CAP 393 - Air Navigation: The Order and the Regulations" (CAA Aug 2012);
- CAP 168 - Licensing of Aerodromes" (CAA April 2011); and
- Wind Energy and Aviation Interests report (DTS 2002).

### Proximity to Civil Aerodromes

13.3.9 As discussed there are no significant aerodromes in operation close to the proposed development and therefore the proposed development is not within the consultation zone around any aerodromes and will not impact aircraft during take-off and landing approach manoeuvres.

The closest safeguarded civil aviation aerodromes indicated on CAA maps were;

- Dundee Airport 85 km;
- Inverness Airport 89 km;
- Edinburgh Airport 105 km;
- Glasgow Airport 94 km; and
- Aberdeen Airport 139 km.

### Visibility to ATC and MoD Radar

13.3.10 The National Air Traffic Service (NATS), are the organisation responsible for operating and safeguarding the ATC system in the UK. They publish information allowing applicants to assess whether their projects will be visible to the national network of radar installations.

13.3.11 Review of the proposed development against this information shows that the site is outwith any of the zones where visibility to radar could be possible for turbines up to 125m and due to the remote location of the site there is no radar visibility within 10km.

13.3.12 The MoD also operates a network of radar installations which are safeguarded by the Defence Infrastructure Organisation (DIO). They also publish mapping information to allow self-assessment of potential wind farm sites with regard to conflict with their radar operation. The proposed development falls comfortably outside of the visibility zones for MoD radar installations.

### MoD Low Flying

13.3.13 The Mod undertakes low flying at various locations across the country for pilot training purposes; allowing the simulation of possible combat situations. The areas where low flying takes place are graded by the priority of which they are used and safeguarded. The grading is as follows;

- Areas with no military low flying;
- Low priority military low flying – "Areas less likely to raise concerns";
- Regular military low flying area – "Where mitigation may be necessary to resolve concerns"; and
- High priority low flying area – "likely to raised considerable and significant concerns".

13.3.14 The DIO publish this information in a format that allows applicants to self-assess the potential impact of their project. The proposed development is located in low flying area No 14. This area has several grades within it, however in and around the proposed development is considered low priority for military low flying.

#### **NATS Consultation**

13.3.15 NATS, the safeguarding authority for ATR radar operations were consulted in November 2011 with regard to the proposed development. They undertook an assessment of potential impacts from the site and concluded that there would be no potential impact from turbines with tip heights up to 160 m.

The NATS response to this consultation can be found in Appendix 13.1

#### **Ministry of Defence Consultation**

13.3.16 In July 2013 the DIO was also consulted with regard to the proposed turbine layouts' potential for impacts upon their radar systems and low priority low flying around the site. The consultation response indicated that the MoD would not object to the proposed development with the turbines at 125 m blade tip height as it would not adversely affect operations.

A copy of this consultation response can be viewed in Appendix 13.1.

13.3.17 The MoD have requested that the perimeter turbines are fitted with 25 candela omni-directional or infra-red lighting at the highest practicable point in the interests of safety. Should the application be successful they also request information on;

- The date construction starts and ends;
- The maximum height of construction equipment; and
- The latitude and longitude of every turbine.

#### **Aviation & MoD Conclusion**

13.3.18 From the assessment that has been carried out on behalf of the Applicant and by the safeguarding authorities through the consultation process it is predicted that the proposed development will not have an adverse impact upon civil aviation or MoD infrastructure or operations.

### **13.4 Telecommunications Infrastructure**

#### **Introduction**

13.4.1 Modern Telecommunications systems use electromagnetic waves to transmit information across large distances, this can be for media broadcast (TV and radio) or for point to point microwave radio transmissions.

13.4.2 There is the potential for conflicts to arise between wind turbines and this wireless telecommunications infrastructure. Where the transmitted signal meets with a turbine on the landscape the signal can be physically blocked preventing it arriving intact at the receiver, or it can be reflected sending it to an unintended receiver or creating a duplicate signal which results in interference to the original signal, often affecting signal quality.

13.4.3 Any tall structure on the landscape can cause this type of interference, however the impact from wind turbines can be exacerbated due to their dynamic movement and own short range electromagnetic output.

## Assessment Methodology

13.4.4 To assess whether the proposed wind farm will have an impact upon communications infrastructure NPC have used a GIS data base of microwave fixed link routes to verify that no links cross the site boundary. With reference to Figure 13.2, this plan shows that there was no communication infrastructure or links that would be impacted by the proposed development. The next step was to carry out a series of consultations which the infrastructure operators and regulators to allow them to independently assess the potential for conflict.

13.4.5 A copy of each of the consultation responses can be found in Appendix 13.1

### Ofcom Consultation

13.4.6 The Office for Communications (Ofcom) is the independent authority and regulator for the UK communications and broadcast industries, as part of this role they operate as a licensing and safeguarding authority to protect the communications broadcasting spectrum.

13.4.7 To fulfil this role they undertake assessments from wind farm applicants to consider whether proposed sites have the potential to impact their licensees' networks (broadcasters & network operators).

13.4.8 Ofcom were consulted regarding the proposed development in 2011 and again with the final site design in July 2013 allowing them to assess whether the proposed development was predicted to have an impact on telecommunications.

13.4.9 Where a network conflict is predicted Ofcom will typically direct the Applicant to the affected network operator. Ofcom's response to the consultation was that no impact was predicted from the proposed development.

### Other Communications Consultations

13.4.10 In addition to the public networks controlled by Ofcom, there are other private communications networks that are operated in the UK, these may be used for national infrastructure purposes such as energy generators, SCADA systems and communications systems for the emergency services.

13.4.11 The locations of the microwave base stations for these networks are not in the public domain for security reasons. Therefore to assess whether the proposed wind farm might impact these networks applicants must contact the network operators directly.

13.4.12 **The Joint Radio Company (JRC)** analyses proposals for wind farms on behalf of the UK Fuel & Power Industry. This is to assess their potential to interfere with radio systems operated by utility companies in support of their regulatory operational requirements. Following consultation in July 2013 JRC have predicted no impact from the proposed development.

13.4.13 **Atkins Ltd** is responsible for providing wind farm assessment services to the Telecommunications Association of the UK Water Industry, following consultation they have predicted no impact on this infrastructure.

13.4.14 **Scottish Water** as a water utility manage their own assets in Scotland, Scottish Water declined to respond to the consultation at this stage. They have a policy of only responding to submitted applications.

13.4.15 **British Telecom** also operate point to point microwave links on the communications network, they also predict that the proposed development will not impact their infrastructure following consultation.

#### **Television Signal Interference**

13.4.16 Television broadcast signals in certain cases can be susceptible to interference caused by wind farms, this is more likely where the television signal (particularly analogue) is already weak at the receiver (TV viewer), and they are both within a few kilometres of, and also in the shadow of the turbines (i.e. turbines are between transmitter and receiver).

13.4.17 The potential for this type of interference has reduced significantly since the analogue TV signal was switched off across the country (2010 in Grampian/STV North area) and TV companies changed to digital broadcasting instead, which features a more robust signal.

13.4.18 Where interference to TV reception is experienced there is typically an alternative solution available to ensure that nearby householders can receive acceptable TV reception. In the case of the proposed development a significant impact is unlikely as there are so few residences nearby who could be affected. If any impacts on TV reception are experienced the Applicant will ensure that mitigation is implemented to restore any affected properties to a normal service.

13.4.19 Wind farms can also cause interference to TV high frequency re-broadcast links that broadcast TV signals between multiple transmitters. The impact assessment on this network has been done by consulting with the network operator. In the UK this network is operated by Arqiva who have responded in July 2013 to confirm that no impact is predicted from the proposed development. A copy of this consultation response can be found in Appendix 13.1

#### **Radio Signal Interference**

13.4.20 Radio signals are far less likely to be susceptible to interference from wind turbines due to the low frequencies used for broadcast, this allows the signal a greater degree of diffraction or ability to pass obstacles. Therefore it is considered unlikely that the proposed development will materially affect radio broadcast signals

### **13.5 Other Infrastructure within the Site Boundary**

#### **Introduction**

13.5.1 Throughout the country there is extensive infrastructure that is used by energy utilities and other distribution businesses; these include oil and gas pipelines, water mains and electrical cables. This infrastructure is often buried underground and interfering with it could compromise its operation as well as public safety.

13.5.2 It is therefore imperative that applicants planning new projects carefully assess their site to ensure that they are not going to affect this infrastructure.

#### **Desk Top Assessment**

13.5.3 To consider the potential for the proposed development to impact upon these types of infrastructure a desk top study was undertaken. NPC maintain a detailed database of national infrastructure covering the whole of the UK which has been used to assess potential impacts from the proposed wind farm. No impacts were identified as demonstrated in accompanying map No. 10326UKC\_M\_001\_A.

- 13.5.4 **Linesearch.org** is an online search service which allows users to search their proposed sites for potential infrastructure that their project could impact. No operators' assets were found within the site boundary using the line search tool.
- 13.5.5 Scottish Water were contacted to consult on the details of the proposed development with regard to sub-surface water infrastructure, however they no longer issue consultation responses prior to submission of a planning applications.
- 13.5.6 Instead Scottish Water refers applicants to an online service where they can order schematic drawings on maps of their proposed development sites to allow assessment of potential impacts upon sub-surface infrastructure. However this service is impractical for large sites such as Talladh-a-Bheith as plans can only be ordered at a maximum scale of 1:2,500 at A3 meaning a large number of plans would be required to adequately assess the whole site boundary area.
- 13.5.7 A study was made of Ordnance Survey maps and satellite photographic imagery to try and assess whether any evidence of water infrastructure could be found. No evidence was found within the site boundary. The remoteness of the site would make it unlikely that there would be any water infrastructure within the site boundary.
- 13.5.8 However a large diameter pipe feeding the pen stock at Rannoch Power Station from Loch Erich crosses part of the site access route at NN 51223 61635. Should any other infrastructure be found around or within the site boundary subsequent to the application the Applicant would undertake mitigation to avoid any adverse impacts.

## 13.6 Shadow Flicker

### Introduction

- 13.6.1 Shadow flicker occurs under conditions when the sun passes behind the hub of a wind turbine and casts a shadow over neighbouring properties. When the blades rotate, shadows pass over the same point causing an effect called 'shadow flicker'. Similarly, gloss surfaced blades flash when they rotate. The likelihood and duration depends upon a combination of the sun, turbine and window locations, turbine orientation, times of day, days of the year and weather conditions.

### Assessed Area

- 13.6.2 Standard guidance<sup>2</sup> states that shadow flicker occurs within ten rotor diameters of the turbine, and that effects only occur within 130 degrees either side of north relative to the turbines. Beyond these limits it is considered that potential impacts associated with shadow flicker will not be significant.
- 13.6.3 A shadow flicker study area of 900 m around each proposed turbine locations was assessed to identify properties that could be affected by shadow flicker incidences.
- 13.6.4 The assessment did not identify any occupied residential dwellings which lie within ten rotor diameters of the proposed wind turbine locations. The nearest occupied residential dwelling was identified as being approximately 4 km from the closest turbine within the proposed development.

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<sup>2</sup> <http://www.scotland.gov.uk/Resource/0040/00405870.pdf>

## Conclusion

- 13.6.5 No residential dwellings lie within ten rotor diameters (900 m) of the turbines. It is therefore considered that the proposed development will not create any adverse impacts due to shadow flicker.