

Telecommunications Impact Assessment

RSK Environment Limited

Pen March Wind Farm

October 2022

PLANNING SOLUTIONS FOR:

- Solar
- Telecoms
- Railways
- Defence
- Buildings
- Wind
- Airports
- Radar
- Mitigation

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ADMINISTRATION PAGE

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Issue	Date	Detail of Changes
1	December 2020	Initial issue
2	January 2021	JRC consultation update
3	November 2021	New layout consultation
4	October 2022	Airwave and JRC consultation updates

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EXECUTIVE SUMMARY

Report Overview

Pager Power has been commissioned to investigate the potential impact a proposed wind development located approximately 5.5km northeast of Merthyr Tydfil, Wales, UK, upon wireless communications infrastructure (point-to-point links) in the surrounding area.

The proposed wind development comprises six wind turbines with a maximum tip height of 180 metres above ground level (agl), a hub height of 105.45 metres (agl), and a rotor diameter of 149.1 metres.

Overall Results

Arqiva, BT, MBNL¹, Vodafone, Telefonica (Virgin Media O2), Atkins, and Dwr Cymru Welsh Water have confirmed that they do not operate any communication links within close vicinity of the proposed development and therefore have no objections to the proposed development.

Airwave (Motorola Solutions) have conducted their own assessment and confirmed that they have no objections to the proposed development.

The Joint Radio Company (JRC) had raised an objection to the proposed development, relating specifically to T3 and T6. The JRC has undertaken an investigation of mitigation solutions. The mitigation solution can be incorporated as part of their existing planned work. The applicant is keen to proceed with the mitigation solution and is in the process of agreeing to commercial arrangements for the JRC's coordination of the mitigation solution.

Mitigation

An overview of possible mitigation strategies has been provided for reference purposes (See Section 5).

¹ Mobile Broadband Network Limited (MBNL) is a joint venture between Everything Everywhere (EE) and Three.

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ABOUT PAGER POWER

Pager Power is a dedicated consultancy company based in Suffolk, UK. The company has undertaken projects in 54 countries within Europe, Africa, America, Asia and Australasia.

The company comprises a team of experts to provide technical expertise and guidance on a range of planning issues for large and small developments.

Pager Power was established in 1997. Initially the company focus was on modelling the impact of wind turbines on radar systems. Over the years, the company has expanded into numerous fields including:

- Renewable energy projects.
- Building developments.
- Aviation and telecommunication systems.

Pager Power prides itself on providing comprehensive, understandable, and accurate assessments of complex issues in line with national and international standards. This is underpinned by its custom software, longstanding relationships with stakeholders and active role in conferences and research efforts around the world.

Pager Power's assessments withstand legal scrutiny and the company can provide support for a project at any stage.

1 BACKGROUND

1.1 Introduction

Pager Power has been commissioned to investigate the potential impact a proposed wind development upon wireless communications infrastructure (point-to-point links) in the surrounding area.

The proposed wind development comprises six wind turbines with a maximum tip height of 180 metres above ground level (agl), a hub height of 105.45 metres (agl), and a rotor diameter of 149.1 metres.

In detail, this report contains:

- Site description;
- Ofcom and stakeholder consultation to identify relevant:
 - Microwave links.
 - Telemetry links.
- Technical analysis including:
 - Exclusion zone calculations (Ofcom-recommended methodology).
- High-level overview of common mitigation options.

Following this, conclusions and recommendations for next steps have been made.

All co-ordinates used within this report are in British National Grid (OSGB36 datum).

2 PROPOSED WIND DEVELOPMENT DETAILS

2.1 Proposed Development Layout

The layout of the proposed wind turbines overlaid onto aerial imagery is shown in Figure 1 on the following page. The wind turbine coordinate and height details are presented in Appendix A.



Figure 1 *Proposed development layout*

3 COMMUNICATIONS CONSULTATION SUMMARY

3.1 Overview

Pager Power is managing on-going consultation with wireless link operators to establish the most up to date wireless link network in the vicinity of the proposed development.

3.2 Consultation Overview

Table 1 below presents a summary of the consultation to date.

Party	Summary
Airwave (Motorola Solutions)	Airwave does not provide link information; they offer their own assessment for a fee (if conducted before submission of a planning application). 21/12/21 – Airwave assessment requested. 04/03/22 – Response received. No objection.
Arqiva	23/11/20 – PP link request sent. 24/11/20 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout. 09/09/21 – Follow up sent. 16/09/21 – Response received. No objection.

Party	Summary
Atkins	23/11/20 – PP link request sent. 25/11/20 – Response received. Information has been passed on to Dwr Cymru Welsh Water. 11/12/20 – Followed up PP link request to Dwr Cymru Welsh Water. Awaiting response from Dwr Cymru Welsh Water. No objection predicted.² 13/08/21 – PP sent details of the new turbine layout to Atkins and Dwr Cymru Welsh Water. 16/08/21 – Response received. Information has been passed on to Dwr Cymru Welsh Water. 26/08/21 – Response received. No objection.
BT	23/11/20 – PP link request sent. 01/12/20 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout. 19/08/21 – Response received. No objection.
MBNL ³	23/11/20 – PP link request sent. 27/11/20 – PP link request sent to MBNL. 29/11/20 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout. 19/08/21 – Response received. No objection.

² Stakeholders may not respond when there is no objection.

³ Mobile Broadband Network Limited (MBNL) is a joint venture between Everything Everywhere (EE) and Three.

Party	Summary
Joint Radio Company (JRC)	23/11/20 – PP link request sent. 23/11/20 – Response received. Initial objection raised. 23/11/20 – Further analysis requested by Pager Power. 15/12/20 – Followed up further analysis request. Awaiting results of further analysis from JRC. 05/01/21 – Followed up further analysis request. 05/01/21 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout (August 2021). 24/08/21 – Response received. Objection (Turbines 3 and 6). 14/09/21 – Link details and further analysis requested by Pager Power. The JRC is not permitted to share link details. 20/09/21 – Followed up further analysis request. Objection remains (Turbines 3 and 6). 01/10/21 – Requested alternative mitigation solutions to turbine movement. 04/11/21 – Engineer confirms that there should be a viable mitigation solution. Awaiting quotation for mitigation investigation. 10/11/21 – Quotation provided for development mitigation proposal. 07/03/22 – JRC report received 09/03/22 – Pager Power requests costs for mitigation solution 22/08/22 – JRC confirm that mitigation can be incorporated into existing planned work and only the JRC's coordination needs to be agreed 30/08/22 – JRC provide a quotation for their coordination for the mitigation solution 28/10/22 – Applicant agrees to the coordination work for the mitigation solution and is in the process of agreeing to commercial arrangements for the JRC's coordination of the mitigation solution

Party	Summary
Vodafone	23/11/20 – PP link request sent. 26/11/20 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout. 19/08/21 – Response received. No objection.
Telefonica (Virgin Media O2)	16/12/20 – PP link request sent. 16/12/20 – Response received. No objection. 13/08/21 – PP sent details of the new turbine layout. 17/08/21 – Response received. No objection.

Table 1 Telecommunications stakeholder consultation

4 TECHNICAL ASSESSMENT

4.1 Methodology

Microwave and UHF⁴ wireless communication links are used to transmit information between two antennae via radio waves within a particular frequency band.

The exclusion zones associated with the identified links have been calculated based on the telecommunications data provided. Further 2-dimensional clearance calculations have then been undertaken to determine the extent of any clearance or infringement of the proposed development. The following subsections present an overview of the interference mechanisms and methodology.

4.1.1 Fresnel Zones

A Fresnel Zone takes the form of an ellipsoid surrounding a link path and represents the area in which obstructions should not be sited in order to avoid diffraction losses. The width of the zone at any point along the link path is determined by the Fresnel Zone number, the frequency of the link and the distance from each link end. The width of the zone is maximal at the midpoint of the link path.

4.1.2 Diffraction – Microwave and UHF Links

Obstructions such as wind developments which are sited in between two microwave link antennae can partially block the radio signal passing between them, thereby reducing the functionality of the link. This can occur even if the obstruction is not directly between the antennae but close to the link boresight⁵. This kind of blocking is called 'diffraction'.

There are various approaches to safeguarding microwave links against from obstruction via wind developments. The most common approaches are:

1. Implementation of a fixed stand-off distance around the link boresight;
2. Safeguarding the relevant Fresnel Zone (discussed below).

The first approach is used by many operators who request a set buffer distance. Set stand offs are occasionally conservative and produce a large exclusion zone distance. The second approach is to assess an obstruction on a case by case basis to calculate the most accurate exclusion zone. Pager Power considers 60% of the Second Fresnel zone when considering the effect of a wind turbine upon microwave and UHF links⁶.

⁴ Ultra-High Frequency

⁵ This is the straight line between the two antennae.

⁶ Manning, T. (1999), Microwave Radio Transmission Design Guide, Artech House Books

4.1.3 Reflections – UHF Links

Obstructions can affect UHF links by reflecting the signal between transmitter and receiver. This is not a significant concern for microwave links because they are highly directional. Reflection effects are not anticipated as no UHF links have been identified. Typically diffraction effects are likely to be the most significant concern due to the greater abundance of microwave point-to-point links and because both microwave and UHF links are safeguarded against diffraction effects.

4.2 Technical Assessment

No analysis could be undertaken by Pager Power because no communication link details have been provided.

5 MITIGATION OPTIONS

5.1 Microwave Link Mitigation

5.1.1 Overview

In the event that an impact on a microwave link was to present itself, the recommended solutions to consider could include:

- Micrositing / Layout Optimisation;
- Re-networking of the link via existing telecommunications sites;
- Use of a leased line.

Further information regarding these options is given below. Other options that can be considered are:

- Construction of a new telecommunications site for the purpose of re-networking solution;
- Use of an alternative technology such as a satellite link.

These options are less likely to be feasible and are not discussed in detail. They could be explored if an impact could not be mitigated by other means.

5.1.2 Micrositing / Layout Optimisation

This is potentially the simplest solution, depending on the available site area.

Ensuring that replanted turbines remain outside the exclusion zones associated with the microwave links and remain more than 250 metres from a microwave link end is likely to remove any potential impact.

5.1.3 Re-networking Solution

In some cases, it is possible to re-network a microwave link via an existing telecommunications site that lies away from the wind farm.

This involves adding an extra node on the link path, so that instead of the signal being sent from End A to End B, it is sent from End A to a re-networking site, and from the re-networking site to End B.

Implementation of such a solution requires identification of a suitable re-networking site, and assessment of the intervening terrain to ensure the appropriate Fresnel zone would not be infringed by terrain for the re-networked link.

The costs and timescales associated with such a solution are variable, however it is likely to be more cost-effective and have a shorter timescale than construction of a new telecommunications site.

5.1.4 Use of a Leased Line

In some cases, it is possible to replace the wireless link with a leased line between the link ends, thereby avoiding potential interference due to the wind development.

The feasibility of such a solution is dependent on the accessibility of each link end with regard to installation of a leased line.

The costs and timescales of the solution are variable and dependent on the individual site locations and the distance between them.

5.2 UHF Telemetry Links

5.2.1 Overview

Three of the most common and cost-effective mitigation options for UHF telemetry link that are affected by wind turbines are:

- Micrositing / Layout Optimisation;
- Use of an alternative scanner;
- Replacement of the UHF telemetry link with a microwave link.

Further information regarding these options is given below. Other options that can be considered are:

- Use of a leased line or fibre optic connection;
- Construction of a new scanning station;
- Use of an alternative technology such as a satellite link.

These options are less likely to be feasible and are not discussed in detail. They could be explored if an impact could not be mitigated by other means.

5.2.2 Micrositing / Layout Optimisation

This is potentially the simplest solution, depending on the available site area. Relocation of any turbines that have the largest interference contribution could prevent any impacts on the link.

Relocating problem turbines away from the link paths may be sufficient to overcome the operator's concerns.

5.2.3 Use of an Alternative Scanner

In some cases, it is possible to direct the outstations to an alternative scanner. Discussions with the link operator would be required to establish the suitability of such a solution.

Costs are not known for such a solution, however these are likely to be of the order of £5,000 per link.

5.2.4 Replacement of the UHF Link with a Microwave Link

In cases where reflection issues are the only concern, replacement of the UHF link with a microwave link. This is because microwave links are not prone to reflection issues in the way that UHF telemetry links are.

However, microwave links do require radio line of sight to operate, which UHF telemetry links do not. Therefore, detailed assessment of the technical feasibility of such a solution would be required. This would include assessment of radio line of sight between the link ends and establishment of whether the intervening terrain would obstruct the appropriate Fresnel zone.

If the solution is feasible costs are expected to be of the order of £15,000 per link.

6 CONCLUSIONS

6.1 Overall Results

Arqiva, BT, MBNL⁷, Vodafone, Telefonica (Virgin Media O2), Atkins, and Dwr Cymru Welsh Water have confirmed that they do not operate any communication links within close vicinity of the proposed development and therefore have no objections to the proposed development.

Airwave (Motorola Solutions) have conducted their own assessment and confirmed that they have no objections to the proposed development.

The Joint Radio Company (JRC) had raised an objection to the proposed development, relating specifically to T3 and T6. The JRC has undertaken an investigation of mitigation solutions. The mitigation solution can be incorporated as part of their existing planned work. The applicant is keen to proceed with the mitigation solution and is in the process of agreeing to commercial arrangements for the JRC's coordination of the mitigation solution.

6.2 Mitigation

An overview of possible mitigation strategies has been provided for reference (See Section 5).

⁷ Mobile Broadband Network Limited (MBNL) is a joint venture between Everything Everywhere (EE) and Three.

APPENDIX A – WIND TURBINE DETAILS

Wind Turbine Details

ID	Easting	Northing	Rotor Diameter (m)	Tip Height (m agl)
1	307733	210855	149.1	180
2	308300	210948		
3	308089	210116		
4	309105	210563		
5	308632	210633		
6	308565	210077		

Wind turbine details



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