



*joint radio company*  
*Spectrum management services*

Public Document

Procedure for coordination with  
wind energy developments.

Issue 2.1  
December 2014



## Change History

Issue	Date	Change History	Authority
Draft Report		Initial Draft	PAS/AAG
1.0	January 2007	Initial Release	AAG
1.1	July 2009	Incremental Update	PAS/SJP
1.2	5 August 2009	Further minor amendments	PAS
1.3	17 August 2009	Confidentiality sections drawn together	AAG
2.0	September 2009	Amendments	AAG
2.0.1	October 2009	Modification of provisions for medium turbines (>2m <30m rotor Ø)	PAS/SJP
2.0.2	March 2010	Minor Editorials	PAS/SJP
2.0.3	April 2010	Coordination concessions for small turbines.	PAS/SJP
2.0.4	May 2014	Minor editorials	PAS/SJP
2.1	November 2014	Periodic Update Review	SJP

Published by The Joint Radio Company Ltd.

JRC is a wholly owned joint venture between the UK electricity and gas industries specifically created to manage the radio spectrum allocations for these industries used to support emergency and safety critical operations. JRC also represents gas and electricity interests to government on radio issues.

<[www.jrc.co.uk/about-us](http://www.jrc.co.uk/about-us)>

© 2014 Joint Radio Company Ltd.

NOTICE: This is an uncontrolled copy.  
The definitive version is always available from  
[www.jrc.co.uk/wind-farms/](http://www.jrc.co.uk/wind-farms/)

Joint Radio Company Ltd.  
Dean Bradley House  
52 Horseferry Road  
London  
SW1P 2AF

☎ +44 20 7706 5199

✉ +44 20 7222 0100

<[admin@jrc.co.uk](mailto:admin@jrc.co.uk)>



This document was Printed: 04 December 2014



## 1 Contents Summary

- (1) This document explains the process to be used by JRC in assessing the potential for wind energy systems to cause disturbance to operational radio links used by the gas and electricity industries for management, safety and control of their networks. The intention of this document is to explain how we protect the operation of these links from interference that might be caused by proposed wind energy developments.
- (2) Where a potential for interference is predicted by our initial coordination process, this document explains the measures that can be taken to explore the possibilities for co-existence of the wind energy systems with utility radio links, the cost of which would be met by the wind developer.
- (3) The overall objective is to achieve co-existence of wind energy and utility radio systems in the most cost-effective manner. JRC does not have any remit to promote or hinder wind energy, but simply to reflect government priorities, which are designed to foster the growth of renewable energy systems but without detriment to telecommunications or any adverse impact on the efficiency and security of energy supplies to consumers.

## 2 Background

- (4) JRC manages 48 channels of UHF (Ultra High Frequency) radio spectrum allocated by the UK Communications Regulator, Ofcom, to the UK Energy Industries for telemetry and telecontrol of their networks. JRC holds the Wireless Telegraphy Act Licence for these channels and assigns frequencies to UK energy companies on an individual basis to operate designated radio links. JRC is responsible for the assignment of these frequencies, their protection and first line interference resolution.
- (5) JRC manages 110 additional 12.5/25 kHz channels of VHF (Very High Frequency) and UHF radio spectrum leased as national or area assignments from the UK Communications Regulator, Ofcom, to the UK Energy Industries for use by their business for both voice and data, fixed and mobile. JRC holds the Wireless Telegraphy (WT) Act Licence for these channels and assigns frequencies to UK energy companies on an individual basis to operate designated radio services. JRC is responsible for the assignment of these frequencies, their protection and first line interference resolution.
- (6) JRC provides a number of other radio spectrum services to the electricity generation, transmission and distribution industry, plus similar services to the gas production, transmission and distribution licence holders. A number of other critical radio spectrum users also take advantage of JRC's spectrum management services.
- (7) Within JRC's portfolio of services, JRC is contracted by a number of companies to protect their microwave fixed links from interference, and this includes the potential for harmful interference by wind turbines. To this end, JRC may also hold the actual WT licences for these fixed links.
- (8) To assist the wind energy industry understand the potential for detrimental impact of wind turbines on radiocommunications links, JRC publishes a range of documents on its web site: [www.JRC.co.uk/wind-farms](http://www.JRC.co.uk/wind-farms), and has developed the procedures outlined below to expedite the coordination process.
- (9) JRC's core funding is derived from subscriptions from the UK gas and electricity industries responsible for delivery of services regulated by the British energy regulator Ofgem (and its equivalent in Northern Ireland). Costs legitimately attributable to the wind energy sector must therefore be borne by that sector as it would be inequitable for JRC costs attributable to renewable energy policies to be subsidised by energy consumers.

## 3 Procedure for evaluating wind energy proposals

### 3.1 UHF links

(10) JRC adopts the following approach:

- Initial applications are sifted to ascertain whether any part of the wind energy development encroaches within a distance around any utility radio infrastructure or link path as defined in the table below:

#### Coordination Zones for JRC assets (modified April 2014).

Asset Type	Turbine Type	Coordination Zone
Base Station Sites: Omni directional.	>32m rotor Ø	1000 m
	<32m rotor Ø	1000 m
	<22m rotor Ø	See 4.2 below
UHF Link	>32m rotor Ø	1000 m
	<32m rotor Ø	500 m
	<22m rotor Ø	See 4.2 below

- If any part of the wind energy development falls within the coordination zone then JRC will undertake an initial technical interference assessment. If our assessment is that the development will affect JRC services then the applicant is notified that JRC, as the licence holder, objects to the scheme, and will sustain that objection in respect to any planning application related to that scheme. JRC will advise the operator of the affected link(s) of the objection, and where instructed so to do, JRC will also object on behalf of the JRC member company concerned.
- In those circumstances where, in spite of the proposed development impinging on the coordination zone, the initial technical assessment indicates that there will not be a conflict, the application may be cleared.
- In advising the wind farm or turbine applicant of the coordination failure and likely planning objection, two services are offered to assist the applicant which will be chargeable to the applicant:
  - Detailed coordination** of each interfering asset to ascertain the precise path profile and potential interaction with the utility radio service(s).
  - Consultancy advice to liaise with the affected JRC member to explore **mitigation options** to enable the wind energy development to co-exist with the affected radio link(s) in a manner acceptable to both parties.

### 3.2 Microwave links

(11) For microwave fixed links, a similar process is followed, but with the following exceptions:

- The separation distance between wind energy system and radio link with which an objection is triggered is reduced to reflect the shorter wavelengths at which microwave fixed links operate, as given in the table below:

**Coordination Zones for microwave links**

Asset Type	Turbine Type	Coordination Zone
Microwave link	>32m rotor Ø	500 m
	<32m rotor Ø	300 m
	<22m rotor Ø	See 4

- Although JRC is usually the licence holder, this is not always the case. In some cases, the objection would be raised on behalf of the licensed operator of the fixed link(s) within our remit to coordinate with wind turbines and manage the process of mitigation.

### 3.3 Satellite links

(12) In general terms, because satellite systems use a highly directional antenna and use an inclined path, the potential for interference between wind energy developments and satellite links is small. Where requested to evaluate the potential for harmful interference to a satellite link from a wind energy development, JRC will assess the compatibility on a case-by-case basis.

### 3.4 Grid connections

(13) Wind energy developers are reminded that where a wind energy development is connected to the electricity distribution network, the electricity distribution company may require additional telemetry and telecontrol points for monitoring and control. Since the additional control points may be required to be monitored using a UHF telemetry and/ or UHF/microwave point to point link, it would be wise for this path to be included in any evaluation at the proposal stage.

### 3.5 Timescale

(14) JRC aims to respond to initial coordination requests within 30 working days.



## 4 Modifications to the procedure

### 4.1 Concessions to reduce the coordination requirements for small turbines.

(15) JRC has developed software to simplify the screening of small turbines.

- The software analyses the relative position of the hub height with that of the ray height of the affected link. In addition, comparison is made of the blade length of the turbine with the first Fresnel Zone radius of the link. From this a quick decision can be made about the potential for the turbine to be problematic to the link, or if further in-depth analysis is required.
- Fresnel intrusion under certain circumstances will be tolerated providing the turbine blade does not cut the actual link ray when considered in three dimensions.
- It should however be noted that turbines that are close to the ends of the link or that are installed in a high and dominant position could still fail this initial screening and require in depth analysis. It should also be noted that the higher the link operating frequency is; the more likely turbines close to a link ray path would fail this screening process.

NOTE: For the purposes of this document, 'Small Turbines' are considered to be those where the rotor does not exceed 22 m in diameter (equivalent to a swept area of less than 380 square metres) with a tip height of less than 50 m.

### 4.2 Concessions to exclude micro turbines from coordination requirements

(16) No coordination will be required for micro turbines if:

- The turbine is building-mounted: where the tip height is no greater than 4 m above the prevailing roof line; or
- If pole mounted: where the hub height is no greater than 10 m above the prevailing ground level and the supporting pole is less than 20 m from the external wall of a significant building (considered to be one in respect of which planning consent would be required for its construction).

NOTE: For the purposes of this document, 'Micro Turbines' are considered to be those where the rotor does not exceed 2 m in diameter (equivalent to a swept area of less than 3.5 square metres).

## 5 Processes to investigate coordination failure

### 5.1 Detailed coordination

- (17) Where an application fails the initial coordination assessment; it is possible that the objection may be lifted if it can be shown from a more detailed analysis that the potential for interference is minimal.
- (18) For **all links operating at frequencies below 3 GHz**, the criteria against which such an evaluation will be conducted is contained within the document 'Calculation of The Clearance Zone', the current version of which is always available on the wind farms area of the JRC web site.
- (19) For **links operating at frequencies greater than 3 GHz**, the criteria used are defined in the document published by the former Radiocommunications Agency 'Fixed-link wind-turbine exclusion zone method' (the 'David Bacon' method), an original copy of which is contained on the JRC web site for convenience.
- (20) For **satellite links**, JRC will investigate each link on a case by case basis.
- (21) The **fee chargeable** for a detailed coordination will be quoted in advance and based on the time required to undertake the work.

Note: In order to fully assess all the parameters with sufficient precision to undertake an accurate detailed coordination, a site visit may be required.

- (22) Undertaking a detailed coordination enables the interaction between wind turbines and radio links to be more precisely defined, but does not guarantee in any way to diminish the potential for interference. Thus, having undertaken a detailed coordination, it is possible that the original objections may be sustained.
- (23) Using data obtained from the detailed coordination, JRC will, on request, supply a map of the proposed wind energy development showing exclusion corridors for the radio link(s). If the wind farm developer is able to modify the plans in such a way that no part of any wind turbine impinges upon the specified corridors, then the developer may wish to submit a revised proposal. If it is confirmed that the turbines no longer intrude into the exclusion zones, then the objections can be lifted.
- (24) JRC will endeavour to produce the data for a detailed coordination within 40 working days of receipt of a purchase order.
- (25) If a detailed coordination of a wind development covers links that are operated by more than one operator, the report may be released in more than one part to protect the confidentiality of each operator's data.
- (26) A detailed coordination will include:
- Listings of the basis that the wind farm is evaluated on. Turbine sizes, turbine locations, micrositing and verification of the link parameters.
  - A layout showing the position of turbines with relation to JRC managed radio infrastructure.
  - A table consisting of two dimensional clearances of all turbines with respect to all links that are within coordination distance.
  - Three dimensional clearance diagrams if relevant.

- Diagrams that show the predicted path losses of all paths using an industry standard radio planning tool (ATDI's ICS Telecom).
- Reflection diagrams that show the geometry of the turbine(s) with relation to the link(s).
- The frequency bands, antenna types, polarisation and heights in use for all links.
- The maximum 'Radar Cross-Section' (RCS) of the turbine used in the calculations, at the reflection angles required for all turbines and all links.
- The calculation of the wanted/unwanted ratios for individual turbines and combined for all links within coordination distance.
- An appendix will show all figures used in the calculations for both the JRC method and ITU-R BT805 method for calculation of wanted/unwanted ratios.

(27) This information serves two purposes

- The developer can see in detail any potential problems highlighted and can, if required, duplicate the calculations.
- With the developer's agreement it is recommended that the report should be released to the operator of the link so they have enough information to;
  - confirm the basis on which the coordination has been carried out;
  - duplicate the calculations if required; and
  - comment on any recommendations JRC may have made regarding maintaining or withdrawing of any objections.

(28) In conducting an evaluation, JRC seeks to act as an independent arbiter and, whilst having power to remove any of its own objections to an application if it considers them to be no longer necessary, individual JRC member companies will make their own judgement based on the findings and cannot be bound by any JRC decision.

## 5.2 Mitigation studies

- (29) A mitigation study will generally follow when a detailed coordination reveals that the potential for interference between the wind energy development and radio link(s) exists, and the wind energy developer wishes JRC to undertake an in-depth study to identify options which may exist for mitigating the interference potential.
- (30) JRC will then appoint a project manager to prepare a proposal to submit to the wind energy developer identifying the proposed schedule of work, cost and timescale for identifying mechanisms whereby the wind energy development might be made compatible with the radio links, or the telecommunications schemes modified to avoid the conflict.
- (31) This work has to be undertaken in collaboration with the link operator as ultimately the solution will usually require adaptation of the telecommunications system to overcome the conflict. The final outcome will normally take the form of an agreement between wind energy developer and link operator for a schedule of work to be funded by the developer if the scheme proceeds.
- (32) In conducting a mitigation study, JRC acts as an independent arbiter and, whilst having power to remove any of its own objections to an application if it considers them to be no longer necessary, individual JRC member companies will make their own judgement based on the findings and cannot be bound by any JRC decision.

## 6 Related matters

- (33) JRC's assessments are based on research reports and experiments, both published and unpublished. JRC has also undertaken its own tests and research programmes, and welcomes proposals for collaboration in further research activities to understand the interaction between wind turbines and radio links more fully.
- (34) Within the wind farms area of JRC's web site is information illustrating some of the problems that have been found to exist.
- (35) JRC is working with the industry to investigate whether there is the potential to relax the requirements described in the assessment document "Calculation of Wind Turbine Clearance Zones, used by JRC for 460 MHz Telemetry Links, when turbine sizes and locations are accurately known" for telemetry links designed to operate at lower availability than primary links and have intermittent duty cycles.
- (36) All assessments are carried out on the basis of location data currently available (unless verified by a site visit or other means as part of a study). This data is largely historical, and was not recorded with the level of accuracy necessary for wind farm coordination, hence uncertainties have to be included in all calculations to reflect prevailing operating environment.
- (37) JRC at present is receiving coordination requests for in excess of 8000 potential developments a year, of which a large percentage are never built. It should be noted that if clearance to a development is given this appertains only to the date of its issue. As the use of the radio spectrum is dynamic and the use of the spectrum is changing on an ongoing basis fuelled by the installation of intermittent, uncontrolled electricity generators; developers are advised to seek re-coordination prior to submitting a formal planning application. This will avoid the possibility of an objection being raised at that time as a consequence of any links being assigned between the clearance and the finalisation of any project.
- (38) Only after a proposal has been submitted for planning permission will JRC or its member companies protect the proposal when planning new radio based services.

## 7 Fixed clearance shortcomings.

- (39) JRC are aware that some link operators use fixed clearance allowances, which some developers take as being the normal required clearance. JRC believes (other than using the usual allowances as an indication that a development may require initial coordination, as defined in Section 3 of this document) each development should be analysed individually as there are potential positional uncertainties, large variations on the clearance requirements for different link frequencies/lengths and different sized turbines developments. This approach often results in developments being cleared where they would otherwise have been denied based on fixed allowances.
- (40) From an uncertainty perspective:
- JRC has seen coordinates supplied for both link end locations and turbines with excess of 100m inaccuracy, with diligence the total uncertainty can be reduced considerably.
  - Micrositing allowances requested by developers vary between a declared zero and for large developments, up to 80 m.
  - Consumer grade GPS systems often used for turbine positioning have inaccuracies, often based on the way they're used and configured in addition to the manufacturer's stated positional accuracy, as do different methods of converting Lat/Long coordinates to British or Irish Grid.
- (41) From a diffraction clearance perspective:
- Turbine blade length can vary between <3 m and 63 m.
  - The 1st Fresnel Zone of a typical 50 km 1400 MHz link is up to 53 m radius compared with a typical 5 km 38 GHz link 2nd Fresnel radius of <5 m.
  - Analysing link/turbine positions in three dimensions rather than two, can under certain circumstances increase clearances considerably, particularly for smaller single turbines.
- (42) From a reflection/scattering perspective:
- The difference in Radar Cross Section between the largest and smallest turbine at the same frequency using the JRC method of calculation can be 26 dB and even more if the ITU-R BT 805 method is used.
  - Tip heights of a turbine (that can influence a turbine's ability to reflect signals) can vary between 15 m and, in extreme cases, in excess of 150 m.
  - The amount of forward scatter, which JRC believes is the most destructive element of wind turbine interference for lower frequency links, varies with both frequency and blade area/width and polarisation.
  - Depending on the path lengths and location along the path of a potential interfering turbine, the reflection angles can vary considerably if using a fixed clearance figure.
  - The discrimination of different link antenna types varies considerably, for example at 10 degrees a vertically polarised 12 element Yagi

antenna, typically used on UHF telemetry outstations, has minimal discrimination, an 18 element shrouded Yagi antenna, typically used on a 1400 MHz link, will only have around 1.5 dB discrimination to reflected signals compared to a 6 ft parabolic dish, often used on high capacity higher frequency links, typically has in excess of 35 dB discrimination. Polarisation can also have an influence on discrimination.

- The difference between the main paths and the reflected paths of a potential interfering signal can vary considerably, depending on where the turbine is located, the terrain and the hub/tip height of the turbine above Ordnance Datum (AOD) compared to the link ray height.
- Depending on location, the interference potential of multi turbine sites is greater than single turbine site, with the same turbine size.

(43) JRC are of the opinion in some instances typical fixed clearances often quoted can be detrimental to the link's performance. Conversely, in some instances, with detailed analysis, typical fixed clearances often quoted can be unreasonable, particularly with respect to a single turbine small scale wind energy development.

## 8 Confidentiality

- (44) Data provided by JRC in response to an enquiry is done so on a **confidential** basis and may not be disclosed to a 3<sup>rd</sup> party or used for any purpose other than for the evaluation of the interaction of the wind development and the radio infrastructure covered by the response.
- (45) In particular, data provided by JRC to a developer **must not** be disclosed to a local authority (including a planning application) or any other public body without express permission from JRC.
- (46) Data provided by the developer to JRC will be regarded as **confidential** and will not be distributed to any 3<sup>rd</sup> party without the agreement of the wind farm developer (except as detailed below).
- (47) When an initial wind farm enquiry is forwarded to JRC, JRC's response will routinely be copied to the utility network operators in the area concerned **unless** specifically requested by the enquirer. This is necessary because although JRC maintains the database of operational radio links, network operators may have alterations, decommissioning or construction of new infrastructure in progress of which JRC will not be aware. This procedure has been implemented in order to avoid the situation where preliminary wind farm enquiries do not reveal any conflict, but by the time a subsequent planning application is submitted, new radio links have been installed which give rise to an objection. Conversely, it is also possible that an existing radio link is scheduled for decommissioning and thus will not present a conflict on the timescale envisaged for the construction of the wind farm.
- (48) Once the local utility network operators have been advised of the initial wind farm application, any further information provided by the developer for the purposes of detailed co-ordination will not be forwarded to the utility network operators, and will be accorded the confidentiality process described in this document.
- (49) Information concerning wind turbine developments provided to JRC by other authorities, most commonly Ofcom and Local Authorities will be accorded similar confidentiality status, but such data is governed by separate confidentiality rules.
- (50) The exercise of these confidentiality rules in respect of 3<sup>rd</sup> party data may in some circumstances result in an apparently irrational outcome to a JRC technical study where the study reflects technical constraints available to JRC under confidentiality agreements but such information is not in the public domain.
- (51) JRC's confidentiality rules are applied strictly on an organisation by organisation basis, such that where more than one developer has an interest in a given site or locality, JRC will maintain confidentiality of data between all the parties involved.
- (52) JRC's confidentiality rules are also applied to individual utilities and link operators such that an electricity network operator will not be advised of the status of the communications links for the gas network in the same area, etc.
- (53) JRC will store all data, including both electronic and paper formats, in a secure environment to reflect the sensitivity of the material.
- (54) It should be noted that due to confidentiality breaches and for security purposes some link operators request JRC not to release any data of radio



---

**Commercial in Confidence**

infrastructure, or operator details to third parties. In this instance only the link identifiers will be given in response to coordination requests.

END

---