Technical Appendix 14.2: TV and Radio Assessment Methodology

1 Technical Appendix 14.2– Television and Radio Assessment Methodology

1.1 Introduction

1.1.1 This Technical Appendix outlines the approach to the assessment of significance and the economic impact methodology that is used in **Chapter 14 Television and Radio (EIAR Volume 1)**.

1.2 Assessment Methodology and Significance Criteria

Assessing Significance

Sensitivity

1.2.1 The sensitivity of receptors has been assessed based on professional judgement and previous experience of comparable developments elsewhere. The criteria used to do this is shown in **Table 1.1.**

Table 1.1 Framework for determining receptors sensitivity

Sensitivity of receptor	Definition
Very High	The receptor has little or no ability to absorb change without fundamentally altering its present character, is of very high environmental value, or of international importance.
High	The receptor has low ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national importance.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance.
Low	The receptor is tolerant of change without detriment to its character, is low environmental value, or local importance. The receptor is resistant to change and is of little environmental value.[i]

1.2.2 A summary of identified sensitive/ important residential areas is provided within **Table 1.2.**

Table 1.2: Summary of Identified Sensitive/ Important residential areas

Receptor	Sensitivity
Killin	Medium
Lochearnhead	Medium
St Fillans	Medium
Dunira	Medium

1.2.3 **Table 1.3** below summarises the magnitude of impact.

Table 1.3: Framework for determining receptors sensitivity

Magnitude criteria	Definition
Large	A fundamental change to the baseline condition of the asset, leading to total loss or major alteration of character.
Medium	A material, partial loss or alteration of character.
Low	A slight, detectable, alteration of the baseline condition of the asset.
Negligible	A barely distinguishable change from baseline conditions.

Significance

1.2.4 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, considering both sensitivity and magnitude of change as detailed in **Table 1.4.** Major and moderate effects are considered significant in the context of the EIA Regulations.

Table 1.4: Significance Criteria

Magnitude of Change	Sensitivity				
	Very High	**High**	**Medium**	**Low**	**Negligible**
High	Major	Major	Moderate	Moderate	Minor
Medium	Major	Moderate	Moderate	Minor	Negligible
Low	Moderate	Moderate	Minor	Negligible	Negligible
Negligible	Negligible	Negligible	Negligible	Negligible	Negligible

Method of Baseline Characterisation

Extent of the Study Area

1.2.5 According to report ITU-R BT.2142-2, television interference caused by wind turbines is theoretically possible at locations up to 13.5 km away from a transmitter site. In Pager Power's experience, effects from wind turbines on television and radio signals are unlikely beyond distances of 10 km.

1.2.6 A Study Area of 10 km centred on the Proposed Development has therefore been used to capture potential terrestrial television and radio interference effects. The Study Area is shown in **Figure 11** in **TA 14.1 (EIAR Volume 4)**.

Desk Study

1.2.7 A comprehensive desk-based review was undertaken to inform the baseline for television and radio reception. Television and radio transmitters coverage data were obtained from UK Free TV online[1] coverage checker service. A signal interference analysis based on terrain, atmospheric refraction and Carrier-to-Interference Ratio (CI Ratio) had been undertaken for five transmitters for the desk base study.

1.2.8 The analysis was carried out by Pager Power in-house software[2], with results presented using Google Earth as a platform.

1.3 Method of Assessment

1.3.1 Having considered the various published works, exploring knowledge of real interference caused by wind farms, and modelling interference in various ways Pager Power has developed an effective modelling method for mapping likely television interference from wind farms. The process involves the following stages:

1. Acquire terrain data in digital format.
2. Determine the following for modelling:
    a) Transmitter location and height.
    b) Turbine locations and hub heights.
    c) Single Blade Area.

1 Website link: https://ukfree.tv/maps/freeview
2 Information of the model can be found in Appendix A of TA 14.1 (EIAR Volume 4)

d) Blade Width for modelling purposes.

e) Television signal wavelength for modelling purposes.

3. Area of interest for interference modelling – this will be a rectangular area defined by top-right and bottom-left coordinate pair.
4. Determine the sample point spacing for modelling purposes – this is currently a fixed value for the entire area.
5. Determine the receiver aerial height for modelling purposes.
6. Calculate coordinates of each Receiver Sample Point in the area of interest.
7. Calculate Free Space Path Losses for the following paths:

    f) Transmitter to each Wind Turbine FSPL_TW.

    g) Transmitter to each Receiver Sample Point FSPL_TR.

    h) Each Wind Turbine to each Receiver Sample Point FSPL_WR.

8. Build electronic terrain profile for each of the above paths. The number of points in the profile is determined dynamically based on the source terrain data resolution and the particular path length.
9. Determine additional diffraction losses for each of the above paths using ITU-R 526 method. These losses are DL_TW, DL_TR and DL_WR respectively. These calculations are carried out for the turbine tip, turbine hub and turbine rotor.
10. Calculate a Wind Turbine Reflection Factor (RF) in accordance with ITU-R BT805.
11. Calculate an adjustment factor (ADJ) to compensate for the 1km free space path loss built into the Relative Amplitude (RA) calculation defined in ITU-R BT805. This is 88.662dB.
12. Determine the following for each wind turbine – sample point pair:

    i) Horizontal Angle (alpha) at the turbine between extended path from transmitter and path to sample point.

    j) Horizontal Angle (beta) at sample point between turbine and transmitter.

    k) Calculate Relative Amplitude (RA) based in accordance with ITU-R BT805. If RA is calculated to be smaller than -10 it is changed to -10 (as described in BT805).

    l) Calculate Loss due to Antenna Directivity (AL) based on angle beta and the curves in ITU-R BT419.

13. Calculate Interference Signal Magnitude for each Turbine Receiver Sample Point Pair at turbine tip, hub and rotor base by summing the following:

    m) - FSPL_TW

    n) - DL_TW

    o) - FSPL_WR

    p) - DL_WR

    q) RF

    r) RA

    s) ADJ

    t) –AL

14. The above absolute values are summed for each turbine sample point and converted back into decibel values and saved as Summed Interference Values (I). Summing occurs with a 20/60/20 respective weighting split for tip, hub and rotor base.
15. Carrier Signal Magnitude (C) is then determined for each Receiver Sample Point by summing:

u) – FSPL_TR

v) – DL_TR

16. CI Ratio is then calculated for each point by subtracting I from C.
17. CI Ratio for each sample point is then recorded on an interference map

Limitations and Assumptions

1.3.2 All analysis is desk-based, no site surveys have taken place. This does not significantly affect the certainty of the results because the information sources are reliable and have, where appropriate, been cross-checked using multiple sources .

1.3.3 The model considered average service frequency for each individual transmitter, which is a suitable representation frequency. In practice, transmitters provide television and radio services across several frequencies.

1.3.4 The analysis only considered Terrain, Atmospheric Refraction and the CIR. Other additional obstructions, such as buildings and vegetation, are not included in the model.