15 Shadow Flicker

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15. Shadow Flicker

15.1 Executive Summary

15.1.1 This chapter presents an assessment of the potential shadow flicker effects from the Proposed Development on residential and commercial receptors. Within the study area for shadow flicker effects (within 130 degrees either side of north from each turbine, and out to 10 rotor diameters), there is one property which is owned by the Applicant and will be uninhabited for the life-span of the Proposed Development. Therefore, a detailed assessment of shadow flicker effects is not required, and it can be concluded that the Proposed Development will have no shadow flicker effects on residential dwellings.

15.2 Introduction

15.2.1 This chapter describes and assesses potential shadow flicker effects resulting from the Proposed Development on neighbouring residential and commercial receptors. This chapter (and its associated figure) is not intended to be read as a standalone assessment and reference should be made to the description of the Proposed Development in Chapter 3.

15.2.2 Shadow flicker occurs when, *"[In] certain combinations of geographical position, time of day and time of year, the sun may pass behind the rotor and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as "shadow flicker". It occurs only within buildings where the flicker appears through a narrow window opening*" (Scottish Government, 2014a).

15.2.3 Any receptors which may potentially be affected have been identified and the risk of shadow flicker assessed.

15.2.4 The magnitude of shadow flicker effects varies both spatially and temporally, and depends on a number of environmental conditions coinciding at a particular point in time, which include:

- time of day and year;
- wind direction;
- height of wind turbine and blade length;
- position of the sun in the sky;
- weather conditions;
- proportion of daylight hours in which the turbines operate;
- type and frequency of use of the affected space; and
- distance and direction of the wind turbine from the receptor.

15.2.5 The flickering effect caused by shadow flicker also has the potential to induce epileptic seizures in patients with photosensitive epilepsy. The National Society for Epilepsy (NSE) advises that around 1 in 131 people have epilepsy and up to 5 % of these have photosensitive epilepsy (NSE, 2011). The common rate or frequency at which photosensitive epilepsy might be triggered is between 3 and 30 hertz (Hz, flashes per second). Large commercial turbines rotate at low speeds resulting less than 3 flashes per second and are therefore unlikely to cause epileptic seizures (Harding et al., 2008: Smedley et al., 2010). Therefore, there are not considered to be any health effects associated with the Proposed Development and this assessment will address the effects of shadow flicker related to local amenity.

15.2.6 Turbines can also cause flashes of reflected light, which can be visible for some distance. It is possible to ameliorate the flashing but it is not possible to eliminate it. Careful choice of blade colour and

surface finish can help reduce the effect and all modern turbine manufacturers use light grey semi-matt finishes to reduce this effect.

15.2.7 A wind development of more than one turbine can also result in more than one turbine affecting a specific receptor at any time, potentially increasing the overall shadow flicker intensity or frequency.

15.3 Legislation, Policy and Guidelines

Legislation

15.3.1 There is no legislation that directly deals with the matter of shadow flicker.

Policy

15.3.2 Chapter 5 of this EIA Report sets out the planning policy framework that is relevant to the EIA. The policies set out include those from the South Lanarkshire Local Development Plan (LDP), those relevant aspects of SPP, PANs and other relevant guidance. Of relevance to the shadow flicker assessment presented within this chapter, regard has been had to the following policies and guidance:

- LDP Supplementary Guidance 10 – Renewable Energy (South Lanarkshire Council, 2015); and
- Paragraph 187 of SPP (Scottish Government, 2014b).

Guidance

15.3.3 The Update of UK Shadow Flicker Evidence Base (DECC, 2011) reviews international legislation relating to the assessment of shadow flicker for wind turbine development and concludes that the area within 130 degrees either side of north from the turbine, and out to 10 rotor diameters, is considered acceptable for shadow flicker assessment. This supports the policy detailed above (refer to paragraph 14.2.2).

15.3.4 This report also draws on the conclusions of the Nordrhein-Westfalen (2002) on the identification and evaluation of shadow flicker, which are further referenced below.

15.3.5 This assessment also takes into consideration the Scottish Government Online Renewables Planning Advice: Onshore Wind Turbines (Scottish Government, 2014).

15.4 Consultation

15.4.1 No consultation has been undertaken for the shadow flicker assessment.

15.5 Assessment Methodology and Significance Criteria

Study Area

15.5.1 The shadow flicker assessment has been carried out for the proposed 14 turbines at the locations identified in Chapter 3. An indicative candidate turbine model has been identified by the Applicant and dimensions of the chosen model used for the purposes of the shadow flicker assessment can be found in Table 15.1.

Table 15.1 - Details of the Turbine Model Used for the Shadow Flicker Assessment

Tip height	*200 m*
Rotor diameter	*155 m*
Blade length	*76 m*

15.5.2 The study area within which a receptor could potentially be affected by shadow flicker has been set at a distance of 10 rotor diameters from each turbine and 130 degrees either side of north (relative to each turbine), as noted within Update of UK Shadow Flicker Evidence Base report (DECC, 2011). In this assessment the study area extends to 1,550 m from each turbine. Figure 15.1 shows the extent of this area and those receptors that could potentially be affected by shadow flicker.

Desk Study

15.5.3 The desk-based assessment, using OS address data and mapping, identified one residential receptor within the study area, Low Broomerside. Table 15.2 summarises the location of the receptor and the distance from the property to the nearest turbine. This is the only property within the study area.

Table 15.2 – Receptor Location

Address	Easting	Northing	Approx. Distance to Nearest Turbine (m)	Turbine
Low Broomerside	279660	629150	679	T2

15.5.4 Low Broomerside is owned by the Applicant and will not be inhabited during the life-span of the Proposed Development. Low Broomerside is therefore scoped out of the shadow flicker assessment. No other receptors are located within the study area.

Assessment of Effect Significance

15.5.5 As there are no inhabited receptors within the study area, no detailed assessment of potential or residual effects from shadow flicker is required and it can be concluded that there will be no shadow flicker effects arising from the Proposed Development.

15.6 Summary

15.6.1 Within the study area for shadow flicker effects there is one property which is owned by the Applicant and will be uninhabited for the life-span of the Proposed Development. Therefore, it can be concluded that the Proposed Development will have no shadow flicker effects on residential properties.

Table 15.3 – Summary Table

Description of Effect	Significance of Potential Effect		Mitigation Measure	Significance of Residual Effect		Comparison with the Existing Development
	Significance	Beneficial/ Adverse		Significance	Beneficial/ Adverse	
During Construction / Decommissioning						
Shadow flicker	None	N/A	N/A	None	N/A	No effect.
During Operation						
Shadow flicker	None	N/A	N/A	None	N/A	No effect, therefore no greater effect beyond that arising from operation of the Existing Development.
Cumulative Effects						
Shadow flicker	None	N/A	N/A	None	N/A	No effect, therefore no greater effect beyond that arising from operation of the Existing Development and other developments in the local area.

15.7 References

DECC- Department of Energy and Climate Change (16 Mar 2011). *Update of UK Shadow Flicker Evidence Base*. Prepared by Parsons Brinckerhoff.

Harding G, Harding P & Wilkins A (2008). *Wind turbines, Flicker and photosensitive epilepsy: Characterising the flashing that may precipitate seizures and optimising guidelines to prevent them*. Epilepsia. Vol. 19 (6): 1095-1098.

Nordrhein-Westfalen (2002). *Notes on the identification and Evaluation of the Optical Emissions of Wind Turbines*. States Committee for Pollution Control. Germany

NSE- The National Society for Epilepsy (2011). Available at: http://www.epilepsysociety.org.uk/AboutEpilepsy/Whatisepilepsy/Triggers/Photosensitiveepilepsy/windturbines.

Scottish Government (2014a). *Scottish Government Online Renewables Planning Advice: Onshore Wind Turbines*. Available at: http://www.gov.scot/Resource/0045/00451413.pdf.

Scottish Government (2014b). *Scottish Planning Policy*. Available at: https://www.gov.scot/Resource/Doc/300760/0093908.pdf

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