Highfield Wind Turbine Replacement

Shadow Flicker Protocol Written Scheme

Author: Daniel Hirons

Approver: Nick Mace

Approval Date: 23rd April 2026

Introduction

Planning consent was granted for a replacement wind turbine on Highfield Farm, Bigrigg, Egremont, planning application reference 4/24/2334/0F1. The replacement wind turbine will be up to 76m to blade tip height.

Planning condition 10 of the consent stipulates:

> *No building or use hereby permitted shall be occupied or use commenced until a protocol for the management of shadow flicker on sensitive receptors has been submitted to and approved in writing by the Local Planning Authority.*
>
> *Reason: In order to safeguard the amenities of adjoining residential occupiers in accordance with Policy DS4 of the Copeland Local Plan 2021-2039.*

The author of this written scheme has over three years of experience in shadow flicker assessments and mitigation schemes. Mitigation programmes organised in concert with planning authorities include shadow flicker and noise mitigation at Auchencloigh Farm wind turbine, East Ayrshire; and shadow flicker assessments and complaint protocols including that at Lochend Wind Farm, Caithness; Doughty Farm, Pendle; and Nelson Farm, Hartlepool.

Shadow Flicker Context

'Shadow Flicker' is the strobe effect caused when a wind turbine's rotating blades intermittently cast shadows over enclosed apertures as they turn. This is most prevalent in dwellings with small windows, where the blades can cause a flicking light effect as their shadows momentarily disrupt the emergence of sunlight into an interior.

The duration, significance, and likelihood of shadow flicker is influenced by a number of factors:

- Sun height and position (and, correspondingly, time of year and day);
- Prevalence of clouds;
- Direction of turbine relative to receptor;
- Distance from turbine to receptor;
- Prevalence of objects between the turbine and receptor which may act as a screen;
- Turbine rotor diameter and height;
- Window size at the receptor;
- Wind speed;
- Wind direction.

There is no recommended quantitative measure for what amount of shadow flicker effect can be considered acceptable within Scotland. Guidance contained within 'Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy'[1] published by Northern Ireland Department of the Environment in 2009, recommends that shadow flicker effects should not exceed '30 hours per year or 30 minutes per day', quoting a previous survey undertaken by Predac, an organisation sponsored by the European Union to promote best practice.

It is found that as a general rule, at a distance of beyond 10 rotor diameters a wind turbine is unlikely to cause material shadow flicker effects. Additionally, shadow flicker is viewed to only occur within buildings where the flicker appears through a narrow window opening.[2]

[1] Best Practice Guidance to Planning Policy Statement 18 'Renewable Energy' (2009)
[2] Scottish Government Planning Advice Note, 'Onshore Wind Turbines', 2014

Procedure for Remediation

If shadow flicker were to be proven to occur and be considered a nuisance, industry practice allows for several forms of mitigation, including:

- Control at the receptor: The provision of blinds, shutters or curtains or similar items that obstruct the flicker effect to the affected property;
- Control on pathway: Obstructing the flicker effect with things such as screening vegetation planted between the wind turbine and the affected property;
- Control at source: Shutdown of the turbine (specifically, the halting of its blades spinning movement) at times of known flicker effect.

In accordance with the aforementioned condition, remediation via control at source will take place in the event of a complaint. The complete detail of this procedure shall occur as:

1. A complaint is received by the Local Planning Authority (LPA) from the owner and or occupier of a dwelling, such dwelling lawfully existing or having planning permission at the time of complaint.
    - The complaint is to be proven by provided video evidence, and a timeframe of the shadow flicker effect is to be provided by the complainant or verification by a site visit by the wind turbine owner.
2. The LPA is to provide the details of evidence; property location; and time frame of evidenced shadow flicker to the owner of the wind turbine.
3. Within 30 days or sooner of receipt of the complaint and evidence, the turbine owner is to set up a protocol which ensures that the turbine is shut down (note: blades are still) at the relevant evidenced time, and evidence this to the LPA with an update to Table 1 of this Written Scheme.
4. Shadow flicker will generally be considered unacceptable where:
    - The video evidence and / or monitoring demonstrates exposure materially exceeding accepted thresholds; and
    - The impact is intrusive, frequent and materially interferes with normal residential use of a habitable room or enjoyment of a residential property.

    Both frequency and severity may be considered by the LPA, and not solely numerical exceedance of the shadow flicker thresholds”

The method of control at source in this case is to input a new dispatch protocol into the Supervisory Control and Data Acquisition (SCADA) system of the wind turbine. This will have the following features:

- When required, the dispatch programme at the relevant start time will shut down the turbine, which causes the brakes to action and blades to become still.
- This state of shutdown will remain until the relevant end time, at which point the dispatch programme will end the state of shutdown and, if conditions allow, the wind turbine will begin operation.
- This process will occur each year at the defined date time(s) until the end the aforementioned planning permission.

The owner at this point does not wish to utilise weather-accurate equipment to further refine this protocol for shutdown periods where cloud conditions make shadow flicker impossible. The owner reserves the right to amend this protocol in the future with such equipment.

Shutdown Times

Further revisions of this scheme will have shutdown times evidenced in the below table:

Table 1 – Shutdown Times

Date	Start Time (GMT)	End Time (GMT)

This record will be available for inspection by the Local Authority and kept for the duration of the wind turbine operation.