Chapter 11: Glint and Glare Assessment

Cossans Solar & BESS EIA Report

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1.0	8 April 2025	Isabel Romero	Isabel Romero	Isabel Romero
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Table of Contents

Tables

Images

Acronyms and Abbreviations

ARP	Aerodrome Reference Point
BESS	Battery Energy Storage System
BRE	British Research Establishment
CAA	Civil Aviation Authority
DNI	Direct Normal Irradiance
G&G	Glint and Glare
MWp	Mega Watt peak
NPF4	National Planning Framework 4
NPPG	National Planning Policy Guidance
OP	Observation points
PV	Photovoltaic
UTC	Coordinated Universal Time

11. Glint and Glare

11.1 Executive Summary

11.1.1 This chapter presents an assessment of the potential glint and glare (G&G) impacts from the Proposed Development, focusing on the operational phase. The assessment evaluates the exposure of relevant receptors, including roads and residential dwellings, to G&G based on the geometry of the solar arrays and surrounding obstacles. Factors such as sunlight angles, weather assumptions, and panel visibility were considered to determine where and when G&G may occur. Two road routes – the A90 and a nearby rural road – and 26 fixed receptors were included in the simulation. No aviation receptors fall within the study area; the closest, Kirriemuir Farm Strip (GB-0577), is approximately 4 km to the north.

11.1.2 The assessment identified that only 17 of the 26 fixed receptors may experience any glare, primarily in the late afternoon and early evening during spring and summer. Of these, all but one (OP26) are affected by green-magnitude glare, which is less intense than common sources like windows and poses no risk to health and safety. OP26 is a residential dwelling owned by a financially involved Landowner and may experience yellow-magnitude glare for brief periods at sunrise and sunset between March and September. Mitigation has been embedded through the Indicative Landscape Plan, which includes native planting designed to reduce potential impacts. Additional screening can be agreed between the developer and landowner at a later stage if necessary. For road users, only the A90 is affected, with short-duration, green-magnitude glare predicted for a few minutes in spring evenings, posing no risk to safety. Cumulative G&G effects from nearby solar farms are also considered negligible due to limited overlapping visibility and the absence of receptors in those areas. No significant G&G impacts are predicted as a result of the Proposed Development.

11.2 Introduction

11.2.1 This chapter considers the potential G&G effects arising from the solar component of the Proposed Development. The assessment is based on the proposed design performed by SLR Consulting and information provided by the Applicant.

Solar PV Array Details

11.2.2 The Proposed Development has considered fixed PV modules with a tilt angle of 20° and south orientation. The heigh above ground is 1.2 m and the configuration is 2-modules in portrait (2P). **Table 11-1** shows the module specifications. The solar photovoltaic (PV) part of the Proposed Development is designed to have an export capacity of 49.9 MW with a solar build out of 65 MWp and is divided into four distinct development areas.

Table 11-1: Solar PV Design Details

Parameter	Detail
Mounting details	Fixed tilt (no tracking)
Module tilt	20°
Module orientation	180° (South)

Definitions

11.2.3 Glint, glare and dazzle are often used interchangeably but are defined in this chapter as described in **Table 11-2** below.

Table 11-2: Terms Definitions

Name	Description
Glint	Glint is a momentary flash of bright light.
Glare	Glare is a more continuous source of bright light.
Dazzle	This is an effect caused by intense glint and glare, which can cause distraction, and if strong enough reduce the ability of the receptor (pilot or driver, or otherwise) to distinguish details and objects.
Specular Reflections	Specular reflections are direct reflections of the sun's light off smooth surfaces, such as glass, steel, and calm water.
Diffuse Reflections	Diffuse reflections are scattered reflections of light produced from rougher surfaces such as concrete, tarmac, and vegetation.

11.2.4 It is noted that the different organisations and agencies apply slightly different definitions to these terms, and some refer to the terms glint and glare interchangeably.

11.2.5 **Image 11-1** illustrates the differences between specular reflection, produced as a direct reflection of the sun on to a smooth surface, and diffused reflection, which is a scattered reflection of light.

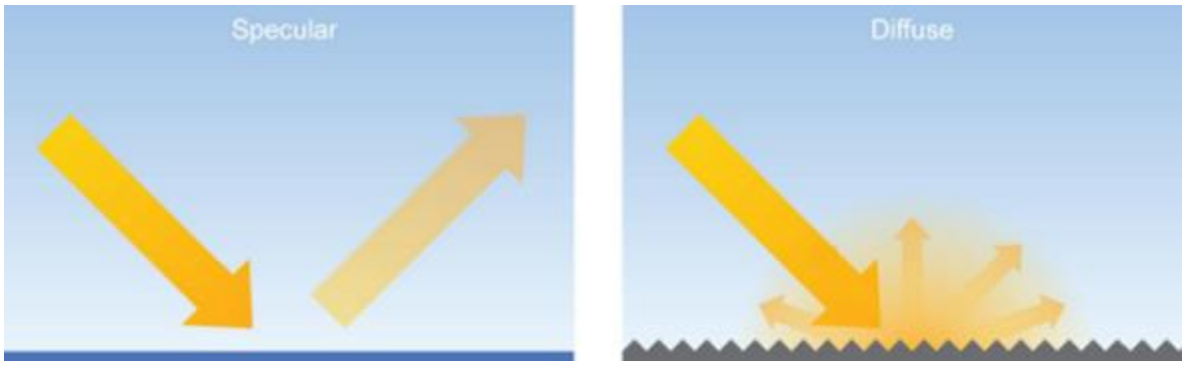

Image 11-1: Types of Reflection: Specular (left) and Diffused (right).

11.2.6 The perceived intensity of glare will vary depending on the ambient light levels (influenced by the time of the day as well as weather patterns), orientation and inclination of the panels, and the distance to the receptor.

11.2.7 The ForgeSolar software output defines glare under a traffic light system, as 'green glare', 'yellow glare' and 'red glare'. This is explained in **Table 11-3** below.

Table 11-3: Magnitude of Glare

Name	Description
Green glare	'Green glare' is glare with low potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Yellow glare	'Yellow glare' is glare with potential to cause an after-image (flash blindness) when observed prior to a typical blink response time.
Red glare	'Red glare' has potential to cause retinal burn (permanent eye damage). Retinal burn is typically not possible for PV glare since the reflected light is not focused on a concentrated point.

11.2.8 Temporary after-image is the phenomenon whereby an image remains momentarily visible on the retina after looking away from a bright light source.

The Reflectivity of Solar Panels

11.2.9 Solar PV panels are designed to absorb sunlight and convert it into electricity; they are not designed to reflect light, although there may still be a small unavoidable reflective component present. The glass which forms the surface layer of solar panels is specifically designed with a low iron content to aid the absorption of daylight and thus has a much lower level of reflectivity than the glass typically seen in conventional windows.

11.2.10 For example, with a 75° angle of incidence, less than 9% of the total incident visible light is reflected, while normal glass reflects approximately 19% of light. If the panels have an anti-reflective coating applied, reflectivity drops to about 5%. Thus, reflectance levels from a given solar site will be much lower than the reflectance generated by standard glass and other common reflective surfaces in the

surrounding environment, although reflectance characteristics will also vary with the incidence angle, which changes as the sun moves across the sky.

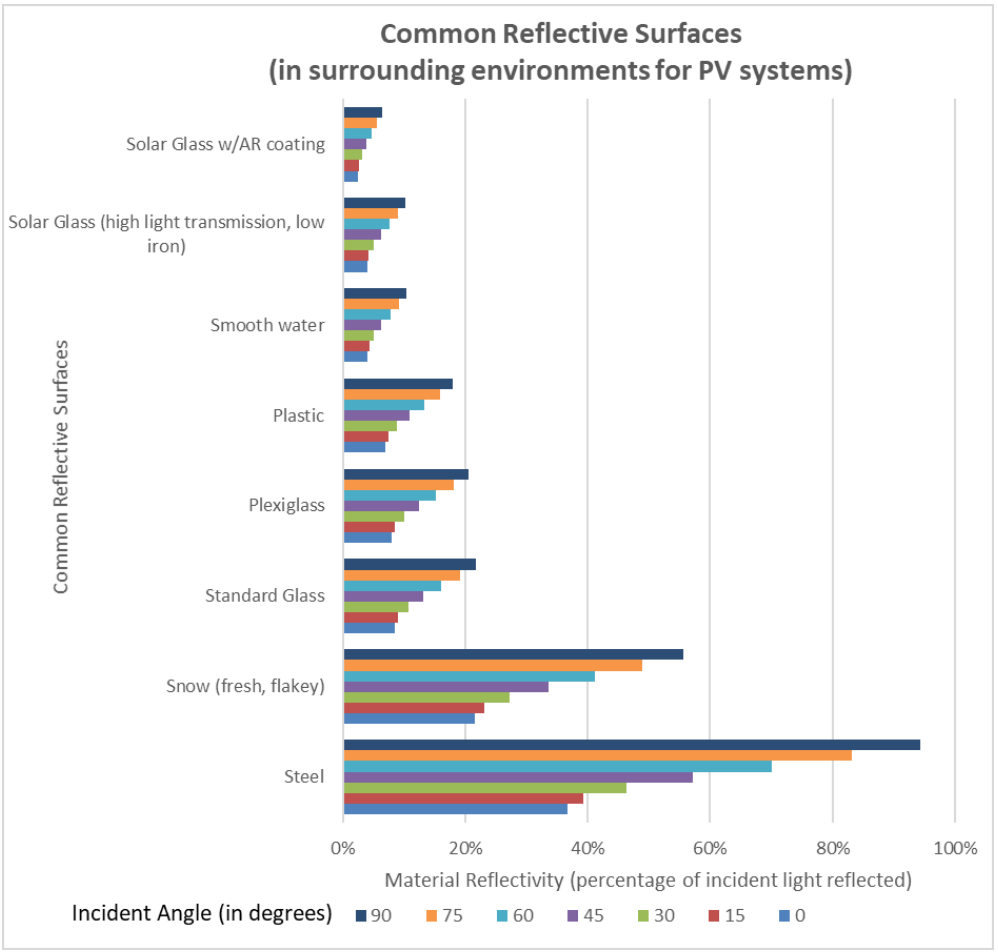

Image 11-2: Reflectivity of Common Materials at Varying Angles of Incidence

(Based on data from Sunpower Corporation, 2009)

11.2.11 Solar panels have a comparable reflectivity to calm water and are considerably less reflective that other natural materials such as snow. Any glare that may occur would be less intense than that seen when flying over a reservoir on a calm day or a snow-covered landscape on a bright day. As can be seen from **Image 11-2**, the reflectivity of light incident on solar glass is considerably less than light reflections from many other materials found in the built and natural environment, and approximately half that of standard glass.

11.2.12 As distance from the glint and glare source increases, the intensity of the event drops appreciably. This is due to a combination of factors including the diffraction of light after it reflects off the panel, atmospheric weather conditions such as the presence of particulates, haze, or low cloud, and the diminishing subtended viewing angle.

Occurrence of Glint and Glare

11.2.13 Glint and glare can only occur when direct sunlight can reach the solar panels. Diffused lighting, caused by weather conditions such as cloud, fog, and mist, cannot result in glint due to the low energy intensity of the light incident on the panels.

11.3 Legislation, Policy & Guidance

11.3.1 Specific policy, legislation and guidance relating to assessing glint and glare effects from solar parks have been considered as part of this assessment and are summarised below.

11.3.2 The Planning Statement associated with this Section 36 application sets out the planning policy framework that is relevant to the EIA. This section considers the relevant aspects of National Planning Framework 4 (NPF4), Planning Advice Notes, the Angus Council Local Development Plan (LDP) and other relevant guidance. Of relevance to the assessment presented within this chapter, regard has been had to the following policies:

National Policy and Guidance

11.3.3 National Planning Framework 4 (NPF4) requires G&G studies to be considered, stating that solar arrays should be supported if the planning authority is satisfied G&G does not result in adverse impacts. However, there is no explicit guidance on the proximity of receptors to the development that should be considered for the assessment within NPF4 either.

11.3.4 The National Planning Policy Guidance (NPPG) (planning policy for England but still serving as a useful reference) notes that large scale solar farms "*could have a damaging effect on the landscape…particularly in undulating landscapes*" and that the "visual impact of a well-planned and well-screened solar farm can be properly addressed within the landscape if planned sensitively" (Paragraph 007: ID 5-007-20140306 & Paragraph 013: ID 5-013-20150327). There is no explicit guidance on the proximity of receptors to the development that should be considered for assessment.

11.3.5 The British Research Establishment (BRE) states that "the sensitivities associated glint and glare, and the landscape/visual impact and the potential impact on aircraft safety, should be a consideration. In some instances, it may be necessary to seek a glint and glare assessment as part of a planning application." It does not define a proximity to the development that receptors should be considered.

11.3.6 Both the NPPG and BRE guidance highlight the additional importance of a G&G study if solar tracking systems are used, whereby solar PV modules rotate to follow the sun's path to maximise power generation. These can cause "additional impacts" such as "differential diurnal and/or seasonal" variations of G&G. The Proposed

Development utilises a fixed mounting structure, rather than a tracking system, therefore these specific notes relating to solar tracking systems are not applicable.

11.3.7 Regarding air-based receptors, the UK Civil Aviation Authority (CAA) states "consideration of glint and glare should be made over a wider area" and indicates a range of up to 2 km from an Aerodrome Reference Point (ARP) as an area of most concern. CAA also developed an interim guidance document published in 2010 and then retracted this in 2012. As a result, no formal copy exists.

Local Planning Policy

11.3.8 As of April 2025, Angus Council does not have specific local planning policies addressing glint and glare (G&G) from solar photovoltaic (PV) installations. While the Angus Local Development Plan (2016) outlines general policies on renewable energy developments, it does not explicitly mention G&G impacts.

11.3.9 However, the Strategic Landscape Capacity Assessment for Solar Energy in Angus provides guidance on the siting and design of solar PV developments to minimize landscape and visual impacts. Although it does not specifically address G&G, adhering to its recommendations can help reduce potential visual effects.

11.4 Assessment Methods & Significance Criteria

11.4.1 The study uses the following methodology to assess the impacts of G&G arising from the Proposed Development.

Glint and Glare Analysis

11.4.2 A geometric analysis is conducted to study where and when glint and glare events may occur. This examines receptors present at ground level, such as dwellings, roads, national waymarked trails, and railway lines. Receptors are identified using available mapping, aerial photography, and street level imagery.

11.4.3 The G&G analysis is completed in several stages using various methods, software models and tools to progressively assess the potential for effects, while building an understanding of the local environmental conditions, either existing or proposed, that impact the potential for glare in the local area.

Assessment of Effects

11.4.4 The detailed geometric analysis uses a software model to make a prediction on the dates, times and durations of glint and glare effects at fixed positions over the course of a year. The software used is the GlareGauge tool that was originally developed in the United States by the Sandia National Laboratory and since improved upon and licensed to ForgeSolar. The times reported as to when G&G may occur are reported in Coordinated Universal Time (UTC) and therefore any relevant daylight savings should be considered when observing the results.

11.4.5 The computer model predicts whether glare effects are possible at a 1-minute temporal resolution over the course of a full year. The model accounts for the maximum panel height, the area taken up by the panels and a fixed observer height.

11.4.6 Any glare that is predicted is classified as either 'green glare' or 'yellow glare' or 'red glare', as described previously in **Table 11-3**. Yellow or red glare impacting receptors such as residential dwellings, roads, railways and aviation receptors may be considered 'significant' in EIA terms, subject to professional judgement on the sensitivity of the receptor and extent, duration and timing of predicted G&G impacts. Effects arising from green glare would generally not be considered 'significant' in EIA terms.

11.4.7 It is important to understand certain limitations within the model. The model calculates results based on the geometric relationship between the observation point at a fixed height, the reflective plane (panels) at a fixed height, and the position of the sun at each time interval as it progresses across the sky. It therefore takes no account of any screening features. It does not account for surface features such as buildings or trees or intervening topography. The software also assumes it is sunny, at the maximum intensity possible, 365 days per year. Since the computer model indicates when glare 'can' happen, not when it 'will' happen, it considerably overstates the realistic glare duration, which is why further interpretation is essential.

11.4.8 The following steps were followed to assess the impacts of G&G arising from the Proposed Development:

- **Identify receptors required for assessment:** residential dwellings and roads within the Study Area, as described in the following section.
- **Input receptors and solar PV array details:** Details such as location and area of coverage were entered into the ForgeSolar modelling tool, and simulations were run.
- **Assess the results:** The simulation results were analysed to assess the duration, intensity, and potential impact of G&G on all identified receptors. While the model has inherent limitations (e.g., the model does not consider objects such as trees and buildings), existing screening measures—such as trees and hedgerows—were manually incorporated into the simulation. These were identified via Google Earth Pro and available OS mapping. This allowed for a more realistic representation of the anticipated conditions.

Study Area

11.4.9 The study area, as shown on **Image 11-3**, is determined as a 1 km radius from the solar component of the Proposed Development for all ground-based receptors (buildings and roads); and 2 km for aviation receptors. However, it has been decided to include the A90, which is located around 1.5 km for the Proposed Development on its closest section, for completeness.

Receptor Identification

11.4.10 The following section highlights the receptors considered for the assessment.

Ground-based Receptors

11.4.11 These are divided into: fixed receptors; and roads and trainlines.

- There are a small number of dwellings within the 1 km study area. In some cases, the identified location is considered to be representative of several discrete receptors in close proximity.
- There are a small number of roads within the 1 km study area of the Proposed Development. Not all of these roads needed to be assessed as some are outside of the area within which effects could theoretically be received. Studies have therefore focused on the A90, located 1.5 km east of the Proposed Development and an unclassified rural road to the north. There are no operative trainlines within the 1 km study area or near to the site.

11.4.12 **Image 11-3** illustrates the study area, including the PV arrays, roads and residential receptors.

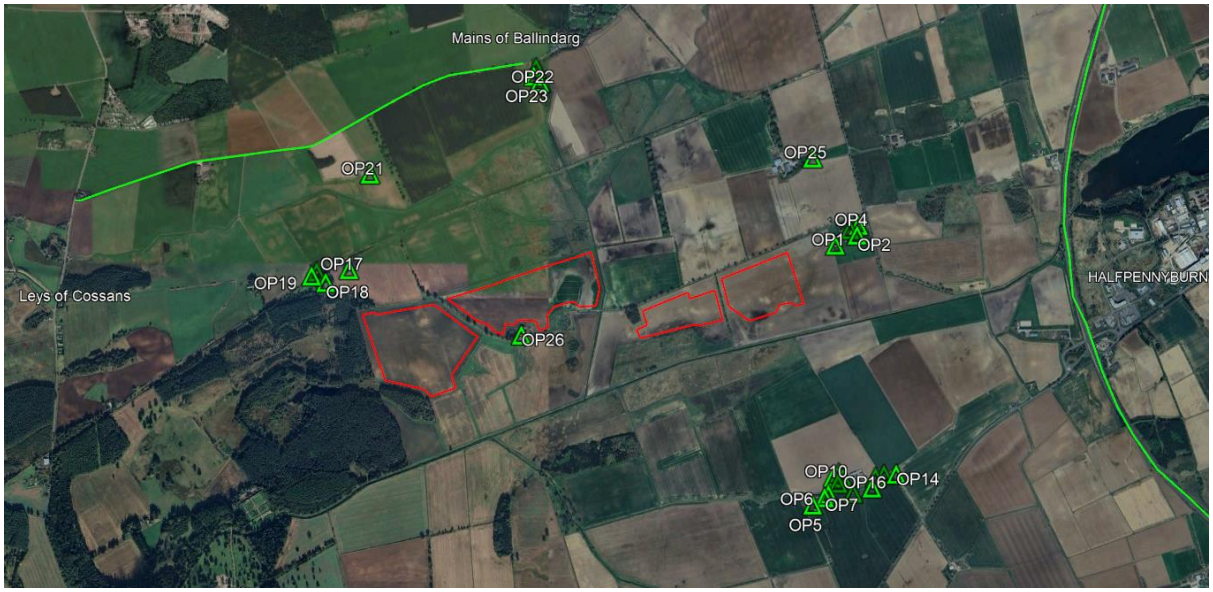

Image 11-3: Study Area with receptors (green) and solar PV areas (red).

11.4.13 Note that the BESS and substation areas have been excluded from the simulation, as glint and glare effects would occur only from the PV panels.

Air-based Receptors

11.4.14 There are no aviation receptors within 2 km of the Proposed Development, with the closest being Kirriemuir Farm Strip (GB-0577), located approximately 4 km north.

11.5 Simulation Software: ForgeSolar

11.5.1 This section details the results of the assumptions and limitations of the software.

Modelling Assumptions

11.5.2 In order to model the panels in the software accurately, the arrays have been separated into four discrete areas to prevent the over-prediction of glint and glare effects. This helps to avoid a limitation in the software whereby convex shapes are assumed to contain panels. The modelled panel array area was therefore divided into the constituent parts, as shown on **Image 11-3**.

11.5.3 There are a total of three sets of modelling assumptions required for the simulation, detailed in **Table 11-4**, **Table 11-5** and **Table 11-6** below.

Table 11-4: Site Configuration Parameters

Parameter	Details
Subtended angle of the sun	9.3mrad (0.5°). This is the default setting given by the software.
Direct Normal Irradiance (DNI)	DNI scales with the position of the sun and has a peak value of 1,000 W/m².
Ocular transmission coefficient	This is the radiation absorbed in the eye before reaching the retina. Value of 0.5 (default figure recommended by the software).
Pupil diameter	This is the diameter of the pupil when daylight is present. Value of 2 mm (default figure recommended by the software).
Eye focal length	This is the projected image size on the retina from a given glare source for a given subtended angle. Value of 1.7 cm This is the default figure recommended by the software.
Time interval	Value of 1 to represent 1 minute

Table 11-5: Receptors Parameters

Parameter	Details
Route receptors	Two routes: A90 and an unclassified rural road at Nether Dumgley
Azimuthal viewing angle	The default setting assumes the pilot (if applicable) can see 50° to the left and right during their approach. In addition, the software considers the road has two directions.
Residential Receptors - Observation points (OPs)	26 OPs (some which represent more than one residential property at the same approximate location)
Obstructions	Range of trees and buildings scattered around site.

Table 11-6: PV Array Parameters

Parameter	Details
PV material category	Category 1. Defined as smooth glass with anti-reflective coating.
Slope error value	A value of ‘varies’ to imply that this depends on the PV material selected. In this case, material Category 1 was selected.

Parameter	Details
Reflective value	A value of 'varies' to imply that this depends on the PV material selected. In this case, material Category 1 was selected.

Modelling Limitations

11.5.4 It is important to understand certain limitations within the model.

11.5.5 The geometry of the entire system is not considered, such as gaps between panels and heights of the mounting structures and individual panels. Therefore, a module height above ground of 2.87 m assumes this is the only elevation at which sunlight reflects from the module (i.e. the lower and higher portions of the array are not considered).

11.5.6 The shape of surrounding obstacles and obstructions (such as trees, electricity poles and fences) are not fully considered. For example, a tree is considered as uniform in its circumference from its tip to the ground as opposed to thinner at the bottom from the trunk and widest in the middle. This can lead to an obstacle's ability to shield a receptor from G&G being both under and overestimated. Further, the precise height of shading obstacles is not known, and estimates are therefore made.

11.5.7 The model does not consider daily variations in weather conditions (e.g. cloud cover) and instead uses a typical clear day as a default. The software also assumes it is sunny, at the maximum intensity possible, 365 days per year. Since the computer model indicates when glare 'can' happen, not when it 'will' happen, it considerably overstates the realistic glare duration, which is why further interpretation is essential. This also overestimate the impacts of G&G.

11.5.8 Only ten obstructions can be modelled. As a result, many existing obstructions such as trees and hedgerows and other buildings may not be present in the model. G&G is therefore overestimated in this instance.

11.6 Baseline

11.6.1 It is assumed that baseline G&G conditions are zero, with no solar PV modules or other such reflective materials within the proposed site boundary. G&G impacts will not arise from the Proposed Scheme during construction or decommissioning phases of the project due to the PV modules not being present at site during either phase.

11.6.2 During the operational phase of the project there will likely be some G&G impacts on nearby receptors. There are several properties within a 1km radius of the project, particularly to the east of the Proposed Development towards the town of Forfar. These properties could be subject to G&G impacts in the late afternoon and evening

when the sun sets in the west, with reflections off the PV modules towards receptors in the east.

11.7 Assessment of Potential Effects

11.7.1 This section details the results of the G&G simulation, along with implications for the Proposed Development, and limitations of the study. Note that further details can be found in the G&G simulation report within **Technical Appendix 11.1**, noting the model assumptions listed in **paragraph 11.5.4** above.

11.7.2 Additionally, the Indicative Landscape Plan (**Figure 5.5**) has been considered in the discussion of potential effects (as embedded mitigation), and it was incorporated into the simulation.

11.7.3 The potential impacts have been assessed for relevance during the construction, operation, and decommissioning phases of the Proposed Development. Based on the nature of the project and surrounding receptors, the construction and decommissioning phases have been scoped out, as detailed below:

Construction Effects

11.7.4 Assessment of construction phase effects has been scoped out due to the factors noted below.

- Temporary nature of activities: The construction phase will involve the use of temporary materials and equipment, which are not highly reflective or positioned in a manner that would result in glint or glare impacts.
- Lack of fixed reflective surfaces: Solar panels, the primary source of potential G&G impacts, are not operational during this phase.
- Low risk to receptors: Temporary equipment or construction activities are unlikely to create significant visual impacts on receptors, such as nearby roads or residences. Any reflections would be momentary, minor, and mitigated through standard construction practices.

Decommissioning Effects

11.7.5 Assessment of decommissioning phase effects has been scoped out due to the factors noted below.

- Removal of reflective surfaces: The primary reflective surfaces, i.e., the solar panels, will be removed during this phase, eliminating the potential for G&G impacts.
- Temporary and managed activities: Similar to construction, decommissioning activities are temporary and involve equipment that is unlikely to generate significant glint or glare effects.

Operational Effects

11.7.6 Therefore, only the operational phase has been considered in this assessment. Furthermore, all mitigation measures presented in this section apply solely to the operational phase.

11.7.7 **Table 11-7** highlights the total duration and magnitude of the G&G experienced by identified and affected receptors across the day and year, based on the ForgeSolar simulation outputs.

Table 11-7: Duration and Diurnal/Seasonal Patterns of G&G

Receptor	G&G Hazard Summary	PV Area	Cumulative Time and Daily G&G Duration
OP5	Green	PV Array 1	Periods between May to August, between 18:00 and 19:00, for up to 5 min per day
OP6	Green	PV Array 1	Periods between April to August, between 18:00 and 19:00, for up to 5 min per day
OP7	Green	PV Array 1	Periods between May to August, between 18:00 and 19:00, for up to 5 min per day
OP8	Green	PV Array 1	Periods between April to August, between 18:00 and 19:00, for up to 5 min per day
OP9	Green	PV Array 1	Periods between April to August, between 18:00 and 19:00, for up to 5 min per day
OP10	Green	PV Arrays: 1 and 2	Periods between April to August, between 18:00 and 19:00, for up to 20 min per day
OP11	Green	PV Arrays: 1 and 2	Periods between April to September, between 18:00 and 19:00, for up to 20 min per day
OP12	Green	PV Arrays: 1 and 2	Periods between April to August, between 18:00 and 19:00, for up to 20 min per day
OP13	Green	PV Arrays: 1 and 2	Periods between April to September, between 18:00 and 19:00, for up to 20 min per day
OP14	Green	PV Arrays: 1 and 2	Periods between April to September, between 18:00 and 19:00, for up to 20 min per day
OP15	Green	PV Array 1	Periods between April to August, between 18:00 and 19:00, for up to 5 min per day
OP16	Green	PV Array 1	Periods between April to August, between 18:00 and 19:00, for up to 5 min per day

Receptor	G&G Hazard Summary	PV Area	Cumulative Time and Daily G&G Duration
OP17	Green	PV Array 2	In March, April and September, between 06:00 and 07:00 for less than 5 min per day
OP18	Green	PV Array 2	In March, April and September, between 06:00 and 07:00 for less than 5 min per day
OP19	Green	PV Array 2	In March, April and September, between 06:00 and 07:00 for less than 5 min per day
OP20	Green	PV Array 2	In March, April and September, between 06:00 and 07:00 for less than 5 min per day
OP26*	Yellow	PV Arrays: 1 and 2	Periods between March and September, between 05:30 - 07:00 and 18:00 - 19:00, for up to 30 min per day
Route 1 (A90)	Green	PV Arrays 1, 2, 3 and 4	Periods between March and September, between 18:00 and 19:00, up to 25 min per day

**Property with financial involvement in the Proposed Development*

11.7.7.1 Fixed Receptors

11.7.8 From the 26 identified ground-based receptors, only 17 are potentially affected by glint and glare (G&G) from the Proposed Development, primarily from PV Area 1 and PV Area 2. Of these, only receptor OP26 experiences glare of yellow magnitude. The remaining receptors are affected only by green magnitude glare, which is less intense than reflections from windows or metallic surfaces and poses no risk to health and safety.

11.7.9 Excluding OP 26, which is discuss separately below, these receptors would only experience glare between 18:00 and 19:00 from April to September, with a maximum duration of 20 minutes per day in a worst-case scenario. However, the model accounts for existing and planned obstructions, as shown in **Image 11-4** below, which further limit the extent of potential glare. Additionally, considering the model limitations, such as its assumption of 365 days of sunshine, the actual impact is further reduced under real-world conditions. As a result, these receptors are assessed as experiencing **no significant** impact.

Image 11-4: Existing (orange) and Planned (light blue) Obstructions/Mitigation for the Proposed Development.

11.7.10 OP26 is a residential dwelling located adjacent to PV Area 2 and is one of the properties owned by the Landowner, who is financially involved in the Proposed Development (see **Image 11-5**).

11.7.11 This receptor is potentially affected by yellow-magnitude glare between March and September, with effects occurring between approximately 05:30–07:00 and 18:00–19:00, for up to 30 minutes per day. However, it is important to note that the results are based on a worst-case scenario model. The software used assumes clear, sunny conditions 365 days per year and does not account for typical Scottish weather conditions, which significantly reduces the likelihood and frequency of actual glare events.

11.7.12 Although existing vegetation is present to the south of the property, glare originates from the east and west during sunrise and sunset due to the lower angle of the sun at those times. To mitigate this, it is recommended to plant native vegetation around the receptor to reduce the potential impact.

11.7.13 However, given the Landowner's financial involvement, the potential effects at this receptor are **not considered significant** in planning terms. Furthermore, it was agreed that solar panels would be set back approximately 70 m from the property, allowing space for potential screening measures. These can be agreed between the developer and the landowner at a later stage and would be expected to further reduce or eliminate any residual effects.

Image 11-5: OP26 next to PV Area 2.

11.7.13.1 Routes

11.7.14 The G&G assessment evaluates two routes: A90 (Route 1) and an unclassified rural road at Nether Drumgley (Route 2).

11.7.15 According to the simulation, the Proposed Development impacts only the A90. The glint and glare originate from the four PV array areas, affecting the southern section of the A90 under assessment, as illustrated in **Image 11-6** below.

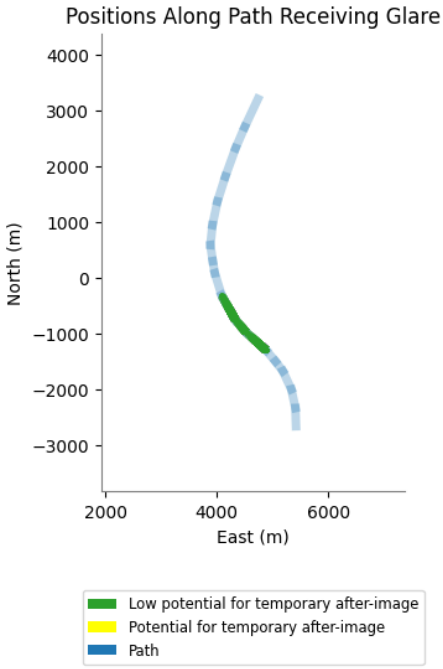

Image 11-6: Positions Along the A90 Receiving Glare (in green).

11.7.16 The analysis indicates that the glare is of green magnitude, posing no risk to health and safety for road users. It occurs for a maximum of 25 minutes between 18:00 and 19:00 from March to April. However, as the road receptor is mobile, an individual driver would experience this potential green glare, which is less intense than reflections from windows or metallic surfaces, only for a few seconds. Additionally, the A90 is located over 1 km from the site, and the simulation does not account for intervening topography. As noted in the model limitations section, the software assumes 365 days of sunshine, which does not reflect real-world conditions. Given these factors, the predicted glare is considered negligible, with no risk to road users and, therefore, assessed as **no significant**. No further action or mitigation is required for the A90.

11.8 Mitigation

11.8.1 No potentially significant G&G effects have been identified when taking account of embedded mitigation, including implementation of the Indicative Landscape Plan (**Figure 5.5**), which proposes planting native scrub and trees to provide screening where potential G&G effects have been identified.

11.8.2 No additional, specific mitigation beyond implementation of the Indicative Landscape Plan is considered to be required.

11.9 Assessment of Residual Effects

11.9.1 The residual effect is unchanged from the potential effects, given that the latter takes account of embedded mitigation (implementation of the Indicative Landscape Plan). Residual effects are therefore considered **minimal to negligible** and not significant at all receptors.

11.10 Assessment of Cumulative Effects

11.10.1 At the time of writing this report, there were two consented solar developments identified within the vicinity. They are the Craignathro Solar Farm, located 2.5 km southeast of the Proposed Development and the Suttieside Solar Farm, located 4.5 km east-northeast. As illustrated in **Figure 5.4. Cumulative ZTV**, the majority of the 5 km area surrounding the Proposed Development does not have simultaneous visibility of all three solar developments. While there are some small areas to the south where visibility of two developments overlaps, no identified receptors are located in these areas. Therefore, given the separation distances and limited cumulative visibility, these consented developments are unlikely to contribute significantly to cumulative glint and glare effects on receptors in the immediate vicinity of the Proposed Development.

11.11 Summary

11.11.1 The baseline glint and glare (G&G) conditions at the site are considered to be zero, as there are no reflective materials currently present. G&G effects during the construction and decommissioning phases have been scoped out, as solar panels will not be installed during these periods and activities are temporary in nature.

11.11.2 During operation, some receptors may experience green-level glare in the evenings, primarily between April and September. Of the 26 identified properties, only 17 are potentially affected, and just one (OP26) experiences yellow-magnitude glare. This property is owned by the financially involved Landowner and is already set back 70 m from the PV panels. While existing vegetation offers some screening, the developer and landowner can agree to add further planting if needed. A short section of the A90 may also experience green-magnitude glare for a few minutes in spring evenings, but this is not considered a risk to driver safety due to its limited intensity and duration.

11.11.3 The assessment includes the embedded mitigation proposed in the Indicative Landscape Plan, which incorporates native scrub and tree planting to reduce potential effects. As a result, no additional mitigation is required. The residual effects, having accounted for this embedded mitigation, are considered minimal to negligible and **not significant**. Cumulative G&G effects with the nearby Craignathro and Suttieside solar farms are also considered unlikely to be significant, due to limited overlapping visibility and the absence of affected receptors within the shared viewshed.

Table 11-8: Summary Table

Description of Effect	Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
	Significance	Beneficial / Adverse		Significance	Beneficial / Adverse
During Construction & Decommissioning					
Based on the nature of the project and surrounding receptors, the construction and decommissioning phases have been scoped out.					
During Operation					
Effect on all road receptors	Minimal to negligible	Adverse	Embedded mitigation – implementing Landscape Strategy Plan including planting/screening and, where required and appropriate, installation of temporary shade netting while vegetation is established.	Minimal to negligible	Adverse
Effect on fixed (residential) receptors	Minimal	Adverse	Embedded mitigation – implementing Landscape Strategy Plan including planting/screening and, where required and appropriate, installation of temporary shade netting while vegetation is established.	Minimal to negligible	Adverse
Effect on other fixed (residential) receptors within the study area	None	N/A	N/A	None	N/A
Effect on Aviation Receptors	N/A	N/A	N/A	N/A	N/A
Cumulative Effects					
Based on distance to the Proposed Development, there is no cumulative glitn and glare effects on receptors.					

11.12 References

Legislation, Policy and Guidance

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