

# Cottam Solar Project

## Preliminary Environmental Information Report: Chapter 16: Glint and Glare

Prepared by: Pager Power  
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## Issue Sheet

**Report Prepared for: Cottam Solar Project Ltd.**

### **Preliminary Environmental Information Report: Chapter 16: Glint and Glare**

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## **16 Glint and Glare**

### **16.1 Introduction**

16.1.1 This chapter sets out the preliminary assessment carried out to determine the potential effects generated by the Scheme during construction and operation in relation to glint and glare. This chapter relates to the potential level of effects associated with the following receptors for which specific study areas have been defined:

- Road users – specifically drivers of motor vehicles;
- River users;
- Occupants of surrounding dwellings;
- Railway operations and infrastructure; and
- Aviation activity surrounding RAF Scampton, Sturgate Airfield.

### **16.2 Assessment Methodology**

16.2.1 There is no formal guidance with regard to the maximum distance at which glint and glare should be assessed. From a technical perspective, there is no maximum distance for potential reflections. However, the significance of a solar reflection decreases with distance. This is because the proportion of an observer's field of vision that is taken up by the reflecting area diminishes as the separation distance increases. In most instances, terrain and shielding by vegetation are also more likely to obstruct an observer's view at greater distances.

16.2.2 The considerations presented above and extensive experience over a significant number of glint and glare assessments undertaken shows that a 1km study area is considered appropriate for glint and glare effects on local dwellings and road users, 500m for railway operations and infrastructure and 15km for aviation activity. In most cases the assessed distance is much less than this due to the likelihood of visibility to a solar development typically reducing with distance as a result of the relatively low lying nature of the solar panels (ground level receptors only).

16.2.3 The initial judgement for selecting receptors is made based on high-level consideration of aerial photography and mapping i.e. receptors are excluded if it is clear from the outset that no visibility would be possible. A more detailed assessment is made if the modelling reveals a reflection would be geometrically possible.

### Assessment Process

16.2.4 The glint and glare assessment methodology set out in this Chapter has been derived from the information provided to the Applicant and its consultants through consultation with stakeholders, assessment experience and by reviewing the available guidance and studies. The methodology for ground level glint and glare assessments is as follows:

- Identify the key receptors in the area surrounding the Scheme;
- Consider direct solar reflections from the Scheme towards the identified receptors by undertaking geometric calculations based on the proposed panel options as set out in Chapter 4;
- Consider the visibility of the panels from the receptor's location. If the panels are not visible from the receptor, then no reflection can occur;
- Based on the results of the geometric calculations, determine whether a reflection can occur, and if so, at what time it will occur;
- For aviation receptors consider the solar reflection intensity;
- Consider the intensity of the solar reflection from the Scheme in relation to aviation activity;
- Consider both the solar reflection from the Scheme and the location of the direct sunlight with respect to the receptor's position;
- Consider the solar reflection with respect to the published studies and guidance - including intensity calculations where appropriate; and
- Determine whether a significant detrimental impact is expected in line with Pager Power's standard process and recommended methodology.

16.2.5 Regard has been had to the EIA Scoping Opinion issued by PINS in March 2022. The responses from this are set out in the table below. Consultation with other bodies is described throughout the Chapter.

**Table 16.1: Consultation responses**

Consultee and Date	Response
The Planning Inspectorate, Scoping Opinion, March 2022	No matters have been proposed to be scoped out of the assessment

Consultee and Date	Response
The Planning Inspectorate, Scoping Opinion, March 2022	Sensitive receptors for glint and glare impacts are listed in Scoping Report paragraph 16.1.1. This does not include river users. The Cottam one site is located adjacent/near navigable waterways and therefore there remains potential for glint and glare to impact on users of the navigation. The ES should assess glint and glare impacts to river users where significant effects are likely to occur.

### 16.3 Study Area

- 16.3.1 A 1km distance surrounding the development is considered appropriate for road users and dwellings. The following receptors have been identified:
- Residential dwellings; and
  - National and Regional roads.
- 16.3.2 A 500m distance surrounding the development is considered appropriate for rail operations and infrastructure; the 500m area surrounding the Scheme contains the following rail infrastructure:
- Sections of railway line; and
  - Identified railway signals.
- 16.3.3 A 15km distance surrounding the development is considered appropriate for aviation considering the type of aerodromes scoped. The 15km assessment area surrounding the Scheme contains the following licensed or military aerodromes:
- Sturgate Airfield – 4km north-west of Cottam 1.
  - RAF Scampton – 4.1km north-east of Cottam 1.
- 16.3.4 The main source of irradiance in the area will be the sun, which is a more intense source of light than solar reflections from solar photovoltaic panels. Road users, pilots and train drivers are already aware of safety implications when navigating in bright sunlight.

## 16.4 Sensitivity of Receptors

### Environmental Receptor – Road User

- 16.4.1 Sensitivity and tolerance to change: For road user receptors, it is relevant to consider that road types can generally be categorized as:
- Major National – Typically a road with a minimum of two carriageways with a maximum speed limit of up to 70mph. These roads typically have fast moving vehicles with busy traffic.
  - National – Typically a road with a one or more carriageways with a maximum speed limit of up to 60mph or 70mph. These roads typically have fast moving vehicles with moderate to busy traffic density.
  - Regional – Typically single carriageways with a maximum speed limit of up to 60mph. The speed of vehicles will vary with a typical traffic density of low to moderate.
  - Local – Typically roads and lanes with the lowest traffic densities. Speed limits vary.
- 16.4.2 Local roads would be considered as ‘Low’ sensitivity and Regional, National, and Major National roads would be considered of ‘Medium’ sensitivity.
- 16.4.3 Magnitude of impact: The magnitude of effect upon road user receptors is predominantly dependent on the following factors:
- The distance between the receptor and the panel area – a study area of one kilometre is applied;
  - The type of road – in the context of traffic speeds and likely densities;
  - Whether a solar reflection is predicted to be experienced in practice; and
  - The location of the reflecting panels relative to a road user’s direction of travel – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side.
- 16.4.4 A ‘Negligible’ magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by a road user.
- 16.4.5 A ‘Low’ magnitude would occur if solar reflections would all originate from outside a road user’s main field of view. Reflections originating within a road user’s main field of view can be of ‘Low’ magnitude based on consideration of the following mitigating circumstances:

- Whether visibility is likely for elevated drivers (applicable to dual carriageways and motorways only) – there is typically a higher density of elevated drivers along dual carriageways and motorways compared to other types of road;
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer’s field of view that is affected by glare; and
- The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not.

16.4.6 A ‘Medium’ magnitude would occur if solar reflections were experienced from within a driver’s main field of view and there are insufficient mitigating factors.

16.4.7 A ‘High’ magnitude would occur if solar reflections were experienced from directly in front of a road user’s direction of travel with no mitigating factors.

#### Environmental Receptor – Dwelling Occupants

16.4.8 Sensitivity and tolerance to change: ‘Low’ because they are of local importance.

16.4.9 Magnitude of impact: The magnitude of effect upon dwelling receptors is predominantly dependent on the following factors:

- The distance between the receptor and the panel area – a study of one kilometre is applied;
- Whether a solar reflection is predicted to be experienced in practice; and
- The duration of the predicted effects, relative to the thresholds of three months per year and sixty minutes per day.

16.4.10 A ‘Negligible’ magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by an observer within a dwelling.

16.4.11 A ‘Low’ magnitude would occur when a solar reflection would be experienced for less than three months per year and for less than sixty minutes per day, or outside of these limits based on consideration of the following mitigating circumstances:

- The separation distance to the panel area – larger separation distances reduce the proportion of an observer’s field of view that is affected by glare;
- The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not;
- Whether visibility is likely from all storeys – the ground floor is typically considered the main living space and has a greater significance with respect to residential amenity; and



- 16.4.12 Whether the dwelling appears to have windows facing the reflecting area – factors that restrict potential views of a reflecting area reduce the level of impact.
- 16.4.13 A ‘Medium’ magnitude would occur if solar reflections were experienced for more than three months per year and for more than sixty minutes per day.
- 16.4.14 A ‘High’ magnitude would occur if solar reflections were experienced for more than three months per year and for more than sixty minutes per day.

Environmental Receptor – Rail Operations and Infrastructure

- 16.4.15 Sensitivity and importance: Railway operations are typically considered to be of ‘Medium’ sensitivity because they are of regional to national importance with a low to moderate capacity to absorb change.
- 16.4.16 Magnitude of impact: The magnitude of effect upon train drivers’ receptors is predominantly dependent on the following factors:
- Whether a solar reflection is predicted to be experienced in practice;
  - The location of the reflecting panels relative to a train drivers’ direction of travel – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side; and
  - The estimated workload of the driver at the location glare is predicted i.e. is there a station or signal present.
- 16.4.17 A ‘Negligible’ magnitude would occur if solar reflections are not geometrically possible or are not predicted to be experienced by a train driver.
- 16.4.18 A ‘Low’ magnitude would occur if solar reflections would all originate from outside a train drivers’ main field of view (30 degrees either side of the direction of travel). Reflections originating within a train drivers’ main field of view can be of ‘Low’ magnitude based on consideration of the following mitigating circumstances:
- The separation distance to the panel area – larger separation distances reduce the proportion of an observer’s field of view that is affected by glare; and
  - The position of the sun – effects that coincide with direct sunlight appear less prominent than those that do not.
- 16.4.19 A ‘Medium’ magnitude would occur if solar reflections were experienced from within a train drivers’ main field of view and there are insufficient mitigating factors.
- 16.4.20 A ‘High’ magnitude would occur if solar reflections were experienced from directly in front of a train drivers’ direction of travel with no mitigating factors.

### Environmental Receptor – Aviation

16.4.21 Sensitivity and importance: Aviation receptors are typically considered to be of 'Medium' sensitivity because they are of regional to national importance with a low to moderate capacity to absorb change. The interim CAA guidance does not say anything specific about glint and glare.

16.4.22 Magnitude of impact: See below for aviation receptor types.

#### **Air Traffic Control (ATC) Tower**

16.4.23 The magnitude of effect upon the ATC Tower receptors is dependent on the following main factors:

- Whether a solar reflection is predicted to be experienced in practice;
- The glare intensity and duration - a reflection of greater intensities and prolonged time periods have a higher impact upon ATC Tower personnel;
- Proportion of an observer's field of vision that is taken up by the reflecting area; and
- Glare location relative to key operational areas - a solar reflection originating near sensitive areas such as the runway threshold will have a higher impact upon the ATC Tower personnel.

16.4.24 A 'Negligible' magnitude would occur if solar reflections are not geometrically possible, or are not predicted to be experienced by ATC personnel.

16.4.25 A 'Low' magnitude would occur if solar reflections were experienced by ATC personnel but there are sufficient mitigating main factors, or the aerodrome confirmed the level of glare is acceptable.

16.4.26 A 'Medium' magnitude would occur if solar reflections were experienced by ATC personnel and effects occasionally and marginally affected the safeguarding operations.

16.4.27 A 'High' magnitude would occur if solar reflections were experienced by ATC personnel and the safeguarding operations were regularly and substantially affected.

#### **Approach Paths**

16.4.28 The magnitude of effect upon aircraft approaching a runway (also referred as approach paths) is dependent on the following main factors:

- Whether a reflection is predicted to be experienced in practice;

- The location of glare relative to the approach bearing – a solar reflection directly in front of a driver is more hazardous than a reflection from a location off to one side;
- The position of the Sun – effects that coincide with direct sunlight appear less prominent than those that do not; and
- Existing reflecting surfaces – a solar reflection is less noticeable by pilots when there are existing reflective surfaces in the surrounding environment.

16.4.29 A 'Negligible' magnitude would occur if solar reflections are not geometrically possible.

16.4.30 A 'Low' magnitude would occur under the following scenarios:

- Solar reflections originate from outside a pilot's main field of view;
- The glare has a 'low potential for temporary after-image';
- The glare has a 'potential for temporary after-image' with sufficient mitigating factors; and
- The aerodrome has confirmed the level of glare is acceptable.

16.4.31 A 'Medium' magnitude would occur if the glare has 'potential for temporary after-image' without sufficient mitigating main factors.

16.4.32 A 'High' magnitude would occur off solar reflections if the glare has 'potential for permanent eye damage'.

#### Environmental Receptor – Public Rights of Way (PROW)

16.4.33 In Pager Power's experience, significant impacts to pedestrians/observers along PROWs are not likely due to glint and glare effects from the Scheme. The reasoning is due to the sensitivity of the receptors (in terms of amenity and safety) being concluded to be of low significance. This is because:

- The typical density of pedestrians on a PROW is low in a rural environment;
- Any resultant effect is much less serious and has far lesser consequences than, for example, solar reflections experienced towards a road network whereby the resultant impacts of a solar reflection can be much more serious;
- Glint and glare effects towards receptors on a PROW are transient, and time and location sensitive whereby a pedestrian could move beyond the solar reflection zone with ease with little impact upon safety or amenity;

- Any observable solar reflection to users of the PROW would be of similar intensity to those experienced whilst navigating the natural and built environment on a regular basis.

16.4.34 The PROWs surrounding the Scheme have therefore not been assessed in detail within the technical glint and glare assessment because any resultant impact would be deemed low, requiring no mitigation.

#### Environmental Receptor – River Users

16.4.35 In Pager Power’s experience, significant impacts to river users are not likely due to glint and glare effects from the Scheme. This view is supported by initial consultation with the Canals and Rovers Trust who have stated *“The canal and river are more than 1km from the solar fields proposed. From our point of view, if the report addresses that receptors more than this distance away will not suffer ill effects (with information to back that up), I believe we would be satisfied with the information provided.”*

16.4.36 The river users surrounding the Scheme have therefore not been assessed in detail within the technical glint and glare assessment. Consideration will be given in the ES if required.

### **16.5 Potential and Likely Environmental Effects**

16.5.1 The following potential effects were identified at the scoping stage for consideration in this assessment:

- Direct effects during construction and operation from glint and glare on:
  - Ground-based receptors (roads and dwellings);
  - Aviation activity surrounding RAF Scampton and Sturgate Airfield;
  - Railway operations and infrastructure (train drivers).
- There are no indirect effects during construction or operation from glint and glare.

#### Road Users

16.5.2 The magnitude of impact upon a maximum of an approximately 2500m of Kirton Road at Cottam 3a is classified as ‘medium’ due to effects occurring within a driver’s main field of view. The resulting significance of effect would be moderate due to the ‘medium’ sensitivity of the type of receptor.

- 16.5.3 The worst-case magnitude of impact upon the remaining sections of road is 'low' due to mitigating factors that will sufficiently reduce the level of impact. The resulting significance of effect is minor and not significant.

#### Dwellings

- 16.5.4 Initial analysis has shown that there will be dwellings that experience an impact which is classified as 'medium' in the worst-case. This is due to effects being predicted to be experienced for more than three months per year but less than 60 minutes per day, and a lack of sufficient mitigating factors such as intervening planting/screening. The resulting significance of effect would be moderate and significant.
- 16.5.5 The worst-case magnitude of impact upon the remaining dwellings is low or negligible due to effects occurring for more than three months per year but less than 60 minutes per day with mitigating factors; effects occurring for less than three months per year and less than 60 minutes per day or no geometric reflections possible towards the dwelling. The resulting significance of effect would be minor and not significant.

#### Aviation

- 16.5.6 The worst-case magnitude of impact upon RAF Scampton would be medium due to glare with 'potential for temporary-after image' predicted for aircrafts approaching runway 22 ('medium' sensitivity), originating from Cottam 1. The resulting significance of effect for runway 22 approach path would be moderate and significant.
- 16.5.7 The worst-case magnitude of impact upon Sturgate Airfield would be medium due to glare with 'potential for temporary-after image' predicted for aircrafts approaching runway 09 ('medium' sensitivity), originating from Cottam 1 and Cottam 2 and for aircrafts approaching runway 14 ('medium' sensitivity), originating from Cottam 1. The resulting significance of effect for both runways, 09 and 14 approach path, would be moderate and significant.
- 16.5.8 Consultation with the safeguarding team (MoD) for RAF Scampton has been initiated and it is currently underway. The consultation with the safeguarding team at Sturgate Airfield has been completed and the conclusion is that the impact is acceptable, and they will not object to the proposal.

#### Railway

- 16.5.9 At this stage detailed modelling has not been undertaken for railway receptors. The worst-case significance of effect would be moderate and significant.

## 16.6 Mitigation

- 16.6.1 Any predicted impacts towards the ground-based infrastructure can likely be solved with relatively simple mitigation strategies – the most common being the provision of screening at the site perimeter to obstruct views of potentially reflecting panels. Where views of reflecting panels are obstructed, no effects can be experienced. Other solutions such as layout modification can be considered but are rarely required in practice.
- 16.6.2 Any moderate impact upon aviation operations will have to be mitigated. Whilst formal guidance within the UK for quantifying impacts is sparse, the industry standard is to evaluate effects on aviation receptors based on their intensity (specifically the potential for a temporary after-image following publication of a methodology by Sandia Laboratories in the USA) as well as their duration and operational sensitivity. For tracking panels, the viability of less invasive mitigation solution can be explored. However, these options may affect the operation of the tracking system. This will be explored further at the ES stage.

### Residual Effects

- 16.6.3 If the mitigation measures identified above are implemented where significant reflection effects are predicted to be experienced, effects would be reduced to low and non-significant at worst.

## 16.7 Cumulative Effects

- 16.7.1 A 'long list' of potential cumulative development sites is provided in **Appendix 2.2** of the PEIR and the more substantial developments are shown on the plan at **Appendix 2.3**. Of particular relevance to any cumulative assessment is the West Burton Solar Project and Gate Burton Solar Project (both NSIP schemes).
- 16.7.2 Identification of other developments that may give rise to cumulative effects will be agreed with the relevant statutory bodies; and any cumulative effects arising will be considered and described. Where there are no cumulative effects, this will also be stated. The cumulative assessment will consider all projects that are built, have been consented or are under construction.

### Predicted Cumulative Effects during Construction

- 16.7.3 Glint and glare effects can occur from any solar panels that are installed within the developable area. However, as not all panels will be installed simultaneously, the length and intensity of any solar reflections during the construction phase will be less than or equal to the operational phase.

- 16.7.4 Therefore, the effects during construction will be less than or equal to effects during operation and therefore cumulative effects are not considered during construction and this has been agreed in the Scoping Opinion.

#### Predicted Cumulative Effects during Operation

- 16.7.5 Cumulative effects are theoretically possible in combination with other solar developments that are consented, under construction or operational and will, therefore, be considered cumulatively within the technical impact assessment. This includes consideration of potential cumulative effects with the West Burton Solar Project and Gate Burton Energy Park. Cumulative effects, where possible, can be mitigated. Mitigating solutions are outlined in paragraph 16.6.1 for ground-based receptors and in paragraph 16.6.2 for aviation receptors.

#### In-combination Effects

- 16.7.6 Identification of any effects on glint and glare receptors in-combination with other effects and/or from combined phases of work on the Scheme will be considered and described. Based on previous project experience, in-combination effects for glint and glare are not predicted. Where there are no in-combination effects, this will also be stated.

### **16.8 Conclusion and Next Steps**

- 16.8.1 The Scheme is predicted to have a 'moderate' significance of effect in terms of glint and glare at worst, without mitigation. The prediction of significant effects at this time is based on receptors having medium sensitivity (for all but local dwellings, where it is low sensitivity) and a worst-case medium magnitude of impact for surrounding road users, dwellings, aviation, and railway receptors. The mitigation measures suggested in this chapter would need to be implemented to remove or reduce any significant residual effects. The requirement for mitigation will be identified, reviewed, and reported in the ES.