ReneSola 浙江昱辉阳光能源江苏有限公司

ReneSola Jiangsu Ltd.

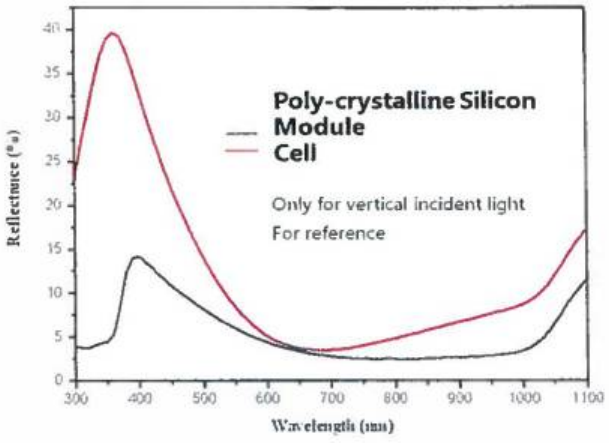
Declaration for Low Reflectivity of Module

Dear Sir/Madam:

Renesola offers module with high efficiency, positive tolerance of initial Pm, outstanding performance at low irradiation condition, and good electricity generation capacity under high temperature.

Low reflectivity is primary factor for increasing module efficiency. Reflection of incident light is suppressed to enhance the conversion efficiency of solar module with a nano-coating structure on the surface of the glass. Besides, the good light-trapping property of Renesola PV module reduces the dazzle caused by specular reflection.

Typical reflectivity test plots are shown as below. The reflectivity of panel is basically less than 5% within most of the wavelength range from 500nm~1000nm with AR-coated glass.



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APPENDIX 1

Review of Glint and Glare Pertaining to Solar PV Arrays

'Glint' and 'glare' are defined by SunPower Corporation as follows:

- Glint: "Also known as 'spectacular reflection', [is] produced as a direct reflection of the sun in the surface of the Solar PV panel. This is the potential source of the visual issues regarding viewer distraction".
- Glare: is "[a] continuous source of brightness, relative to diffused lighting. This is not a direct reflection of the sun, but rather a reflection of the bright sky around the sun. Glare is significantly less intense than glint".

In the UK, there are no guidelines for the assessment of (or, indeed, the necessity to assess) the impact of glint and glare. As a result, a number of sources have been consulted, amongst them, sources from the United States, Australia and Cornwall County Council (under the authority of which conditional planning permission was granted for the development of a Solar PV array (application number: PA10/03993)).

This report argues the case that, in the majority of cases, a glint and glare assessment for static Solar PV arrays in the UK is unnecessary.

Reflectivity
The very nature of the Solar PV panel is such that reflectivity is kept to a minimum. The "concept of efficient solar power is to absorb as much light as possible while reflecting as little light as possible, standard solar module produces less glare and reflectance than standard window glass. [...] Solar modules use 'high-transmission, low iron glass' which absorbs more light, producing small amounts of glare and reflectance than normal glass"[i]. As shown in the graphs below (figures one and two) common construction materials, such as steel and glass, and many features of the natural

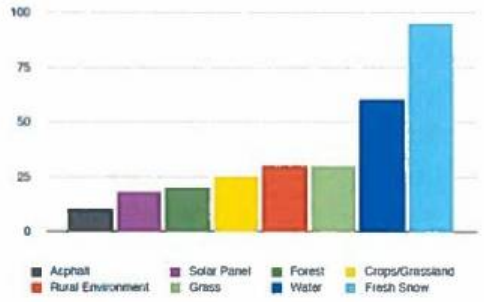

Figure One: Comparative Reflection Analysis[ii]

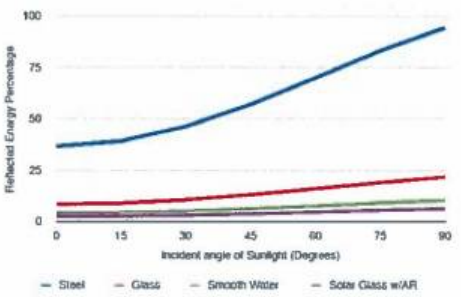

Figure Two: Analysis of Typical Material Reflectivity[iii]

environment, such as water and grass, have a higher reflectivity than Solar PV arrays. As such, the undertaking of a glint and glare assessment for Solar PV arrays, when one would not be undertaken for constructions such as greenhouses, unpainted metal roofing, or a pond or reservoir, is clearly unnecessary. Indeed, many, if not all, features surrounding a Solar PV array will have a higher reflectivity than the array itself.

Aircraft
One of the greatest concerns of a Solar PV array is the impact which is might have on aircraft flying overhead, owing to the angle of a static Solar PV panel. Of course, any glint and glare is dependent on aircraft altitude, relationship to the Solar PV array and the angle of the array. However, the increasing number of airports around the world which have on-site Solar PV arrays indicates the

miniscule health and safety risk presented to air traffic.[iv] Solar PV arrays not located directly in, or on the immediate flight path into, or out of, an airport, cannot be considered to have any impact on air traffic.

Cornwall County Council
Cornwall County Council is unique in the UK insofar as it has begun to develop a planning policy pertaining to Solar PV arrays. However, it has taken the view that the development of Solar PV arrays is similar in character to that of greenhouses, with other comparisons having been made to polytunnels.[v] These comparisons are problematic, however, as the character of Solar PV arrays is vastly different to either greenhouses or polytunnels. They are less reflective, and will generally be lower lying.

European Approach
In other European territories, glint and glare are not considered to be material impacts. In these countries, glint and glare assessments only tend to be carried out in specific circumstances; not as a matter of course. For example if 'tracking' panels are utilised, as they could cause differential diurnal and/or seasonal impacts.[vi]

Practical Considerations
There is no methodology, which is accepted UK-wide, with which to carry out a glint and glare assessment of a Solar PV array prior to its construction. Wiltshire Council Strategic Planning Officers have recommended a review of the current understanding of glint and glare pertaining to Solar PV arrays. In the US, computer models have been used to assess the impact of glint and glare of major solar arrays, but these tend to be mirrored (which will have a far higher glint/glare impact) or tracking systems.[vii]

Landscape and Visual Mitigation
As with any major development, the construction of a Solar PV array will require that mitigation measures be implemented in order to decrease the landscape and visual impacts of the development. These mitigation measures, which commonly involve the planting of trees or hedgerows, or utilising the surrounding landform, will also reduce, or eliminate, any perceived glint and glare originating from the screened Solar PV array.

Sources

- Notice of Grant of Conditional Planning Permission for Application Number: PA10/03993 (Solar PV Array at site of former tin mine Wheal Jane near Truro, Cornwall).
- *SOLARGEN Energy: Panoche Valley Solar Farm Project: Glint and Glare Study*, 21st May 2010
- *Tessera Solar: Imperial Valley Solar Project: Glint and Glare Study*, 26th April 2010
- http://majorprojects.planning.nsw.gov.au/files/62890/Nyngan%20EA%20Final%201.0%20Appendix%20F%20Report%20Part11.pdf
- http://regensw.s3.amazonaws.com/solar_parks_event_note_november_2010_cb7bd1d625965fdf.pdf

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[i] *Appendix B – SunPower Solar Module Glare and Reflectance*, from *SOLARGEN Energy: Panoche Valley Solar Farm Project Glint and Glare Study*, 21st May 2010
[ii] http://majorprojects.planning.nsw.gov.au/files/62890/Nyngan%20EA%20Final%201.0%20Appendix%20F%20Report%20Part11.pdf. Accessed: 15/02/2011
[iii] Ibid
[iv] *SOLARGEN Energy: Panoche Valley Solar Farm Project: Glint and Glare Study*, 21st May 2010
[v] http://regensw.s3.amazonaws.com/solar_parks_event_note_november_2010_cb7bd1d625965fdf.pdf. P8. Accessed 15/02/2011
[vi] http://regensw.s3.amazonaws.com/solar_parks_event_note_november_2010_cb7bd1d625965fdf.pdf. P18. Accessed 15/02/2011
[vii] *Tessera Solar: Imperial Valley Solar Project: Glint and Glare Study*, 26th April 2010; and: *SOLARGEN Energy: Panoche Valley Solar Farm Project: Glint and Glare Study*, 21st May 2010