



PROJECT 15-282 | YARRANLEA PV SOLAR GENERATION FACILITY PRELODGMET DISCCUSIONS WITH NEIGHBOURING LANDOWNERS

Between Monday 30th May 2016 and Friday 3rd June 2016 a number of face to face meetings and telephone discussions were completed with owners of neighboring properties in the vicinity of the proposed PV Solar farm. A number of key issues were raised during these meetings which are outlined below.

1. Will the facility be visible from our residence?

There are approximately 5 residential properties from which the completed facility will be visible. Due to existing dense remnant vegetation immediately to the West of the site, the nearest residence is completely screened.

Amelioration measures which will be implemented include a 3m wide densely vegetated landscaping buffer to the perimeter of the site, (excluding the Murlaggan Road Frontage). This will substantially reduce the visual impact of the completed installation and therefore whilst the facility will be visible from some aspects, the visual impact is considered to be low.

In addition to these amelioration measures, the technology planned for this project is a single axis PV system whereby the 2.0m wide panels are aligned in strings running in a North South direction approximately 5.7m apart. In the morning the panels will be oriented towards the East and progressively tilt to the West throughout the day. As a result of this progressive movement the panels are maintained at an optimal angle of incidence to the incoming angle of the sun. As such from the Northern aspect, the visible panel width will vary from 17 to 34 % of the site, with the balance being a view of the pasture grasses established in the understory of the PV arrays.

There is a perceived issue of glint and glare surrounding the reflectivity of the proposed PV solar panels. As a result of the perceived reflection levels, there is a concern of possible distractions to motorists, aircraft and the hazard of eye damage.

The Poly-Crystalline Solar Panels proposed for the installation are designed to absorb the suns energy and directly convert it to electricity. The PV modules being used in the installation for the Yarranlea Solar Farm absorb approximately 82-90% of the light received and have been designed using two anti-reflective coatings which significantly reduces the reflectivity.

PV Solar Panels have been installed at a number of airports in the USA, including Denver and the Oakland FedEx International Airport Hub. These precedents and further studies have found that the reflection created would not cause problems for aircraft, particularly at the critical take off and landing stage.

The level of glare and reflectance from the PV solar panels are considerably lower than the level of glare and reflectance in common surfaces and those surrounding the proposed Solar Farm. The PV panels would reflect approximately 10-18% of energy which is less than typical rural environments which have a reflectivity of approximately 15-30%.

Figures 1 and 2 compare the percentage of reflected energy from common reflective surfaces to that of a PV Solar Panel.

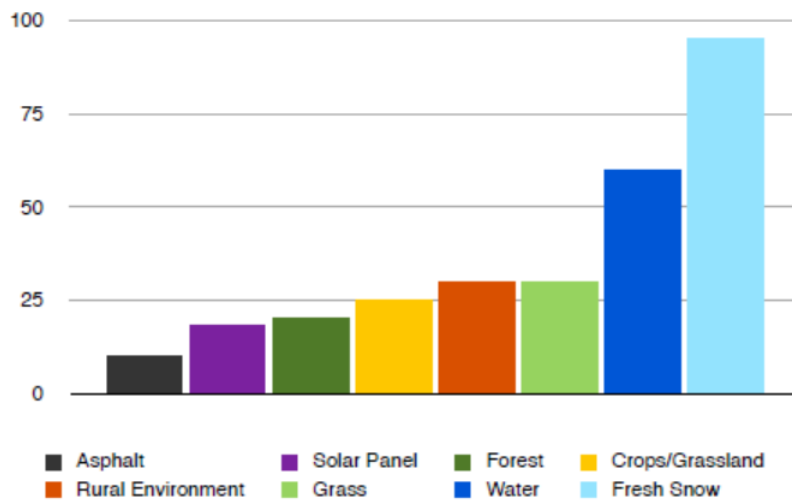


Figure 1 – Comparative Reflection Analysis

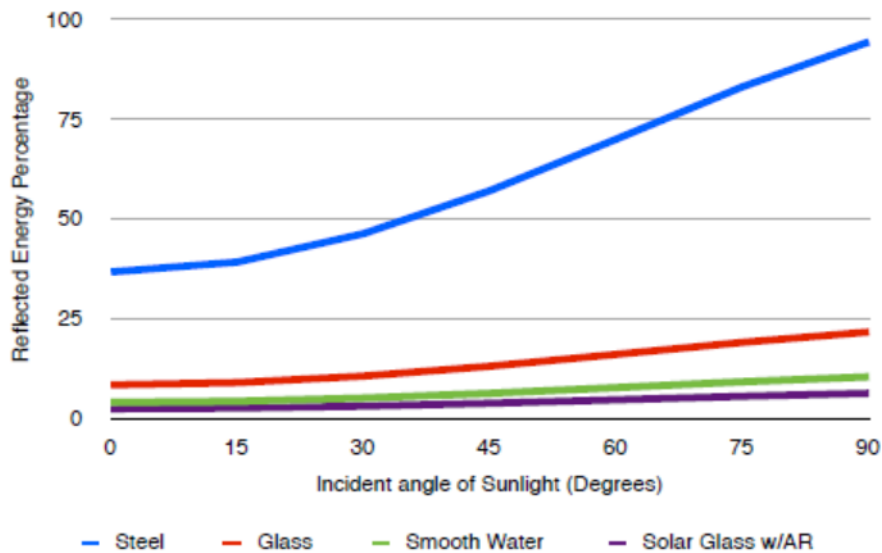


Figure 2 – Analysis of Typical Material Reflectivity

In the course of normal operations activities will be limited to daylight hours. There will be some low level security lighting provided to the Power Collection substation facility located in the South-Western Corner of the site. Outdoor lighting associated with the use will be designed, sited, installed and tested to comply with Table 2.1 & 2.2 of Australian Standard AS4282-1997 Control of the obtrusive effects of outdoor lighting using a control level of 1. Additionally, all lighting will be of a type that gives no upward component of light when mounted horizontally (i.e. a full cut-off luminaire).

It is undeniable that the proposed development of the Yarranlea Solar Farm would have an impact on the landscape character of the area. However, in the context of land currently being utilised, (strip farming of various crops including cotton, Water storage Dams and the defunct quarry area on Roache Road), the visual impact associated with the development of a renewable energy source on the site is considerably low. The selected technology and amelioration measures proposed are considered to be an appropriate mitigation strategy.

2. Will the facility emit an Electromagnetic Field or Radiation?

Electromagnetic fields (EMFs) are invisible fields of electric and magnetic force associated with the movement of charged particles. EMFs are produced by natural sources, such as the movement of liquid magma below the earth's crust as well as human-made sources, most often involving the production and distribution of electricity. EMFs also arise from the operation of electronic equipment and appliances in our homes and businesses such as computers, televisions and refrigerators.

The strength of electric and magnetic fields is directly related to the magnitude of the voltage and current present in the system — the stronger the voltage and current the stronger the electric and magnetic fields. Notably, the intensity of both electric and magnetic fields weakens at an exponential rate the greater the distance from the source. The precise rate at which the field weakens is dependent on the specific configuration of the electrical equipment involved. The strength of electric fields are further weakened, or shielded, by common materials including buildings, trees, fences and walls.

EMFs are comprised of both electric and magnetic fields. In electric power systems, voltage, defined as the force that causes electrons to flow in a wire or cable, produces electric fields. The strength of an electrical field is measured in units of volts per meter (V/m). Current produces magnetic fields (defined as the rate at which electrons flow across a conductor). The strength of a magnetic field is typically measured in units of tesla (T), gauss (G) or milligauss (mG).

Health protection guidelines for exposure to high level magnetic fields

The most rigorous exposure guidelines are those developed by the International Commission on Non-ionizing Radiation Protection (ICNIRP). For the general public, the ICNIRP has established a threshold for acute exposure of 830 milligauss for power frequency magnetic fields. It is important to note that these guidelines were established

with a large safety margin and that exposure above the guideline's established limits is not necessarily harmful to human health. In fact, the ICNIRP's occupational exposure guidelines for power frequency magnetic fields are substantially higher at 4,170 milligauss¹. The ICNIRP's health protection guidelines for static magnetic fields suggest that the general public not be exposed to fields in excess of 4 million milligauss. This limit is increased to up to 80 million milligauss for certain medical procedures such as magnetic resonance imaging (MRI)².

Potential Electromagnetic Fields from PV Solar Facility.

There are three main sources of electromagnetic fields associated with this project and table 1 outlines the potential emissions and guideline exposure limits.

EMF generator	EMF at 900mm	EMF at 3m	ICNIRP Limits
Solar PV Panel Strings	1697mG	509mG	4,000,000mG
Inverter / Transformer Modules	344mG	3mG	830mG
110kV Export Transmission Line	29.7mG		830mG

Table 1 – EMF emissions and Exposure limits

It is only the 110kV export transmission line which is located outside of the project boundary, (within the Yarranlea-Tumaville Road reserve). The line however is located underground and will be buried by

approximately 900mm of soil. The EMF emissions from this line will be far less than the existing Ergon Energy overhead transmission network in the area.

Given the separation of the plant and equipment from neighboring properties, the resulting electromagnetic fields from this project would be largely indistinguishable from background levels.

References.

1 International Commission on Non-Ionizing Radiation Protection. "Guidelines for Limiting Exposure to Time-Varying Electric, Magnetic, and Electromagnetic Fields (up to 300 GHz)." Health Physics. Vol. 74, No. 4. 1998.

2 International Commission on Non-Ionizing Radiation Protection.

3. Will the facility generate noise?

There are two key stages to the delivery of this project, Construction Phase and Operational Phase.

During the construction phase works will be limited to daylight hours Monday to Saturday and limited between the hours of 9:00am and 4:00pm on Sundays. There will be noise associated with these activities, such as pile driving, earthmoving equipment, concrete placement and the like. Works and deliveries will however be undertaken in a manner sensitive to the impacts on adjoining properties.

During the operations phase there are some plant items which do emit noise such as drive motors for the PV array tracking system and cooling fans on the Inverter / transformer modules, however, these elements are largely operational during daylight hours, during generation.

The facility will achieve compliance with the Acoustic Quality Objectives listed in the Queensland Government Environment Protection (Noise) Policy 2008 when measured at any sensitive place or commercial place.

4. Will there be any more power lines on our property?

There will be no infrastructure associated with this project which is to be located on non-participating landowner properties. All works will be confined to the subject site, the Yarranlea-Tummalville Road reserve and the Ergon Energy land holding which contains the existing Yarranlea 110/33kV substation.

5. How will weeds and vermin be managed?

It is understood that Black Wattle will regenerate in this area once agricultural activities cease. The completed PV solar facility will be planted with selected pasture grasses with the exception of some limited gravel paths to provide a fire break to the site perimeter and the Power Collection substation. The perimeter of the site will also be planted with a low level vegetated buffer to reduce the visual impacts of the completed facility.

As part of the ongoing operations and maintenance of the facility a weed management plan will be implemented to ensure that black wattle, prickly pear and other exotic species are controlled. The grasses within the facility will be maintained by mowing or stocking with appropriate species which are able to co-exist with the installation, such as sheep.

Should biological control of grasses be undertaken, they would be confined to the fenced areas of the site and it is anticipated that this would secure these livestock from the known wild dog problems which exist in the area. The site will be serviced by frequent refuse collection service to manage the small waste generated by staff operating the facility on a full time basis.

6. Will there be an impact on Land Valuations?

There are very few Utility scale PV projects which have been constructed in Australia at this time and as such there are no studies into the potential impacts on land valuations associated with projects of this type.

AGL – Nyngan Solar Farm, Near Dubbo, (Operational Early 2015): <https://www.agl.com.au/about-agl/how-we-source-energy/renewable-energy/nyngan-solar-plant>

FRV – Moree Solar Farm, (Operational Early this year) - <http://www.moreesolarfarm.com.au/>

FRV – Royalla Solar Farm, South of Canberra), (Operational mid 2015) <http://www.frv.com/portfolio-en/australia/royalla-solar-farm-act-24-mwp>

Mugga Lane Solar Farm, (Near Canberra) – Under Construction

<http://www.mlsolarpark.com.au/default.htm>

Sunshine Solar Farm, Near Valdora Sunshine Coast) – Under Construction

<https://www.sunshinecoast.qld.gov.au/Council/Planning-and-Projects/Major-Regional-Projects/Sunshine-Coast-Solar-Farm>

It may be possible to draw parallels to studies completed on Utility scale Wind farms which is somewhat conservative given their more significant expanse and visual impacts.

NSW Department of Lands (2009) studied a total of 45 transactions from Wind Farms all over Australia: 8 study areas, applying the 'before and after' and/or 'matched pairs' evaluation method. Of these, only 5 showed adverse affect of the view of wind farms. *"From our analysis of previous studies and our own investigations, the majority of wind farms erected in Australia appear to have had no quantifiable effect on land values. A relatively small number of "lifestyle" type properties located very close (less than 500 metres) to wind farms in Victoria were found to have lower than expected sale prices*

(based on a statistical analysis), and it is possible that audio and visual aspects of wind farms contributed to this. Evidence suggests that any such wind farm related impacts on land values can be readily alleviated by ensuring a suitable separation distance between the wind turbines and any nearest residential dwellings. Generally, the separation distances identified in NSW appear to be sufficient in this regard."

29 August 2013 — A study from Lawrence Berkeley National Laboratory has found no evidence of wind turbines affecting property prices.

Analysing more than 50,000 home sales near 67 wind farms across nine US states, it found no evidence of impacts to sale price from the turbines. Berkeley Lab said the study, *A Spatial Hedonic Analysis of the Effects of Wind Energy Facilities on Surrounding Property Values in the United States*, was the most comprehensive to date, using a number of sophisticated techniques to control for other potential impacts on house price, including collecting data from before the wind facilities' development announcement to post-construction and operation.

"Although there have been claims of significant property value impacts near operating wind turbines that regularly surface in the press or in local communities, strong evidence to support those claims has failed to materialise in all of the major US studies conducted thus far", said report lead author Ben Hoen.

Considering the vertical footprint of this project is considerably smaller than a windfarm and visual amenity amelioration measures will be implemented the potential to impact on land valuations is considered unlikely.

7. Will there be an impact on the local roads?

There are two key stages to the delivery of this project, Construction Phase and Operational Phase.

During the operations phase there will be approximately 3 full time staff employed at the site and their impact on the local road network is considered to be immaterial.

During the construction phase works there will be an increase in traffic movements associated with plant, materials and labour accessing the site. It is anticipated that all site traffic will be travelling to/from the south towards the Gore Highway. Workers are expected to originate from, or be based at Toowoomba or Pittsworth, and equipment is expected to be transported from Toowoomba or Brisbane. There may be some limited travel from Oakey and areas North of the site, which would use the Pittsworth Oakey Road and Saint Hellens Road to access the site. The number of these movement is unlikely to be high.

As a mean of limiting disruptions to the local community, a heavy vehicle curfew will apply during the times which the local school bus operated. Additionally, prior to construction, a dilapidation survey of Yarranlea-Tummalville Road will be completed and any post construction damage attributed to the project will be repaired.

During construction a Traffic Management Plan with appropriate controls and signage for Pittsworth-Tummalville Road from the Gore Highway to the intersection of Yarranlea-Murlaggan Road will be implemented.

8. Will there be an impact on Storm water runoff and drainage flow paths?

The PV Solar facility is mounted on steel poles in rows such that the PV panels are elevated above the existing ground level. The majority of the site will be planted with selected pasture grasses with the exception of some limited gravel paths to provide a fire break to the site perimeter and the Power Collection substation. As a result of this, there will be no increase in stormwater discharges from the site. Due to the mounting arrangements the PV panels will be elevated above the existing soil conservation contour banks, which will be retained.

Prior to installation of the PV panel support poles, the existing soil conservation contour banks will undergo a maintenance program. This will include some reshaping to broaden of the crest of the banks to ensure robustness during major runoff events and flattening of the batter slopes. This treatment will ensure that they are more conducive to mowing activities in a safe manner and also increase their strength, hence reducing the opportunity for a 'blowout' during major precipitation events.

The impervious areas from the Power Collection substation, will be directed through a natural stormwater treatment system which will remove any sediment runoff and improve the nutrient loads prior to discharging to the environment.

In summary the construction of the Solar PV facility will not impact stormwater characteristics on adjacent properties.