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Agricultural Assessment Report Bairnsdale Solar Farm and Battery Energy Storage System

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Agricultural Assessment Report Bairnsdale Solar Farm and BESS

Executive Summary

This Agricultural Assessment Report examines the agricultural productivity of the proposed Bairnsdale solar farm and battery energy storage system (BESS) to be located on the north eastern corner of the Princes Highway and Power Station Road intersection, and the impact of its construction on a range of agricultural considerations.

The site proposed for the solar farm and BESS totals 20.73ha of which approximately 3.5ha will be covered by the footprint of the batteries and a further 10 or so hectares for the solar panel arrays. The site has previously been used exclusively for grazing. The soils in this location are classed as soils of low to moderate fertility with significant subsoil constraints that limit their ability to be highly productive. The soil types are not considered to be suitable for long term cropping and so they would be likely to remain as pastures for grazing.

The proposed solar farm and BESS at this site would have no long term detrimental effect on the productive capacity of the soil, nor would it have a significant impact on the overall productivity of the region or state, nor impact on the ability of neighbouring businesses to operate.

Background

An agricultural assessment of the site of the Bairnsdale solar farm and BESS has been requested by Habitat Consulting Pty Ltd on behalf of BE Pro BD Pty Ltd. This report has been informed by the requirements of the "Solar Energy Facilities, Design and Development Guidelines", Victorian Government (2019)[1].

The requirements outlined in the Guidelines are to:

- protect strategically important agricultural and primary production land from incompatible land use,
- protect productive agricultural land that is of strategic significance to a local area or in a regional context, and
- avoid the loss of productive agricultural land without considering the impact of the loss on the agricultural sector and its consequential effect on other sectors.

Specifically the report covers the following aspects:

- the impact on the loss of the site if it has high quality soils, particularly soils that are niche to a type of crop or other agricultural activity,

[1] https://www.planning.vic.gov.au/__data/assets/pdf_file/0028/428275/Solar-Energy-Facilities-Design-and-Development-Guideline-August-2019.pdf

- the potential loss of reliable, accessible water (such as irrigated areas) and its impact at a local or regional scale,
- the impact of fragmentation and a change of land use to non-agriculture activity on local and regional productivity and output,
- the impact of a change of land use on recent and/or current efforts to modernise and reform agricultural activity in the area,
- whether the land has specifically been set aside or defined for agricultural use and development in a planning scheme or other strategic document,
- whether the change in land use is to the detriment of a government's previous or existing investment and support for the site or the area, and
- whether the proposed solar energy facility can co-locate with other agricultural activity, to help diversify farm income without reducing productivity.
- Assess the cumulative impact of this solar farm development with other solar farms in the vicinity.

The proposed site (shown in Figure 1) is located approximately 4km west of the Bairnsdale town centre, on the northern side of the Princes Highway. It is bounded by the Melbourne - Bairnsdale railway line on the northern boundary, and Power Station Road on the west. The Bairnsdale power station and the Auswest Timber Mill are located on the western side of Power Station Road and are adjacent to the proposed solar farm and BESS site.

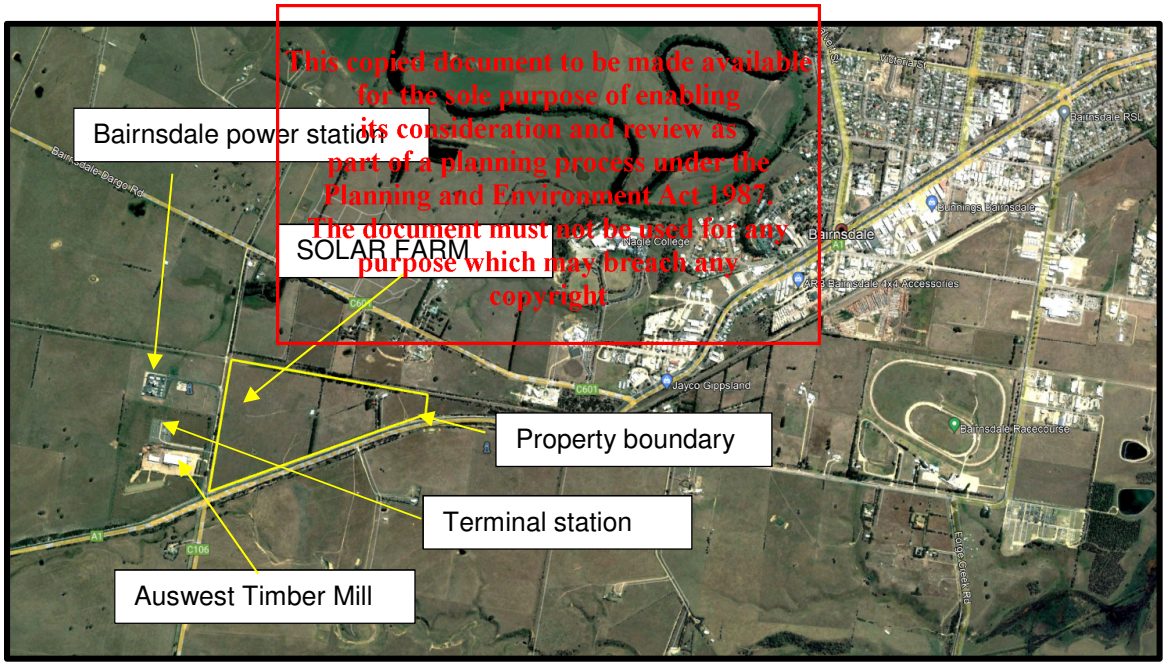

Figure 1 Location of Bairnsdale solar farm and BESS.

The green shaded area in Figure 2 shows the area to be leased for the solar farm and BESS adjacent to Power Station Road. Figure 3 shows the BESS and solar panel configuration.

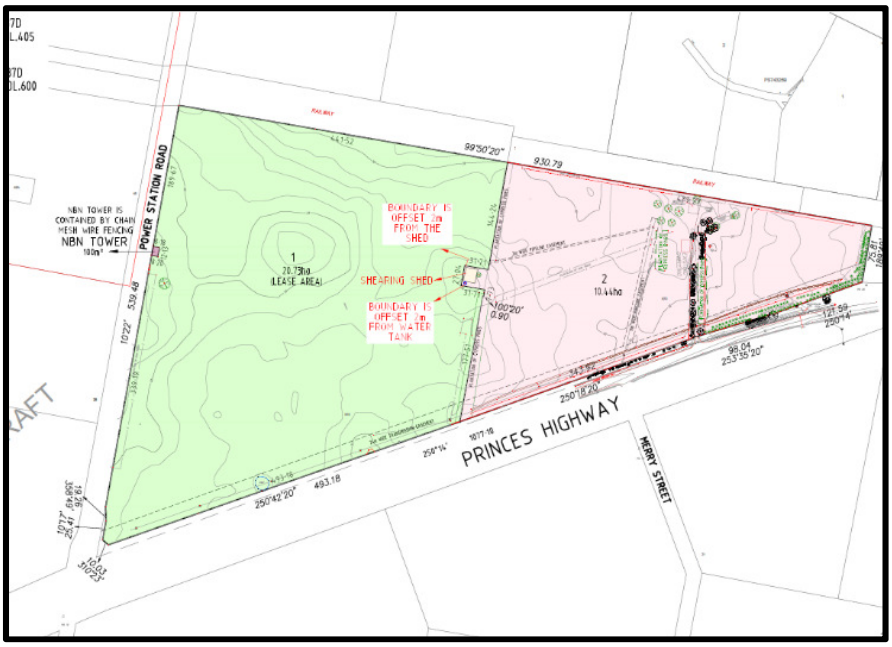

Figure 2. Lease area for solar farm and BESS showing site topography

The area occupied by the by the BESS will be approximately 3.5ha, leaving a residual of approximately 17.2ha. The solar arrays will occupy approximately 10ha of this area.

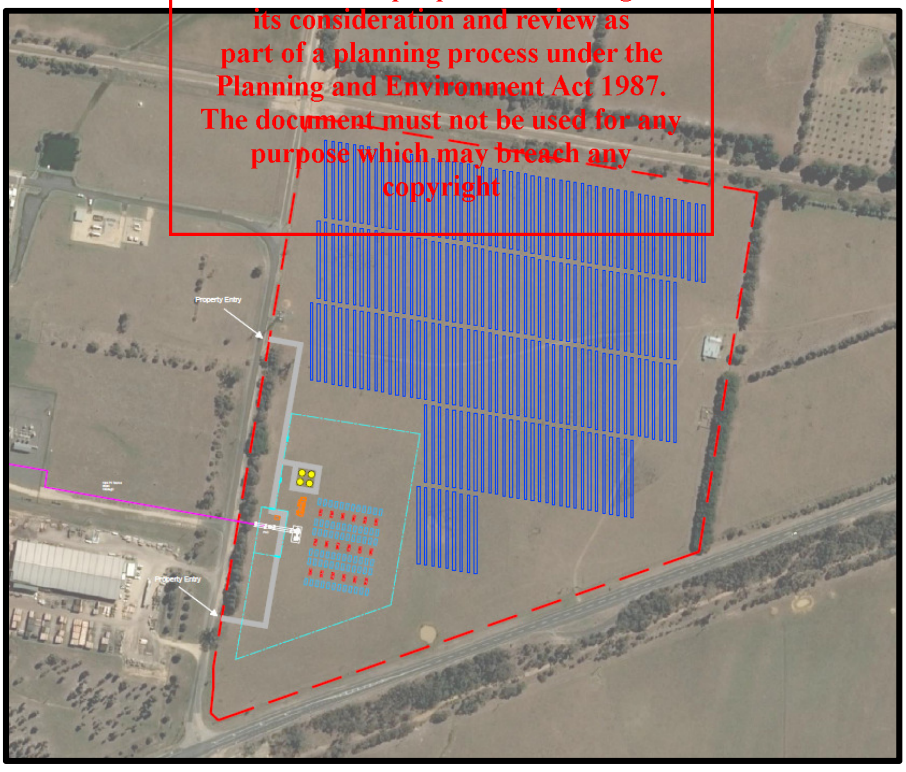

Figure 3 Bairnsdale solar farm and BESS design.

Site Characteristics

The site is gently undulating, as shown by the contour lines in Figure 2, with a slight rise in the middle of the site.

Figure 4 shows the site view from the Princes Highway and Figure 5, the site view from Power Station Road.

Figure 4. Solar farm and BESS site location, from Princes Highway

Figure 5. Solar farm and BESS site location from Power Station Road

Geology, and Soils

The soils at the site are derived from recent sediments and are located on old stream terraces. The soil and landform associations for the Bairnsdale area are shown in Figure 6.

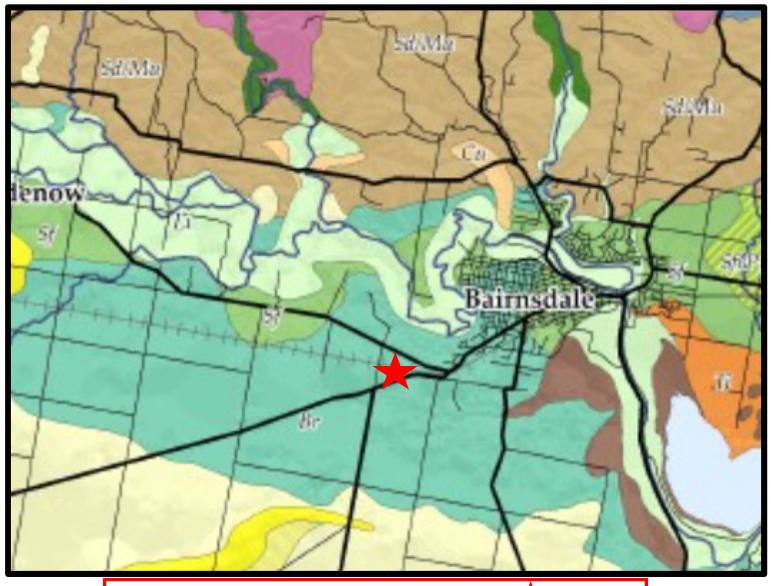

Figure 6. Soils of the Bairnsdale area. (★solar farm and BESS site)

The soils at the site belong to the Briagalong soil association (Br). The soils are texture contrast soils. The surface soils are light textured soils (fine sandy loams to sands) often with a bleached subsurface layer. This bleached zone is formed by leaching of nutrients over a long period of time and is associated with seasonal waterlogging resulting in the loss of soil structure and the ability to hold nutrients.

Medium to heavy clays occur at variable depths, but generally before 50cm. Strong mottling occurs in the deeper subsoils. Mottling (variable colouring of the clay layer) is also associated with seasonal waterlogging.

The surface soils are strongly to moderately acidic with decreasing acidity with depth. The subsoils are sodic to highly sodic resulting in poor soil structure and rooting depth restriction. The loss of soil structure coupled with the sandy nature of the soils results in a low water holding capacity. These soils respond to light rains when the soil is dry. However because of their low water storage capacity, plants quickly suffer moisture stress if follow-up rains don't occur.

In their natural state these soils would have been deficient in phosphorus, nitrogen, sulphur and molybdenum as well as being strongly acidic. Some soils in this soil association would also be likely to be deficient in potassium. The current nutrient status of soils will be a reflection of recent management and fertilizer history and it would be expected that, at least the phosphorus and sulphur levels would have improved through the addition of fertilizers. Soil acidity would have increase since clearing for agriculture and may or may not have been addressed through the addition of lime.

In summary, the soils at the proposed site are of inherent moderate to poor quality with significant subsoil limitations.

Agricultural Use

Historical images indicate that, for the last 20 years, the site appears to have been used only for grazing. While not a complete time record, the historical images show no evidence of pasture resowing or cropping having taken place during this period.

While irrigated vegetable production occurs along the Mitchell River Flats to the north of the site, it would not be feasible for water to be diverted from the river to irrigate this or nearby land and so the site would remain as a dryland farm.

Agricultural Assessment

The size of the site needs to be kept in context. It is a small area – total of 20.73ha. Of this will approximately 10ha will be used for the solar farm and 3.5ha for the BESS.

Strategic importance of land

The site has no strategic importance. It is zoned FZ1 and the area is not specifically mentioned in any planning scheme as being of high value agricultural land nor has the land been subject to government programs that would limit the ability of the facility to proceed. Further, the property is close to the peri-urban area of Bairnsdale and has industrial premises on its western boundary.

Agricultural Productivity

Stock Productivity

The potential loss of productivity from the installation of a solar farm and BESS can be calculated from the predicted carrying capacity and the area affected.

The length of growing season can be used to provide an estimate of potential stock carrying capacity[2] of an area. The growing season is a function of amount of rain and its distribution. Realisation of this potential depends on the consistent good agronomy and husbandry and the absence of inherent soil constraints.

Based on the rainfall data for the area, the likely average growing season is around six months for the property. This equates to a potential stocking rate of around 11 Dry Sheep Equivalents[3] (DSE) /ha.

For a cattle operation this would equate to a maximum of thirteen breeding cows for whole site.

Based on the most recently available benchmarking data[4] the area would have likely returned an average gross margin of approximately $462/ha. Note however that since these data were reported, there have been major reductions in the sale price of stock which would reduce the gross margin.

Overhead costs such as rates, insurance, power, etc. need to be deducted from these gross margin figures to arrive at net farm income, out of which financing costs, capital purchases, etc.,

[2] Saul G.R and Kearney, G.A (2003) Potential carrying capacity of grazed pastures in southern Australia, Department of Natural Resources and Environment, Victoria.

[3] Dry Sheep Equivalent is a standard animal (non lactating/non pregnant 50 kg sheep) that is used to compare carrying capacity, profitability, etc., between different stock types. For example, one breeding ewe is equivalent to two DSE over a year and a cow and calf is equivalent to 17 DSE over a year.

[4] https://agriculture.vic.gov.au/about/agriculture-in-victoria/livestock-farm-monitor-project#h2-0

would need to be paid. The scale of these costs generally result in only a marginal positive cash return in good years for most small to medium scale farmers.

It should be noted that East Gippsland is notorious for its variable seasons, where prolonged periods on low rainfall have been interspersed with periods of above average rainfall often falling within a narrow period. This seasonal variability has a major effect on farm incomes.

The loss of the number of stock potentially carried on the site (maximum thirteen cows) is insignificant in relation to the State's cattle herd of 1.4 million head.[5]

Crop Productivity

While there is no evidence of a history of cropping, limited cropping would be possible. Potential crop yields can be inferred from the growing season rainfall (GSR). In simple terms, growing season rainfall (mm) is a combination of a 50% discount of the rain falling from February to April, plus the rainfall from May to October. This figure is multiplied by a factor of 20 to give the potential yield of wheat and by 10 to give the potential yield for canola.

Rainfall data for this location[6] indicates that the average growing season rainfall for the last 20 years has been approximately 360 mm. This equates to a potential yield of 7.2 t/ha for wheat and 3.6 t/ha for canola. These figures assume excellent agronomy and absence of subsoil impediments. Data from a recent survey of the economics of grain production in Victoria[7] indicated a conversion factor of 80% of potential yield is a realistic outcome. However the sodicity and drainage constraints of the soils outlined above, mean that yields would likely be much less than 80% of potential yield. An estimate of average yields of 4 t/ha wheat and 2 t/ha for canola would be more realistic.

Based on 50% price deciles for wheat[8] ($280/t) the gross income would be expected to be approximately $1120/ha if the site was cropped with wheat. Note however, that these soils are not suited to continuous cropping and the small size of the remaining area of the site may not be attractive to cropping contractors.

The latest available data for cropping[9] indicates average variable costs of $273/ha to give a gross margin of $847/ha for wheat. Again the return to the farmer would be reduced by the cost of overheads, depreciation and finance costs.

If the total area of 20.7ha was removed from agricultural production on average would result in the potential loss of approximately 82t wheat/year to the State or 41t canola/year. As with the livestock figures, these are insignificant numbers when compared to the State's predicted production for 2022-23 of 3,813,000t wheat and 990,000t canola[10] and their loss would not have a material impact on the local economy.

Agrovoltaic considerations

The pasture around the solar farm and BESS will require management to reduce fire risk over summer. If grazing was to be considered, sheep would be the preferable enterprise.

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[5] https://agriculture.vic.gov.au/__data/assets/pdf_file/0012/699285/Beef-Fast-Facts-June-2021-Final.pdf

[6] https://www.longpaddock.qld.gov.au/silo/point-data/ - -38.30 147.05

[7] Cropping Zone Management Guideline Victorian High Rainfall. GRDC (2017)

[8] https://mecardo.com.au/percentiles-november-2022/

[9] The integration of technical data and profit drivers for more informed decisions, GRDC

[10] https://www.agriculture.gov.au/abares/research-topics/agricultural-outlook/australian-crop-report/victoria

Impact on agricultural use of land

When the solar farm and BESS are decommissioned, there will be no residual detrimental impact on the productivity of the site. Soil fertility will decline over time, but this can be corrected through the addition of suitable amendments, if deemed appropriate by the owner.

Cumulative impacts.

The documentation of solar farms by Planning Victoria[11] lists a planning application for a 50 MW farm at Perry Bridge 32km to the south west.

There are unlikely to be any cumulative effects on agriculture from the establishment of a solar farm and BESS at this density of infrastructure development.

Conclusion

The proposed Bairnsdale solar farm and BESS, 4 km west of Bairnsdale, will cover a total area of 20.7ha.

The site has been used for grazing, with no evidence of cropping in the immediate past.

The soils are of moderate to low quality which limits their potential for high productivity.

The loss of production from the diversion of this land to a solar farm and BESS will have an insignificant impact on the State's agricultural production and is unlikely to impact on the activities of surrounding farming properties.

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[11] https://www.planning.vic.gov.au/permits-and-applications/specific-permit-topics/solar-energy-facilities/solar-energy-projects