FEASIBILITY STUDY FOR A SOUTHERN GIPPSLAND SOLAR FARM

South Gippsland Shire Council

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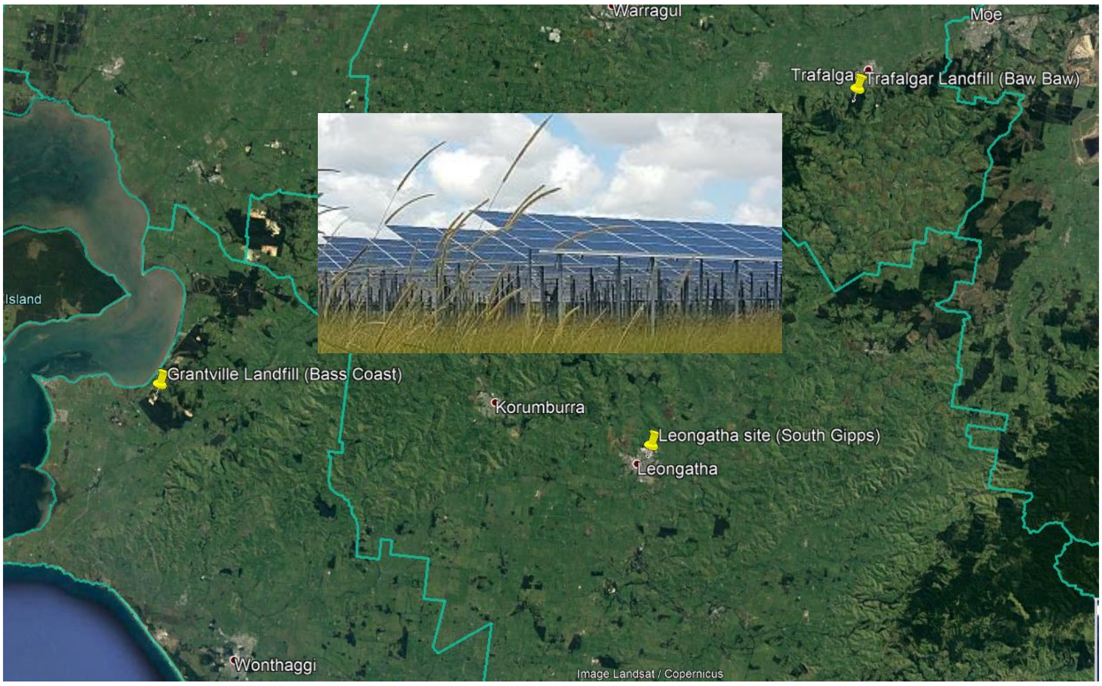

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Executive Summary

South Gippsland Shire Council would like to establish solar farm projects on Council owned land, and to collaborate with neighbouring Shires including Baw Baw and Bass Coast Shires to enable more efficient, cost effective and successful deployment of large scale solar in the region.

A summary of the sites is provided below:

Council	Site	Site address	Solar capacity MW	Solar Generation GWh/yr	Council consumption GWh/yr: Total	Council consumption GWh/yr: Excl. street lighting	Solar % of total
South Gippsland Shire	Southern Gippsland Solar Farm site at Leongatha	20 Tilson Court Leongatha Victoria 3953	1.66	2.80	1.63	0.99	171%
Bass Coast Shire	Grantville Landfill Site	1685 Bass Highway Grantville Victoria 3984	1.14	1.64	1.94	0.93	84%
Baw Baw Shire	Trafalgar Landfill Site	Lot 163 Giles Road Trafalgar Victoria 3824	1.09	1.53	2.82	1.32	54%
Total			3.89	5.96	6.39	3.23	93%

The outcome of the site-selection evaluation indicates Leongatha as the most attractive site, Grantville as the second ranking and Trafalgar as the third:

Criteria	Percentage Weighting	Longatha	Grantville Landfill	Trafalgar Landfill
1. Land physical suitability	**20%**	17.7	13.0	12.3
2. Grid connection	**25%**	24.0	21.0	14.0
3. Land economic suitability	**15%**	11.0	15.0	15.0
4. Planning and environmental	**15%**	10.8	11.7	15.0
5. Community support	**25%**	20.0	22.5	22.5
Total	**100%**	83.5	83.2	78.8
	RANK	1	2	3

A number of energy use models were considered for the project including:

Model	Project Capex funder	Project Operator	Purchaser of power	LGC income
1A	Group of Councils	Group of Councils	Group of Councils, pool price pass through	Group of Councils
1B	Group of Councils	Group of Councils	Councils, fixed PPA	Group of Councils
2	Council	Council	Council	Council
3	Councils and Community	Council(s)	Council(s)	Council(s)
4	Private sector	Private sector	Council(s)	Private owner

A summary of the financial comparison of scenario 1-3 is given below:

Scenario	1A	1B	2	3
Council Capex ($M)	-2.67 of which SGS ~ $0.89M	2.67	-2.67	-2.16
NPV of 25 year saving to Council $M	2.65 Of which SGS ~$0.88M	1.25	1.09	2.59
Payback (yrs) for Council investment	7.9	10.1	13.0	8.1

The acceptance of exposure to the wholesale spot price for both generation and consumption is a mechanism proven by the Sunshine Coast Council to deliver favourable financial outcomes under a solar farm scenario. This model is adopted in our analysis for South Gippsland Shire, Baw Baw Shire and Bass Coast Shire.

For scenario 1A, assuming a 1.66MWp single axis tracker installed at Leongatha, analysis of savings to ratepayers over a 25 year period indicates a potential saving of $2.65M, with payback period around 7.9 years:

Table 1-1: Comparison of 25 year net present value for 3 Councils BAU vs 1.66MWp solar farm

Cost Type	***BAU NPV $millions***	***Solar Project NPV $millions***	***Difference $millions***
Energy Use charges	-$7.25	-$2.88	$4.37
Other energy bill charges	-$11.33	-$11.33	$0.00
Total electricity cost	**-$18.58**	**-$14.21**	**$4.37**
Total project Capex		-$2.67	-$2.67
Operating costs inc. retailer		-$2.35	-$2.35
LGC income		$0.32	$0.32
Electricity export income		$2.49	$2.49
Solar farm terminal value		$0.50	$0.50
TOTAL COSTS	**-$18.58**	**-$15.93**	**$2.65**

For scenario 2 where South Gippsland Shire Council proceeds without participation from Bass Coast Shire or Baw Baw Shire, the lifetime saving would be of the order of $1.1M with a longer payback of around 13 years.

For scenario 3 where the Council receives some co-funding from a local community fundraising initiative, the Council would repay the community funds with interest. The net outcome to the Council would be a $2.59M saving to ratepayers with a payback period of around 8.1 years.

For scenario 4, South Gippsland Shire could offer the Leongatha site to private solar developers rent-free, and the three Councils could procure the generation at a fixed price PPA commencing in 2019. A PPA rate to deliver both a saving to Council on their energy bill and sufficient return to the private developer could be achieved in the $100-$120 /MWh range.

Sensitivity analysis			
% saving to Council vs BAU energy charge	0%	10%	20%
PPA rate 2019 $/MWh	$134.11	$120.70	$107.28
Annual bill saving vs BAU (3 Councils)	0	$37,200	$74,000
Developer payback period (yrs)	7.9	9.2	12.3
Developer Internal rate of return	11.8%	9.5%	7.1%

A further alternative outside the scope of this study is procurement of power generated at larger private sites elsewhere in Victoria. Council procurement initiatives such as the Eastern Alliance for Greenhouse Action (EAGA) are focusing on procuring from larger scale solar and wind farms in the national electricity market. These involve lower PPA rates than we estimate could be generated from a solar farm at the Leongatha site, but do not offer the advantage of establishing local solar farms within the municipality.

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1. Introduction and Purpose

South Gippsland Shire Council would like to establish solar farm projects on Council owned land, and to collaborate with neighbouring Shires including Baw Baw and Bass Coast Shires to enable more efficient, cost effective and successful deployment of large scale solar in the region.

The project aims to lead the way towards Council owned medium scale renewable energy facilities in the Gippsland region. It also aims to foster community action in relation to reduction of greenhouse gas emissions. The study investigates energy use models to meet the aims of assisting local community, engaging and educating the community and making a significant contribution towards a renewable energy future for the local community.

The three Councils successfully secured funding under the Victorian Government's Collaborative Council – Sustainability Fund Partnership – Round 5 program for the development of this feasibility study for a medium scale solar farm on Council owned land in Leongatha and a basic site assessment of one site in each of Baw and Bass Coast Shires. The Sustainability Fund provides partial funding with the remaining funding being provided by the Councils. Enhar was engaged to provide consulting services for a Feasibility Study into a Southern Gippsland Solar Farm. Enhar engaged Gippsland Solar to assist with the site assessments.

Figure 1-1: Participating Councils and site locations

Table 1-1: Sites included in study

Site	Address	Scope of Works	Usable land (Ha)
Southern Gippsland Solar Farm site at Leongatha	20 Tilson Court Leongatha Victoria 3953	Solar Farm Feasibility and Business case Development	4.3
Grantville Landfill Site	1685 Bass Highway Grantville Victoria 3984	Solar farm feasibility assessment	2.0
Trafalgar Landfill Site	Lot 163 Giles Road Trafalgar Victoria 3824	Solar farm feasibility assessment	1.5

The objective of this study is to test the feasibility of a small group of Councils working together to create a local renewable energy source from which the subsequent electricity generation can be purchased collaboratively.

2. Site Selection Criteria and evaluation

This section discusses assessment of site suitability and energy use model by developing a matrix for site selection and energy use model selection.

2.1 Site Selection criteria

The following criteria are critical in selecting a site for medium to large scale solar farm generation:

- Suitable solar irradiation levels
- Optimum scale of land area suited to target generation scale
- Access to connect to grid lines or substations with
    - sufficient capacity to connect
    - low cost of connection

- Low value land where large scale solar usage is economically favourable compared to other potential land uses over the 25-year project time horizon
- Land parcel(s) unsuitable for higher economic activities such as residential or industrial development, cropping agriculture or public uses
- Land zoning allowing electricity generation
- Absence or low occurrence of protected planning designations including Aboriginal Heritage, significant landscape overlays, protected flora and fauna etc
- Land topography suited to solar arrays, flat or with gentle gradients below 10 degrees
- Absence of trees especially older mature native trees, within the area targeted for solar array construction
- Low visual impact on neighbouring residences, ideally very few residences being able to see the arrays of panels
- Ease of access for construction and maintenance traffic
- Where community support is strong or is likely to be strong

2.2 Target project size and land area usage

An initial step in site selection is to determine the desired generation volume. The optimum size of solar generation capacity arises through analysis of Council forecast electricity demand and assessment of the available site size and grid capacity.

The following analysis summarises the results of the Enhar analysis of Council load data. Input data included half hour interval data 1 April 2017 - 31 March 2018 for Council large sites and public lighting plus limited interval data from small sites. Overall Council summary consumption for April 2017- March 2018 was also incorporated into this analysis.

2.3 Council Load Analysis

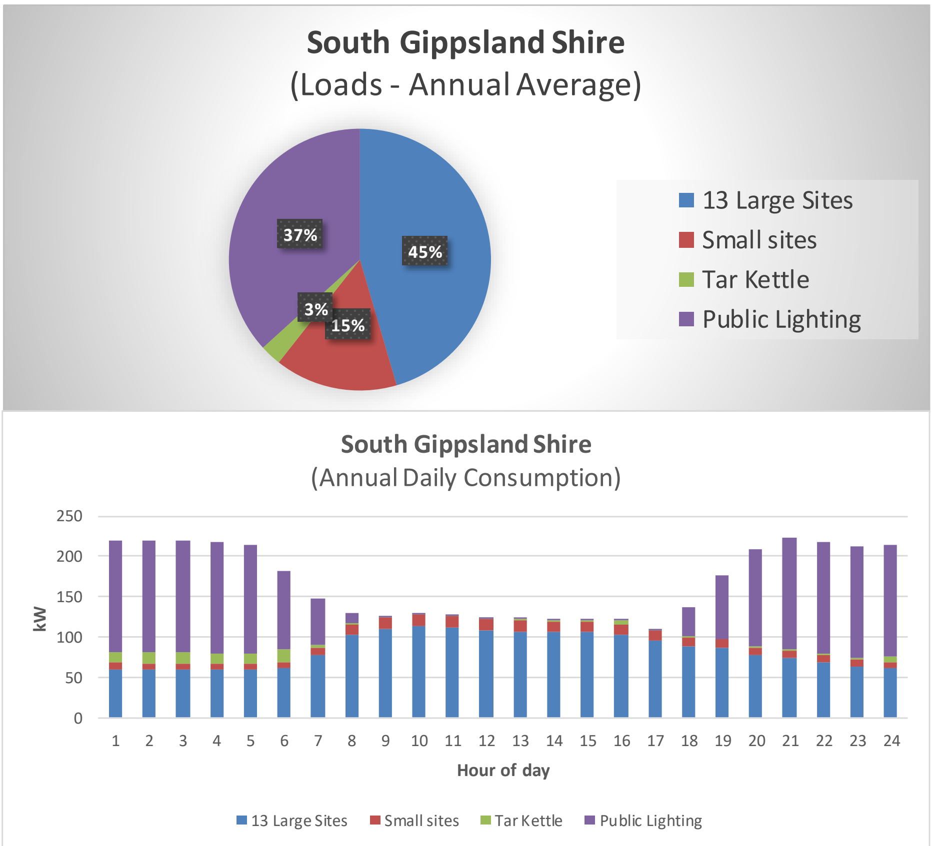


Figure 2-1: South Gippsland Shire load profile 2017-2018

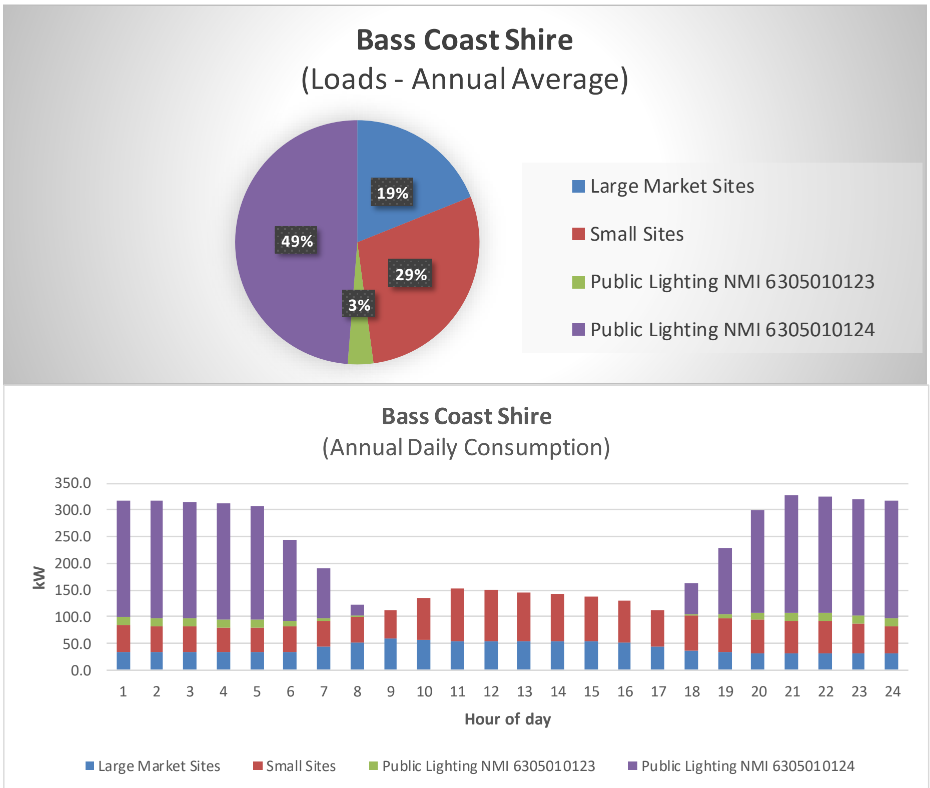


Figure 2-2: Bass Coast Shire load profile 2017-2018

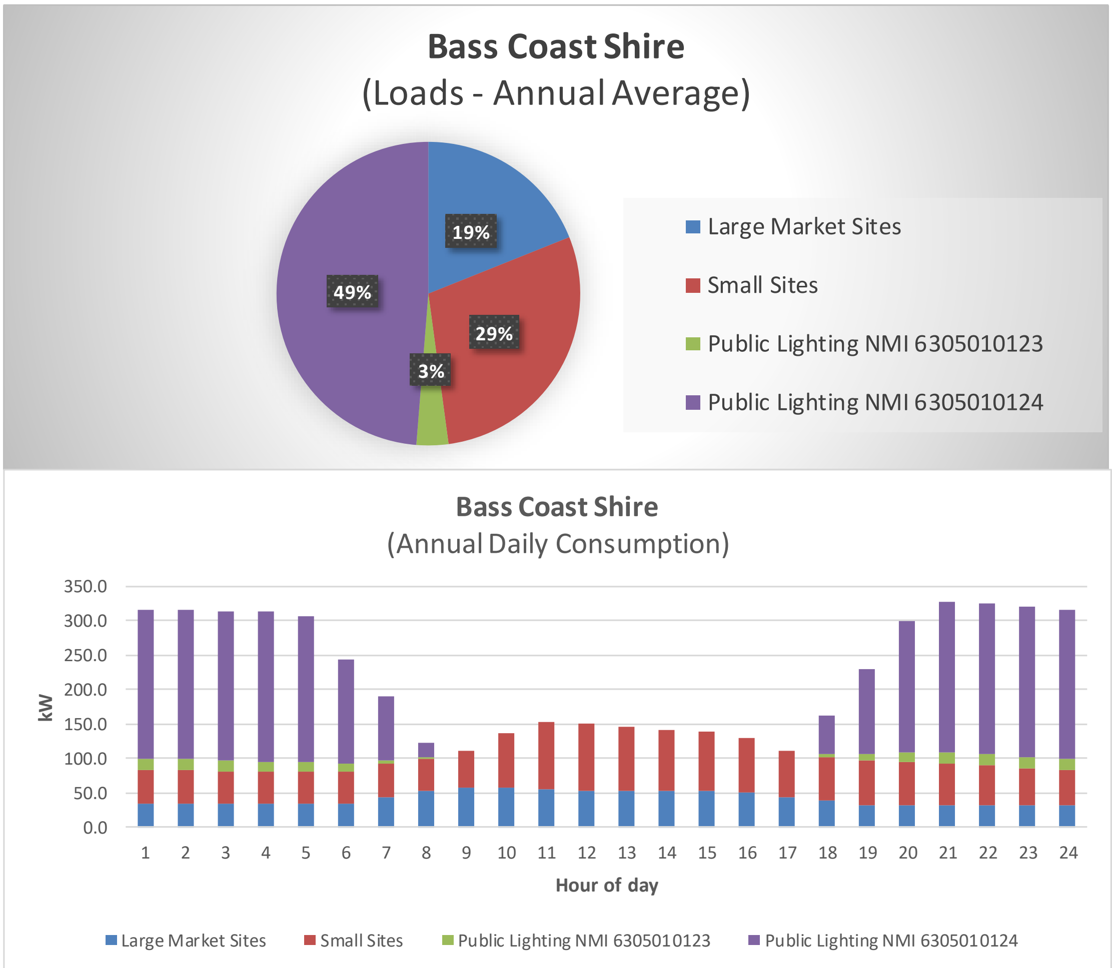


Figure 2-3: Baw Baw Shire Council load profile 2017-2018

The demand volume informed the quantity of land area required during the assessment of site options.

Table 2-1: Annual council electricity consumption

Council	Total annual consumption April 2017 – March 2018	Annual consumption excluding street lighting
South Gippsland Shire	1.6 GWh/yr	0.99 GWh/yr
Bass Coast Shire	1.9 GWh/yr	0.93 GWh/yr
Baw Baw Shire	2.8 GWh/yr	1.3 GWh/yr
Total	**6.4 GWh/yr**	**3.2 GWh/yr**

Various approaches can be taken regarding how large the scale of annual solar generation should be sized compared to annual consumption, such as:

1. Council owned and operated solar farm: annual net solar farm generation approximately matches annual daytime Council net consumption
2. Council enters power purchase agreement (PPA) with private owner: Council purchases appropriate volume to offset significant portion of consumption, developer determines project scale based on their commercial drivers which may include selling power to additional offtakers

Public Lighting is a significant portion of annual load, as shown in Figures 2-1 to 2-3 above. While it could be desirable to scale annual solar generation to match annual net Council consumption from a carbon perspective, solar generation does not add value to the night time consumption of street lighting, therefore for economic reasons is it recommended to target daytime consumption only.

Given the three Councils are collaborating on the project, the aggregate total non-street lighting consumption for all three Councils can be considered to be the target i.e. around 3.2 GWh/year.

Our analysis indicates that a maximised single axis tracking solar farm of 1.66MWp in the Leongatha site has the potential to produce around 2.8 GWh/year, enough electricity to cover nearly 90% of the total electricity consumed across the three Councils excluding street lighting.

The table below illustrates the land requirements for two main solar farm technologies, fixed tilt and tracker arrays:

FIXED TILT ARRAYS	
0.83	MW DC / hectare
0.69	MW AC / hectare
1.4	hectares per MW AC
SINGLE AXIS TRACKING ARRAYS	
0.50	MW DC / hectare
0.42	MW AC / hectare
2 - 2.4	hectares per MW AC

Table 2-2: Solar farm land area requirements

Single axis tracking delivers a lower cost of energy but uses more land area than fixed tilt. Single axis tracker systems are generally more challenging to apply to undulating landfill sites due to foundation requirements and sensitivity to terrain gradient.

Project-specific economics and land size availability influence the choice between single axis tracking and fixed tilt at each site.

Array design is discussed further in sections 2.4 and 2.5 below.

2.1 Council tariff analysis

A solar farm contribution via a range of business models can be expected to impact the energy usage charges part of the bills. The analysis indicated that the impactable energy charges account for around 39% of total annual energy costs. The remaining 61% of costs comprising environmental, network, market and metering charges will remain unchanged by the solar project.

Enhar undertook an analysis of energy tariffs based on bills received from each Council, summarised in Table 2-3 below.

Table 2-3: Energy tariff analysis

	Energy Tariffs $/kWh				
	PEAK	OFF-PEAK	Weighted average	Annual consumption kWh	Approx annual expenditure $ *
South Gippsland Shire	0.1181	0.0819	0.0967	988,795	$95,650
Bass Coast Shire	0.1261	0.0819	0.1091	929,515	$101,368
Baw Baw Shire	0.1641	0.1060	0.1398	1,250,753	$174,849
Total			**0.1173**	**3,169,063**	**$371,867**

*These charges account for approximately 39% of total annual electricity costs.

These are representative Energy tariffs $/kWh at 2018 rates, after loss factors are applied and exclude network charges, fixed charges. They are for large and small sites and exclude street lighting.

Large site bills were inspected for all Councils. For those Councils where small site bills were not provided, the large site tariffs were conservatively used.

2.2 Site selection assessment against solar farm criteria

For Councils to develop medium scale solar farm projects, the site selection criteria include:

- Low value land
  - Large scale solar usage of the land should be economically favourable compared to other potential land uses over the 25 year project time horizon
  - Land use planning considerations should be evaluated
- Solar resource
  - Solar resource is similar throughout the target region so resource is not a differentiating factor between sites
  - Shading at certain sites will give greater losses especially where tall trees surround the sites, this will impact on energy yield
- Grid connection availability including proximity to suitable grid lines and/or substations
  - At this <5MW scale, proximity of 11kV or 22kV lines or substations are required to facilitate viability of grid connection
  - Connection at 11kV, where capacity exists, will be more economic than 22kV. Connection at 66kV would be uneconomic for projects of this scale due to the cost of transformer and switching equipment.
  - Preliminary grid connection enquiries were lodged for each site with Ausnet. Reponses from Ausnet are included in Appendix C below.
- Native vegetation
  - Absence or low incidence of native vegetation is preferred
- Planning permission feasibility including site sensitivities such as
  - Amenity impacts – minimal or no visibility from nearby residences
  - Minimal environmental overlays including ecology, flora and fauna
  - Absence of flood overlays
  - Absence of Indigenous heritage overlays
- Community Support
  - Existing or expected local community support for usage of site as a solar farm is important

- Ease of engagement of community at the specific site is a consideration
- Support from Council for usage of site as a solar farm is important

The three available sites have been reviewed against the site selection criteria. A summary of the evaluation is provided in Table 2-4 below:

Table 2-4: Site ranking against criteria (traffic light ranking)

		Site		
Criteria	Percentage Weighting	Leongatha	Grantville Landfill	Trafalgar Landfill
1. Land physical suitability	20%	17.7	13.0	12.3
2. Grid connection	25%	24.0	21.0	14.0
3. Land economic suitability	15%	11.0	15.0	15.0
4. Planning and environmental	15%	10.8	11.7	15.0
5. Community support	25%	20.0	22.5	22.5
	100%	83.5	83.2	78.8
	RANK	1	2	3

2.3 Energy Use Models

A range of alternative funding and operation models are available including the following:

Table 2-5: Funding and energy use model options for solar farms

Model	Project Capex funder	Project Operator	Purchaser of power	LGC income
1	Group of Councils	Group of Councils	Group of Councils	Group of Councils
2	Council	Council	Council	Council
3	Councils and Community	Council(s)	Council(s)	Council(s)
4	Private sector	Private sector	Council(s)	Private owner

The study includes a Council-led solar facility from which the power generation is jointly purchased by a group of Councils [Model 1]. In addition, a single-Council project by South Gippsland Shire was also modelled [Model 2]. Further, an option where the local community invest in the project was considered [Model 3]. Finally, a scenario where the Council provides only the land and power purchase contract was considered, with a private developer developing, building and owning the solar farm [Model 4].

For a solar farm project, a greater share of capital ownership by the Council will lead to greater control and potential returns, by avoiding charges from intermediaries. Larger investment comes with more development risk however. In terms of risk mitigation, an increasing number of case studies provide risk-management approaches used by other Councils successfully undertaking similar projects such as Newcastle Council 5MW and Sunshine Coast Council 15MW projects, both of which are Council-funded and owned solar farms.

If providing the majority of the capital itself and owning the operational solar farm, the Council(s) would be required to:

- Obtain the suitable planning permits internally
- Obtain a firm grid connection offer from Ausnet
- Engage a retail partner to use the solar generation to offset Council bills, trade surplus generation, act as licenced generator, etc
- Engage with local community, possibly facilitating partial community ownership
- Engage an EPC construction company to design and build the solar farm
- Engage the EPC or another O&M company to operate the solar farm
- Undertake ongoing management of the solar farm administration etc

Notable examples of Councils who have implemented solar farm projects on Council owned land include the Sunshine Coast Council 15MW solar farm commissioned in 2017 and the Newcastle City Council 5MW solar farm on a landfill site under construction in 2018.

The models adopted by Sunshine Coast for example includes a transition to wholesale spot price for purchasing and sale rather than fixed rate retail contracts. By accepting some risk on the spot market, it is possible in some instances to create a better outcome for the Council's bottom line than by asking retailers to hold all the risk of short term market price fluctuations.

If the Councils were to not invest any capital and provide the site rent-free to a private developer with a PPA commitment for Council consumption for example, the developer will include a risk premium on the PPA rate to offset the risk taken with the cost of permits, grid connection, construction etc.

If seeking an external developer to provide the capital and take the development risk, the Council could reduce the risk to the developer and therefore improve the final cost of energy by:

- Providing the land rent-free with any required re-zoning completed
- Assist with planning permit processing, waive planning permit application fees if possible
- Provide clarity on the long-term power purchase and rate by running a 'reverse auction' which developers and retail partners could bid into, giving both the developer and the Council certainty on the power purchase rates and volumes
- Provide some capital funding via a grant or a loan
- Assist to facilitate community engagement and potential community fundraising for a community owed portion of the site

Mornington Peninsula Shire has recently issued a tender for lease of a former landfill site for use as a 5MW solar farm. The Council provided a drafted lease, plus completed environmental assessments and detailed design reports free of charge to solar farm developers, significantly de-risking the site. The Council tender for leasing the land does not commit the Council to purchasing the generated solar power but offers to discuss this with the company who is successful awarded the lease.

Community ownership and fund raising may provide some of the project capital and enhance local community participation.

2.3.1 Large Generation Certificates

In the scenario where the Council invests in and is the co-owner of the solar farm, the Council would earn income from the sale of Large Generation Certificates (LGCs) also. Self-surrendering of LGCs can also offset LGC liability on the Council retail bills, as an alternative financial saving mechanism. The Council would coordinate with its retailer to relieve the LGC charges from the Council energy bills in lieu of providing LGCs through its own generation.

If the Councils have formal emissions reduction targets, Council could retire the LGCs without selling them, to contribute to further emissions reductions in the market. LGC income is a minor part of overall project returns as LGC prices are forecast to reduce significantly and are assumed to be zero after 2024.

If Council wished to voluntarily retire LGCs corresponding to the total of Council's electricity purchases to support carbon neutrality, the impact on the financial models is discussed in section 3.6 – 3.8.

2.3.2 Virtual Net Metering arrangement

Network companies in Australia are not regulated to discount the network charge rates when a generator and consumer are on the same distribution area. Distributed generators argue that their proximity to local consumers should receive a significant discount or waiver on standard network charges. However while this is the subject of significant lobbying and proposals to change National Energy Market rules, no rule change has been approved therefore the only examples of discounted network charges (consistent with full virtual net metering) are a few isolated cases.

Where a Council becomes both a generator and a consumer, the application of a generation 'credit' to a bill can offset the consumption 'debit' therefore the energy charge component can be 'netted off'. This could be considered a type of 'virtual net metering' for the energy charges. Network charges continue to be applied as usual. We do not anticipate it is likely that a local exemption for network charges could be negotiated with Ausnet for these projects, and all business models are assumed to apply standard network charges.

2.4 Community Participation

Consultation with the Energy Innovation Cooperative was undertaken during the preparation of this study.

Discussion focused on methods of community engagement with and contribution to the project. These include:

1. Direct investment by community members
2. Community members purchasing power from the project via a retailer
3. Payment from the project to a local community benefit fund
4. Use of a community run retailer to purchase the generated solar power and sell power to Council sites
5. Local jobs and training, upskilling

The potential for the Leongatha residents and community to strongly support or object to the project was discussed, with measures such as the above being expected to increase engagement and support.

The benefits of a strong community support were emphasized, including the likelihood of stronger support from Councillors for the project if local community support is strongly demonstrated.

In relation to the Leongatha project, a 1.3MW single axis tracker project costing $2-2.5M to build, the following concept was discussed:

- Community investment totaling up to $500,000 could be sought via a community investment platform. To attract investors, a 'better than bank interest' deal should be offered, such as 5% interest paid annually with capital and interest repayments over 10 years.
- The remainder of capital funding would be required from Council or private developer

2.5 Single Axis array design

Single axis tracker arrays utilise an east-west rotation to optimise energy production. They are able to generate approximately 25% more annual yield than fixed tilt when compared on an equal panel area or equal kWp rating basis.

Figure 2-4: Single axis tracking arrays [source: Nextracker]

These images from international projects[1] illustrate typical configurations of north-south axis systems. Where site area is sufficient, ground conditions are suitable and terrain slopes are less than 6-10° these are systems generally preferred for large scale solar projects.

2.6 Solar array Design for former Landfills

Two of the sites to be considered are former landfill sites: Trafalgar Landfill and Grantville Landfill. From aerial photo records, Trafalgar landfill was capped around 4 years ago, so would be approximately 5 years into its settlement process when solar is installed. At the 5 year stage, remaining settlement should be minor.

Grantville landfill has been very recently capped so is liable to settlement which can be problematic for rigid framing systems. Both Grantville and Trafalgar have a cap of soil which would not allow any penetrations greater than ~500mm. Both

[1] https://interestingengineering.com/tracking-the-sun-trackers-for-solar-power-systems and solarprofessiona.com

sites also have significant undulations in terrain with dome shaped elevation profiles. On this basis it is considered that single axis tracking systems will be less suitable for these sites unless shorter arrays with ballasted foundations could be designed and economically deployed.

To review suitable designs for former landfills, consultations with Joule Energy have been undertaken by Enhar including review of their 2016 landfill solar array design option research project. This was funded by ARENA and resulted in publicly available documentation regarding the suitability of various array designs for former landfill sites[2].

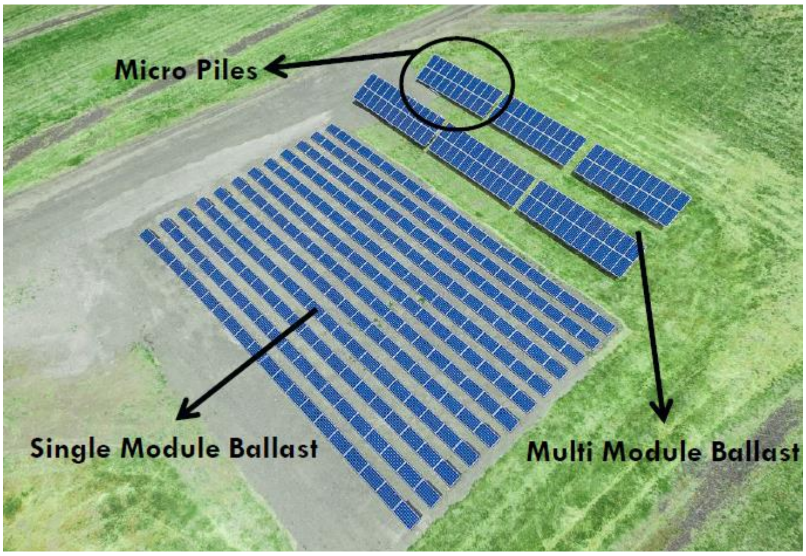


Figure 2-5: Solar array design on Wollert former landfill [source: Joule, 2017]

The comparison of the various mountings indicated pros and cons of all systems. Where minimal subsidence is expected and the surface has a sufficient load bearing capacity, a multi module ballasted system has advantages of no penetration of cap and optimum tilt angle:

[2] https://arena.gov.au/projects/pilot-landfill-solar-project/

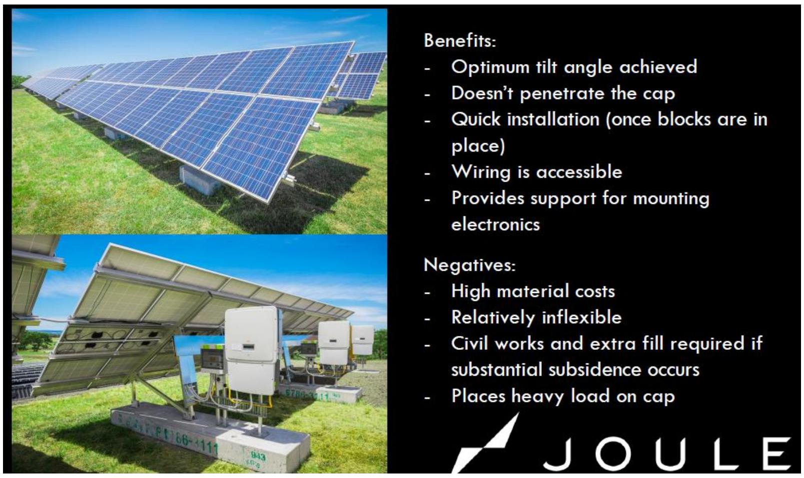


Figure 2-6: Multi module ballast system design non-penetrating [source: Joule, 2017]

Alternative system designs include the 'Maverick' system developed by 5B Energy[3] which is an east-west fixed tilt system with smaller ballast and fast deployment speed:

Figure 2-7: East west system [source: 5B Solutions]

Aerocompact's ground mount design also offers a ballasted system potentially suitable for deployment on former landfills:

[3] 5b.com.au/

Figure 2-8: East west Aerocompact system [source: Aerocompact]

Further comments on the Trafalgar and Grantville landfill design options are provided in the separate site assessments in Appendix B below.

3. Business Model: Leongatha

This section provides additional detail on design, business case and financial modelling for the Leongatha site.

3.1 Site Design

A design for the site has been prepared and is presented in Figure 3-1 below:

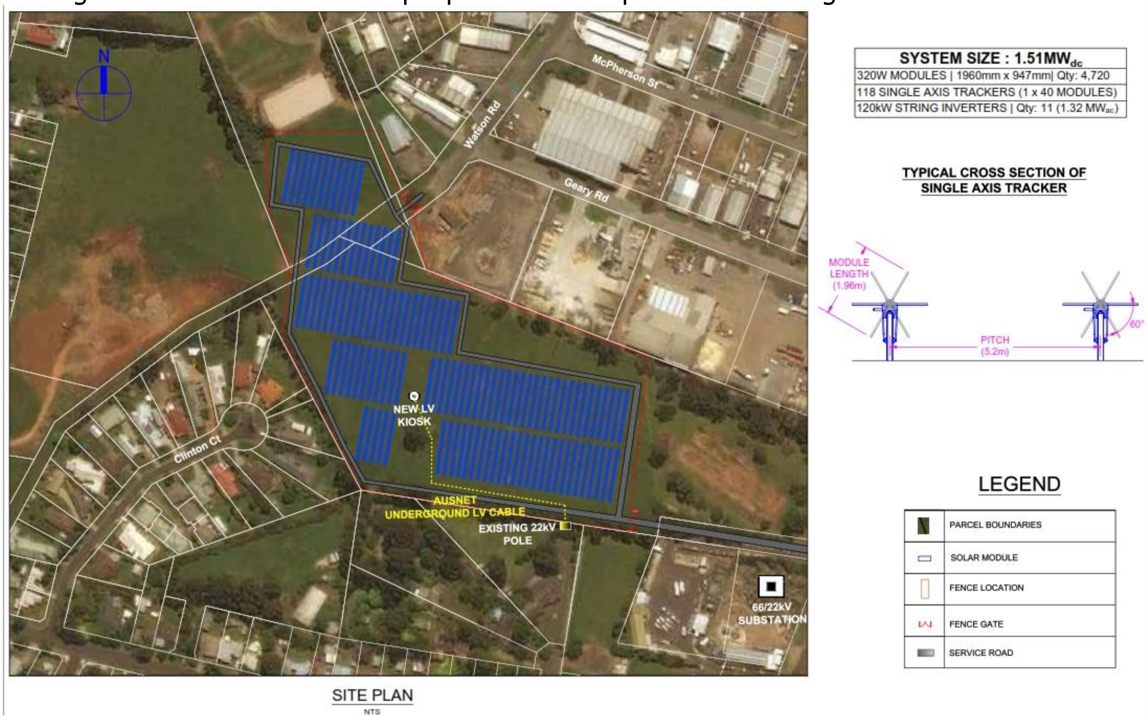


Figure 3-1: Leongatha solar farm concept layout

3.1.1 Solar Technology options

Single axis trackers deliver economic benefits including lower overall cost of energy and a flatter energy generation profile with more morning and afternoon generation. The proposed design at Leongatha adopts a typical single axis tracker design with 40 panels per tracker. Longer arrays of 80 panels per tracker are also possible and more economic where sufficient space exists e.g. the eastern section of the site. The detailed layout schematic is provided in Appendix A below.

3.1.2 Energy Yield Simulation

Design	Leongatha Single Axis Tracker v6
Module DC Nameplate	1.66 MW
Inverter AC Nameplate	1.44 MW Load Ratio: 1.15
Annual Production	2.795 GWh
Performance Ratio	84.0%
kWh/kWp	1,687.6
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)

Energy yield simulations have been conducted using Helioscope software. The local solar resource, shading impacts from nearby trees and east-west tracking were simulated at hourly intervals for 12 months, as summarised here in Table 3-1.

Table 3-1: Energy yield summary for Leongatha site

A summary energy yield and shading report is provided in Appendix A.

3.2 Planning and zoning

Preliminary consultation was undertaken by Enhar with Laurie Brentnall, Supervisor Planning Liaison and Administration at South Gippsland Shire. This section summarises the outcome of these discussions.

As the capital cost of the development is over $1M it will require a planning permit.

In terms of issues for the planning permit to address, there are no Statewide guidelines on assessment of solar farm planning applications so it will be guided by the local Council.

The site is north facing sloping away from the dwellings on the south and western sides. As shown in Figure 3-1, there is some vegetation screening those properties but this may need to be increased depending on the panel elevations and reflectivity. The area to the north and east is an industrial area which is less sensitive to any visual amenity impacts. Some immediate concerns/questions which the application will need to address are:

1. Any loss of access to bike track via reserve from the bowl of Clinton Court
2. Possible amenity concerns –
    a. construction and operation noise impacts on residences
    b. panel reflectivity, glint and glare impact on residences
    c. visibility of panels and array from existing houses along Clinton Court and Bent Street
3. Security measures; fencing for separation from BMX track and adjoining properties
4. Night lighting for security and possible impact on neighbouring properties
5. Any loss of public park space and access.
6. Maintenance access requirements:
    a. Operational vehicle access to be carried out in daylight hours rather than 24/7.
    b. Vehicle access via a permanent gravel path.

The planning application will need to be advertised.

Discussions with South Gippsland Shire Council Planning team indicate the existing road easement passing through the site could be rezoned to enable a permit to be approved. This road easement is unlikely to be utilised in the context of current or planned land usage.

In relation to public access, walking surveys around the site indicate that the area under consideration for solar farm is not accessible to the public and no significant evidence was found that the public do access this area. It is therefore considered likely that if security fences were installed around this area, local residents will not experience any significant loss of access.

Figure 3-2: Panoramic view across site from end of Watson Road, looking south-west

3.3 Procurement and Governance framework

The procurement and Governance framework for the contestable sections of the project would include:

- A tender to engage suitable expertise to secure planning permit approvals and grid connection approvals
- A tender to engage a suitable retailer to supply power to all 3 Councils and purchase the generated power from the solar farm, on say 3-5 year terms
    - The appointed retailer would hold a generation license which the project would utilise
- A tender to engage a suitable construction partner to supply, install and commission all equipment at the site
- Engagement with Ausnet to supply, install and commission the required grid connection infrastructure
- For ongoing maintenance and operation, either incorporate O&M with the construction tender, or a separate O&M contract for 3-5 year terms

3.4 Capital Cost

The following estimate is for a single axis tracker array comprising

- 115 trackers
- Each tracker using 40 x 360W panels (72 cell panels)
    - Longer trackers of 80 panels can be used where space allows
- Total 4600 panels (1.66MWp) and
- 24 x 60kW inverters (1.44MWac)

Table 3-2: Capital Cost estimate for 1.66MWp solar farm at Leongatha

	Subtotals
Solar Arrays	
Panels	$737,000
Single axis trackers	$369,000
Inverters	$295,000
Cables	$246,000
Frames and piles	$123,000

Civil works	$246,000
Security fencing, lighting	$74,000
Construction labour, plant	$369,000
Subtotal	$2,457,000
Ausnet Grid connection works	
New 2MVA LV kiosk inc installation	$190,000
Buried cable from existing 22kV pole	
Contingency	$50,000
Sub total	$240,000
Battery system (possible option at later stage)	
Sub total	Not included
Development & Professional service Costs	
Land purchase	$0
Land levelling	$0
Development application Council fee	$3,331
Environmental assessments	$10,000
Town planning service	$5,000
Flora and Fauna and Native Veg assessment	$10,000
Grid connection Ausnet fees	$20,000
Engineering design	$20,000
Accountant Fees	$10,000
Legal Fees	$10,000
Bank charges/Due diligence	
Bank Guarantee	
Sub Total	$88,331
Total Project Cost	**$2,785,331**
Total project $/MWac including grid	$1,934,257

3.5 Operational Costs

Table 3-3: Estimated operational costs for 1.66MWp solar farm at Leongatha

Solar PV operating costs	Years 1-5	Years 6-25
Service & Maintenance	$33,537	$41,921
Warranty		
Insurance		
Land management, weed control		
Monitoring & reporting		
Administrative cost		
HV + Comms metering		
Contingency (inc security costs)	$20,000	$20,000
Total Operating Costs	**$53,537**	**$61,921**

Retailer charges for the wholesale price pass through model are estimated at 10% of traded value of purchases and sales, coming to approximately $31,000/year.

3.6 Model 1: Business Model for group of 3 Councils

3.6.1 Model 1A: Pool Price Pass Through Model

As noted above, a leading business model for an organisation establishing a solar farm to manage electricity costs at a portfolio of other sites is the approach which has been successfully adopted by Sunshine Coast Council.

This uses a switch to both purchasing all Council building consumption and selling all Council solar farm generation on the wholesale spot price market, using one electricity retailer. The Council accepts the risk of electricity spot price fluctuations rather than the retailer handling that risk. It delivers upside when the spot price of power is high, normally driven by cooling loads in daytime when sunshine is peaking, coinciding with when the solar farm is generating high power output.

By accepting risk of spot price fluctuations, it is possible to create a better long term outcome for the Council's bottom line than when the retailer holds all the risk of short term market price fluctuations.

Enhar has modelled this scenario for this project using the following approach:

- Wholesale spot price historical price analysis (hourly) for 12 months
- Comparison to 12 months of Council consumption (all 3 Councils) on hourly basis excluding public lighting
- Simulation of solar farm hourly yield and revenue earned from sale of surplus power
- Solar generation impacts the energy-use charges only, all other charges (environmental, network, market and metering) are unaffected
- Comparison of solar/wholesale scenario vs business as usual to determine payback period of investment. Use of 2.5% discount rate for net present value calculations
- Fees paid to the retailer of ~10% of traded value (approx. $30-$40,000/year)

A comparison of the 25 year net present value indicates an overall saving to ratepayers of approximately $2.6M over the project lifetime compared to business as usual (BAU):

Table 3-4: Comparison of 25 year net present value for 3 Councils BAU vs 1.66MWp solar farm

Cost Type	***BAU NPV $millions***	***Solar Project NPV $millions***	***Difference $millions***
Energy Use charges	-$7.25	-$2.88	$4.37
Other energy bill charges	-$11.33	-$11.33	$0.00
Total electricity cost	**-$18.58**	**-$14.21**	**$4.37**
Total project Capex 1.66MWp		-$2.67	-$2.67
Operating costs inc. retailer		-$2.35	-$2.35
LGC income		$0.32	$0.32
Electricity export income		$2.49	$2.49
Solar farm terminal value		$0.50	$0.50
TOTAL COSTS	**-$18.58**	**-$15.93**	**$2.65**

Our analysis indicates that a project in this configuration would achieve a payback period of approximately 7.9 years.

Capex could be split for example 1/3 each per Council hence $0.89M each.

The cost of retail service for the model is assumed at 10% of traded value per MWh bought and sold. This comes to approximately $10/MWh fee to the retailer.

The modelling to develop this business case involved simulating hourly generation illustrated below:

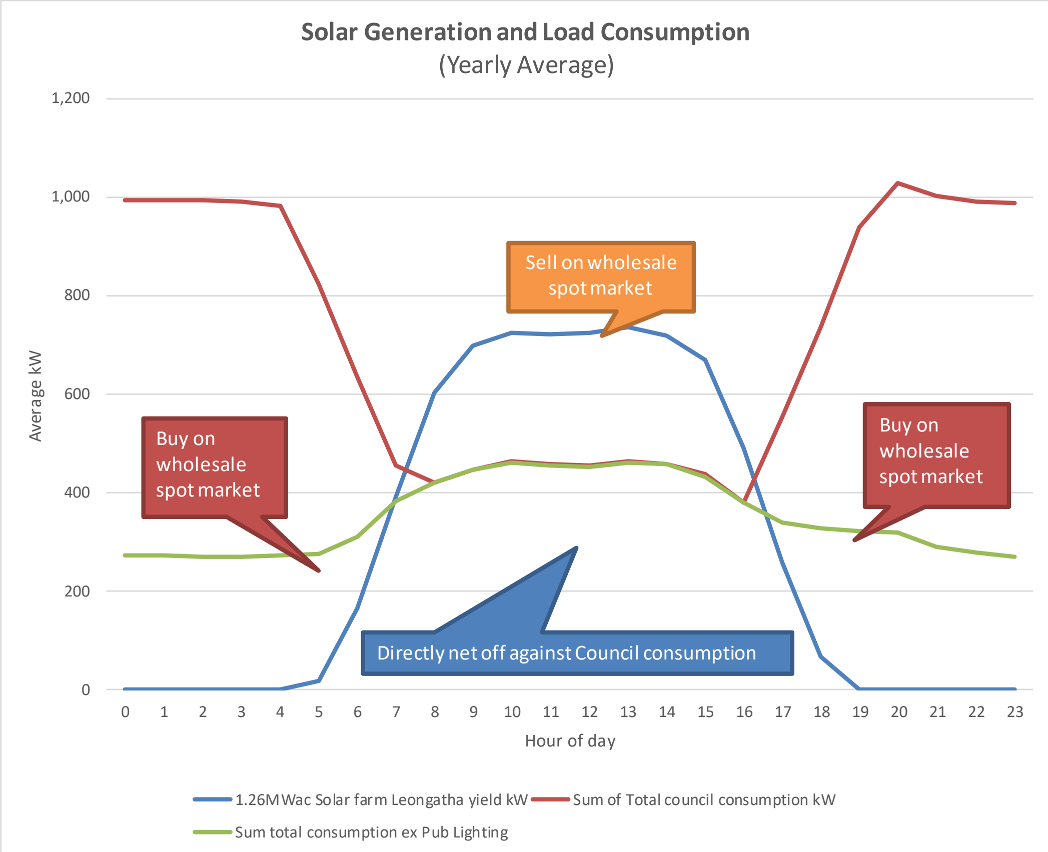


Figure 3-3: Annual average daily profile of solar generation vs 3 Council consumption

Analysis of historic hourly wholesale spot price records from AEMO and simulation of 12 months of generation revealed the frequency of high-income periods during summer afternoons:

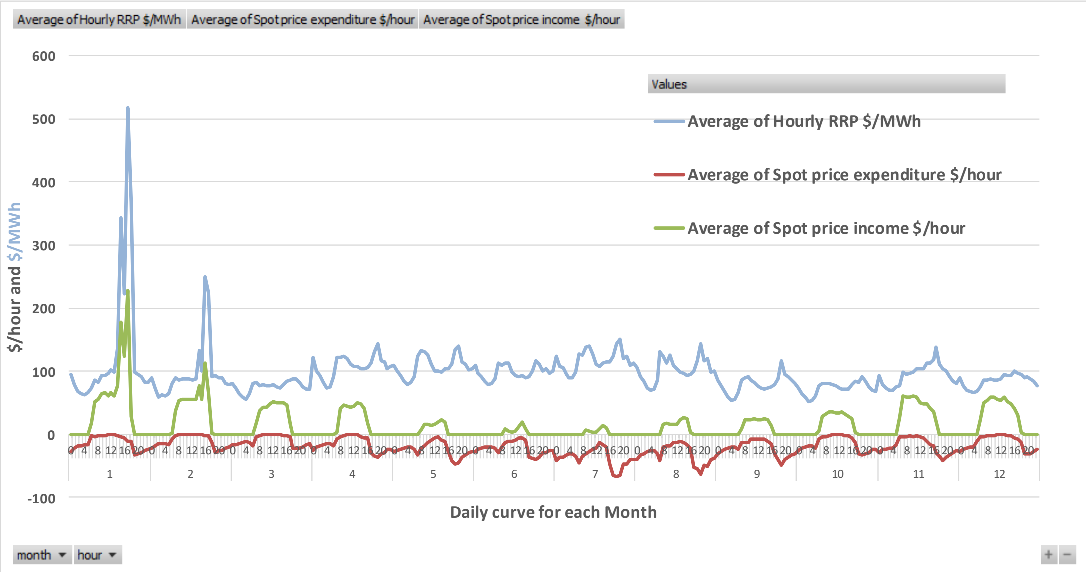


Figure 3-4: Hourly simulation of energy use charges and income with 1.5MWp solar project

Additional modelling of multiple years of interval data and electricity spot price data could be undertaken to develop further sensitivity analysis.

It should be noted that monthly and annual cashflows will vary considerably and the Council would have to accept some degree of uncertain short term cashflow due to short term fluctuations in wholesale spot price markets.

3.6.2 Model 1B: Sell all generation at fixed PPA rate

South Gippsland Shire also wished to understand what the payback outcomes would look like if the project were to sell power to other councils at a fixed power purchase agreement (PPA) rate.

The framework and rates for this scenario correspond what is being proposed by the Greenhouse Alliances, who are looking at group purchasing from renewable generation companies or retailers in the range of $65 - $95/MWh.

The Capex and Opex are identical to scenario 1A, the difference is that the Council energy bill costs is unchanged, electricity supply contracts are unchanged, and all solar farm generation delivers a separate income via the PPA.

Table 3-5: Scenario 1B: Payback periods for Scenario 1B at various PPA rates

Variable		
PPA rate $/MWh earned by project	65.00	95.00
Payback period (yrs)	17.3	10.1

The overall financial summary of the $95/MWh scenario is provided in Table 3-6 below:

Table 3-6: Scenario 1B Council owned 1.66MWp solar farm $95/MWh PPA scenario

Cost Type	BAU NPV $millions	Solar Project NPV $millions	Difference $millions
Energy Use charges	-$7.25	-$7.25	$0.00
Other energy bill charges	-$11.33	-$11.33	$0.00
Total electricity cost	**-$18.58**	**-$18.58**	**$0.00**
Total project Capex		-$2.67	-$2.67
Operating costs inc. retailer		-$2.35	-$2.35
LGC income		$0.32	$0.32
Electricity export income		$5.44	$5.44
Solar farm terminal value		$0.50	$0.50
TOTAL COSTS	**-$18.58**	**-$17.35**	**$1.23**

3.7 Model 2: South Gippsland Shire Council focus

If South Gippsland Shire Council proceeded to build/own/operate for the project without Bass Coast Council or Baw Baw Shire Council participating, the following outcomes could be anticipated:

Table 3-7: South Gippsland Shire 25 year comparison of BAU vs 1.66MWp solar farm

Cost Type	BAU NPV $millions	Solar Project NPV $millions	Difference $millions
Energy Use charges	-$1.86	-$0.74	$1.13
Other energy bill charges	-$2.92	-$2.92	
Total electricity cost	**-$4.78**	**-$3.65**	$1.13
Total project Capex		-$2.67	**-$2.67**
Operating costs inc. retailer		-$2.35	-$2.35
LGC income		$0.32	$0.32
Electricity export income		$4.16	$4.16
Solar farm terminal value		$0.50	$0.50
TOTAL COSTS	**-$4.78**	**-$3.69**	**$1.09**

Our analysis indicates that overall project payback period for South Gippsland Shire would be approximately 13 years.

3.8 Model 3: Community joint investment with Council

In this scenario, community members could invest in the project through loaning money to the Council towards the capital cost of the project. Following the assumptions discussed with Energy Innovation Cooperative (see section 2.4 above), the community loan would be repaid by the Council at an interest rate higher than bank interest e.g. 5% per annum.

Table 3-8: Comparison of 25 year net present value for 3 Councils & Community BAU vs 1.66MWp solar farm

Cost Type	*BAU NPV $millions*	*Solar Project NPV $millions*	*Difference $millions*
Energy Use charges	-$7.25	-$2.88	$4.37
Other energy bill charges	-$11.33	-$11.33	$0.00
Total electricity cost	**-$18.58**	**-$14.21**	$4.37
Total project Capex 1.66MWp		-$2.16	**-$2.16**
Community $0.5M loan 10 year repayment with 5% interest		-$0.56	-$0.56
Operating costs inc. retailer		-$2.35	-$2.35
LGC income		$0.32	$0.32
Electricity export income		$2.49	$2.49
Solar farm terminal value		$0.50	$0.50
TOTAL COSTS	**-$18.58**	**-$15.99**	**$2.59**

3.9 Model 4: Council leases site and offers PPA

In the scenario where a private developer builds the project, the Council would provide the land rent-free and purchase the generated power through a retailer.

The Council would negotiate the tariff rate with the developer with the developer requiring a sufficient tariff to justify the capital expenditure and project risk. The PPA rate needs to be attractive to both the Council(s) and the developer.

For example, the Council could seek the PPA tariff to be 10% below their business as usual rates for their energy tariffs analysed in section 2.1 above. This estimated the weighted average tariff for the 3 Councils small and large market sites is $117/MWh in 2018.

Using 2018 tariffs and a forward forecast from the Jacobs 2017[4] to obtain business as usual energy tariffs, we derive possible PPA rates which would be negotiated. The 2017 Jacobs forecast anticipates electricity prices will be higher in 2019 than 2018 which is the scenario adopted in this analysis. We then analyse the financial model from a private developer's perspective to determine how attractive each PPA rate might be to the private developer.

A summary analysis is shown below:

[4] https://www.aemo.com.au/-/media/Files/Electricity/NEM/Planning_and_Forecasting/EFI/Jacobs-Retail-electricity-price-history-and-projections_Final-Public-Report-June-2017.pdf

Table 3-9: Council PPA rate sensitivity analysis

Sensitivity analysis			
% saving required vs BAU energy charge	0%	10%	20%
PPA rate 2019 $/MWh	$134.11	$120.70	$107.28
Annual saving vs BAU (3 Councils)	0	$37,200	$74,000
Developer payback (yrs)	7.9	9.2	12.3
Developer IRR	11.8%	9.5%	7.1%

Table 3-10: PPA contract scenario for 10% saving vs BAU

Year Actual rates in 2018 and forecast 2019 onwards.	Energy charge tariffs, weighted av for 3 Councils, $/MWh	Discount sought via solar PPA	Estimated PPA for solar generation $/MWh
2018 (actual rates)	$117.34	10%	$105.61
2019	$134.11	10%	$120.70
2020	$134.11	10%	$120.70
2021	$128.52	10%	$115.67
2022	$128.52	10%	$115.67
2023	$134.11	10%	$120.70
2024	$139.69	10%	$125.72
2025	$128.52	10%	$115.67
2026	$117.34	10%	$105.61
2027	$111.76	10%	$100.58
2028	$111.76	10%	$100.58
2029	$122.93	10%	$110.64
2030	$125.72	10%	$113.15
2031	$125.72	10%	$113.15
2032	$128.52	10%	$115.67
2033	$128.52	10%	$115.67
2034	$122.93	10%	$110.64
2035	$117.34	10%	$105.61
2036	$111.76	10%	$100.58
2037	$113.43	10%	$102.09
2038	$115.13	10%	$103.62
2039	$116.86	10%	$105.17
2040	$118.61	10%	$106.75
2041	$120.39	10%	$108.35
2042	$122.20	10%	$109.98
2043	$124.03	10%	$111.63

Note the required PPA rates derived in the analysis above are significantly higher than PPA rates currently being discussed by projects such as the EAGA procurement initiative which involve PPA arrangements with larger wind and solar projects outside the municipality.

3.10 Surrender of LGCs

As noted in section 2.3.1 above, the Council solar farm would generate Large Generation Certificates, at a rate of 1 LGC per MWh of solar generation. South Gippsland Shire wished to determine the impact of voluntary surrender of LGCs on the business models. In particular, surrendering a quantity of LGCs which corresponds to the total annual council electricity consumption.

Voluntary surrender of LGCs traditionally contributes to 'additionality' of renewable energy capacity since it ensures other renewable generators will have to be established to make the corresponding contribution to the Renewable Energy Target. Enhar notes that in the current market and policy conditions, LGC income is a minor portion of the income for new renewable projects and is unlikely to have a significant impact on the business case for any new renewable generator.

Nonetheless for carbon accounting purposes the voluntary surrender of LGCs can provide advantages and we have modelled the following scenarios:

Table 3-11: Impact of voluntary surrender of LGCs on financial outcomes

LGC surrender analysis	Model 1A		Model 1B	
	Sell all LGCs	Voluntary surrender	Sell all LGCs	Voluntary surrender
South Gipps Council total consumption, MWh/yr	1,631	1,631	1,631	1,631
Solar farm generation, MWh/yr	2,795	2,795	2,795	2,795
LGCs to voluntarily surrender	-	1,631	-	1,631
LGCs to sell	2,795	1,164	2,795	1,164
Payback period	7.9	8.5	10.1	11.5
NPV of net savings over 25 years $M	$2.65	$2.52	$1.25	$1.11

As can be seen above, voluntary surrender of sufficient LGCs to match total Council consumption has minor impact on the financial outcomes of the project.

The impact on models 2, 3 and 4 is of the same magnitude i.e. the 25 year NPV of net savings under all models is ~$0.14M less due to the reduced LGC income.

3.11 Conclusions

The Leongatha site is suitable for a solar farm development of approximately 1.66MWp capacity using single axis trackers.

The impacts of such a development on existing land use appear to be acceptable from an environmental and economic perspective. Social acceptability will be dependent on strong community engagement including the nearby residents with views over the site.

A Council build-own-operate model coupled with a move to wholesale spot price purchase and sale of power could deliver a substantial return on investment for Council, totalling approximately $2.6M in savings over the 25 year project lifetime. Alternatively selling the generated power under a fixed price PPA of $95/MWh could generate lifetime savings of around $1.25M.

A private company may develop and build the site if Council provides the site rent-free, support through permits and community engagement plus a power purchase agreement which is in excess of $100/MWh.

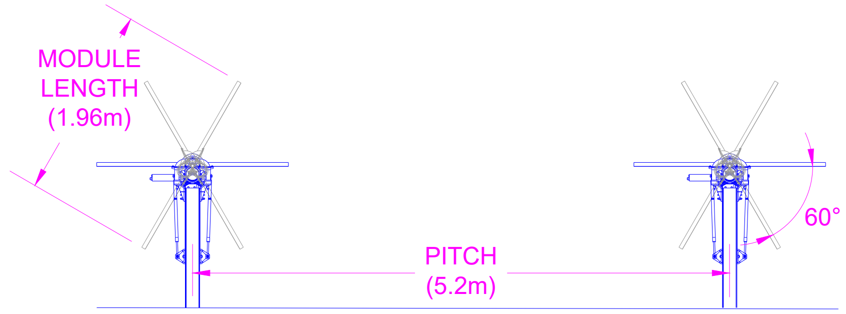
Appendix A: Layouts and energy summaries

SITE PLAN

NTS

SYSTEM SIZE : 1.66MW$_{dc}$
360W MODULES | 1960mm x 947mm| Qty: 4,600
115 SINGLE AXIS TRACKERS (1 x 40 MODULES)
60kW STRING INVERTERS | Qty: 24 (1.44 MW $_{ac}$)

TYPICAL CROSS SECTION OF SINGLE AXIS TRACKER



LEGEND

	PARCEL BOUNDARIES
	SOLAR MODULE
	FENCE LOCATION
	FENCE GATE
	SERVICE ROAD

Enhar Pty. Ltd.
Suite G03 60 Leicester St
Carlton Vic 3053
www.enhar.com.au

South Gippsland Shire Council
9 Smith Street, Leongatha, VIC 3953
www.southgippsland.vic.gov.au
council@southgippsland.vic.gov.au

NOTES:

1. Details and measurements are indicative and not based on visual inspection. All details shall be confirmed prior to commencing any work

2. Tracker cross sections from Nextracker drawing

REV	REVISION DESCRIPTION	DRWN BY	CHKD BY	DATE
B	PRELIMINARY LAYOUT	FH	DN	02/11/2018
A	PRELIMINARY LAYOUT	FH	DN	04/07/2018

PROJECT TITLE: 1.51MW Solar Farm Project (-38.47223,145.9567)

PROJECT LOCATION: 3 Yeaman Ct, Leongatha, VIC 3953 , Australia

DRAWING TITLE: SITE LAYOUT DRAWING

PROJECT CODE: P1828

DWG NUMBER: P1828-TR-SL-01

STATUS: PRELIMINARY

SCALE: NTS

REVISION: A

SHEET SIZE: A3

Leongatha Single Axis Tracker v6 South Gippsland Shire, 3 Yeaman Ct, Leongatha VIC 3953, Australia

Report

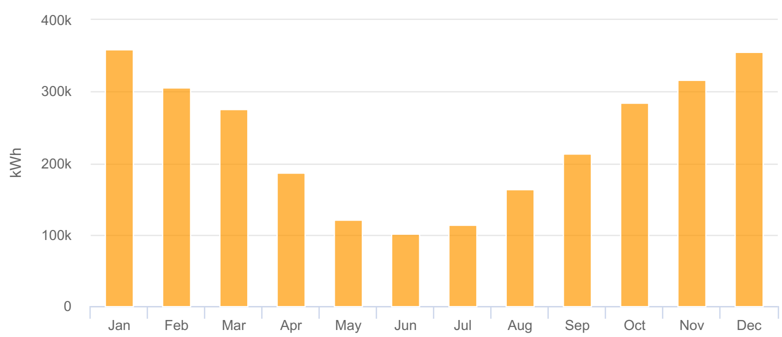
Project Name	South Gippsland Shire
Project Address	3 Yeaman Ct, Leongatha VIC 3953, Australia
Prepared By	Rana Mitra rana@enhar.com.au

System Metrics

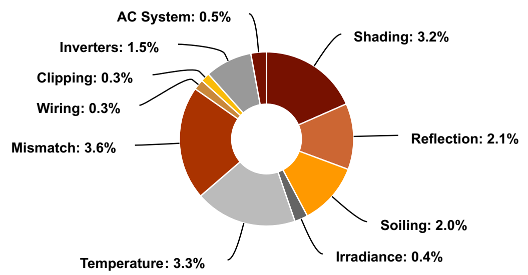
Design	Leongatha Single Axis Tracker v6
Module DC Nameplate	1.66 MW
Inverter AC Nameplate	1.44 MW Load Ratio: 1.15
Annual Production	2.795 GWh
Performance Ratio	84.0%
kWh/kWp	1,687.6
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	883bdd9168-2561898dd0-2b8c6f3164-96e2f62ef9

Project Location

Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	1,556.6	
	POA Irradiance	2,009.2	29.1%
	Shaded Irradiance	1,945.4	-3.2%
	Irradiance after Reflection	1,904.1	-2.1%
	Irradiance after Soiling	1,866.0	-2.0%
	Total Collector Irradiance	**1,866.0**	**0.0%**
Energy (kWh)	Nameplate	3,092,032.9	
	Output at Irradiance Levels	3,078,894.2	-0.4%
	Output at Cell Temperature Derate	2,978,203.7	-3.3%
	Output After Mismatch	2,869,624.4	-3.6%
	Optimal DC Output	2,860,003.4	-0.3%
	Constrained DC Output	2,851,669.1	-0.3%
	Inverter Output	2,808,770.0	-1.5%
	Energy to Grid	**2,794,730.0**	**-0.5%**
Temperature Metrics			
	Avg. Operating Ambient Temp		16.1 °C
	Avg. Operating Cell Temp		25.6 °C
Simulation Metrics			
	Operating Hours		4579
	Solved Hours		4579

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model
Irradiation Variance	5%
Cell Temperature Spread	4° C
Module Binning Range	-2.5% to 2.5%
AC System Derate	0.50%

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.075	3°C
Flush Mount	-2.81	-0.0455	0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	2	2	2	2	2	2	2

Module Characterizations

Module	Characterization
TSM-DEG14(II) 360W (Trina Solar)	Spec Sheet Characterization, PAN

Component Characterizations

Device	Characterization
TRIO-60.0-TL-OUTD-480 (ABB)	Spec Sheet

Components

Component	Name	Count
Inverters	TRIO-60.0-TL-OUTD-480 (ABB)	24 (1.44 MW)
Strings	10 AWG (Copper)	288 (19,387.2 m)
Module	Trina Solar, TSM-DEG14(II) 360W (360W)	4,600 (1.66 MW)

Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	15-16	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Single-axis Trackers (N/S)	Portrait (Vertical)	0°	9°	3.2 m	1x40	115	4,600	1.66 MW

Detailed Layout

Grantville Landfill v1 Bass Coast Shire, 1685 Bass Highway Grantville Victoria 3984

Report

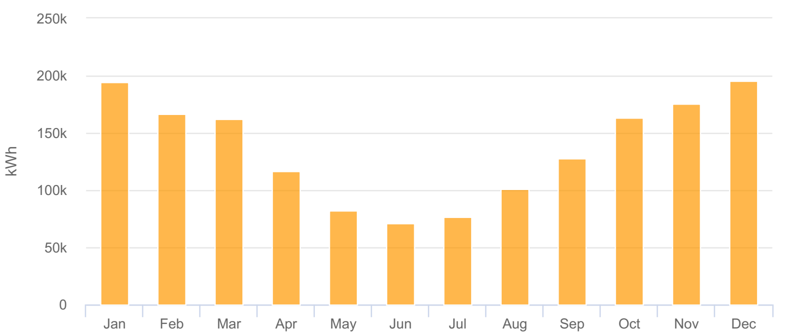
Project Name	Bass Coast Shire
Project Address	1685 Bass Highway Grantville Victoria 3984
Prepared By	Rana Mitra rana@enhar.com.au

System Metrics

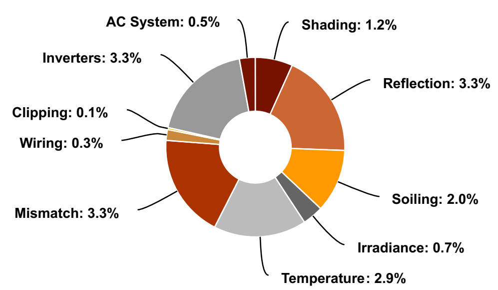
Design	Grantville Landfill v1
Module DC Nameplate	1.14 MW
Inverter AC Nameplate	1,000.0 kW Load Ratio: 1.14
Annual Production	1.635 GWh
Performance Ratio	83.8%
kWh/kWp	1,431.8
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	eb6a592e71-e365b1f550-bf7b0dc412-b5e908c126

Project Location

Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m^2)	Annual Global Horizontal Irradiance	1,552.4	
	POA Irradiance	1,708.9	10.1%
	Shaded Irradiance	1,688.6	-1.2%
	Irradiance after Reflection	1,633.0	-3.3%
	Irradiance after Soiling	1,600.4	-2.0%
	Total Collector Irradiance	**1,600.4**	**0.0%**
Energy (kWh)	Nameplate	1,828,225.6	
	Output at Irradiance Levels	1,816,216.8	-0.7%
	Output at Cell Temperature Derate	1,762,925.0	-2.9%
	Output After Mismatch	1,705,218.8	-3.3%
	Optimal DC Output	1,699,431.4	-0.3%
	Constrained DC Output	1,698,332.9	-0.1%
	Inverter Output	1,642,970.0	-3.3%
	Energy to Grid	**1,634,760.0**	**-0.5%**
Temperature Metrics			
	Avg. Operating Ambient Temp		16.4 °C
	Avg. Operating Cell Temp		24.7 °C
Simulation Metrics			
	Operating Hours		4569
	Solved Hours		4569

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.075	3°C
Flush Mount	-2.81	-0.0455	0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	2	2	2	2	2	2	2

Irradiation Variance	5%
Cell Temperature Spread	4° C
Module Binning Range	-2.5% to 2.5%
AC System Derate	0.50%

Module Characterizations

Module	Characterization
TSM-PD14 320 (Trina Solar)	Spec Sheet Characterization, PAN

Component Characterizations

Device	Characterization
Fronius Agilo 100.0-3 Outdoor (Fronius)	Default Characterization

Components

Component	Name	Count
Inverters	Fronius Agilo 100.0-3 Outdoor (Fronius)	10 (1,000.0 kW)
Strings	10 AWG (Copper)	206 (13,754.8 m)
Module	Trina Solar, TSM-PD14 320 (320W)	3,568 (1.14 MW)

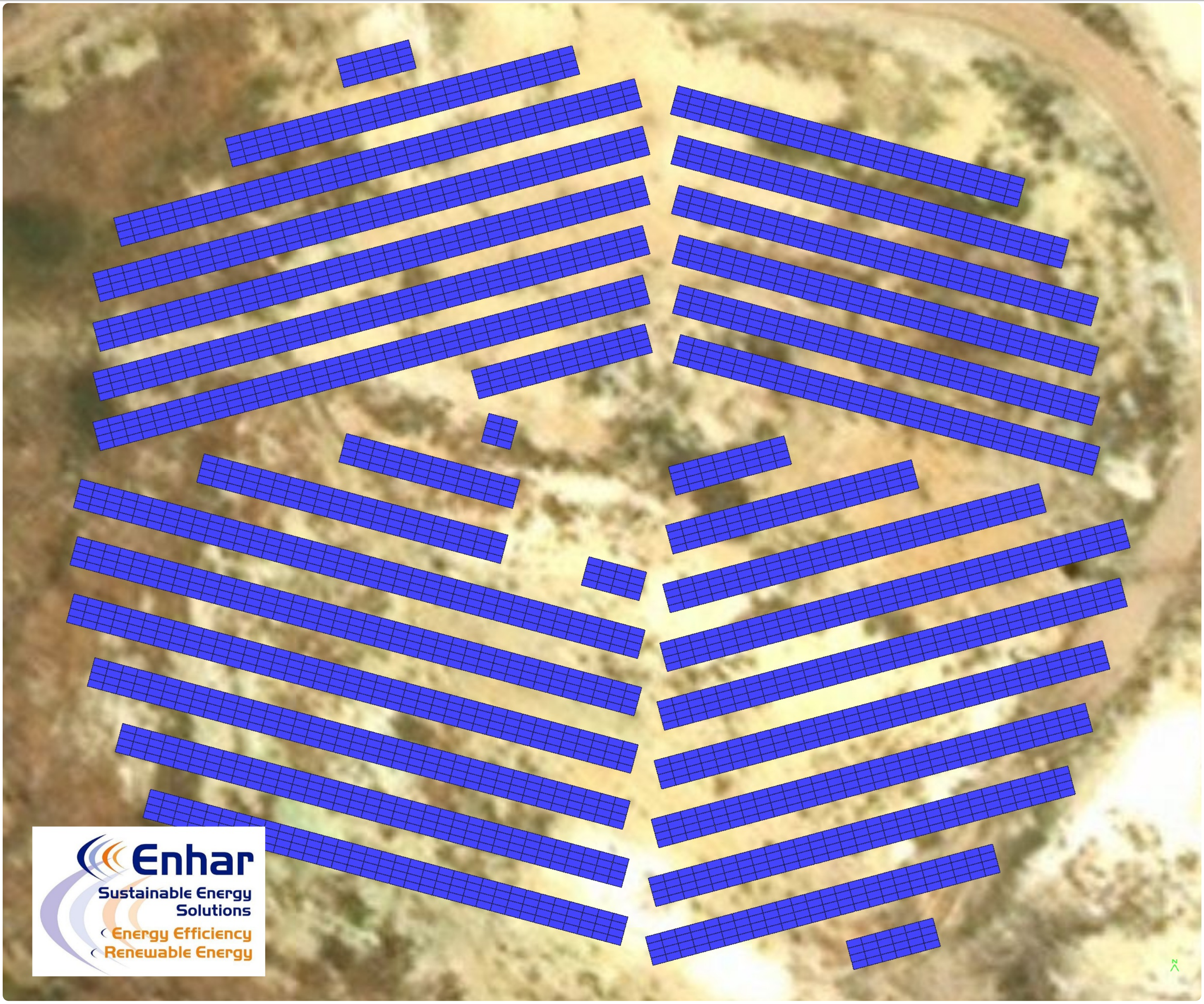
Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	13-20	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	15°	345°	2.4 m	4x1	229	916	293.1 kW
Field Segment 2	Fixed Tilt	Landscape (Horizontal)	15°	15°	2.4 m	4x1	167	668	213.8 kW
Field Segment 3	Fixed Tilt	Landscape (Horizontal)	15°	15°	3.5 m	4x1	261	1,044	334.1 kW
Field Segment 4	Fixed Tilt	Landscape (Horizontal)	15°	345°	3.5 m	4x1	235	940	300.8 kW

Detailed Layout



Fixed tilt v1 Baw Baw Shire, 163 Giles Road Trafalgar Victoria 3824

Report

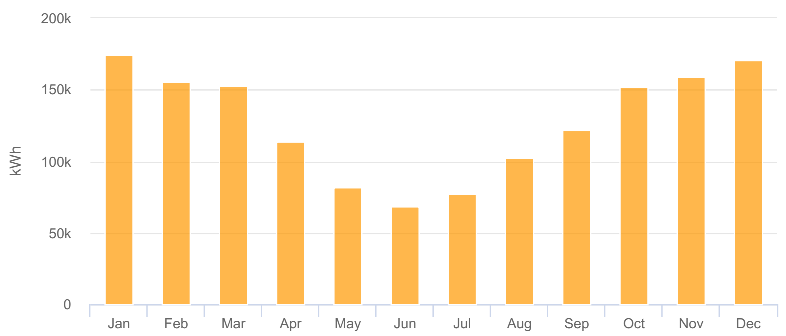
Project Name	Baw Baw Shire
Project Address	163 Giles Road Trafalgar Victoria 3824
Prepared By	Rana Mitra rana@enhar.com.au

System Metrics

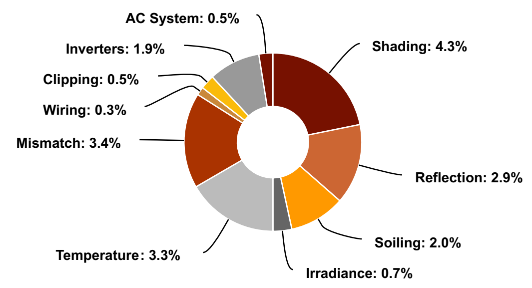
Design	Fixed tilt v1
Module DC Nameplate	1.09 MW
Inverter AC Nameplate	890.2 kW Load Ratio: 1.22
Annual Production	1.528 GWh
Performance Ratio	81.9%
kWh/kWp	1,404.7
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Simulator Version	313bacff38-3b229da260-4401033963-a72a4e2d9d

Project Location

Monthly Production



Sources of System Loss



Annual Production

	Description	Output	% Delta
Irradiance (kWh/m²)	Annual Global Horizontal Irradiance	1,522.9	
	POA Irradiance	1,715.3	12.6%
	Shaded Irradiance	1,641.5	-4.3%
	Irradiance after Reflection	1,594.2	-2.9%
	Irradiance after Soiling	1,562.3	-2.0%
	Total Collector Irradiance	**1,562.1**	**0.0%**
Energy (kWh)	Nameplate	1,700,503.5	
	Output at Irradiance Levels	1,689,017.4	-0.7%
	Output at Cell Temperature Derate	1,633,580.1	-3.3%
	Output After Mismatch	1,577,766.7	-3.4%
	Optimal DC Output	1,573,116.0	-0.3%
	Constrained DC Output	1,565,037.8	-0.5%
	Inverter Output	1,536,020.0	-1.9%
	Energy to Grid	**1,528,340.0**	**-0.5%**
Temperature Metrics			
	Avg. Operating Ambient Temp		16.2 °C
	Avg. Operating Cell Temp		24.6 °C
Simulation Metrics			
	Operating Hours		4567
	Solved Hours		4567

Condition Set

Description	Condition Set 1
Weather Dataset	TMY, 10km Grid, meteonorm (meteonorm)
Solar Angle Location	Meteo Lat/Lng
Transposition Model	Perez Model
Temperature Model	Sandia Model

Temperature Model Parameters

Rack Type	a	b	Temperature Delta
Fixed Tilt	-3.56	-0.075	3°C
Flush Mount	-2.81	-0.0455	0°C

Soiling (%)

J	F	M	A	M	J	J	A	S	O	N	D
2	2	2	2	2	2	2	2	2	2	2	2

Irradiation Variance	5%
Cell Temperature Spread	4° C
Module Binning Range	-2.5% to 2.5%
AC System Derate	0.50%

Module Characterizations

Module	Characterization
TSM-PD14 320 (Trina Solar)	Spec Sheet Characterization, PAN

Component Characterizations

Device	Characterization
Sunny Tripower 24000TL-US (SMA)	Modified CEC

Components

Component	Name	Count
Inverters	Sunny Tripower 24000TL-US (SMA)	37 (890.2 kW)
Strings	10 AWG (Copper)	185 (8,125.1 m)
Module	Trina Solar, TSM-PD14 320 (320W)	3,400 (1.09 MW)

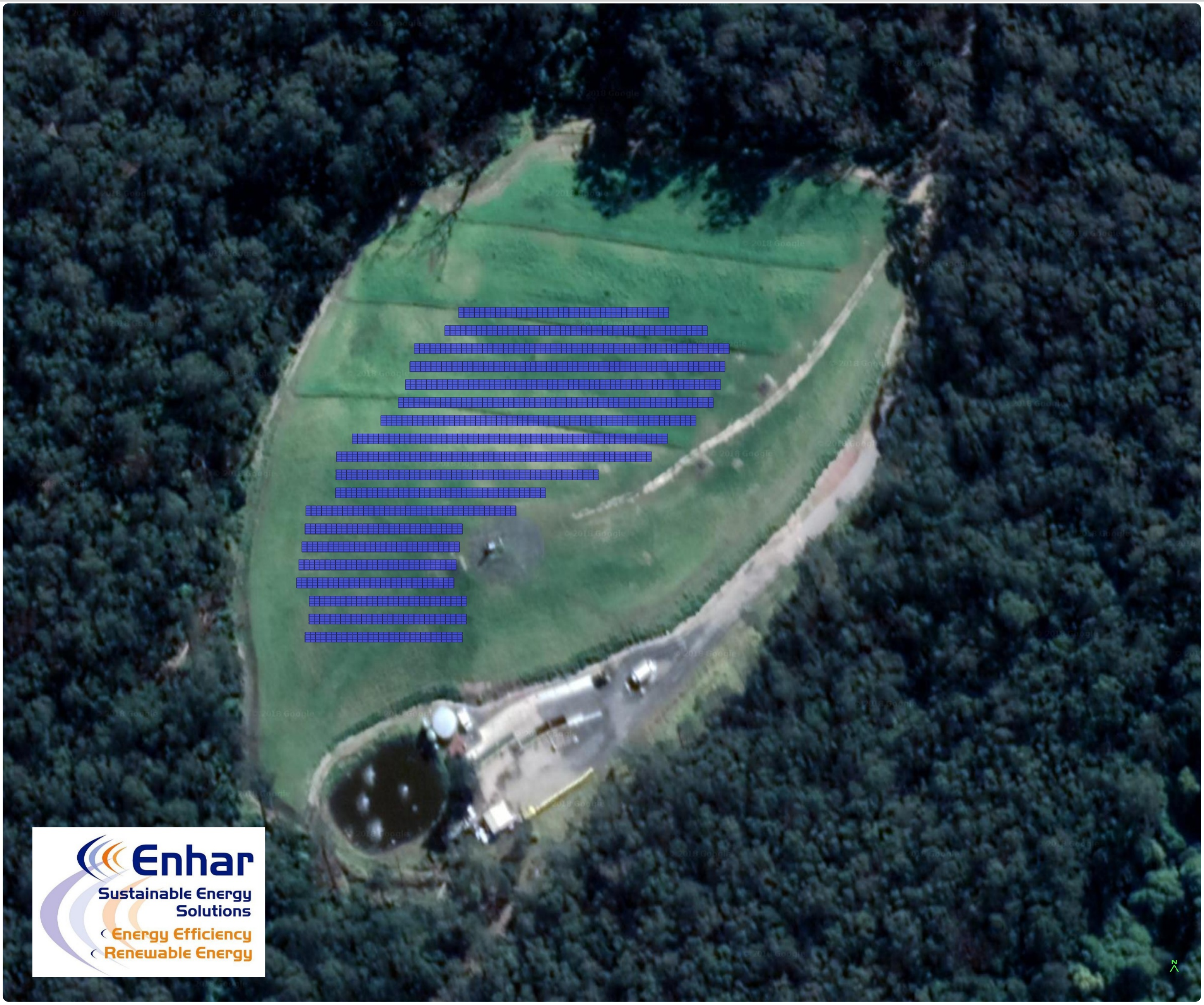
Wiring Zones

Description	Combiner Poles	String Size	Stringing Strategy
Wiring Zone	12	5-20	Along Racking

Field Segments

Description	Racking	Orientation	Tilt	Azimuth	Intrarow Spacing	Frame Size	Frames	Modules	Power
Field Segment 1	Fixed Tilt	Landscape (Horizontal)	20°	0°	3.0 m	4x10	85	3,400	1.09 MW

Detailed Layout



Appendix B: Site evaluations

Site name **Longatha**

Notes

Largest available site, can match 100% of South Gippsland Shire Council demand and ~85% of three Council's demand. Excellent proximity to grid connection. Alternative use for site is new location for Council offices. Adjacent to residential zoning, will be highly visible to numerous residents.

Weight / max sub-score	Score	Criteria	Sub-Score [out of poss. 5]	Detailed criteria	Comments
20%	18	**1. Land physical suitability**	5	Matching of land area/generation to individual Council demand	Significantly more than Council demand ~2GWh/yr
30			4.5	Matching of land area/generation to all three Council demand	Generation would equal ~85% of total all three Council annual demand
			3.5	Solar resource and shading	Some shading from surrounding tall trees, adjacent industrial buildings
			4	Terrain steepness suitability	Some undulations
			4.5	Construction and maintenance traffic access	
			5	Geotechnical and foundations	
25%	24	**2. Grid connection**	5	Grid connection voltage suits project scale and economics	22kV pole adjacent to site, straight off substation, can provide 415V connection
25			4.5	Sufficient capacity on grid to connect desired generation	Substation capacity highly likely to be ample for project, pending Ausnet response
			4.5	Viable cost of grid connection	Anticipate low cost to connection from Ausnet, provision of standard 22kV/415V kiosks plus 100m buried cable
			5	Level of competition for grid capacity from other proponents	no known competition
			5	Timescale of grid connection impacting project development	no known delays
15%	11	**3. Land economic suitability**	5	Solar usage economically favourable compared to other land uses	Land mainly unused, some minor recreational walking, no income generated for Council
15			3	Land zoning unsuitable for higher economic activities in future	Industrial zoning possible
			3	Land owner aspirations for this parcel(s) suit solar farm	Council may move its Civic Centre and offices to another site, this is a candidate site for such options
15%	11	**4. Planning and environmental**	3	Land zoning compatible with energy generation	PUBLIC PARK AND RECREATION ZONE (PPRZ), may require re-zoning to enable solar farm.
25			5	Planning overlays, sensitivities	No overlays on parcel
			4	Absence of trees including mature native trees	One mature tree requires to be cleared to maximise project size, rest is plain grassland
			2	Visual impact on residences	Large number of adjacent residences on Bent St can view the area.
			4	Potential for screening any impacted residences	Tree planting screening potential towards Bent St
25%	20	**5. Community support**	5	Existing Council support for site	Primary site identified by Council for consideration, prior evaluation performed by Gippsland Solar
10			3	Existing or expected community support for site	Local residents may be divided in terms of visual impact, Climate groups may support site due to its merits
100%	83	**Total out of poss 100**			

Site name **Grantville Landfill**

Notes

Suitable site where low value Council owned land area can be utilitised. Some visibility from nearby residences but expected to be environmentally acceptable. Grid connection through forested area to eb confirmed via Ausnet consultation.

Weight / max sub-score	Score	Criteria	Sub-Score [out of poss. 5]	Detailed criteria	Comments
20%	13	**1. Land physical suitability**	4.5	Matching of land area/generation to individual Council demand	Potential yield at 1.64 GWh/yr compared to Council consumption of 2GWh/yr, or 0.93GWh/yr excluding street lighting
30			2	Matching of land area/generation to all three Council demand	Generation would equal ~30% of all 3 council demand
			4	Solar resource and shading	Sharding from terrain contours, surrounding trees.
			3.5	Terrain steepness suitability	Terrain domes and drops off into steep slopes >10 deg gradient
			2.5	Construction and maintenance traffic access	Operational landfill, construction traffic must be managed within landfill traffic plan
			3	Geotechnical and foundations	Require balasted design, penetrations no more than 0.5m deep
25%	21	**2. Grid connection**	5	Grid connection voltage suits project scale and economics	Nearby 22kV about 200m to north east of site, potentially able to provide LV connection kiosk
25			4	Sufficient capacity on grid to connect desired generation	The 22kV liene is Likely to be able to accept 1MWac generation
			4	Viable cost of grid connection	If LV connection available, low cost of connection
			4	Level of competition for grid capacity from other proponents	Expect low or no competition in this area from other generators,other than perhaps a future landfill gas generator
			4	Timescale of grid connection impacting project development	No issues anticipated
15%	15	**3. Land economic suitability**	5	Solar usage economically favourable compared to other land uses	No other use of land viable, other than landfill gas collection
15			5	Land zoning unsuitable for higher economic activities in future	
			5	Land owner aspirations for this parcel(s) suit solar farm	No alternative public or private uses of site area within next 20+ years
15%	12	**4. Planning and environmental**	5	Land zoning compatible with energy generation	
25			5	Planning overlays, sensitivities	
			4.5	Absence of trees including mature native trees	some saplings growing on site but can be easily removed as roots may anyway damage landfill cap
			3	Visual impact on residences	Site is high domed hill which is visible for large radius including residential and commercial premises
			2	Potential for screening any impacted residences	Planting trees to screen visual impact not an option due to landfill cap shape and problems with tree roots on cap/seal
25%	23	**5. Community support**	5	Existing Council support for site	
10			4	Existing or expected community support for site	Likely widespread support, and those residents with view of the site already have industrialised view of the landfill
100%	83	**Total out of poss 100**			

Site name **Trafalgar Landfill**

Notes

Unused former landfill area has high shading from tall forest surrounds, so a lower solar resource than other sites, and some steep terrain. The distance to suitable grid connection is higher than the other sites. The low visual impact is an advantage of this site.

Weight / max sub-score	Score	Criteria	Sub-Score [out of poss. 5]	Detailed criteria	Comments
20%	12	**1. Land physical suitability**	4.5	Matching of land area/generation to individual Council demand	Potential yield at 1.6 GWh/yr compared to Council consumption of 2GWh/yr, or 1GWh/yr excluding street lighting
30			2	Matching of land area/generation to all three Council demand	Generation would equal ~28% of all 3 council demand
			2	Solar resource and shading	Shading high due to tall dense forest circling the site
			3	Terrain steepness suitability	Terrain steep in most areas, domed high area most suitable
			4	Construction and maintenance traffic access	disused landfill, construction traffic relatively uninhibited. Site traffic to utilise existing track, avoid flare
			3	Geotechnical and foundations	Require balasted design, penetrations no more than 0.5m deep
25%	14	**2. Grid connection**	2	Grid connection voltage suits project scale and economics	site has 415V, capacity of cable unsuitable for connection
25			4	Sufficient capacity on grid to connect desired generation	require with ~1km of line to the nearest 22kV pole
			1	Viable cost of grid connection	await Ausnet response, expect high cost
			4	Level of competition for grid capacity from other proponents	don't expect other generators to seek connections in this area
			3	Timescale of grid connection impacting project development	no issues known/anticipated, however more upgrades required than other sites may take longer
15%	15	**3. Land economic suitability**	5	Solar usage economically favourable compared to other land uses	No other use of land viable, other than landfill gas collection
15			5	Land zoning unsuitable for higher economic activities in future	
			5	Land owner aspirations for this parcel(s) suit solar farm	No alternative public or private uses of site area within next 20+ years
15%	15	**4. Planning and environmental**	5	Land zoning compatible with energy generation	
25			5	Planning overlays, sensitivities	
			5	Absence of trees including mature native trees	no trees growing on area to be used
			5	Visual impact on residences	no visibility from any residences
			5	Potential for screening any impacted residences	
25%	23	**5. Community support**	5	Existing Council support for site	site has been nomoniated by Council sustainability team
10			4	Existing or expected community support for site	anticipate reasonable support, no known grounds for objection
100%	79	**Total out of poss 100**			

GRANTVILLE LANDFILL SOLAR FARM

PRELIMINARY ASSESSMENT AS APPENDIX TO ENHAR REPORT REF P1828-C001-004 ON A SOUTHERN GIPPSLAND SOLAR FARM

Summary

Site address, land area size	Solar resource
Grantvile Landfill, Glen Forbes VIC 3990 Lat Long -38.449327, 145.5326969 Area: 2 Ha	Annual global in plane radiation: 1,709 kWh/m^2
Landowner details	**Comments**
Bass Coast Council own the site and commercial landfill operator engaged. Active landfill with recently finished capped landfill cell areas.	The former landfill area is suitable in terms of offering unshaded areas for around 1MW array. Challenges include impact of settlement over next ~5 years on the frame/structures, undulation and terrain gradients and visual impact on neighbours.
Grid connection	**Grid status**
Ausnet connection to the nearby 22kV lines to the east of the site appears feasible. Ausnet response quotes approximately $190,000 for providing a 22kV extension to the solar area with a 2MVA LV kiosk.	Preliminary response received from Ausnet. Next steps Ausnet detailed study requires $12,800+GST fee to Ausnet.
Generation capacity	**Annual generation**
1.14MWp using fixed tilt array, on the finished landfill areas.	1.64 GWh/yr
Planning Permit	**Environmental impact Issues**
Preliminary Consultation with Council Planner Donna Taylor indicates several issues to be addressed. The facility would be classed as a Renewable Energy Facility and would require planning permission in accordance with the Special Use Zone, Schedule 2. The land is also within the Bushfire Management Overlay.	Key considerations for the application would include; - Visual impacts on nearby properties would need to be considered and appropriately addressed through siting and screening where required. - Bass Highway – any potential impacts for users of the highway would need to be considered. I would encourage you to approach VicRoads prior to lodgement of an application to ensure that any concerns they may have are addressed as part of the assessment process. - Any traffic impacts, both during construction and operation of the plant.
Further opportunities	
Behind the meter solar PV for the landfill operations could be installed as a small project.	Larger solar capacity could be installed in future years as other landfill cells complete.

Site Layout

Figure 1: Landfill operations areas and first stage solar area (red)

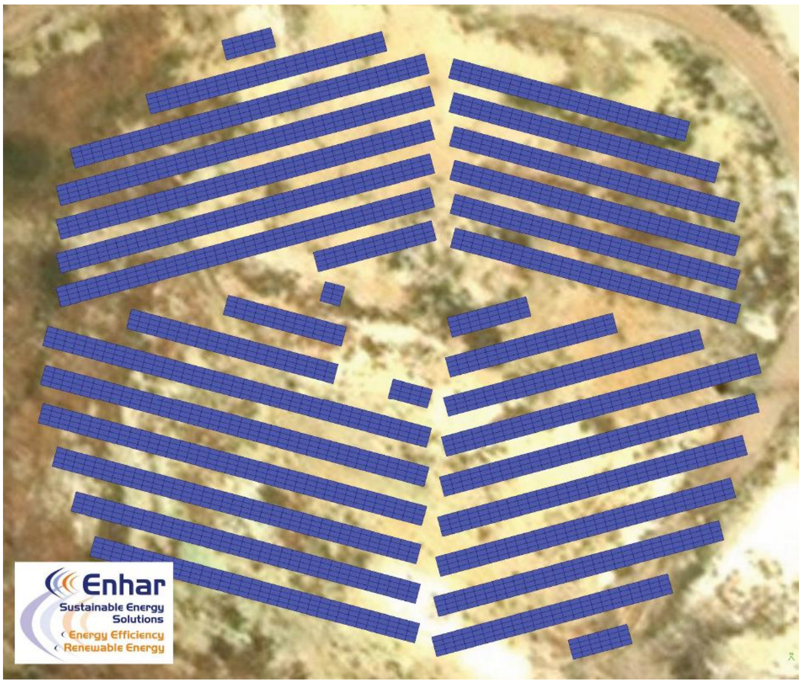


Figure 2: Potential concept layout (fixed tilt) responding to domed terrain gradient

Site Photographs

Figure 3 - 22KV line from road, closest pole to site and to the Telstra tower

Figure 4: Ausnet connection route [Ausnet sketch]

Figure 5: Panorama from top of landfill highest point [Enhar, 11/5/18 1:37 pm]

Figure 6 Largest vegetation on the former landfill area

Figure 7: Slope at side of former landfill area, solar panels to be installed at top on less steep areas

Enhar
Suite 03, 60 Leicester Street
Carlton
Vic 3053
Tel: 03 9429 9463
info@enhar.com.au
www.enhar.com.au

Ref: P1823-C001-003

Minutes: Solar PV at Grantville Landfill

Date	:	9th Jul 2018 – 10.30am
Location	:	Telecon
Attendees	:	Michael Spiller, Coordinator Waste Services, Bass Coast Shire Enhar – Demian Natakhan (Project Director)
Apologies	:	Araz Sarkisian –Sustainability Officer - Bass Coast Shire

Agenda Item	Details
Project scope / council objectives	• To establish a solar farm on the completed cells at Grantville Landfill

ISSUES, CONSTRAINTS AND SOLUTIONS

Impacts on gas collection pipework: Michael advised that the existing gas pipes can be disconnected temporarily during construction and reconnected, so should not pose a barrier to installation of solar arrays.

Impacts on revegetation: Council strategy is to revegetate the site with native grasses. Trees and shrubs are not compatible with the landfill cap, therefore will preference removal of the existing young trees. This is suitable for solar farm purposes and there appears to be no conflict.
The frames of the solar array should allow access for a person on foot for weed management, to enable spraying of weeds.

EPA licensing: From previous meeting: Dianne has spoken to EPA about solar on landfills, in principle EPA don’t have an objection, they enquire about footing design, would require drawings. If can be demonstrated no impact on the cap, are likely to approve. We discussed alternative panel and frame/footing design with lower impact on landfills. Michael advised the relevant contact at EPA is Elicia Brown, regional representative.

Power Cable: at this stage the most feasible solar farm connection would be northwards to the 22kV line feeding the Telstra tower. This would require cable running overground from the inverter, then underground under the existing site road, and onwards through the forested area towards the 22kV line.   Michael advised that the existing site road is bedded on an old bund, therefore a bore underneath the road should be feasible. An overhead cable crossing the site road could cause safety issues due to large truck heights so is not preferred.

Gas Collection and Energy Production

The areas targeted for solar generation are those which have been completed and gas collection is underway.

Michael advised that a tender was issued seeking energy generation solutions from the existing gas collection system. This found that with the 150m3/hour gas production, with 50% methane concentration, that energy generation may be viable.

However the restriction of single phase power to the site impacts on the viability of the equipment required to maintain system pressure etc.

Information Exchange	Michael to email a copy of gas audit and tender responses for gas energy generation.

Appendix C: Ausnet Reponses

Our Reference: 75049696
Date: 10 August 2018

ENHAR PTY LTD

Locked Bag 14051
Melbourne City Mail Centre
Victoria 8001 Australia
T: 1300 360 795
www.ausnetservices.com.au

Dear Sir/Madam,

ELECTRICITY SUPPLY: 88 HORN ST LEONGATHA (LEONGATHA SOLAR FARM)

Thank you for your enquiry regarding the supply of electricity to the property detailed above. This **Preliminary Estimate** is based upon information provided by you or your electrician. Any additional costs associated with tree clearing, easements crossing private property/government land and any constraints placed upon AusNet Services by third parties are not included in this estimate.

CONCEPTUAL DESIGN:
For us to provide you with an adequate electricity supply, three phase - 230/400 volt, AusNet Services proposes to install a 2MVA kiosk transformer on the property as per the attached conceptual design.

Please refer (over-page) for conceptual design drawings.

We estimate your contribution to these works to be within the range of
$(170,000) to $(190,000) * *GST inclusive*. (Offer only valid for 60 days)

These costs are indicative only and should not be regarded as a firm quotation.

FIRM OFFER:
To obtain a Firm Offer, please complete the attached Firm Offer Request Form. **A project fee of $12,800 + GST is payable.** This fee is non-refundable, but should you proceed with the works, it will be deducted from the total cost.

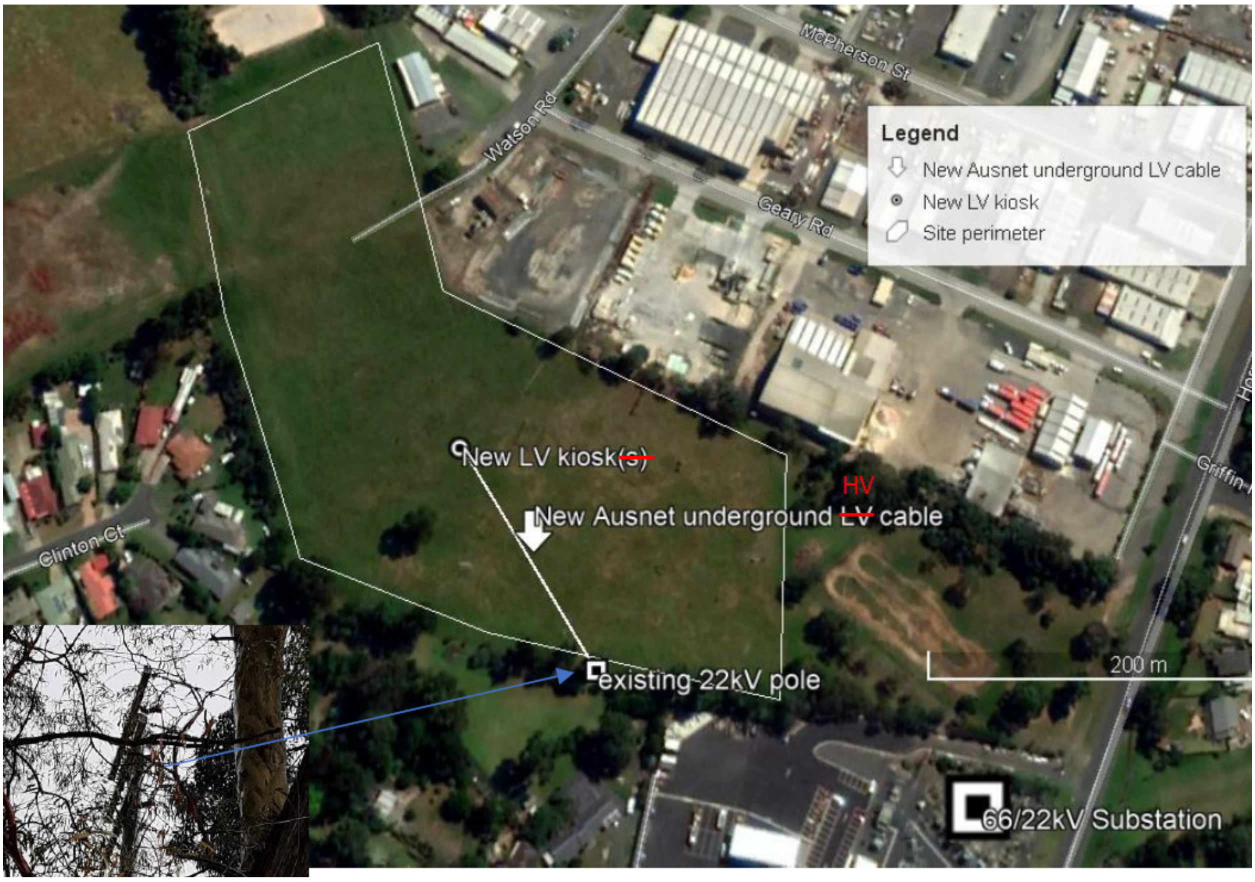
Upon payment, we will undertake a comprehensive technical analysis and prepare a fixed cost quote. It may be necessary to meet our representative at the site to discuss your requirements. We will advise you of construction time frames and contestable construction choices.

For all enquiries please contact me directly on **0457816703.**

Regards,

Ryan Teuma
Design Officer
AusNet Services

CONCEPTUAL DESIGN: 88 HORN ST LEONGATHA (LEONGATHA SOLAR FARM)



"FIRM OFFER REQUEST FORM"

ISSUE DATE: 10 August 2018 **Our Reference:75049696**

Ryan Teuma

Please provide a Firm Offer for an electricity supply to the following location:
88 HORN ST LEONGATHA (LEONGATHA SOLAR FARM)

Name:		
Company Name (if applicable):		ABN:
Postal Address:		Postcode:
Phone No:	Fax No:	
Email Address:		
Signature:		Date:

Payment of Firm Offer Fee - Please complete above details for Invoice.

☐ Please send invoice for payment by BPay/credit card/EFT

☐ I have enclosed my cheque made payable to: **AusNet Electricity Services Pty Ltd**

I am fully aware that I will forfeit this money if I do not accept your Firm Offer within 60 days of contract issue date.

RETURN TO:

AusNet Services
Ryan Teuma
Email: ryan.teuma@ausnetservices.com.au

Ryan Teuma <ryan.teuma@ausnetservices.com.au> 19/7/2018 16:15

FW: Solar connection enquiry: Trafalgar Landfill

To demian@enhar.com.au <demian@enhar.com.au> Copy
Raj Manihar (Raj.Manihar@bawbawshire.vic.gov.au) <raj.manihar@bawbawshire.vic.gov.au>

Hi Demian,

As discussed on the phone I can provide the following information for your proposal to install a 890kW solar farm at the Trafalgar Landfill site.

1.5MVA kiosk substation required to facilitate low voltage connection to the network.
3 phase powerline is approx. 1.2km from site (located approx. 90m North of the Trafalgar Abattoir on pole 2203491 'FILTRATION PLANT 11' Substation).
Customer permission/easement required to access and utilise pole 2203491.
Approx. 650m of High Voltage Underground required.
Approx. 480m of overhead high voltage conductor upgrade required.

Solar Farm to comply with SOP 11-16 & SOP 33-08 attached.

A high level desktop estimate has been prepared with costs to provide an LV connection on the property to be approximately $320,000 + GST +/- 20%.

Please see attached pdf 'AusNet Services Preliminary Sketch'/

Regards,

Ryan Teuma
Design Officer

AusNet services | missionzero

AusNet Services – East Region

PO Box 339 Stratton Drive
Traralgon Vic 3844 Australia
Mobile 0457 816 703
ryan.teuma@ausnetservices.com.au
www.ausnetservices.com.au

From: Demian Natakhan [mailto:demian@enhar.com.au]
Sent: Friday, 15 June 2018 2:01 PM
To: James Snaize
Subject: Solar connection enquiry: Trafalgar Landfill

*** EXTERNAL EMAIL: Stop and think before opening attachments, clicking on links or responding.***

James

Please find attached a prelim enquiry for solar at Trafalgar Landfill.

Appreciate if this can be processed along with the Grantville Landfill and Leongather enquiries, which is all part of a related project.

Thanks,

Demian Natakhan | Director | Enhar Pty Ltd - Sustainable Energy Consulting |

Suite G-03, 60 Leicester Street, Carlton VIC 3053 Australia |
T: +61 (3) 9429 9463 | M: +61 (0) 468 309 863 F:+61 (3) 8676 4924 |
E: demian@enhar.com.au | www.enhar.com.au |

Enhar
Sustainable Energy Solutions
Energy Efficiency
Renewable Energy

TRAFALGAR ABBATOIR
FILTRATION PLANT 11
2203491
Sunny Creek Connection Rd
SUNNY CREEK 24
SUNNY CREEK 25
Wiktor Rd
Uralla Nature Reserve
SUNNY CREEK 31
K
Sunny Creek
Giles Rd
Old Thorpdale Rd
Slatters Rd

Demian Natakhan

From:	Ryan Teuma <Ryan.Teuma@ausnetservices.com.au>
Sent:	Thursday, 26 July 2018 2:56 PM
To:	Demian Natakhan
Subject:	Enhar solar farm - 1685 Bas Hwy, Grantville
Attachments:	Tech Schedule EXAMPLE.DOCX; SOP 11-16. Feb 2018 Protection Requirements for Embedded Generators.pdf; SOP 33-08 Solar PV generator – Power Quality Compliance Requirements.pdf; 75049698 - Initial Review.pdf

Hi Demian,

Please find the Initial Review attached for your Grantville landfill solar farm proposal.

I can also provide the following information for your proposal to install a 1MW solar farm at the Grantville Landfill site.

Scope:
1.5MVA kiosk substation required to facilitate low voltage connection to the network.
3 phase powerline is approx. 300m from site (Pole 2803123)
Customer permission/easement required to access and utilise pole 2803123.
Approx. 300m of High Voltage Underground required.

Solar Farm to comply with SOP 11-16 & SOP 33-08 attached.

A high level desktop estimate has been prepared with costs to provide an LV connection on the property to be approximately $200,000 + GST +/- 20%.

Please see attached pdf 'AusNet Services Preliminary Sketch'.

Regards,

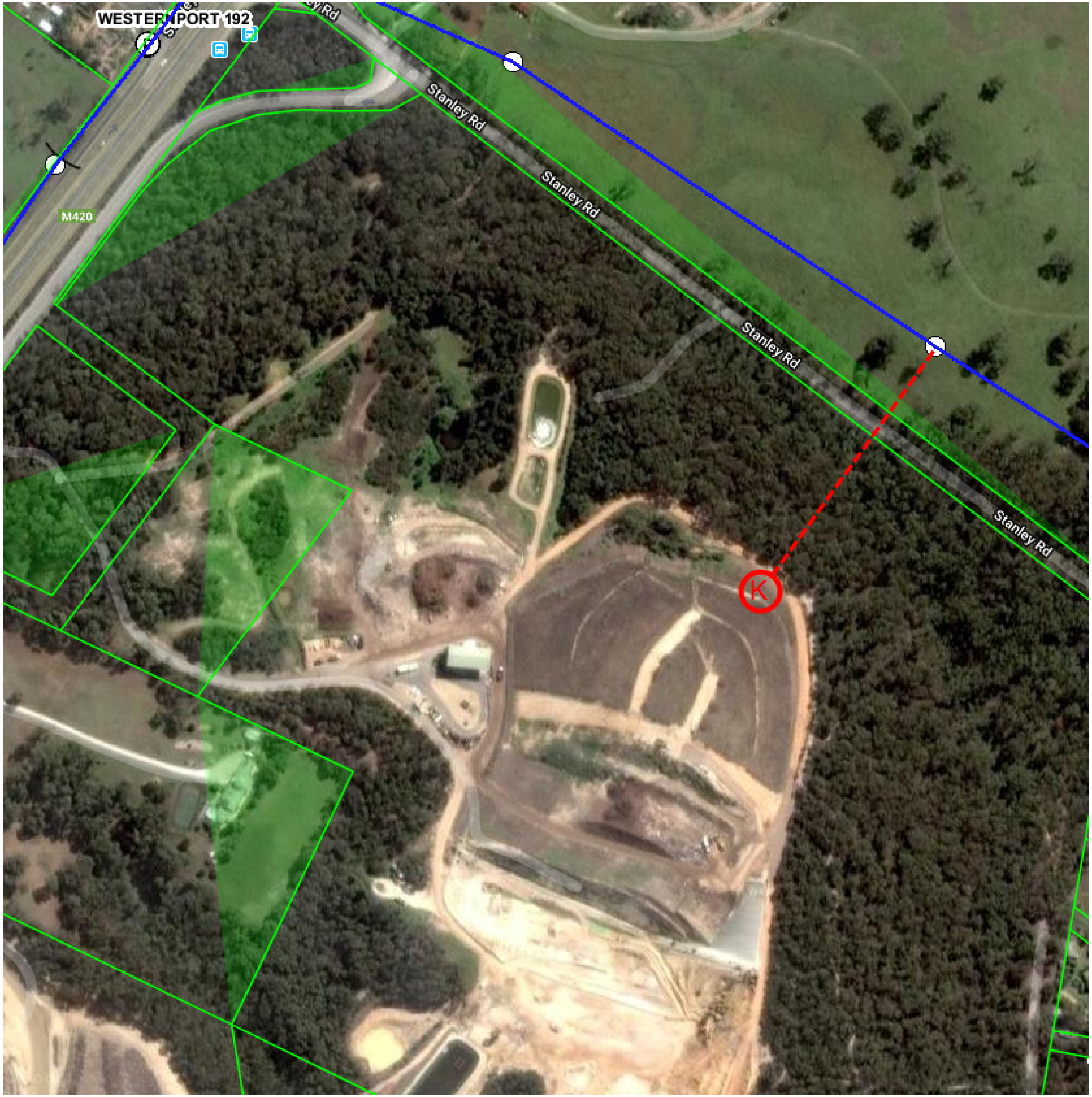
Ryan Teuma
Design Officer

AusNet services | missionzero

AusNet Services – East Region

PO Box 339 Stratton Drive
Traralgon Vic 3844 Australia
Mobile 0457 816 703
ryan.teuma@ausnetservices.com.au
www.ausnetservices.com.au

From: Demian Natakhan [mailto:demian@enhar.com.au]
Sent: Thursday, 19 July 2018 2:49 PM
To: Ryan Teuma


WESTERNPORT 192
M420
Stanley Rd
Stanley Rd
Stanley Rd
Stanley Rd
K

Our Reference: 75049698

Date: 26 July 2018

Locked Bag 14051
Melbourne City Mail Centre
Victoria 8001 Australia
T: 1300 360 795
www.ausnetservices.com.au

DEMIAN NATAKHAN
ENHAR

Dear Demian,

INITIAL REVIEW PROPOSED INVERTER ENERGY SYSTEM

AusNet Services has recently reviewed your Initial Enquiry Application for the installation of 1MW of fixed tilt solar PV panels at the premise of, 1685 Bass Highway, Grantville.

Based on the information provided, we have concluded that distribution network augmentation is required to connect the installation to the AusNet Services network. To determine network augmentation requirements a further detailed review of the installation needs to be undertaken.

NEXT STEPS:
Only the initial review has been prepared. If you wish to proceed with the detailed review please complete all the following steps:

- Submit technical details of the proposal.
- Forward a single line diagram of the installation labelled with "FOR CONSTRUCTION".
- Payment of the Project Fee of $7,600 plus GST.
- Forward the ABN of the client having the system installed
- Provide a contact person and their details for the premises.

A receipted Tax Invoice will be forwarded to you following payment of the Project Fee. Should you require a Tax Invoice prior to making payment, it will be provided upon request. **Cheques must be made payable to "AusNet Asset Services Pty Ltd".**

DETAILED REVIEW
On receipt of this fee and the above information AusNet Services will undertake a detailed technical review of the system described in the Application Form. In which you may need to provide additional information including the consultant's report described in the Application Form.

Once this detailed review is undertaken AusNet Services will prepare a detailed design, establish an accurate estimate of the costs and a Firm Offer encompassing Contracts and full details of the competitive tendering options available.

Once the review and final design is agreed AusNet Services' will also issue the Connection Agreement, which must be executed prior to any connection to the electricity network.

Until you receive the Connection Agreement there is no approval for this proposed installation

PRIOR TO CONNECTION

Your proposed system cannot be turned on or used until such time as:

- Infrastructure has been upgraded
- Suitable metering has been installed.
- Approved protective device installed and injection testing completed.
- Anti-islanding test completed.
- Other agreed commissioning tests.

Prior to the connection of the proposed generating system you will need to have completed the connection agreement with AusNet Services and entered into an agreement with a licensed electrical Retailer for the sale of any exported energy.

For further information relating to current licensed electricity retailers and copy of the Electricity Distribution Code, please contact the Essential Services Commission on 1300 134 575 or visit their website at www.esc.vic.gov.au.

If you require any further information in relation to the above, please do not hesitate to contact myself at the Traralgon office on 0457 816 703.

Yours sincerely

Ryan Teuma
Design Officer
AusNet Services – Traralgon

Appendix D: Case Studies

Sunshine Coast Council 15 MW solar farm

Sunshine Coast Council decided to investigate and ultimately invest in a 15 MW solar farm. Commencing operation in late 2017, this project enabled Sunshine Coast to become the first Council in Australia to develop, build, own and operate a solar farm of such a scale.

After installing solar PV on 24 of its buildings and determining that rooftop solar could only meet ~10% of Council's overall demand, large scale generation became the next focus.

A solar developer had obtained a permit for 10 MW solar on a site and approached the Council to become the PPA off-taker for the project. The Council decided that a more economical way forward would be to become the owner of the project, and acquired the project. During further development, Essential Energy indicated that grid capacity would be sufficient for expansion to 15 MW.

Figure A-1: Sunshine Coast Council 15 MW solar farm construction render [photo: Enhar]

A large amount of information on the project has been publicly shared by Sunshine Coast Council on their website [5].

Enhar discussed the project with the Energy Projects Office to further understand the business model and development process which enabled the Council to successfully implement this project. Previous literature was also reviewed[6]. Key success factors included:

• Supportive councillors who voted to progress with the project on six occasions it came before Council

• Large energy use at 30 GWh/year of three amalgamated regional Councils helped to justify the project scale, though one of these withdrew from the scheme at a later date.

• Internal staff championing the project undertook extensive modelling to de-risk the project from Council perspective

• Engagement of a retail partner early in the project who assisted the Council to structure the energy trading components, understand the electricity market and navigate through licenses and exemptions

• Council found that taking on wholesale spot market price exposure risk for both the sale of solar generation and purchase of power for Council consumption achieved the strongest business case (see table below). This was due to removing the wholesale price risk from the retailer who therefore charges significantly less in fees.

• Positive engagement with the network company Ergon, who delivered well on their component of the project construction.

An internal business case was developed for the Council to offset its long term electricity costs through constructing its own solar farm. This $50.4M project will make ~$22M net savings to ratepayers over its lifetime through reductions to Council's electricity retail costs plus revenue from sales of electricity and LGCs.

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[5] https://www.sunshinecoast.qld.gov.au/Environment/Sunshine-Coast-Solar-Farm

[6] RP1032 Final Project Report, Facilitating End User Deployment of Off-Site Renewable Generation, Emily Mitchell, Graham Mills, 2017

Sunshine Coast purchased the land and coordinated the final project development process. Contracts for construction and retail partnership were awarded to Downer and Diamond Energy. In light of recent reductions in solar farm capital costs and the increases wholesale electricity rates, today's business case for Councils to follow this path will generally be stronger.

The business case summary from the project compared the long term 30 year net present value (NPV) of a Council owned solar farm vs business as usual, finding that the overall savings to the ratepayers would be ~$22M. The business case from Sunshine Coast includes the table below.

Table 5-4: Sunshine Coast Council Financial Summary and Comparison[7]

Cost Type	BAU NPV $millions	Project NPV $millions	Difference $millions
Energy Charges	$78.7	$35.4	$43.3
Carbon Charges	-	-	-
Network Charges	$132.8	$132.8	-
DNSP Service & Maintenance	$98.5	$98.5	-
Other Charges	$9.4	$9.4	-
Total electricity cost	**$319.2**	**$276.0**	**$43.3**
Total Project Spend	-	$50.4	$50.4
Operating Costs	-	$10.6	$10.6
LGC Value	-	$22.6	$22.6
Electricity Export	-	$12.8	$12.8
Solar Farm terminal value	-	$4.4	$4.4
Total Costs	**$319.2**	**$297.1**	**$22.1**

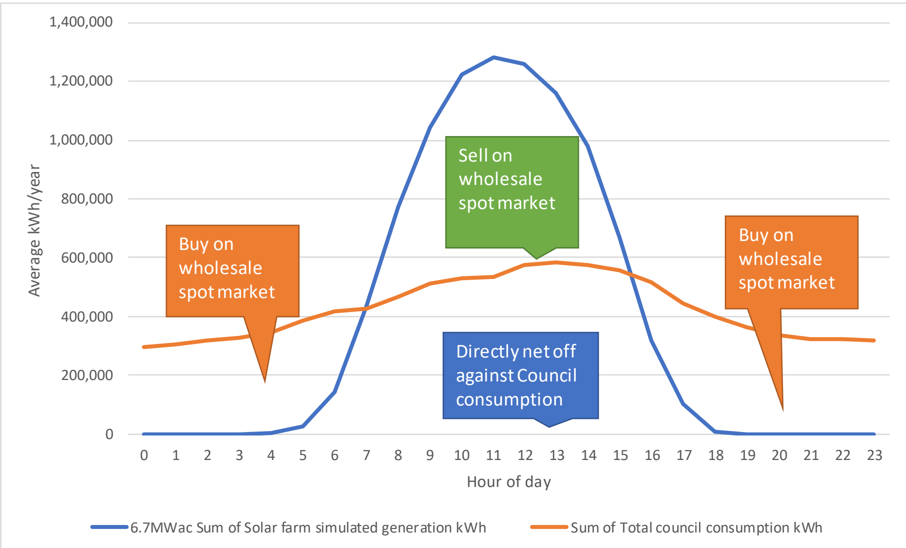

Figure 5-5: Wholesale spot price strategy for Council owned solar farm

By June 2018, the project had been operating for 12 months.

The Council released figures which indicated that it had improved the Council's bottom line by $1.7M in this period, more than twice the forecast amount. The higher than anticipated wholesale price and LGC price led to this improvement in the financial outcome.

[7] Sunshine Coast Solar Farm Project Business Case Summary May 2016, via www.sunshinecoast.qld.gov.au/