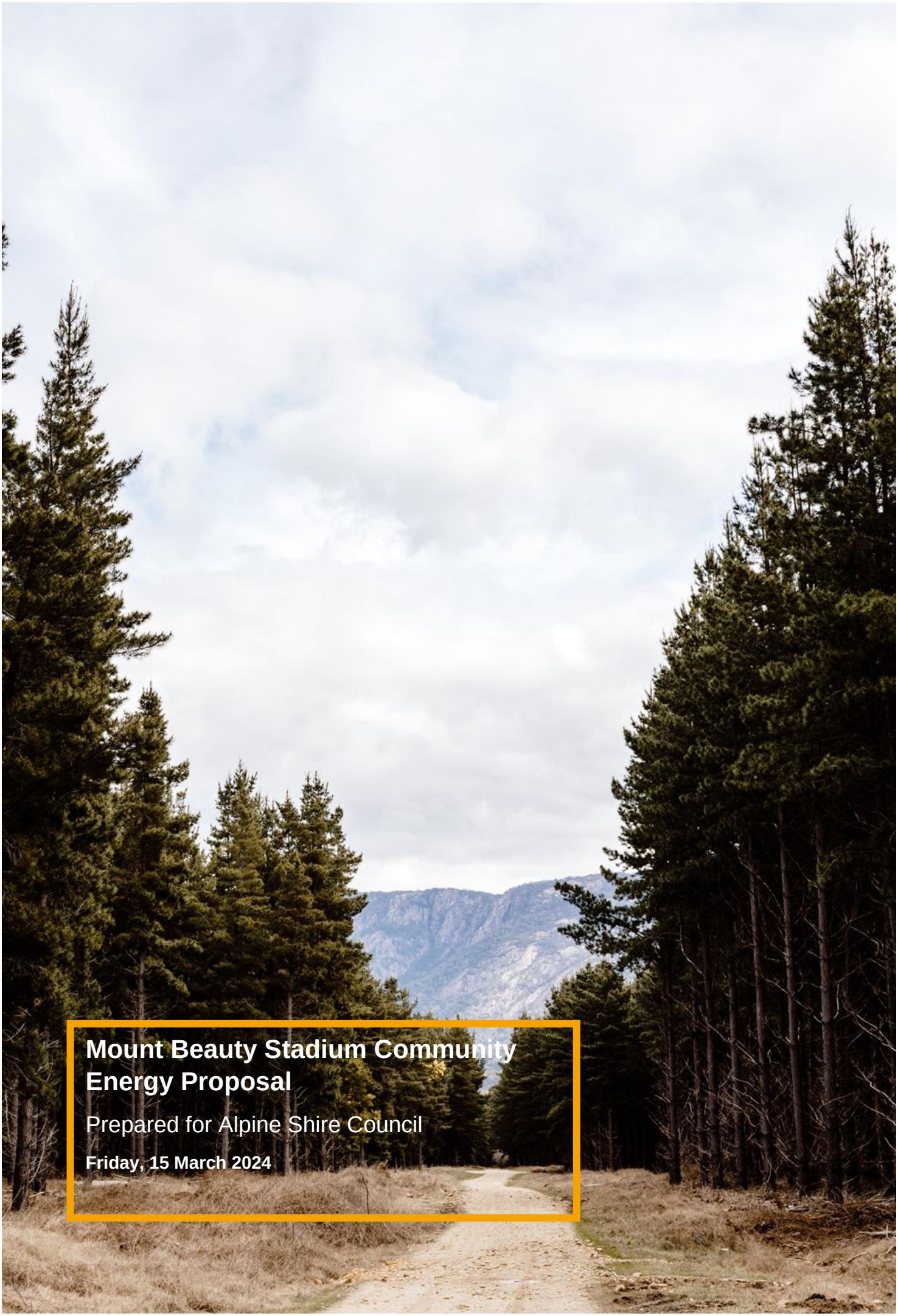


Mount Beauty Stadium Community Energy Proposal

Prepared for Alpine Shire Council

Friday, 15 March 2024

Table of contents

Table of contents 1
1. Introduction 2
1.1 Background 2
1.2 Site Summary 2
1.3 Commercial Arrangements 3
1.4 Proposal Options 3
2. Method 4
3. Results 5
3.1 Option One: Indigo Power Infrastructure Ownership 6
3.2 Option Two: Host Site Infrastructure Ownership 9
3.3 Results Discussion 18
4. Proposal Benefits 18
5. Conclusion 19
Appendix One: Modelling Assumptions 20
..... 23

1. Introduction

1.1 Background

Indigo Power has been engaged by the Alpine Shire Council to prepare a prospectus to promote opportunities for investment in community energy and/or public Electric Vehicle (EV) charging infrastructure on Council land. All Council sites have been reviewed and shortlisted to a final ten sites best suited to community energy and/or public EV charging infrastructure. The Mount Beauty sports stadium is one of these ten sites.

Community batteries technologies and business models are in the early stages of development. To support the ongoing development of community batteries, Federal and Victorian Governments are currently providing funding through grant programs. Grant funding provides an opportunity to mitigate financial risk for the delivery of community batteries.

This proposal outlines options for the delivery of a community battery facility at the host site.

1.2 Site Summary

The Mount Beauty Stadium and Pool could accommodate a solar and battery system capable of supplying both on site load, with sufficient renewable energy to provide back-up power to users of the site during an emergency, and to contribute renewable energy supply to the town on a day-to-day basis.

The site has an existing 23 kW solar PV system. An additional 35 kW solar PV system and a 50 kW/200 kWh flow battery energy storage system is proposed for the Mount Beauty Stadium and Pool. This system is large relative to site load and would provide extended periods of back-up power to this important emergency response site during an emergency and be able to export excess renewable energy to the community for local consumption.

The site may require structural engineering to improve the weight bearing capacity of the roof. The additional $40,000 for these works has been included in the costs outlined in the design brief. This cost is based on an Indigo Power estimate and has not been verified by a structural engineer. The total cost to install the system, including structural engineering to strengthen the roof, is $377,400. Details of the breakdown of capital costs are included in Table One below.

The modelling outlined in this proposal removes structural engineering costs, assuming that these are paid for by the site owner independent of this proposal.

Table One. Capital cost breakdown.

Solar cost excluding structural works	$62,000
Battery capital costs	$275,400
Subtotal	$337,400
Potential structural engineering additional costs	$40,000

The site land and building are owned by Council. The facility is managed by Council, but the pool is leased to a private entity who pays the pool related electricity bills. Council pays the electricity bills not related to the pool.

1.3 Commercial Arrangements

Community batteries can realise several outcomes across social, environment and financial categories. Different commercial and/or operational arrangements are required for the realisation of these outcomes. These are detailed in Table Two below.

Table Two. Description of the commercial arrangements necessary to realise community battery outcomes.

Outcome	Commercial/operational Requirement
Community renewable energy supply	The solar and battery system can supply renewable energy to the host site and to the community. Selling renewable energy from the facility to the community requires the involvement of an electricity retailer able to buy the power from the site and on sell it to customers. Doing this in a meaningful way requires additional software to match local consumption with the site's export. See Indigo Power's energy sharing software as an example[1].
Electricity sales	It is possible to sell electricity back to the host site's existing electricity retailer through a standard electricity retail feed-in tariff. However, this does not maximise the facility's financial return. Improved electricity sales outcomes are achieved by linking the facility to the national electricity market and managing the battery to capture high electricity prices. This requires an arrangement with a third party with appropriate licences and registrations.
Frequency control ancillary services sales (FCAS)	Additional revenue streams for battery storage are through the provision of services that moderate the frequency of electricity in the network, referred to as FCAS. Access to FCAS revenues requires an arrangement with a third party aggregator with appropriate licences and registrations.
Energy Resilience	Sites with large energy storage systems can provide access to energy for the community during an emergency outage. This outcome requires an appropriate software platform linked to an onsite control device to switch between day to day and emergency functioning. Emergency operation typically involves charging the battery and holding its capacity for emergency use only. Energy resilience outcomes are dependent upon high system reliability. That is, the system can't be out of order during an emergency event. This requires an arrangement with an appropriate electrical services provider to ensure the system is monitored and maintained.
Grid support	Batteries can provide grid support services to the local electricity grid, including demand raise and lower services and voltage control. There is no ready market for the delivery of these services. However, grid support opportunities for small scale storage may occur in the future, which would require an arrangement with an appropriate aggregator to control and deploy storage according to a grid support contract or market-based system.

1.4 Proposal Options

The following two proposals have been developed on the assumption that battery host sites, including Councils, are seeking a simple, low risk solution that maximises outcomes across

[1] https://indigopower.com.au/community-energy-hub/

as many value streams as possible. Two options are presented based on either the host site's ownership of the solar and battery facility, or ownership of the facility by a third party. The options presented below are specific to Indigo Power, however, there may be other appropriately qualified third parties with the necessary licences and registrations to deliver similar options.

1. **Option One: Third Party Ownership:** Indigo Power, or another third party, owns and maintains the proposed solar and battery facility and leases the necessary space from the host site. Low-cost renewable energy and a resilience service is provided to the host site in place of a lease payment. Indigo Power would use excess generation and storage capacity to supply clean energy to its local customers, supporting its renewable energy focused wholesale electricity strategy. Indigo Power would access FCAS markets under its existing arrangements and assess any grid support options on a case-by-case basis. Indigo Power insures the battery. Indigo Power is responsible for funding the capital cost of the project and builds, owns operates and maintains the battery.
2. **Option Two: Host site infrastructure ownership:** Host site ownership of the facility and Indigo Power builds, operates and maintains the facility. Operation of the battery by Indigo Power under a licence agreement. Low-cost renewable energy and a resilience service is provided to the host site, alongside an annual licence payment. Indigo Power would use excess generation and storage capacity to supply clean energy to its local customers, supporting its wholesale electricity strategy. Indigo Power would access FCAS markets under its existing arrangements and assess any grid support options on a case-by-case basis. Indigo Power maintains the battery and assumes the cost of maintenance under the terms of the licence agreement. The host site insures the battery. The host site funds the capital cost and recovers some of the cost through licence payments from Indigo Power.

The financial outcomes of both options are presented in Section Three below.

2. Method

Modelling of the designed community battery is performed to determine the financial outcomes of the two options presented in Section 1.4 above. The modelling is performed in two stages. The first stage models energy flows at the site, incorporating load, solar generation and battery energy storage. The battery operates optimally for all price signals (wholesale prices and network charges). This produces an operational model for the battery that maximises financial outcomes. Environmental objectives are incorporated by design – using behind-the-meter solar – and by using a $100/tonne shadow carbon price, based on average emissions factors. This reduces battery charging from high emissions electricity overnight. Modelling provides an estimate of the revenue potential of the battery over a fixed time horizon. This modelling is carried out using the energy modelling software Gridcog.

The second modelling stage post-processes the cashflows resulting from the Gridcog models. This allows the terms of the agreement between the host site and Indigo Power to be developed and demonstrates the business case for both parties. Power purchase agreement and annual licence fees are the output of this process as well as host site cost savings.

As grant funding is currently available for community batteries the analysis includes 100% grant funding for the capital cost of the community battery. The capital cost for solar installation is assumed by Indigo Power or the host site, depending on the ownership option under analysis. This proposal would need to be redrafted if grant funding were not available for battery capital costs. Assumptions used in the energy flow modelling and the financial modelling are presented in Appendix One.

Analysis for this site assumes that the two sites (pool and stadium), currently on separate meters, are combined and that the whole site is connected to the network through one meter point.

3. Results

Both proposal options involve the operator of the system selling electricity to the host site to meet all the sites electricity needs. This would be done through a power purchase agreement with agreed rates. The PPA price for both options is presented in Table Three below. These rates are designed to provide a significant – better than 20% – reduction in the host site's electricity costs. However, for this site, this is challenging.

Table Three: Assumed power purchase agreement rates.

Category	Description
Sale of electricity to the site through a behind the meter power purchase agreement	Block One (first 200 kWh per day): 16 c/kWh Block Two (above 200 kWh per day): 40 c/kWh No daily supply charge or other electricity retail or network associated charges.

Note: The existing site solar and battery system could continue to deliver power to the site at no cost under either arrangement.

3.1 Option One: Indigo Power Infrastructure Ownership

The following analysis outlines the Mount Beauty Stadium and Pool's position under an arrangement whereby Indigo Power leased the site to install a further 35 kW (58 kW in total) of solar PV and a 200 kWh battery at the site. The analysis assumes Indigo Power sells electricity to the host site as per Table Three above. Table Four provides a summary of the host site's energy position at year one of the project. Figure one summarises the host site's energy position under this delivery model over a ten year period.

Table Four. Summary host site energy profit and loss under a lease agreement for year one.

Mount Beauty Stadium & Pool - Financials

Indigo Power

Summary		Year 1	Note
Current:			(i)
Retail Supply			
- inflows		-$277	
- outflows		$1,090	
Certificates			
- inflows		$0	
- outflows		$681	
Network			
- inflows		$0	
- outflows		$2,101	
Solar operation/maintenance		$381	(ii)
Battery operation/maintenance		$300	(iii)
	Net cost:	$4,276	(iv)
Proposed:			
Retail Supply			
- inflows		-$286	
- outflows		$4,105	

Certificates		
- inflows	$0	
- outflows	$0	
Network		
- inflows	$0	
- outflows	$0	
Sub total:	$3,819	
Sub total savings	$457	
Sub total Percentage Savings:	11%	

Battery Ownership Financial Benefit:

Community Battery Net Margin	$0	(v)
Net cost:	$3,819	(vi)
Saving:	$457	(vii)
Percentage Saving:	**11%**	

Notes/Assumptions

(i) All figures exclude GST.

(ii) This represents cost of operating and maintaining the existing solar system.

(iii) The cost of operating and maintaining the existing battery system.

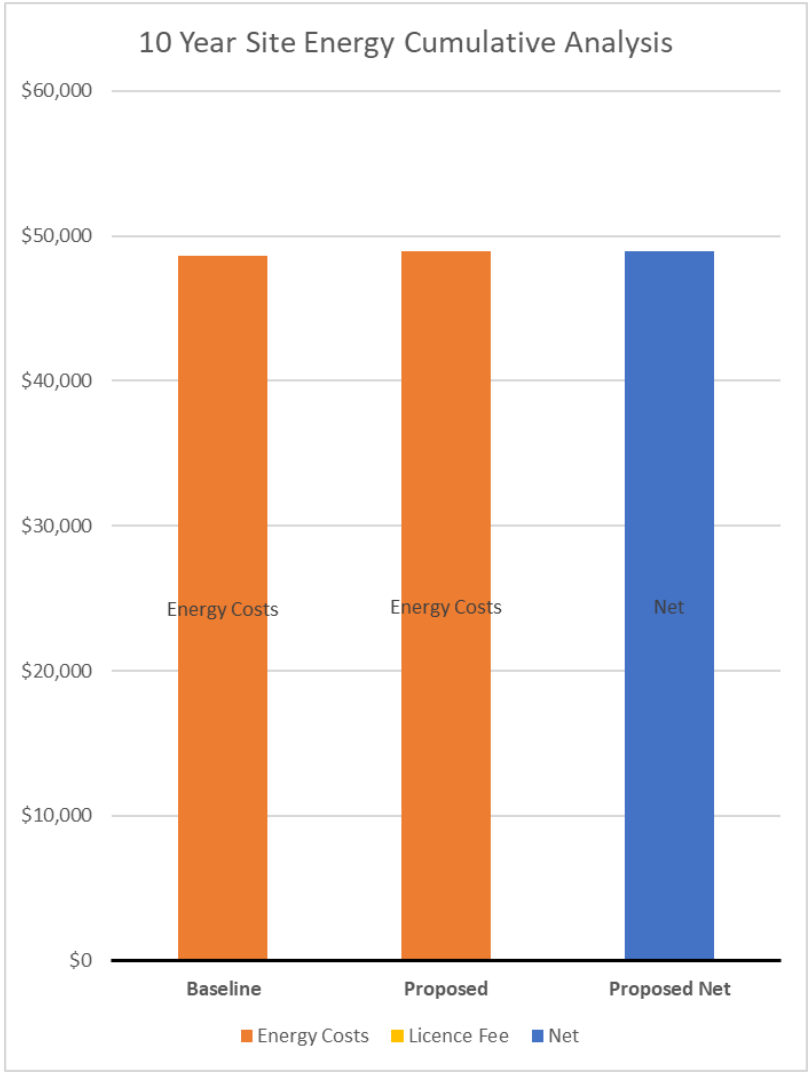
(iv) The current net cost of electricity at your site including connection, supply, operation and servicing, after deduction of any feed-in credit.

(v) This is the profit shared with the owner of the battery from the new facility. It is not part of the energy calculation.

(vi) The proposed net annual cost of electricity at your including profit share.

(vii) Estimated saving of our proposal, when compared to your existing situation.

Figure One. Ten year host site energy analysis under a scenario where the battery is owned by Indigo Power, who leases an area of the site.



Under this scenario the Mount Beauty Stadium and Pool would benefit through a cost saving of $457 or 11%[2] in year one of the community battery operation. Over ten years the host site is expected to pay about the same amount for their electricity, assuming retail rates increase at the inflation rate only. No financial contribution would be required from the host site either upfront or across the life of the facility.

The electricity costs would be split between Council, who pays the electricity bills for the Stadium, and the pool operator, who pays the pool bills. Each would be metered separately and pay for electricity according to the amount consumed.

3.2 Option Two: Host Site Infrastructure Ownership

Under this model the Council would be the beneficiary of grant funding for the battery capex and invest in the remaining portion of the system. Indigo Power would operate and maintain the system, supplying power to the site as per the rates in Table Three, and accessing wholesale electricity and FCAS revenue.

This model could have two fee structures:

1. A net surplus share arrangement whereby IP and Council share the operational net surplus for the facility. Current modelling assumes Indigo Power charges an annual fee based on 50% of the annual operating margin of the battery (excluding financing costs, grant funding and depreciation). The fee covers all of Indigo Power's operating costs for the deployment of the battery in necessary markets.
2. A fixed fee arrangement whereby IP pays to Council an annual amount sufficient for Council to recover the inflation adjusted (3%) cost of its investment over the twenty year life of the project. The annual payment amount under this model is $4,167.37.

All modelling assumes option one, sharing the operational net surplus, is applied. A host site energy analysis for year one is presented in Table Five and a ten-year analysis is presented in Figure Two. Table Six details the expected financial case for Council if it were to invest in, and own, the battery. Table Six only considers the financial performance of the battery, it does not consider the whole site and its cost savings. Table Seven considers the performance of the whole site. It considers both the site cost savings and the financial performance of the battery. Figure three provides a breakdown of financial benefit, between Council and Indigo Power, over a ten year period.

[2] Note: This assumes site load for the period of supplied meter data and Indigo Power's business rates for the site. It does not include the rates for the current electricity retail provider at the two sites.

Table Five. Simple one year host site energy analysis under option two, the licence agreement.

Mount Beauty Stadium & Pool - Energy Summary

Summary		Year 1	Note
Current:			(i)
Retail Supply			
- inflows		-$277	
- outflows		$1,090	
Certificates			
- inflows		$0	
- outflows		$681	
Network			
- inflows		$0	
- outflows		$2,101	
Solar operation/maintenance		$381	(ii)
Battery operation/maintenance		$300	(iii)
	Net cost:	$4,276	(iv)
Proposed:			
Retail Supply			
- inflows		-$286	
- outflows		$4,105	
Certificates			
- inflows		$0	
- outflows		$0	
Network			
- inflows		$0	
- outflows		$0	

Sub total:	$3,819	
Sub total savings	$457	
Sub total Percentage Savings:	11%	
Battery Ownership Financial Benefit:		
Indigo Power Payment	-	(v)
	$3,460	
Net cost:	$359	(vi)
Saving:	$3,917	(vii)
Percentage Saving:	**92%**	

Notes/Assumptions

(i) All figures exclude GST.

(ii) This represents cost of operating and maintaining the existing solar system.

(iii) The cost of operating and maintaining the existing battery system.

(iv) The current net cost of electricity at your site including connection, supply, operation and servicing, after deduction of any feed-in credit.

(v) This is the profit shared with the owner of the battery from the new facility. It is not part of the energy calculation.

(vi) The proposed net annual cost of electricity at your including profit share.

(vii) Estimated saving of our proposal, when compared to your existing situation.

Figure Two. Ten year host site energy analysis under a scenario where Council owns the battery and licenses its use to Indigo Power.

In this instance, the owner of the battery, who receives the licence fee, and the organisation who pays the electricity bills may be different. If this is the case, the cost savings to the organisation who pays the electricity bills will not be as great as Table Five, but reflect those in Table Four.

As Table Six below shows, the IRR for this site is slightly positive (1%). The proposed solar and battery system recovers the cost of the solar PV system over a ten year period. Figure Three provides a breakdown of the sharing of the financial benefit of the battery over a ten year period.

Table Six. Detailed profit and loss and cash flow analysis under option two, host site infrastructure ownership.

Community Battery Financials - Mount Beauty Stadium & Pool

Indigo Power

Income Statement	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Income:										
Wholesale export	$6,332	$5,911	$9,440	$6,262	$9,877	$20,741	$13,372	$16,839	$18,051	$21,069
Blocked Energy Import Block 1	$3,613	$3,781	$3,962	$4,012	$4,380	$4,596	$4,803	$5,047	$5,283	$5,514
Blocked Energy Import Block 2	$492	$522	$552	$569	$599	$633	$670	$711	$764	$787
Energy Import Off-Peak	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Import Peak	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Export	-$286	-$271	-$257	-$261	-$236	-$224	-$212	-$201	-$191	-$181
Certificates sold	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Grants	$27,540	$27,540	$27,540	$27,540	$27,540	$27,540	$27,540	$27,540	$27,540	$27,540
Ancillary services	$1,459	$1,392	$1,349	$1,271	$1,205	$1,141	$1,032	$925	$806	$683
Total:	$39,150	$38,874	$42,585	$39,393	$43,364	$54,427	$47,206	$50,861	$52,254	$55,413
Expenses:										
Network charges	$1,099	$1,190	$1,283	$1,211	$1,223	$1,143	$1,483	$1,523	$1,630	$1,733
Wholesale import	$726	$695	$820	$771	$772	$1,043	$1,199	$1,279	$1,685	$1,774
Operations - solar	$580	$606	$633	$662	$692	$723	$755	$789	$825	$862
Operations - battery	$2,000	$2,090	$2,184	$2,282	$2,385	$2,492	$2,605	$2,722	$2,844	$2,972

Insurance	$285	$298	$311	$325	$340	$355	$371	$388	$405	$424
Interest on Loan	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Depreciation	$20,840	$20,840	$20,840	$20,840	$20,840	$20,840	$20,840	$20,840	$20,840	$20,840
Total:	$25,531	$25,719	$26,072	$26,091	$26,252	$26,596	$27,253	$27,541	$28,229	$28,605
Gross Surplus/Deficit:	**$13,619**	**$13,155**	**$16,513**	**$13,301**	**$17,113**	**$27,832**	**$19,952**	**$23,320**	**$24,025**	**$26,808**
Indigo Power fee:	**$3,460**	**$3,227**	**$4,906**	**$3,301**	**$5,206**	**$10,566**	**$6,626**	**$8,310**	**$8,662**	**$10,054**
Net Surplus/Deficit:	**$10,159**	**$9,928**	**$11,607**	**$10,000**	**$11,907**	**$17,266**	**$13,326**	**$15,010**	**$15,363**	**$16,754**

All figures ex GST

Cash Flow	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Opening balance:	$0	-$58,541	-$55,313	-$50,406	-$47,106	-$41,899	-$31,333	-$24,706	-$16,396	-$7,733
Cash inflows:										
Grants	$275,400	$0	$0	$0	$0	$0	$0	$0	$0	$0
Loan	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating income	$11,610	$11,334	$15,045	$11,853	$15,824	$26,887	$19,666	$23,321	$24,714	$27,873
Total:	$287,010	$11,334	$15,045	$11,853	$15,824	$26,887	$19,666	$23,321	$24,714	$27,873
Cash outflows:										
Capital costs	$337,400	$0	$0	$0	$0	$0	$0	$0	$0	$0
Operating expenses	$4,691	$4,879	$5,232	$5,251	$5,412	$5,756	$6,413	$6,701	$7,389	$7,765
Indigo Power fee	$3,460	$3,227	$4,906	$3,301	$5,206	$10,566	$6,626	$8,310	$8,662	$10,054
Loan payments (principal)	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total:	$345,551	$8,106	$10,138	$8,552	$10,618	$16,322	$13,039	$15,011	$16,051	$17,819
Net cash flow:	-$58,541	$3,228	$4,907	$3,300	$5,207	$10,566	$6,626	$8,310	$8,663	$10,054

Closing balance:	**-$58,541**	**-$55,313**	**-$50,406**	**-$47,106**	**-$41,899**	**-$31,333**	**-$24,706**	**-$16,396**	**-$7,733**	**$2,320**

Internal Rate of Return	
Internal Rate of Return:	1%
Payback Period:	10 Years
Avg annual RoI:	10.0%

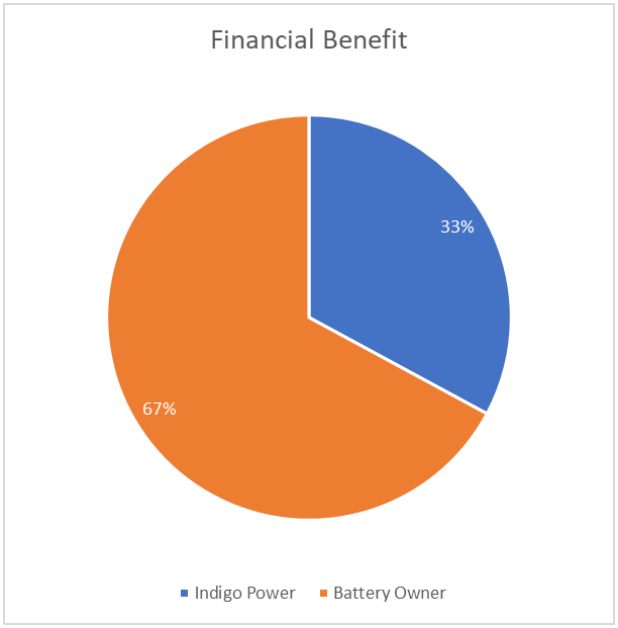


Figure Three: Expected distribution of financial benefit between the owner and operator of the facility over a ten year period.

Table Seven considers the relative performance of the whole site, considering the financial performance of the battery as well as expected cost savings. The IRR calculation presented in this table includes cost savings, and we refer to this calculation as the adjusted rate of return. The inclusion of cost savings means the adjusted rate of return is greater than the internal rate of return if there are host site cost savings across the ten year period. The adjusted rate of return is applicable if the owner of the battery facility and the organisation who pays the electricity bills at the site are the same. As the analysis shows, the adjusted rate of return is slightly positive at the site, reflecting the immaterial amount of cost savings.

Table Seven. The relative performance of the whole site under option two, host site infrastructure ownership.

Whole Site Analysis - Mount Beauty Stadium & Pool

Detailed Proposal		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Current											
Retail Supply											
- inflows		-$277	-$248	-$221	-$211	-$180	-$161	-$144	-$129	-$115	-$103
- outflows		$1,090	$1,139	$1,190	$1,244	$1,300	$1,358	$1,419	$1,483	$1,550	$1,620
Certificates											
- inflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- outflows		$681	$457	$430	$417	$435	$437	$0	$0	$0	$0
Network											
- inflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- outflows		$2,101	$2,195	$2,294	$2,397	$2,505	$2,618	$2,736	$2,859	$2,988	$3,122
Solar operation/maintenance		$381	$398	$416	$435	$455	$475	$496	$519	$542	$566
Battery operation/maintenance		$300	$314	$328	$342	$358	$374	$391	$408	$427	$446
	Total:	$4,276	$4,255	$4,437	$4,624	$4,872	$5,101	$4,898	$5,140	$5,391	$5,651
Proposed											
Retail Supply											

- inflows										
Blocked Energy Import Block 1		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Blocked Energy Import Block 2		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Import Off-Peak		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Import Peak		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Export		-$286	-$271	-$257	-$261	-$236	-$224	-$212	-$201	-$191	-$181
- outflows:										
Blocked Energy Import Block 1		$3,613	$3,781	$3,962	$4,012	$4,380	$4,596	$4,803	$5,047	$5,283	$5,514
Blocked Energy Import Block 2		$492	$522	$552	$569	$599	$633	$670	$711	$764	$787
Energy Import Off-Peak		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Import Peak		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Energy Export		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Certificates										
- inflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- outflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Network										
- inflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
- outflows		$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Less IP Payment		-	-	-$4,906	-$3,301	-$5,206	-$10,566	-$6,626	-$8,310	-$8,662	-$10,054
		$3,460	$3,227								
	Total:	$359	$804	-$649	$1,019	-$463	-$5,560	-$1,365	-$2,753	-$2,805	-$3,933
Net savings/cost:		**$3,917**	**$3,451**	**$5,086**	**$3,605**	**$5,335**	**$10,661**	**$6,263**	**$7,893**	**$8,196**	**$9,584**

Adjusted Rate of Return	
Adj Rate of Return*:	0.5%
Payback Period:	10 Years
Avg annual RoI:	10.0%

3.3 Results Discussion

The Mount Beauty Stadium proposal has the following characteristics:

- Indigo Power ownership of the system (Option One) delivers cost savings for the site, however, these are not as large as other sites due to the existing solar and battery system.
- The licence agreement (Option Two) has a slightly positive internal rate of return over a ten year period. The payback for the system would be ten years. The adjusted rate of return is also slightly positive. The small difference between these two rate of return calculations shows that cost savings for the site are not material.

Possible additional structural engineering costs have not been included in the financial modelling. These additional costs would make the financial case for the project challenging.

The existing solar and battery system at the site already creates some benefit for the host site. For this reason, the total site benefit for a proposed solar and battery system is not as large as other sites without an existing system.

In summary, the financial case allows for the installation of a solar and battery system at the Mount Beauty Stadium and Pool; it is positive but not strong. The non-financial benefits of the proposal are outlined in Section Four below.

4. Proposal Benefits

The proposed solar power and battery system would create the following benefits.

1. **Household benefits:** On an average day the battery system would use 30% of its capacity to supply on site load, with 70% used to supply of electricity to the Mount Beauty community across the evening peak. AusNet Services data shows that the average daily household consumption for the Alpine Shire LGA is 19 kWh[3]. The battery will export in the early evening to replace high emissions intensity electricity consumption at this peak demand time with near zero emissions electricity supplied from the solar and battery facility.[4] Our expectation is that export between the hours of 5 pm and 9 pm each evening will be the equivalent of the consumption of approximately 22 households across this period.[5] If Indigo Power operated the battery, the local community would be able to track its performance through our energy sharing software.

2. **Energy Resilience:** The operational modelling report shows that daily energy consumption totals for the combined stadium and pool site are bimodal. When the pool is not operating, typical daily consumption is 25 kWh, and when the pool is operating, typical daily consumption is 250 kWh. Only crucial circuits will be backed up with battery storage. For this reason, per day electricity consumption during an emergency

[3] See https://www.ausnetservices.com.au/electricity/network-information/energy-usage-data
[4] As the operational modelling report shows, the battery is primarily charged from zero emissions generation from the on-site solar PV system, although not entirely.
[5] Assuming one third of household daily electricity consumption occurs in this peak time.

power outage is likely to be towards the lower range of daily electricity consumption totals. If fully charged at the time of an emergency power outage, the battery could supply 25 kilowatt hours of electricity to the site each day for eight days (eight days of back up power).

3. **Environmental:** The battery will be controlled to charge predominantly from the solar PV system installed on site. The site is supplied with green energy through a power purchase agreement and additional emissions abatement will be primarily driven by the export of power to the community at peak demand times, when emissions intensity is high.

4. **Cost Savings:** The community battery facility would reduce the host site's electricity costs by at least 20%, depending on the operational model selected. Recent increases in the electricity prices are linked to increases in fossil fuel commodity markets. Greater dispatchable renewable energy generation reduces reliance on fossil fuels and could lead to long term savings for local households.

5. **Network Benefits:** The community battery would include advanced, microgrid enabled control technology to enable the delivery of network related support services should the opportunity arise. In the interim, the battery facility would export at peak demand times to the electricity grid, assisting with possible low voltage issues on the network.

6. **Innovation:** There are very few community battery facilities currently in operation in Australia. This proposal would establish the business case for the delivery of community batteries at council sites in regional Victoria.

5. Conclusion

This proposal provides options for the delivery of an additional 35 kW solar PV system and a 50 kW/200 kWh flow battery energy storage system is proposed for the Mount Beauty Stadium and Pool. The site has an existing 23 kW solar PV system.

The total cost of the system would be $337,400 but there may be an additional cost to improve the structural integrity of the roof to hold additional solar panels.

Two options are presented for delivery of the system. Indigo Power can build own and operate the system and lease the space to install the system from Council. This model does not require a capital contribution from Council. Alternatively, Council can choose to contribute the cost of the solar PV system and own the system themselves.

Energy savings for the site would be shared with the private operator of the pool under both commercial models.

Financial analysis assumes that government grant funding is available for 100% of the battery cost, but not the cost of the solar PV system.

Appendix One: Modelling Assumptions

Energy Flow Assumptions Table

Assumption or Input	Detail
Platform	Gridcog operational modelling Excel financial modelling
Inflation	4.5%
Load	Site meter data for a twelve month period within the previous 24 months. Assume load profile remains unchanged across time.
System sizing	System design and sizing is based on detailed site assessment from Indigo Power's qualified electrician and preliminary modelling in GridCognition.
Solar Generation	Solar system designed in the design platform Pylon. System details provided as input to Gridcog software. Generation profile based on system configuration and solar resource assessment and forecasting platform Solcast for the site's coordinates.
LGCs (if generation is greater than 100 kW)	LGC certificate generation based on solar generation modelling. Inflation-adjusted LGC price assumed is $44 in 2025, decreasing to $38 in 2026, $32 in 2027 and $0 at the end of the Renewable Energy Target in 2031.
Network tariffs	Site network tariffs are based on existing site network tariffs. CPI applied to network tariffs. It is assumed that the tariff structure and inflation-adjusted rates do not change.
Wholesale price	Forward curve from Endgame Economics (Q3 2022 Central Case) are applied. Forward curves do not incorporate negative spot prices.
FCAS	Previous 12 months contingency FCAS data used. The value inflow Indigo Power has been reduced to 25%[6] to derate the FCAS outcome in line with likely future reductions in FCAS prices.
System responsiveness	Gridcog modelling assumes perfect foresight, with the system performance perfectly responding to all price signals. A derating factor is incorporated in post-processing and applied to wholesale energy exports and imports, mimicking the imperfect foresight operation which will be achieved in

[6] FCAS earnings were derated in Gridcog, rather than post-processing, as the optimiser performs wholesale market-FCAS co-optimisation, meaning that the more lucrative option is chosen.

	practice. The wholesale export performance has been de-rated accordingly.
Environmental performance	A carbon price of $100/tonne based on average emissions factors has been applied to grid electricity to incentivise battery charging from on site solar and discourage charging from high-emissions energy overnight.
Retail rates	Baseline analysis assumes Indigo Power electricity retail tariffs for the 2023/24 financial year.
Solar and battery efficiency loss	Efficiency loss has been applied to solar and battery performance according to specifications provided by the supplier.
Battery depth of discharge	Specifications provided by the manufacturer on battery depth of discharge have been applied.

Financial Assumptions

Assumption or Input	**Detail**
Energy flows	Energy flows are provided as an output from the operational modelling performed in Gridcog
Grant amount	Grant funding for 100% of the battery capex is assumed. All other funding (solar capex) is provided as an investment from Indigo Power or from the host site under the licence agreement.
Grant funding amortisation	Grant funding contributions have been amortised over the life of the battery according to accounting standard AASB120, rather than treated as year one revenue.
Behind the meter power purchase agreement price	The sale of electricity to the host site from the solar and battery system will be through two rates, with two tiers. The first at a lower rate and the second at a higher rate. The first tier is for electricity consumed up to a kWh amount equivalent to the total size of the battery storage over the course of a day. The second tier is any electricity consumed in a day above this amount. Inflation is applied to PPA rates.
OPEX Battery	A battery opex cost of $1000 p.a per kWh battery installed is applied. Opex costs include monitoring and maintenance, control and aggregation fees, market access fees, and Indigo Power overheads for battery deployment.

OPEX Solar	A solar opex cost of $500 p.a. per 50 kW installed is to calculate solar opex. Solar opex costs include system inspection, maintenance and cleaning.
Insurance	Insurance of $2500 per 1 million of asset insured has been applied. Paid for by Indigo Power in the case of its ownership of the asset. Paid for by the host site in the case of its ownership of the battery and Indigo Power's licensing of the battery.
Network connection and fees	In both options Indigo Power assumes responsibility for the site meter. Network charges are absorbed by Indigo Power in both cases and are not passed on to the host site.
Lease costs	The cost for Indigo Power to lease the necessary area to host the solar, battery and associated equipment has been set to zero. Consideration for the lease is expected to be a low cost PPA rates.
Licence Fees	Indigo Power calculates licence fees based on the expected revenue potential of the battery, minus the cost of operating and maintaining the battery, minus an Indigo Power margin.
System lifespan and depreciation	Battery system 15 years. Solar PV system 25 years. Linear depreciation.

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