McCallum Disability Services

Solar PV Feasibility Study

May 2019

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Introduction

Feasibility Study Background

McCallum Disability Services (MDS), established in1953 as a non-profit organisation, delivers a range of services including accommodation, respite, day support, outreach, lifestyle options and supported employment across Ballarat and St Arnaud. McCallum provide a responsive range of programs and services to more than 300 people to maximise their opportunities in community life.

Like many other non-for-profit organisations with a large property portfolio, MDS has experienced considerable increases in the cost of electricity in recent times. The Community Power Hub has worked with Matt Vallance of MDS to investigate solar power options at McCallum Industries in Sturt Street, McCallum Linen and and a new residential site. The results have been very positive with compelling business cases. As a consequence, MDS was keen to undertake a feasibility study to determine the benefits of installing solar PV systems across the various facilities.

This study focuses on the potential for MDS to reduce its power costs through the installation of readily deployable solar photovoltaic (PV) systems and to redirect savings into providing services for people with disabilities. The study also highlights the environmental benefits associated with the reduction in greenhouse gas emissions.

The recommendations of this report are based on a review undertaken by the Community Power Hub (CPH) Ballarat to assess the solar PV options available to MDS.

Executive Summary

As part of the recommendations of a feasibility study, conducted by the Community Power Hub, an opportunity was identified for McCallum Disability Services to reduce energy costs and carbon emissions through the implementation of solar systems across nine suitable facilities including residential accommodation. In total there is the potential to install 80kW of solar generation.

More than half of the solar power generated will be consumed on site, maximising the return on the estimated capital investment of $98,600 as well as reducing power costs by $19,900 in the first year, based on current power tariffs. This represents at 30% reduction in power costs at the identified sites and more than $497,500 savings over the life of the project (25 years), which would be available to be reinvested to enhance disability services. Greenhouse gas emissions will be reduced by over 2,837 tonnes over the project lifetime.

This feasibility study will assist McCallum Disability Services to approach potential funding sources to implement the solar system proposal.

Solar Photovoltaic (PV)

Solar PV energy solutions are becoming increasingly common on residential and commercial sites around Australia as a means to reduce increasing energy costs and reduce greenhouse gas emissions. The capital costs of solar PV systems have dropped dramatically in recent years due to the very high uptake in Australia. Solar PV technology is a well-proven and readily deployable technology. The modular nature of solar PV makes for readily scalable solutions.

The electricity consumption of the major MCallum sites, as detail in the next section, were analysed by the Ballarat Community Power Hub. This feasibility study aims to establish the financial viability and benefits to McCallum of installing the proposed solar systems. The result of the analysis has proved compelling and is highly recommended as a solution to reduce energy costs and greenhouse gas emissions.

Power Consumption Details

MDS purchases its electricity through Momentum and Origin Energy. Detailed below are all twenty-two properties listed by respective annual electricity usage.

McCallum Property Details

Site Address	Comments	NMI	2018 kWh	Daily kWh	2018 Power Cost
[redacted]	McCallum Linen	[redacted]	191,625	525	38,727
	Admin		135,780	372	30,666
	McCallum Industries		52,925	145	12,503
	Accomodation (Govt. owned)		37,595	103	7,312
	Administration and day services		*32,040*	*87.78*	*8,539*
	Residential house		21,093	57.79	5,286
	Club Lowd - Day services		19,903	54.53	4,744
	Residential house (Govt. owned)		18,202	49.87	3,776
	Residential house		17,717	48.54	3,631
	Residential house		17,272	3.3	3,552
	Residential Units		15,928	43.64	4,244
	Residential Units		12,315	33.74	2,673
	Residential Units		11,972	32.8	2,612
	Residential house		11,435	29.7	2,971
	Laundromat		9,508	26.05	2,923
	Admin		8,019	21.97	2,394
	Residential Units		7,792	21.35	2,253
	Residential Units		6,139	16.82	1,577
	Residential Units		3,836	10.51	1,169
	Residential Units		3,650	10	1,136
	Residential Units		4,164	11.7	1,227
	Residential unit		1,263	3.46	806
		Totals	640,173		$144,721

The overall electricity consumption from 1st January to 31st December 2018 was 640,173 kWh at a cost of $144,721. Over half the consumption can be attributed to McCallum Linen, McCallum Industries sites and the administration building at 29 Learmonth Street. The energy usage figures are based on the half hourly interval data obtained through the power distributor Powercor and power costs from February 2019 power bills.

Power Tariffs

Details of the Momentum and Origin Energy electricity tariffs are below. These tariffs are based on the February 2019 power bills. Most of the small sites have a two-tier peak tariff and daily supply charge only. The tier 2 peak tariff applies once daily electricity usage exceeds 13.69 kWh. Four sites also pay an off-peak tariff, while 29 Learmonth Street also pays a summer demand charge. All tariffs identified have had the GST included.

McCallum Property Details

Site Address	NMI	Peak c/kWh (inc Discount)	Peak Step 2	Off Peak c/kWh (inc Discount)	Supply c/Day	Metering Charge C/Day	Demand Summer c/kW	Retailer
[redacted]	[redacted]1	22.396	19.217		157.476	251.647		Momentum
	4	24.035	23.23	14.058	443.22		135.85	Momentum
	9	22.3			173.42			Momentum
	0	24.519	23.683	11.231	135.212			Momentum
	7	*26.42*		*13.59*	*173.415*			*Origin*
	5	29.3601		15.554	144.12			Origin
	0	22.396	19.217		157.476			Momentum
	2	18.414	16.434		133.804			Momentum
	9	18.414	16.434		133.804			Momentum
	6	18.414			133.804			Momentum
	0	22.187			144.12			Origin
	3	18.414	16.434		133.804			Momentum
	1	18.414	16.434		133.804			Momentum
	2	22.396	19.217		157.476			Momentum
	8	26.855		13.535	173.415			Origin
	5	21.958			173.415			Origin
	1	22.165			144.122			Origin
	5	18.414	16.434		133.804			Momentum
	9	18.414	16.434		133.804			Momentum
	0	18.414	16.434		133.804			Momentum
	9	18.414	16.434		133.804			Momentum
	6	22.165			144.122			Origin

It should be noted a number of properties are paying relatively high tariffs in comparison to the overall property portfolio.

It is recommended MDS attempt to renegotiate tariffs with the existing energy retailers or seek an alternative less costly arrangement.

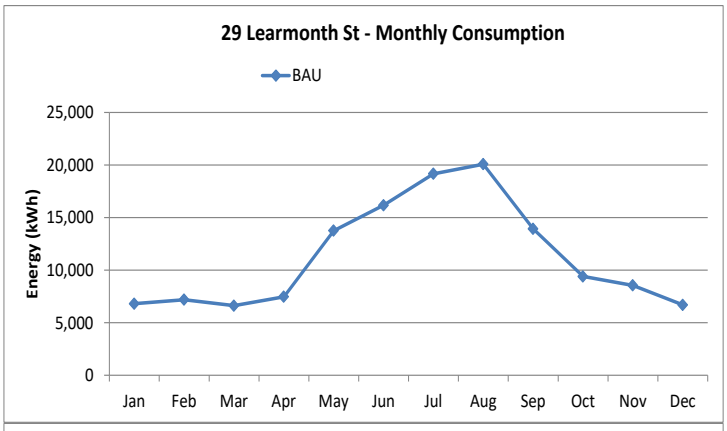
Site Specific Power Consumption

The Community Power Hub has presented McCallum with solar feasibility reports for McCallum Industries and McCallum Linen in 2018. In the case of McCallum Industries a 40kW solar systems was recommended and subsequent

grant funding from the Victorian Government has resulted in the system being installed in May 2019. A 99kW solar system was recommended for the McCallum Linen site, based on the continuation of the existing operations. This study will not therefore include the further recommendations and analysis of these two sites.

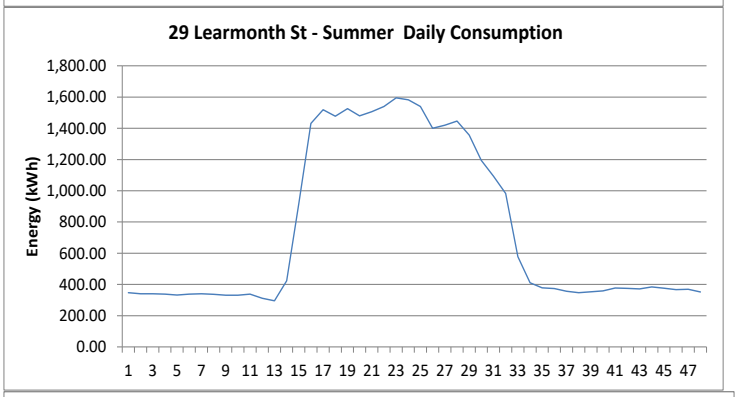
An analysis of the monthly and daily power consumption for the next three largest power consumption sites, namely 29 Learmonth Street, 1 Long Street and a St Arnaud residential site for the 2018 calendar is shown below:

29 Learmonth Street



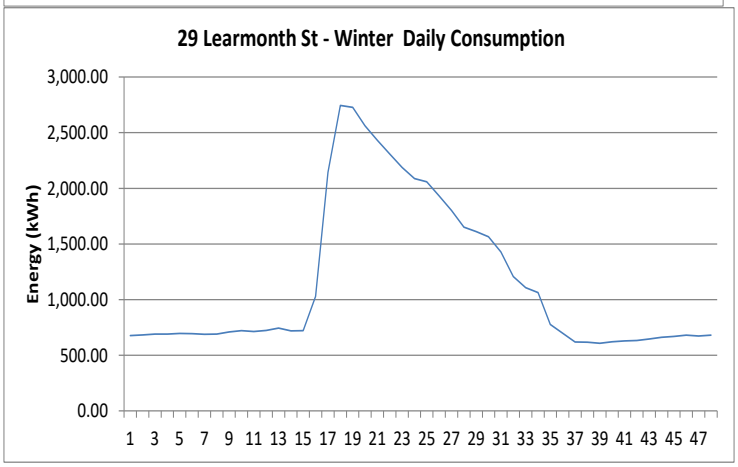
Monthly Power Consumption

Electricity consumption increases from April, peaks in July and August and fall through to October. This would be consistent with a greater reliance on reverse cycle air conditioners and heaters in the cooler months.



Summer Daily Power Consumption

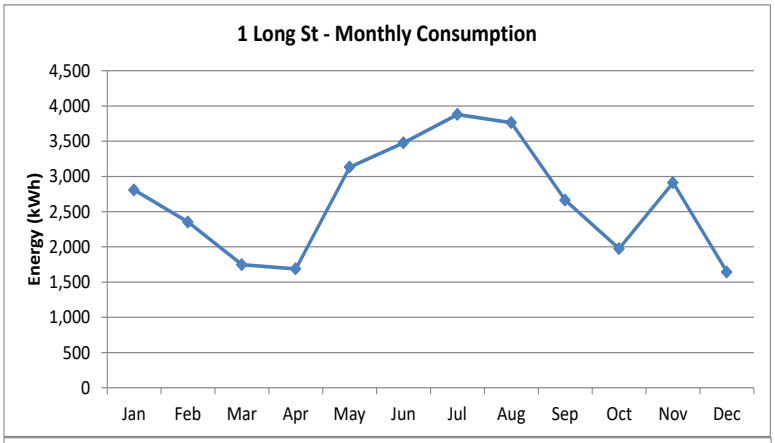
Electricity consumption increases from 7 am and peaks between 8 am and 3 pm and drop to a minimum after 5 pm. This is consistent with office type operations and suggests little reliance on cooling systems in the summer months.



Winter Daily Power Consumption

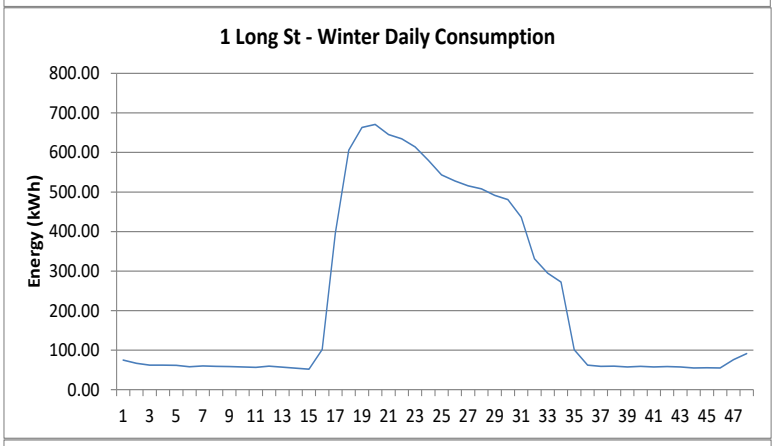
Electricity consumption increases from 8 am, peaking at 9 am and falling away gradually until 6 pm. It appears an initial reliance on heating systems at the start of the day, which drops off as the office warms up. This is indicative of an automatic temperature control system being used to control heating systems.

1 Long Street, St Arnaud



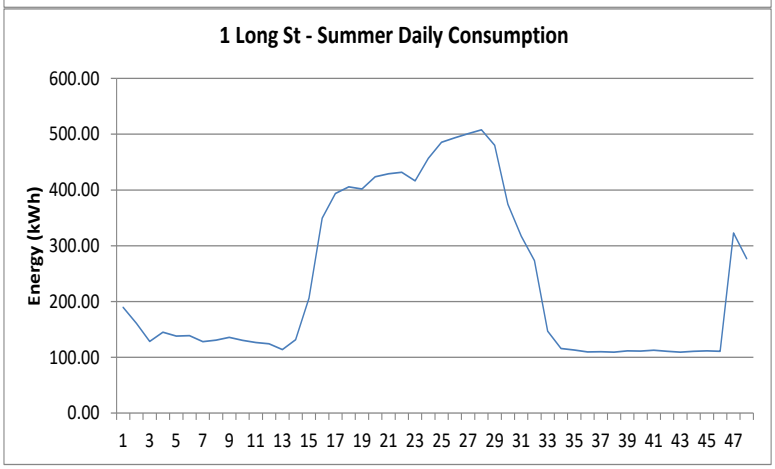
Monthly Power Consumption

Electricity consumption increases from April, peaks in July and August and fall through to October. There is also higher consumption from January and February. This would be consistent with a greater reliance on reverse cycle air conditioners and heaters in winter and cooling systems in summer.



Winter Daily Power Consumption

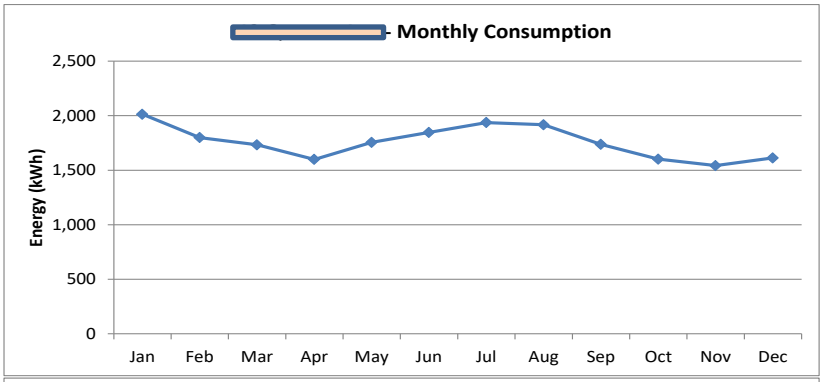
Electricity consumption increases from 8 am and peaks at 9 am and falls away to low levels by 6 pm. . It appears an initial reliance on heating systems at the start of the day, which drops off as the building warms up.



Summer Daily Power Consumption

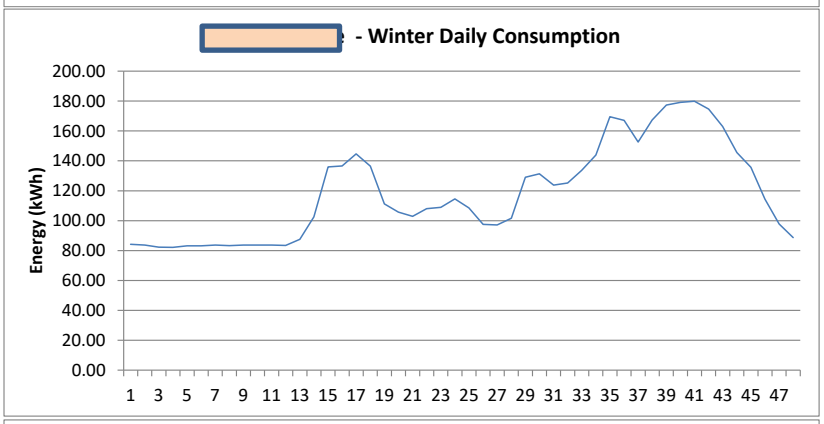
Electricity consumption increases from 7 am to 8 am and gradually peaking at 3 pm and falling away gradually until 5 pm. This is consistent with office type operations and increasing reliance on cooling systems as the day and building warms.

Residential Site, St Arnaud



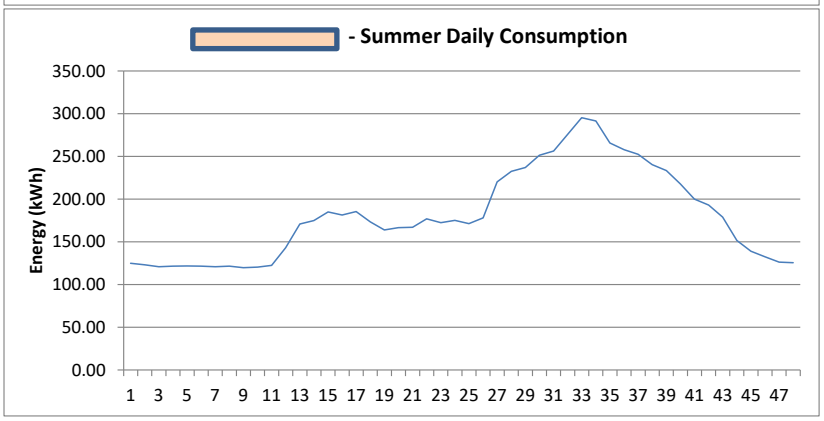
Monthly Power Consumption

Electricity consumption is relatively consistent throughout the year, dipping in autumn and spring. This would be consistent with the activities of a respite centre.



Winter Daily Power Consumption

Electricity consumption increases from 7 am and peaks at 8 am around breakfast then gradually rises again from 10 am peaking again at 6 pm. It appears an increasing reliance on heating systems during falling away post 9 pm.



Summer Daily Power Consumption

Electricity consumption increases gradually from 6am through to 5 pm and gradually falling during the evening. This is consistent with an increasing reliance on cooling systems as the day and building warms.

Solar PV Opportunity Analysis

Of the twenty-two McCallum sites, a new Ballarat residential site and 1820 Sturt Street have been subject to earlier feasibility studies and will not be further analysed in the study. Tow Ballarat residential sites are government owned facilities and therefore will not be considered for solar assessment in this study.

Thirty-minute interval data for calendar year 2018 obtained from Powercor was analysed using the Sunulator program, developed by the Alternative Technology Association, to determine the feasibility and optimum size for solar PV systems on all McCallum sites. This program was used to model solar systems and system size based on suitable, available roof space and power consumption profiles.

Analysis of this data has highlighted that a Ballarat residential block of units have relatively low power consumption and consequently the financial pay back period is a minimum of 9 years. In addition these units have limited capacity to install solar arrays on the roof structure, which is further hampered by the existing solar hot water collector panels. As a result this site will not be further considered in this assessment.

Solar system sizes under 100kW generate Small Scale Technology Credits (STCs) under the federal Renewable Energy Target for every megawatt hour of energy produced at each power meter. These credits are effectively a rebate to the solar system purchaser, which is passed on as a discount by the solar system supplier. The STC's price varies on a daily basis. With the increased roll out of renewable energy capacity across Australia it is anticipated the price will reduce from the current price of $36.00, effectively reducing the system discount over time.

Site visits were undertaken to confirm the suitability of the roof surfaces for solar installations. The information obtained in these visits was subsequently compared to the aerial photography obtained from the Nearmap GIS program. Pre approval was also obtained from Powercor for the connection of solar systems to the power grid.

The preliminary analysis of potential solar systems on each of the remaining McCallum sites, including potential power cost savings are detailed in the table below:

Solar Array Options

Site	Proposed System Size	Yearly Power Cost	Power Cost Saving	CAPEX	Solar Self Consumption	Payback Years	Powercor Approval	Comments
Learmonth St	30kW	$30,661	$7,696	$34,000	68.00%	5	30kW	North direct on roof
1 Long St St Arnaud	15kW	$8,539	$3,851	$22,600	53.00%	7	15kW	North on tilt frames
	5kW	$5,286	$1,575	$6,000	75%	4	5kW	North direct on roof
	5kW	$4,744	$1,177	$6,000	60%	6	5kW	North direct on roof
	5kW	$3,631	$951	$6,000	62%	7	5kW	E/W direct on roof
	5kW	$3,552	$963	$6,000	64%	7	5kW	E/W direct on roof
	5kW	$4,233	$1,537	$6,000	58%	6	5kW	North on tilt frames
	5kW	$2,673	$909	$6,000	50%	8	5kW	Inappropriate roof
	5kW	$2,612	$906	$6,000	50%	7	5kW	Inappropriate roof
	5kW	$2,971	$1,105	$6,000	53%	6	5kW	NW direct on roof
	5kW	$2,923	$1,380	$6,000	57%	5	5kW	Shaded and limited roof
	5kW	$2,394	$1,046	$6,000	51%	7	5kW	E/W direct on roof
	5kW	$2,253	$1,012	$6,000	29%	7	5kW	Inappropriate roof
	5kW	$1,577	$826	$6,000	27%	9	5kW	Inappropriate roof
	5kW	$1,277	$861	$6,000	27%	9	5kW	Inappropriate roof

Solar System Recommendations

It is recommended to consider installing solar systems across the remaining nine McCallum sites as detailed below.

Recommended Solar Arrays

Site	Proposed System Size	Power Cost Saving	CAPEX	Payback Years	IRR	NPV	LCoE
29 Learmonth St	30kW	$7,696	$34,000	5	22.50%	$89,943	6.6
1 Long St St Arnaud	15kW	$3,851	$22,600	7	16.00%	$37,344	8.2
[redacted]	5kW	$1,575	$6,000	4	26.50%	$19,917	6.5
	5kW	$1,177	$6,000	6	19.00%	$12,532	7
	5kW	$951	$6,000	7	14.70%	$8,793	7.7
	5kW	$963	$6,000	7	14.90%	$8,989	7.7
	5kW	$1,537	$6,000	6	18.40%	$11,932	7
	5kW	$1,105	$6,000	6	17.60%	$11,189	7.2
	5kW	$1,046	$6,000	7	16.40%	$10,192	7.7
Totals	80kW	$19,901	$98,600				

The total capital investment for the nine sites amounts to $98,600 investment with the potential to reduce power costs by $19,900 in the first year based on existing power tariffs. This represents at 30% reduction in power costs for these sites. This amounts to in excess of $497,500 savings over 25 years.

The solar systems could be installed in phases over the next few years, which would enable funding to be raised and allocated over a period.

Assumed System Costs

An indicative system pricing to inform costs has been obtained from the Solar Choice website at:
http://www.solarchoice.net.au/blog/category/installation-advice/solar-system-prices-2/

These prices are based on the February 2019 average Melbourne commercial solar systems installed prices allowing for the discount of STC's. It is recommended that McCallum undertake a tender process requiring three quotes to establish actual prices, which will impact on the financial outcomes of this project and will ensure the best price as the solar system supply and installation market is very competitive.

Financial Results

The sum of cash flows discounted at a rate of 2.5% indicate the nine solar systems would pay back the initial investment over 5 to 7 years if McCallum were to fund the systems from its capital expenditure budget.

The discount rate assumed for the financial calculations above is 2.5% and the Net Present Value (NPV) is calculated over 20 years.

The internal rates of return (IRR) ranging from 14.7% to 26.5% for the solar PV systems are extremely attractive, based on current power tariffs. Likewise, the greater the funds raised through grants and community funding programs, the shorter the payback period and the higher the internal rate of return.

The capital expenses allow for the supply and installation of the proposed solar systems. The financial results have been derived from the analysis undertaken using the Sunulator analysis program, described earlier. The analysis allows annual cleaning of the solar panels and the replacement of inverters after ten years and solar panel after thirty years.

The Levelised Cost of Energy (LCOE) estimates the overall cost of generating electricity from the solar system per kWh. This is useful to compare against other projects, and also against retail electricity costs per kWh. This is calculated by dividing total generation over the financial horizon by the total up-front and capital costs for the project, discounted by the 2.5% discount rate. Costs include both the up-front system cost and equipment replacement costs. The LCOE for the new solar systems ranges from 6.5 to 8.2 c/kWh and compares very favourably with the existing electricity tariffs of 18.4 to 22.5 c/kWh, which is likely to increase over time.

Connecting to the Power Grid

The installation of solar PV arrays is subject to the approval of the power distribution network provider. which is Powercor in Western Victoria. Pre-approval has been granted at each site by Powercor to the level indicated earlier in this study. Powercor approval can change over time based on changing constraints on the electricity grid. Further approval should be sought just prior to any intended solar system installation.

Environmental Benefits

The installation of Solar PV systems on the nine McCallum sites will reduce the use of power derived from fossil fuels and reduce annual greenhouse gas emissions as detailed below:

Overall System Size	80kW
Tonnes $C0_2$ emissions reduction	113.5
Equivalent no of cars off the road	32.7

Over 25 years this equates to a reduction of 2,837 tonnes in greenhouse gas emissions.

Social License

Social license is an important and powerful lens through which we frame trust. Social license acknowledges the active role that people, and communities, can play in granting ongoing acceptance and approval of how companies and industry sectors conduct their business.

A key driver of social license, and the successful delivery of a project, lies in whether people see the project as creating benefits and delivering shared values from an economic, demographic and social perspective. It is about not being seen to do the right thing but actually doing it.

Engaging and partnering with communities early in a project is critical and will be vital to informing and gaining community support and financial backing for the proposed solar project. This includes communicating a clear understanding of how the project will benefit the community by delivering improved community services that can cater for regional needs.

Community, social and economic impacts

The savings in energy costs the project will accrue over its life will be significant. The savings will be directed to enhancing McCallum's disability services, thereby strengthening the local community.

The Perceptions of Climate Change report by Sustainability Victoria has identified the majority of Victorians support the increased uptake of renewable energy and taking action to reduce greenhouse gas emissions in order to take action on climate change.

Project planning and heritage impacts

The project is limited to installation of PV panels on existing roofs. The proposed PV installations are on contemporary buildings, rather than buildings identified as being of heritage significance and no negative impacts on neighbourhood amenity have been identified.

In today's society, rooftop installed photo voltaic panels are considered by the majority of people as a normal and integral part of domestic, commercial and institutional contemporary architecture.

Conclusion

The solar PV options outlined in this report present a strong business case for implementation, with significant savings given sector wide increases in power costs. If fully implemented, the project would represent a total investment of $98,600, with a saving of $497,500 in power costs and a reduction in greenhouse emissions by 2,837 tonnes over twenty-five years. The savings achieved can be directed to enhancing disability services to the benefit the local community.