

**COMMUNITY BATTERY DESIGN BRIEF
MYRTLEFORD REC RESERVE & SHOWGROUNDS**

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1. Scope

1.1. Project objectives

Indigo Power is funded to prepare analysis for the delivery of community batteries, energy nodes and EV charging facilities at Alpine Shire Council sites. A focus of the project is to provide community sites with backup power to improve energy resilience.

The project seeks to deliver all necessary information to support applications to appropriate grant funding streams, including the 100 Neighbourhood Batteries Program (100NB). This Design Brief meets the objectives of this funding program.

1.2. Design Objectives

Recommend system design and costing based on the site Preliminary Modelling Report and existing site infrastructure. This Design Brief is intended to provide detailed information on system design and costing.

2. Site Overview

2.1. Maximum solar PV capacity

The site has the capacity to host 270 kW of solar on 25-degree tilt frames (used to improve consistency of generation across seasons). However, the cattle pavilion has issues with the structure and the sub mains supplying the pavilion and because of this we will not be installing on this building. Therefore, we believe the current capacity of the site is 185KW. We propose to install all panels on stadium roofs on tilt frames and all panels on the Richardson Pavilion to be flat laid with half facing east and the other half facing west.

2.2. Electrical infrastructure and limitations

The site connects directly to a 1000kva transformer. The switchboard is presently capable of 300 A for the Showgrounds and 100 A for the Stadiums. This switchboard could be replaced to any size up to 1200 amps per phase. The Richardson Pavilion has 16mm mains going to an 80-amp 3 phase switchboard. The Stadium has 50mm mains heading to a 100-amp 3 phase switchboard. At this present point of time the Cattle Pavilion has 16mm mains which would be too small to accommodate solar due to the distance of sub mains and volt rise issues, because of this we will not be installing on this building. We therefore expect to be able to export all of the 150kW capacity of this system at any one time from any solar and battery system.

The site already has existing solar and battery installed, the final panel design will be done at a later date to make sure these system's are incorporated into the final design. Integration with the existing solar and battery doesn't appear to pose a problem at this stage.

The site would need to be an AC coupled system due to the fact that a battery of that size from Redflow requires Delta inverters which are an AC coupled option only. Redflow offer no DC coupled option for a battery of this size. We will also be installing on multiple buildings meaning an AC coupled option is more economical. The main switchboard will need to be replaced and upgraded to a 500amp switchboard.

2.3. Preferred output as suggested by modelling

From these results, we would recommend 600 kWh of battery storage be paired with the preliminary solar system design that incorporates some flat and some tilt frames.

We suggest that this system can be further augmented with a stage two expansion of the original system. This would include additional Redflow battery modules and upgrades to the Cattle Pavilion to accommodate the installation of additional solar at this site.

3. System Design

3.1. Recommended System

3.1.1. System Summary

Solar PV Size	160kW additional
Solar PV Brand	Tier One (Tindo, SunPower, Hyundai, Jinko)
Battery Size	150kW/600kWh
Battery Brand	Redflow
Inverter Size	2 x 100KW
Inverter Brand	Delta
Control Device	Mondo Ubi
Electrical infrastructure	500-amp Three Phase supply
Grid Connectivity	Connected directly to a 1000kva transformer

3.1.2. Site Battery System Details

The recommended battery technology is three Redflow 50kW/200kWh Energy Pod's with,

- 20 x ZBM3 Flow Batteries
- Redflow Pod Battery Enclosure.
- Electrical system including Battery Management System.
- Redflow heating system.

This system will be coupled with 2 x 100kW Delta Hybrid Inverter.

Battery decibel rating is low at no more than 40dB.

3.2. Technology

3.3.1. Battery Technology

Indigo Power has a preferred supplier list of battery manufacturers. For projects that have an energy resilience focus we prefer flow batteries as they are long duration and have an electrolyte that is not volatile and flammable. Redflow batteries are our current preferred supplier of flow battery technology.

Redflow battery is the world's smallest and most scalable, commercially available, zinc-bromine flow battery. Zinc and bromine are both readily available resources. Redflow are one of the most environmentally friendly energy storage solutions in the world, their batteries are fully recyclable and manufactured from widely available, low-toxicity materials. Redflow

energy storage technology is scalable, from tens of kilowatt hours to hundreds of megawatt hours to suit your energy storage needs. The batteries are ideally suited for extreme conditions and can operate without additional cooling or heating and with no degradation from 10 degrees Celsius to 45 degrees Celsius. For locations where the battery temperature will fall below 10 degrees Redflow provide an inbuilt heater pack for the battery. For a Redflow Pod200 (50kW/200kWh) battery the running power draw is around 1.4kW. The heater pads are thermostat controlled based on electrolyte temperature, so they build up heat until the electrolyte reaches the correct threshold and then switch off again. Redflow is an Australian company, and their battery is suited for Australian conditions. Redflow offer up to a 10 year / 36,500 kWh warranty via an optional long term service agreement.

3.3.2. Control Technology

Mondo's Ubi platform can implement its own stand-alone DER optimisation or connect to a third party for an integrated approach depending on the objective. The Ubi platform integrates with the local grid and the local grid operator, thereby supporting network support functions. For example, the Ubi follow instruction from a Distribution Network Service Provider (DNSP) to reduce or increase voltage in real time. Near real-time data can be pushed back to the DNSP for monitoring and adjusting voltage if required. We recommend Ubi technology for those interested in network support capability.

Mondo has proven, current capability in:

- Demand peak lopping
- Wholesale arbitrage – scheduled and unscheduled
- Behind the meter energy generation and use optimisation
- Distributed energy resource scheduling
- Implementing dynamic operating envelopes published by a DNSP
- Responding to high voltages by exporting reactive power
- Selecting and grouping assets to provide a service
- FCAS controller (monitoring and proportionally responding to frequency deviations when enabled)

Mondo's Energy Management Platform has a mature monitoring and control capability including forecasting of system operation and near real time monitoring.

3.2.3. Solar PV

There is a preference for 'tier one' products, companies with Australian presence and the use of Australian-made components that meet quality standards, where available. The selection of solar PV panels is required to have high human rights standards, excluding the use of forced labour, human trafficking, and slavery (including child labour) in their manufacture.

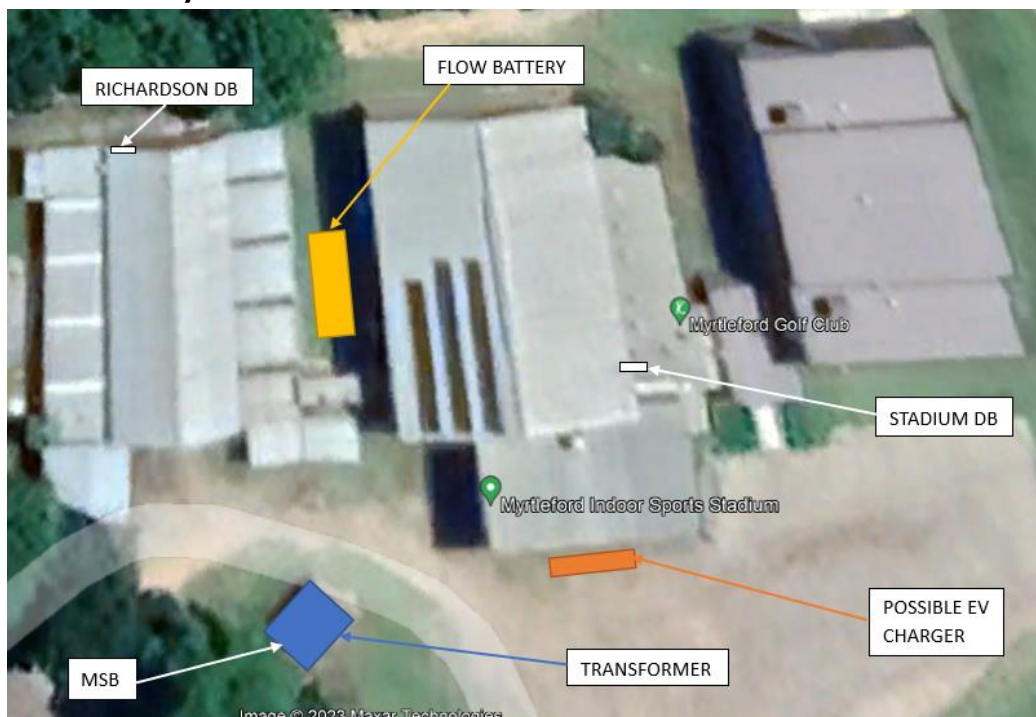
3.4. Design Layout

3.4.1. Solar PV layout



Solar PV does not consider the installation at the site, which has been installed following site inspection. However, PV design can easily be adjusted to accommodate this existing system.

3.4.2. Site layout



The dimensions of the proposed battery are:

- Height: 2.23m
- Width: 8.0m
- Length: 2.9m

Redflow batteries are a containerised unit and can be padlocked to ensure the safety of the site is maintained. No cages or bollards are required to protect the battery or to restrict access.

Battery placement is based on the applicable standard (AS5139). In summary, the standards state that a pre-assembled integrated battery energy storage system shall not be installed:

- a) Within 600mm on any exit, window, door, an appliance, in access walkways or evacuation routes.
- b) Within 900mm below any of the above.
- c) Against a wall where there is a habitable room on the other side unless the wall is of a suitably non-combustible barrier, or there is a non-combustible barrier between the wall and the battery. A surface or barrier material is considered suitably non-combustible if the material is deemed to be not combustible when tested in accordance with AS1530.1. The following are considered non-combustible and do not need to be tested: brick or masonry block, concrete, compressed cement sheeting, ceramic or terracotta tiles.

3.4.3. Structural considerations

No observed roof or building structural issues have been identified on the Stadium or the Richardson Pavilion. The Cattle Pavilion appears to be very old, timber battens throughout. The building would need assessment and most likely the roof and battens replaced, because of this we will not be installing on the Cattle Pavilion.

3.5. Health, Safety and Compliance

If delivered by Indigo Power, delivery would follow our Health, Safety and Wellbeing Policy and all associated procedures for all work undertaken.

Indigo Power's typical project management approach includes:

- Employee and contractor induction
- Employee and contractor license and certification recording
- Site walk-through
- Safe Work Method Statement (SWMS)
- Job Safety Analysis (JSA)
- Daily toolbox meetings
- Site contractor check-in/out
- Traffic management plan and implementation, as required.

For delivery and operation of the system the following standards apply:

- AS4777: Grid connection of energy systems,
- AS5033: Install and safety of PV arrays,
- AS3000: Electrical installations,
- AS4086: Secondary Batteries for PV,
- AS5139: Electrical installations - Safety of battery systems for use with power conversion equipment
- AS1170 Wind loading PV mounting

4. EV Charging Addition

The Alpine Shire Council has requested information to support the possible installation of an EV charging facility at the site.

4.1. Technical Considerations

This site could host a 50 kW EV charging facility.

The EV charging facility would be supplied from the behind the meter solar and battery system. A sub meter could be installed after the primary site meter and before the EV charger to account for all energy consumed at the EV charger. This would offer Council the option of having the solar and battery system and the EV charger managed separately.

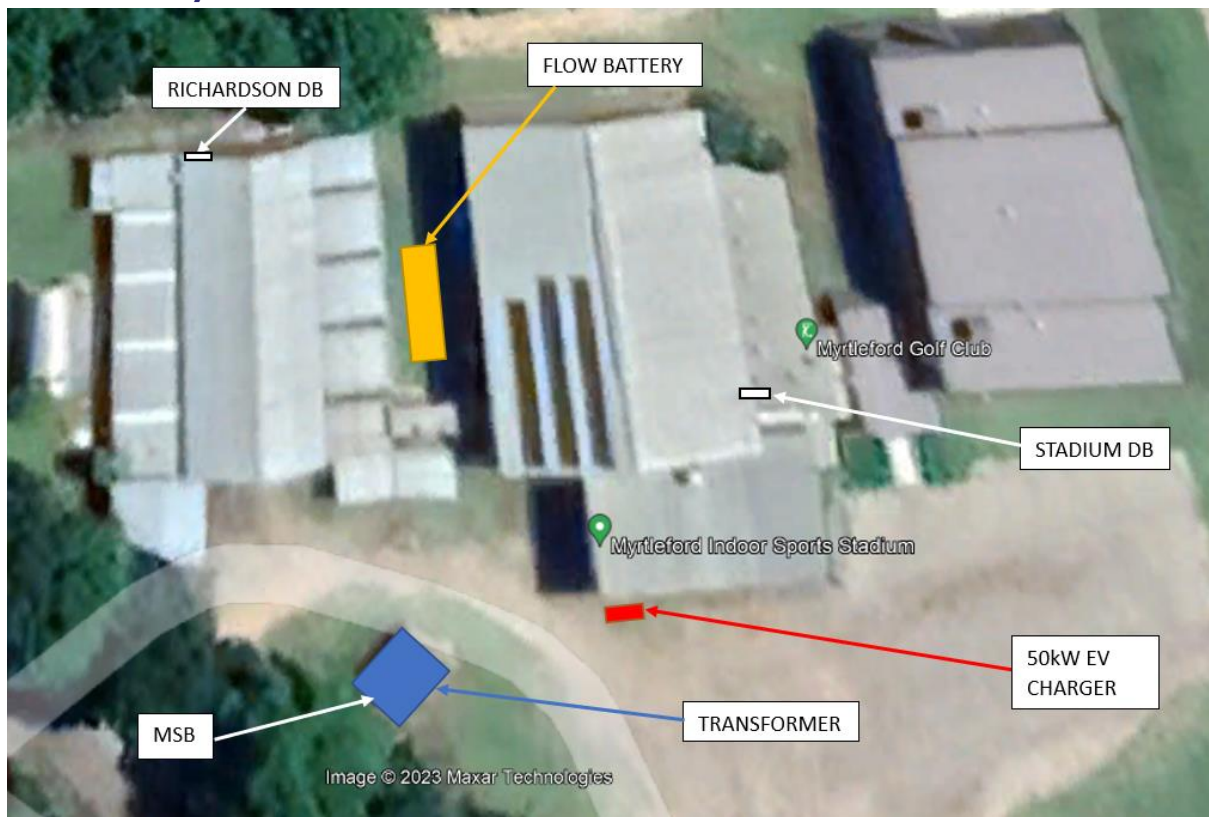
The EV charger could provide EV drivers with competitive charging rates given its access to onsite renewable energy.

4.2. Fee Estimate

Our fee estimate for the delivery of a 50 kW charger is \$75,000 ex GST. This cost includes:

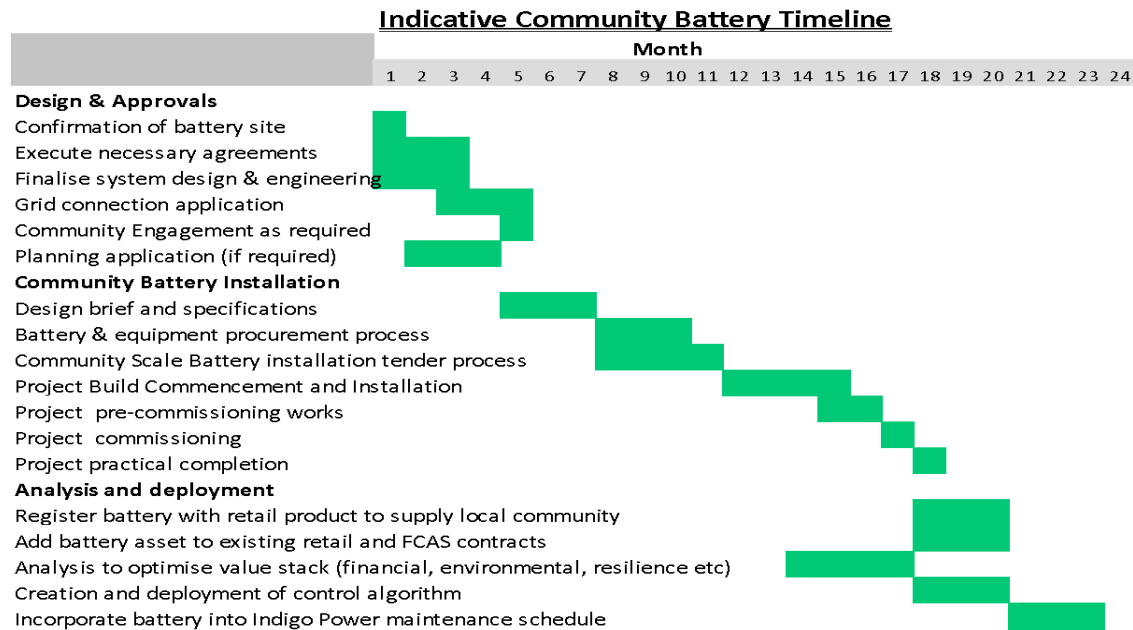
1. Design and electrical engineering
2. Project management of installation
3. Procurement of charger
4. Installation and commissioning
5. Supply and install metering
6. Civil and site works including traffic bollards, concrete foundations for the charger, line marking
7. Travel

4.3. Site Layout



5. Delivery Plan

Delivery of a community scale battery can take up to 24 months from planning and approvals, through procurement which can take upwards of six months, all the way through to designing the correct control algorithms and deployment for wholesale and FCAS exposure. A typical project management timeline is presented below.



5.1. Indicative Delivery Costs

Task	Description	Cost estimate
Civil Works and Structural Engineering	The site requires a full assessment by a structural engineer.	\$54,000
Battery installation	Procure the battery, contractor installation of the battery and connect to the MSB.	\$737,400
Solar PV installation	Panels, inverters, racking, feet.	\$259,200
Switchboard	Replacing the MSB with 500a capacity	\$30,000
Engineering and connection fees	Connection fees, Mondo UBI, SLD's, Grid application.	\$12,600
TOTAL		\$1,093,200

All delivery costs exclude GST. EV charger costs would be in addition to this fee.

Once completed this project will generate LGCs. These LGCs have not been factored into the price above. Due to the solar installation being greater than 100kW this site will not qualify for STCs and therefore STCs have not been factored into the installation cost.

6. Project Risks

Project risks are described in the Table below.

Risk	Likelihood	Impact	Impact Rating	Mitigation
<i>Details of potential occurrence</i>	<i>Rare, Possible, Very likely</i>	<i>Details of potential consequences</i>	<i>Mild, Moderate, Severe</i>	<i>Steps to reduce likelihood and/or impact of risk</i>
Complex site ownership or leasing agreements	Likely	Many community sites have complex ownership and/or leasing arrangements with many stakeholders involved. It may be impossible to secure the agreement of all parties. It may also be impossible to avoid complicated legal/commercial arrangements.	Moderate	Engagement of all site stakeholders early in the project, identifying any complexity or key concerns. Flexibility in legal drafting to accommodate different site ownership and leasing arrangements.
Adverse network tariffs	Possible	Battery would need to operate under the existing tariffs. Current tariffs typically prevent charging from grid. With generation on site this risk is controlled to a large degree.	Low	Installation of sufficient generation behind the meter (on site).
Site Suitability	Rare	The project uncovers problems with the site.	Severe	Full site assessment has been carried out. All important stakeholders have been consulted. This risk has been controlled to a large degree. However, in a worst case scenario, consideration can be given to other opportunities in the local region. Indigo Power can identify and assess alternative on site options and host sites quickly.
Connection application results in undersized import/export limit	Possible	The distribution network service provider may impose an export limit, preventing the optimal amount of export from the site. This would impact ongoing project revenue.	Mild	Inspection of existing infrastructure controls for this risk. Should the grid application impose export limits the system can be resized.
Health and safety and environmental impacts	Rare	OHS	Mild	The Project would adhere to all relevant regulations and to Indigo Power's Health and Safety Policy. Reputable firms will be selected from Indigo Power's preferred supplier list, all with appropriate qualifications and experience in the energy sector and with appropriate health and safety arrangements in place.

Integration with existing infrastructure	Possible	Existing electricity generation and storage infrastructure, switchboards, cabling etc can complicate a project and impact the delivery of the project through either increased cost or time delays.	Low	Site inspection has been carried out and largely controls this risk. Any upgrades or integrations have been costed.
Slippage in timelines	Possible	Time Delay	Mild	Regular updates to host site and stakeholders. Creation of a project specific timeline prior to project commencement.
Cost overruns	Possible	Budget Impact	Moderate	Identify cost risks early and throughout the project
Changes to Project Management personnel	Possible	Human Resources	Moderate	Indigo Power is a well-established business with stable staffing. All decisions made by project management personnel would be recorded to address the risk of staff changes.
Lack of community support & project understanding	Rare	Community or users of the site oppose the project.	Mild	Clear and regular communications through all channels. This is a very low risk given Indigo power's relationship with community energy partners. The Project would support a program of extensive stakeholder and community engagement during the project.
Contractor availability	Possible	Time Delay	Moderate	Early scheduling; tender release
Finalisation of commercial agreements	Possible	Community batteries are being delivered under new commercial models. It may take time to agree and sign the necessary commercial agreements. This can cause time delays.	Mild	Early engagement and discussion of the likely agreement terms. Indigo Power has developed standardised agreements to facilitate agreement between project proponents.
Community battery: stock availability	Possible	Time Delay	Moderate	Early scheduling; tender release and manufacturer engagement
Failure of battery technology	Possible	Unable to deliver project objectives.	Mild.	Maintenance schedule.

7. Decommissioning and disposal plan

Redflow batteries have a net zero-dollar recycling cost at end of life. This is due to the electrolyte in the battery still being valuable and reusable at end of life. Redflow are setting up a decommissioning centre for all their batteries once end of life has been reached. The only costs involved will be removal of the battery pods and freight to Redflow's depot in Melbourne Victoria.

A battery is determined to be at its end of life if there is a failure of hardware or componentry that renders the battery unusable. If the battery is under warranty, it will be replaced under the manufacturer's warranty program at no cost to the customer. The faulty battery is then sent back to the manufacturer for refurbishment.

There are also several specialised battery recyclers that can be contacted on the Australian Battery Recycling Initiative website. Below are some examples of battery recyclers located in Australia (current as of January 2023):

- Ecoactiv (<https://www.ecoactiv.com.au>)
- Ecobatt (<https://www.ecobatt.net/>)
- TES-AMM (<https://www.tes-amm.com>)
- Envirostream (<https://envirostream.com.au/>)
- Renewable Metals (<https://www.renewable-metals.com/>)
- The Activ Group (<https://activgroup.io/>)

8. Maintenance

Indigo Power can include ongoing maintenance and inspections as part of any site lease or battery licence agreement.

A maintenance plan would have the following objectives:

- System reliability, especially across the summer months to ensure site power supply during an emergency.
- Optimised system efficiency and performance on a day-to-day basis and ensuring low downtime.
- Ensuring safety systems are functional.
- Maximising system lifespan.
- Maintenance of product and workmanship warranty, which requires maintenance on a regular basis.

Included in the maintenance of the community batteries and solar PV systems would be the following:

- Inspection of the solar panels annually to determine whether cleaning is required.
- Desk-based monitoring of battery system functioning and performance. This includes checking solar generation, adequate charging of batteries, and battery state of charge.
- Standard testing of system operation including shutdown, voltage, current and general operation in line with Clean Energy Council (CEC) guidelines.
- Onsite inspection of electrical components annually including battery inverters, switches, isolators, earthing and inspection associated safety and fire suppression alert equipment.
- Identifying any worn or damaged components including cabling, solar panel mounting gear, switches. Repair and replace accordingly.

9. Appendix

9.1. Site electrical infrastructure

Detailed photos of site electrical infrastructure can be found at the below link.

https://drive.google.com/drive/folders/1knuPLW5b3VNTSj17vh5dekNu6oaKF8Qz?usp=share_link

9.2. Site structural and layout photos

Detailed photos of structural building integrity and proposed layout locations can be found at the below link.

https://drive.google.com/drive/folders/1koi89Ys4qOO9YIPmpok032-lczUySOkX?usp=share_link

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