

The General Manager
MidCoast Council
PO Box 482
Taree NSW 2430

Dear Sir,

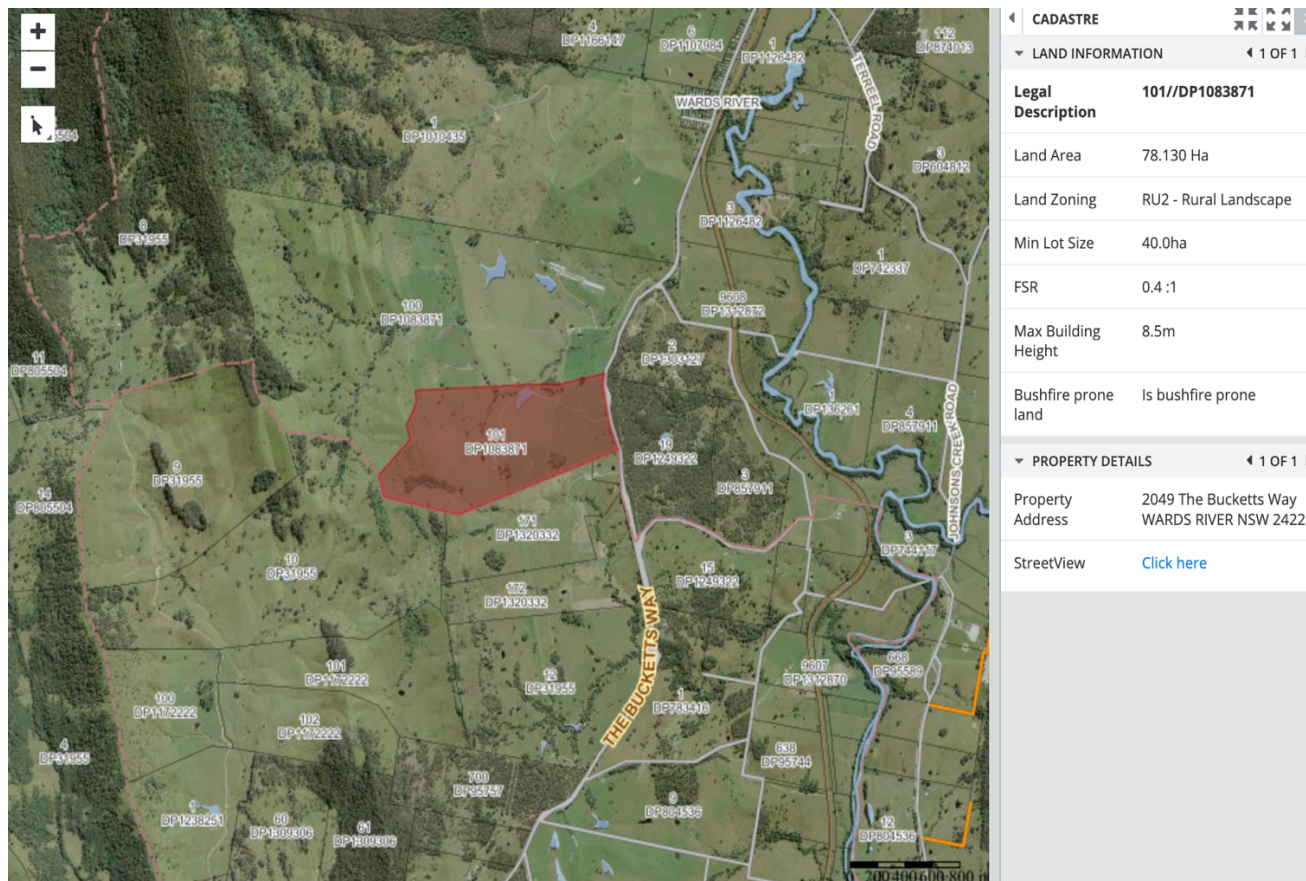
SUBJECT: STATEMENT OF ENVIRONMENTAL EFFECTS
PROJECT: STORAGE BATTERY UNITS X 4 AND ASSOCIATED EQUIPMENT

1. Introduction

This Statement of Environmental Effects (SEE) has been prepared to accompany a Development Application for a Storage Battery Units x 4 and associated equipment at 2049 The Bucketts Way, Wards River (Lot 101 DP 1083871). The site of the proposed development is shown in **Figure 1**.

Figure 1 – Site Location

Source: Midcoast Council Online Mapping
North ^



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Battery Storage x 2 and Associated Equipment
2049 The Bucketts Way, Wards River

2. Scope of this Report

This report assesses the potential environmental impacts of the proposed development.

The decision-making process for the proposed development falls under Part 4 of the Environmental Planning and Assessment Act 1979 (EP&A Act). The Council, in deciding whether consent should be granted, must examine and consider relevant matters for consideration. This report is intended to assist in this decision-making process and to provide information that satisfies the requirements of Section 4.15 of the EP&A Act as addressed in **Table 1**. The assessment is undertaken in accordance with Part 2 Schedule 3 of the EP&A Regulation 2000.

Table 1 Section 4.15 Matters

(a) the provisions of: (i) any environmental planning Instruments;	All relevant provision of the <i>Great Lakes Local Environmental Plan 2014</i> and State Environmental Planning Policy (Transport and Infrastructure) 2021 has been considered within this report.
(ii) Any proposed instrument that is or has been the subject of public consultation under this Act and that has been notified to the consent authority (unless the Planning Secretary has notified the consent authority that the making of the proposed instrument has been deferred indefinitely or has not been approved);	Draft Midcoast Local Environmental Plan was endorsed by Council in February 2025. The draft LEP retains the RU2 zoning for the land and also proposes to make electricity generating works permissible in the RU2 zone.
(iii) any development control plan	There are no relevant provisions of the Great Lakes Development Control Plan 2014 that apply to the proposed development.
(iiia) and planning agreement that has been entered into under section 7.4, or any draft planning agreement that a developer has offered to enter into under section 7.4;	The subject land is not known to be subject to a planning agreement.
(iv) the regulations (to the extent that they prescribe matters for the purpose of this paragraph)	Not Applicable.
(v) (Repealed)	-

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(b) The likely impacts of that development, including environmental impacts on both the natural and built environments, and social and economic impacts in the locality;	See below.
- context and setting	The subject land is in a rural precinct in the Wards River locality. The proposed development is considered consistent with the general context and setting in the locality.
- Access, transport, and traffic	The proposal is consistent with the scale of development indicated in Council's planning policies and is not expected to adversely impact on the function of the local road network.
- Utilities	The subject land is serviced by all essential services for a rural property.
- Heritage	Not applicable.
- Flora and Fauna	The proposed does not require the removal of any significant vegetation to facilitate the development.
- Natural Hazards	The subject site is mapped as bushfire prone land. The development can comply with the requirements of Planning for Bushfire Protection 2019 (RFS, 2019) by enabling safe and reliable access for fire fighting vehicles.
- Site Design and Internal Design.	Site design and Internal design is considered appropriate.
(c) The suitability of the site for the development	
Does the proposal fit within the locality?	The proposal is compatible with existing and likely future developments within the surrounding locality.
Site attributions conducive to the development	The site attributions are conducive to the development.
(d) Any submissions made in accordance with this Act or the regulations;	For Council consideration.

The proposed development is not integrated development, and the site is not within the coastal zone.

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3. The Proposed Development

The proposed development is the construction of a Battery Energy Storage System (BESS) comprising one Power Conversion System (PCS) and four battery cabinets, with a total capacity of 20MWh. The system will be connected to the electrical infrastructure on site. There is also associated infrastructure to support the batteries and enable operation. The batteries will draw electricity from the electrical grid during times of low demand for storage and then deliver electricity back to the grid during periods of high demand.

The control of potential fluid spills from the battery units relies on active system monitoring and rapid response protocols (see attached).

First, it is important to clarify the nature of the fluids involved. The Lithium Iron Phosphate battery cells contain liquid electrolyte, but it is predominantly absorbed within the internal components. A large volume leak from the batteries themselves is highly unlikely. The primary fluid in the system is the coolant used for thermal management.

To address potential coolant leaks, the Battery Energy Storage System utilises a comprehensive, triple-tier leak detection programme designed by the manufacturer, HyperStrong:

- **Low Return Water Pressure Alarm:** High-precision pressure sensors monitor the return pipe. If the pressure drops to 0.2 Bar or below due to fluid loss, the sensor triggers an alarm signal.
- **Flood Sensors:** These are deployed at the lowest points inside the liquid-cooled container, or in areas where liquid is likely to accumulate, to detect liquid leaks.
- **Insulation Detection and Two-Way Judgement:** The system monitors the electrical insulation status. To avoid false alarms, a two-way detection mechanism requires two concurrent conditions to confirm an insulation failure and issue an alarm.
- **System Response:** Upon triggering a leak fault, the system performs PA2 protection actions, which include a Power Conversion System emergency stop, Direct Current circuit breaker tripping, and battery disconnection. This automated response stops the active circulation of coolant, which limits the volume of fluid released.

Furthermore, upon the activation of any leak alarm, our operations and maintenance personnel are immediately notified. Our protocol dictates that personnel will travel to the site to inspect the equipment, contain any spills, and stop further fluid loss.

Other additional details of the proposed development are also attached.

Plans of the proposed development are included with the Development Application.

4. Local Planning Provisions

The subject land is zoned RU2 Rural Landscape under the provisions of Great Lakes Local Environmental Plan 2014 (LEP 2014). The objectives of the zone are:

- To encourage sustainable primary industry production by maintaining and enhancing the natural resource base.
- To maintain the rural landscape character of the land.
- To provide for a range of compatible land uses, including extensive agriculture.
- To provide for rural tourism in association with the primary industry capability of the land which is based on the rural attributes of the land.

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- To secure a future for agriculture in the area by minimising the fragmentation of rural land and loss of potential agricultural productivity.

The proposed development is prohibited in the RU2 zone under the provisions of LEP 2014.

Other provisions of Great Lakes Local Environmental Plan 2014 are addressed in **Table 2**.

Table 2 – Greater Taree Local Environmental Plan 2010 Considerations.

2.3 Zone Objectives and Land Use Table	Zoned RU2 Rural Landscape.	Wholly consistent.
4.3 Height of Buildings	Ensure height of a building is appropriate for the site.	Complies – No component of the proposed development exceeds the 8.5 metre height limit for the site.
4.4 Floor Space Ratio	To ensure the density, bulk, and scale of the development is appropriate, integrated with the streetscape, and character of the area.	Complies – The 0.4:1 Floor Space Ratio is not exceeded for the subject land.
4.6 Exemptions to Development Standards	To provide an appropriate degree of flexibility in applying certain development standards to achieve a better outcome.	Not applicable.
5.10 Heritage Conservation	To conserve the heritage significance of heritage items and heritage conservation area.	The subject land is not mapped as being a heritage item or conservation area.
5.11 Bush Fire Hazard Zone	Bush fire hazard reduction work authorised by the Rural Fires Act 1997 may be carried out on any land without development consent.	Complies – The site is mapped as being bushfire prone, however, the proposed development complies with Planning for Bushfire Protection (RFS 2019).
5.21 Flood Planning	To minimum the flood risk to life and property associated with the use of land, while allowing development that is compatible with the flood function and behaviour on the land.	Not applicable – the subject land is not mapped within a flood planning area.
6.3 Development Control Plan	To ensure that development on land in an urban release area occurs in a logical and cost-effective manner, in accordance with a staging plan and only after a development control plan that	Complies – the proposed development has been assessed under the relevant development control plan in Part 6 of this report.

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	includes specific controls has been prepared for the land.	
7.1 Acid Sulfate Soils	To ensure that development does not disturb, expose, or drain acid sulfate soils and cause environmental damage.	Not applicable – the land is not mapped as containing Acid Sulfate Soils.
7.11 Essential Services	Development consent must not be granted to development unless the consent authority is satisfied that the provision of services that are essential for the development are available or that adequate arrangements have been made to make them available when required.	Complies – the subject and has all available essential services required for the proposed development.

5. State Environmental Planning Policy (Transport and Infrastructure) 2021

Despite being prohibited under the provisions of LEP 2014, the proposed development is permissible under the provisions of the Division 4 of State Environmental Planning Policy (Transport and Infrastructure) 2021 being:

2.36 Development permitted with consent

(1) Development for the purpose of electricity generating works may be carried out by any person with consent on the following land—

(a) in the case of electricity generating works comprising a building or place used for the purpose of making or generating electricity using waves, tides or aquatic thermal as the relevant fuel source—on any land,

(b) in any other case—any land in a prescribed non-residential zone.

prescribed non-residential zone means any of the following land use zones or a land use zone that is equivalent to any of those zones—

(a) RU1 Primary Production,

(b) RU2 Rural Landscape,

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6. Development Controls

There are no specific provisions of Great Lakes Development Control Plan 2014 that apply to the proposed development.

7. Impact Assessment

Vegetation

Native vegetation is not required to be removed for the proposed development.

Acid Sulfate Soils

The proposed development will not adversely impact ASS.

Contamination

The subject land is not known to be potentially contaminated.

Aboriginal Heritage

There are no known Aboriginal heritage items on the land.

Bushfire

The subject land is classified as bushfire prone buffer on Council's mapping. The site of the development will have a gravel access that will be able to be traversed by fire fighting equipment in the event of a fire event at the site. Such access will be consistent with this required by Planning for Bushfire Protection 2019.

Traffic

Any additional traffic created by the proposed development will not have an insignificant impact on the local road network.

Noise

A Noise Impact Assessment has been undertaken for the proposed development and is attached to the Development Application. This assessment concludes:

Noise criteria were determined from noise measurements and the recommendations of the NSW EPA.

Noise modelling was done based on noise measurements of a similar BESS at Port Macquarie.

The manufacture's acoustic data for a similar sized unit details lower noise output levels. The Port Macquarie BESS' measured levels were used to produce an extremely conservative report.

Predicted noise levels comply with the trigger levels recommended by the NPfI.

No noise impact is predicted at the surrounding receivers.

Flooding

The subject land is not classified as flood prone Council's mapping.

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8. Conclusion

Information presented in this Statement of Environmental Effects indicates that the proposed development being the construction of four 5MW storage battery units that would be connected to the electrical infrastructure and associated infrastructure at 2049 The Bucketts Way, Wards River, is consistent with the relevant Local and State planning instruments. The potential impacts of the proposed development have been examined, and the environmental impacts have been found to be acceptable or able to be managed so that there are no detrimental impacts. The proposed development will not adversely impact upon the surrounding environment.

Yours faithfully

Midcoast Town Planning

A signed copy can be provided upon request.

TONY FISH

Town Planner



Description of the leak detection protocol

Beijing Hyperstrong Technology Co., Ltd

Date: January 22, 2024

directory

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1 Overview of the programme

In order to ensure that the energy storage liquid cooling system can detect and deal with the leakage problem in time during operation, and ensure the stable operation and safety of the system, triple leakage detection measures are designed at the energy storage system level, and the two-way detection mechanism is combined to improve the sensitivity and reliability of the detection.

2 Leak detection measures

2.1 Monitoring measure 1: Alarm for low return water pressure of liquid-cooled unit

Description: A high-precision pressure sensor is installed at the return port of the liquid-cooled unit to continuously monitor the pressure change in the return pipe. When the system is short of liquid or leaking and the return water pressure drops below a preset threshold, the sensor triggers an alarm signal.

Threshold setting: Set the alarm threshold for low return pressure to ≤ 0.2 Bar. Once the pressure is detected to be lower than this value, the system will automatically send an alarm that the return water pressure of the liquid-cooled unit is too low, prompting the operation and maintenance personnel to check.

2.2 Monitoring measure 2: Flood sensor

Deployment: Installing flood sensors at the lowest point inside the liquid-cooled container or in areas where liquid is likely to accumulate ensures that any form of liquid leak can be detected the first time.

Principle: The operating principle of a water immersion sensor is based on the conductivity of liquids, which detects the presence of water through electrodes and converts the signal into a dry contact output. In the normal state, the contact of the sensor is open. When water comes into contact with the conductive part of the sensor, a circuit closure can be formed, resulting in a change in current that can be detected by the sensor and converted into an electrical signal

Function: The flood sensor is designed with high sensitivity, once it detects the presence of liquid in the surrounding environment, it will immediately send a flood alarm signal to the system to

quickly respond to the leakage event.



Figure 2.1. Picture of a flood sensor

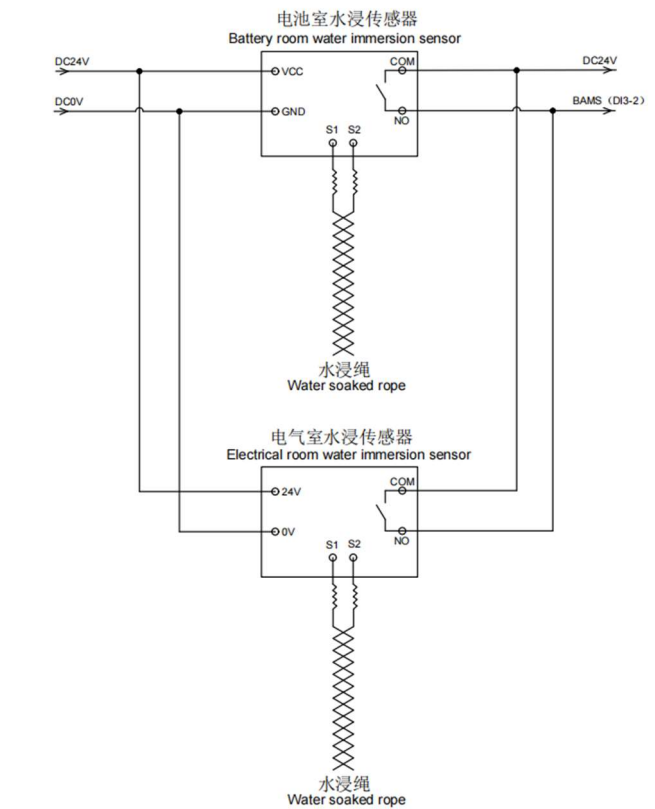


Figure 2.2. Immersion sensor principle

2.3 Monitoring measure 3: insulation detection and two-way judgment mechanism

Insulation detection: The container has a built-in insulation detection module to monitor the insulation status of the system. When coolant leaks and may come into contact with electrical components, the insulation detection module evaluates whether the insulation performance of the system is compromised.

Testing principle: BMS products integrate high-voltage insulation detection function, and the scheme and detection principle are basically implemented with reference to the method recommended by the standard GB/T 18384.1-2015. The implementation principle is shown in the figure. S1 and S2 are insulation resistance detection master switches, which are used to disconnect the measurement resistance from the high-voltage bus without VP and VN measurements, and try to avoid the long-term short-circuit of the measurement resistance between the high voltage and the ground, resulting in the reduction of the insulation resistance.

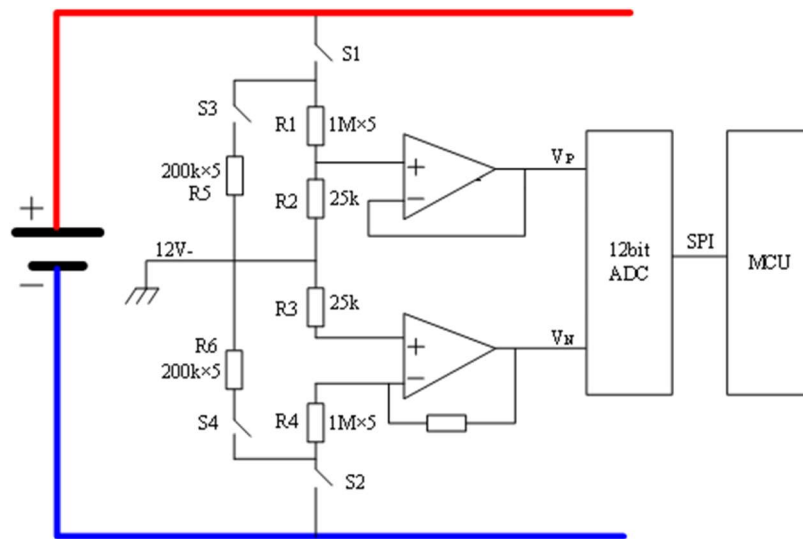


Figure 2.3. Monitoring principle

3 Leakage failure

Based on the above three real-time monitoring methods, and in order to avoid a single alarm false alarm, a two-way detection mechanism is introduced to determine the insulation failure. Specifically, when the system meets one of the following two conditions at the same time, it will be judged as an insulation failure and an alarm will be issued: first, the return water pressure is detected to be too low and the system insulation fault is detected; The second is that a flooding alarm is detected and the system insulation is faulty. This mechanism effectively improves the accuracy of insulation detection and reduces false alarms caused by a single condition trigger.

After the system triggers the leakage fault, it performs PA2 protection actions: level 1 fault, PCS emergency stop dry contact emergency stop, DC circuit breaker tripping, battery disconnection.



BESS DESIGN REPORT

BESS Wards River BESS
2025/09/12

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1. INTRODUCTION

The objective of this report, produced by FCAS Solutions, is to define the specification of the proposed Battery Energy Storage System ('BESS') at Wards River BESS, and to clarify the technical features of all equipment within the specification. The current description of the project could be subject to changes in the next stages of the project development.

The proposed design solution has 2 battery container units of 5010.0 kWh with total rating of 4988.0 kWac/10.0 MWhdc. The main characteristics of the project are shown in Table 1.

Table 1. Project Characteristics

Wards River BESS-1 Project	
Main characteristics	
Location	Australia, New South Wales
Rated power (AC)	4988.0 kWac
Installed energy (DC)	10.0 MWhdc
Power supply duration	2.01 h
Civil characteristics	
Suitable plot area	0.42 ha
Electrical characteristics	
Medium voltage	33 kV
Power conversion systems - PCS (up to 4988.0 kW)	1
Number of transformers (up to 4988.0 kVA)	1
Number of storage inverters (up to 2494.0 kVA)	2
Number of BESS containers (up to 5010.0 kWh)	2

The general layout of the BESS is shown in Figure 1.

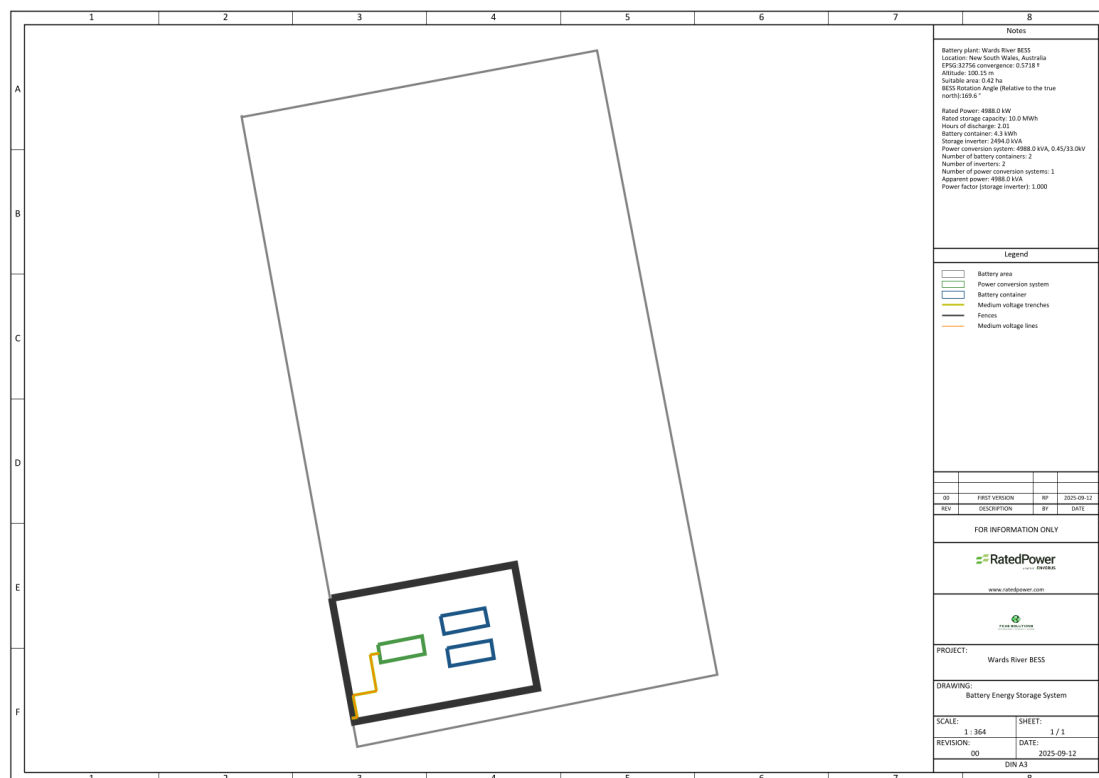


Figure 1. General layout

The Battery Energy Storage System is parallel to an axis rotated 79.6 degrees with respect to true north in the clockwise direction.

2. SITE

2.1. Location

The standalone BESS plant location has the characteristics shown in Table 2.

Table 2. Location characteristics

Standalone BESS plant location characteristics	
City / Town	Wards River
Region	New South Wales
Country	Australia
Latitude	-32.24 °
Longitude	+151.93 °
Altitude	100.15 m a.m.s.l.
Timezone	UTC +10

The area where the BESS is to be built consists of one area with a total surface area of 0.42 ha.

2.2. Topography

A preliminary terrain topography analysis was performed to study the suitability of the terrain for the construction of the BESS.

The grid resolution of the elevation data is 30.0 m (North-South and East-West directions). This data was provided by Google Earth (SRTM-30).

Using the previously mentioned elevation data, earthworks were performed to level the terrain. The ground within the boundaries defined by the area in the KML file was leveled for the installation of the BESS. The earthworks analysis resulted in a total fill volume of 5538.19 m³ and cut volume of 5235.27 m³.

3. MAIN EQUIPMENT

The main equipment used to build the battery energy storage system is:

- Battery containers, which hold the necessary equipment to store the DC energy.
- Storage inverters, which convert from DC to AC or from AC to DC.
- Power Transformers, which raise the voltage level from low to medium.
- Power Conversion Systems, which hold the necessary equipment to convert the DC power to AC.

3.1. Battery Container

A battery container is filled with battery racks connected in parallel. It is composed of the following elements:

- One Energy Management System (EMS), which will monitor the status of the batteries and define the battery system operation. It will be responsible for estimating the batteries SOC, controlling the charge/discharge and managing the status of the system, which includes the temperature management, safety protection and communication with other elements of the BESS.
- One HVAC system, which will ensure that the batteries work under the desired temperature conditions.
- One fire suppression system able to extinguish any potential fire spread within the battery container.

The features of the battery container are shown in Table 3 and Table 4.

Table 3. Battery containers

Battery containers	Quantity	Nominal Energy
Default container 1	2	5010.0 kWh

Table 4. Battery container dimensions

Battery container dimensions	
Mechanical characteristics	
Length	6.06 m
Width	2.44 m
Height	2.9 m

An example picture of a battery container is shown in Figure 2.

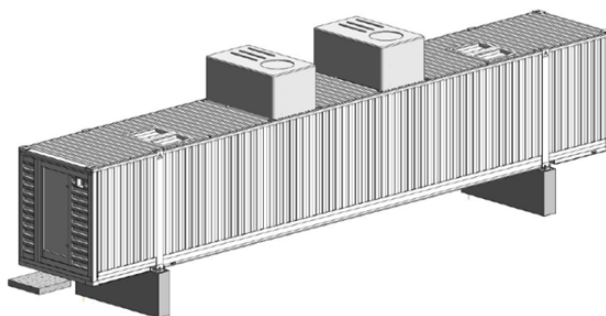


Figure 2. Example of battery container

Storage Inverter

The storage inverter converts the direct current from the batteries to alternating current and vice versa. It is composed of the following elements:

- One or several DC-to-AC bidirectional power conversion stages with a voltage level controller.
- Protection components against high working temperatures, over or under voltage, over or under-frequencies, minimum operating current, mains failure of transformer, anti-islanding protection, protection against voltage gaps, etc. In addition to the protections for the safety of the staff personnel.
- A monitoring system, which has the function of relaying data regarding the inverter operation to the owner (current, voltage, power, etc.).

In Figure 3 a commonly used storage inverter for BESS is shown.



Figure 3. Example of storage inverter

The main characteristics of the selected inverter are shown in Table 5.

Table 5. Storage inverter characteristics

Storage inverter characteristics
Main characteristics

Inverter model	INGECON SUN STORAGE 3660TL C450 H1000 F50
Manufacturer	Ingeteam
Maximum DC to AC conversion efficiency	97.00 %
Input side (DC)	
Voltage range	646 - 1300 V
Maximum input voltage	1500 V
Output side (AC)	
Apparent power	2494.0 kVA
Maximum Power (datasheet)	2494.0 kVA
Nominal Power (datasheet)	2494.0 kVA
Rated power	2494.0 kW
Power factor	1.000
Output voltage	450 V
Output frequency	50 Hz

Table 6. Storage Inverters

Inverters	Quantity	Rated power AC	Apparent power	Power factor at inverter output
INGECON SUN STORAGE 3660TL C450 H1000 F50	2	2494.0 kW	2494.0 kVA	1.000

3.2. Power Transformer

The power transformer raises the voltage of the inverter AC output to achieve a higher efficiency transmission in the power lines of the BESS. An example of a power transformer is shown in Figure 4.



Figure 4. Example of power transformer

The main features of the power transformer are shown in Table 7.

Table 7. Power transformer characteristics

Power transformer characteristics	
Rated power	4988.0 kVA
Voltage ratio	0.45/33.0kV
Cooling system	ONAN
Tap changer	2.5%, 5%, 7.5%, 10%
Short circuit (X_{cc})	0.08

3.3. Power Conversion System

The power conversion systems or PCS are buildings or containers whose objective is to increase the voltage of the energy collected from the batteries to a higher level, to facilitate the evacuation of the stored energy.

The storage inverters and power transformers will be housed in the power conversion system.

An example of a power conversion system is shown in Figure 5.



Figure 5. Example of a power conversion system (example from Ingeteam)

The power system shall be supplied with medium voltage switchgears that include one transformer protection unit, one direct incoming feeder unit, one direct outcoming feeder unit and electrical boards. Particularly, for the first power conversion system of each MV line, a direct incoming unit will not be installed.

The main features of the default power system are shown in Table 8.

Table 8. Power conversion system characteristics

Power conversion system characteristics	
Number of transformers	1
Voltage ratio	0.45/33.0kV

Table 9. Power conversion systems

Power conversion systems	Quantity	Num Inverters	Power AC	Energy DC	Power supply duration
1	1	2	4.99 MVA	10.02 MWh	2.01 h

4. BESS SIZING

4.1. Electrical Configuration

The methodology used to define the BESS power requirement consists of sizing the battery containers to find a configuration that satisfies the power supply duration goal.

The main features of the electrical configuration are shown in Table 10.

Table 10. BESS configuration characteristics

Electrical configuration characteristics	
Power factor at storage inverter output	1.000
BESS rated power	5.0 MW
BESS installed energy	10.0 MWh
Power supply duration	2.01 h

The medium voltage network connecting the power conversion systems to the substation operates at 33 kV. It is composed of 1 medium voltage branches.

4.2. Electrical Cabling Design

The goal when calculating the characteristics of the electrical wiring is to minimize the cable lengths and sections. The sections are selected according to the Australian MV Prysmian Guide.

When selecting a cable cross section, the current carrying capacity, the voltage drop, and the short circuit current were considered. The maximum allowed voltage drop was 0.50% for the AC cables of the MV network.

A summary of the selected cable sections and their installation method is shown in Table 11.

Table 11. Summary of the selected cable sections

Section	Conducting material	Insulating material	Installation type
300 mm ²	Al	XLPE	Buried in trench

4.3. Civil Works

Some of the parameters considered for the civil works required to build the BESS are shown in Table 12.

Table 12. Civil works

Civil works	
Distance face to face between BESS	3.0 m

Distance side to side between BESS	3.0 m
MV trench maximum section	0.4 m ²

A total perimeter of 84.07 m of chain link fence surrounds the different areas of the BESS. The fence has at least 2.0 m of height and 3.0 m between posts

The minimum depth at which medium voltage cables are placed is 700.0 mm. These cables are separated horizontally by 200.0 mm. The vertical separation between them is 200.0 mm.

A simplified trench cross section of the MV trenches is shown in Figure 6.

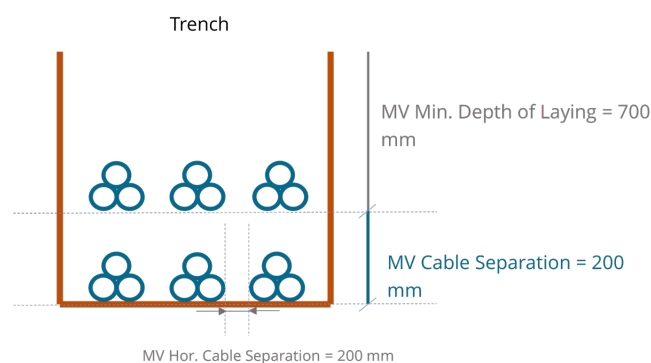


Figure 6. Simplified MV trench cross section

The offset horizontal space between the cable rows and the trench boundaries is 50.0 mm.

The section of the trenches used in the design are shown in Table 13, along with the total trench length and volume for each type.

Table 13. Trench cross sections

Trench type	Cross section	Length	Volume
Medium voltage trench	400.0 x 1000.0 mm	13.19 m	5.27 m ³

5. BESS DISPATCH

5.1. Cycling Configuration

The cycling configuration shown in Table 14 was used for the BESS dispatch and represents how often the batteries are charged and discharged and what are its limits.

Table 14. BESS cycling configuration

BESS cycling configuration	
Initial State of Charge	10.0 %
Maximum State of Charge	100.0 %

Minimum State of Charge	0.0 %
Cycles per day	1.0
C-rate	0.50

5.2. Degradation

The BESS is degraded with time and use, and this effect reduces its maximum capacity also described as State of Health. The Table 15 shows the estimated degradation applied to the capacity of the BESS for each year of operation.

Table 15. BESS State of Health

Year	State of Health
Year 0	98.00 %
Year 1	96.04 %
Year 2	94.12 %
Year 3	92.24 %
Year 4	90.39 %
Year 5	88.58 %
Year 6	86.81 %
Year 7	85.08 %
Year 8	83.37 %
Year 9	81.71 %
Year 10	80.07 %
Year 11	78.47 %
Year 12	76.90 %
Year 13	75.36 %
Year 14	73.86 %
Year 15	72.38 %
Year 16	70.93 %
Year 17	69.51 %
Year 18	68.12 %
Year 19	66.76 %
Year 20	65.43 %