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Dalvui Battery Energy Storage System (BESS)

Preliminary Hazard Assessment (PHA)

Tilt Renewables

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Contents

1 Executive Summary

Tilt Renewables (the Proponent) is proposing a Battery Energy Storage System (BESS) with an indicative capacity of 196 MW / 392 MWh at Terang, Victoria (the Project). Due to dangerous goods being present on site, a Preliminary Hazard Analysis (PHA) has been prepared to support the planning permit application to the Minister for Planning for the Project. This PHA outlines potential design and operational risks of the Project, and mitigation measures to be considered during the Project's detailed design.

The Lithium-Ion battery technology used in BESS design is considered dangerous goods Class 9 (Miscellaneous) and the expected quantity on site exceeds the Placarding, Manifest and Fire Protection Quantity thresholds. As such, the relevant steps for placarding, manifest application, emergency response and fire protection systems must be taken to ensure the regulations are adhered to. Several other materials expected to be present on site also require these steps to be taken to adhere to regulations.

Hazards that may pose a potential off-site risk were identified and documented in a Risk Register (refer to Appendix A: Hazard Identification Table / Risk Register). The consequence of each of the identified hazards were assessed to determine if the consequences may impact adjacent facilities or sensitive receptors. The following eight hazards were identified pertaining to the BESS:

Hazard	Cause
Arcing or short-circuit	Cable or equipment fault
Battery cell fire hazard	Fire hazard arising from combustible materials used in the storage system
Battery cell thermal hazard	Thermal hazard, due to thermal properties of the system or components Thermal runaway hazard, causing propagation of increasing temperatures, pressure and fire towards neighbouring cells
Explosion hazards	Cooling system failure and/or overcharging of battery causing rapid expansion and confinement of gases
Dropping of battery cell(s) during installation	Faulty mechanical handling equipment or error in procedure during battery installation
Vandalism damage	Unauthorised access
Transformer arcing / fire / explosion	Insufficient insulating, oil maintenance, equipment fault
Live contact with transformer	Insufficient enclosure or barricading around transformer

Additionally, the consequence of six environmental hazards were assessed to determine the impact on the BESS. All identified hazards are manageable through appropriate technical and management safeguards which reduce the residual risk and make it unlikely that a significant risk is posed.

All BESS Projects in Victoria must adhere to the 'Guidelines for Renewable Energy Installations (1) Under the CFA guidelines, there is a requirement for hazard identification and the determination of appropriate dangerous goods storage and handling. In accordance with the Corangamite Planning Scheme (2), the Project must be referred to the Victorian WorkCover Authority that trades as WorkSafe Victoria as the Fire Protection Quantity is likely to be exceeded under the Dangerous Goods (Storage and Handling) Regulations 2012 (likely to exceed UN Class 9 for the use of Lithium-Ion). This PHA contains information to support this referral to WorkSafe Victoria.

This PHA recommends implementation of appropriate technical safeguards as listed below during the detailed design of the Project with the intent to reduce the residual risk such that no identified hazards pose a significant risk:

- Where appropriate, containers and infrastructure for the BESS must be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of fire water runoff.
- Confirm the cooling system allows the BESS to operate in all temperature conditions expected for the location.
- Applicable site flood risk levels to be utilised during detailed design phase to minimise flood risk to the Project

- Satisfy the applicable requirements for lightning protection specified in AS/NZ 1768

Additional safeguards during construction and operations are proposed to ensure the risks are managed so far as is reasonably practicable:

- Where appropriate, the BESS should be installed and commissioned /tested in accordance with IEC 62619: Safety requirements for secondary lithium cells and batteries, for use in industrial applications to ensure safe operation.
- Asset Management Plans and Assurance activities should be prepared. In addition, conduct a comprehensive and regular program of maintenance and inspections, covering the BESS and related infrastructure (i.e. transformers, HVAC, civil structures) to ensure the system is serviced and maintained as per the manufacturer's requirements.
- The Project should be kept free of extraneous materials
- Placarding and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2012 and the relevant Australian Standards must be provided.
- Appropriate spill containment equipment (including absorbent, neutralisers, tools and personal protective equipment) for the clean-up of spills must be provided and available on-site.

The following safety management plans for the Project should be developed during detailed design of the Project.

- Emergency Management Plan including
  - Safe operating conditions for temperature
  - Details of the electrical safety hazards
  - Details of the effects of fire on the battery energy storage system
  - The shut-down procedures if the batteries are subject to fire
  - A plan for partial and full decommissioning of the BESS in the event of an emergency incident that renders the facility inoperable or unsafe, prior to its anticipated end-of-life
- A Fire Management Plan to minimise fire risks
- An Emergency Information Book within the Emergency Information (Manifest) Container; including the following:
  - The safe operating conditions (e.g. temperature) of the BESS
  - The details of any emissions or toxic gases, including during a fire
  - All dangerous goods stored on-site that must have a current Safety Data Sheet (SDS).
  - Other manifest requirements as listed in the Dangerous Goods (Storage and Handling) Regulations 2012

2 Introduction

2.1 Project Context

Tilt Renewables (the Proponent) is seeking approval for the Dalvui BESS project with a total indicative capacity of 196 MW / 392 MWh. To support the planning permit application for the Project a PHA has been prepared to identify the hazards and assess the risk associated with the storage and handling of dangerous goods at the Project site, and demonstrate the Project can meet the relevant Victorian Legislative requirements.

Aligning with Victoria's Renewable Energy Action Plan, the Project will help maintain reliable and affordable energy supply for Victoria. The intention is to combine the operation of the Project with renewable energy generation to support Victoria's transition away from reliance on fossil fuels. Furthermore, the Project will provide suitable capacity firming for the Proponent's growing portfolio of renewable energy assets.

2.2 Project Description

Key components of the Project include battery pack containers, 3.5 MW inverters, 33 kV transformers and 66 kV transformers. Key ancillary infrastructure includes an Operations and Maintenance (O&M) Building (that includes storage and site office), access track connecting the BESS from McCrae St via an existing access point and permanent site carparking.

The Project will further involve connection upgrade works within the Terang Terminal Station (TTS), connecting to the BESS via an underground connection along Littles Ln and McCrae St.

2.3 Site Location

The proposed site location of the Project is east of the existing TTS on McCrae street, Terang, Victoria as shown in Figure 2-1 The site is located in the Corangamite Shire and falls within the Country Fire Authority's (CFA) South West Fire District with a CFA fire station located approximately 2 km west of the site.

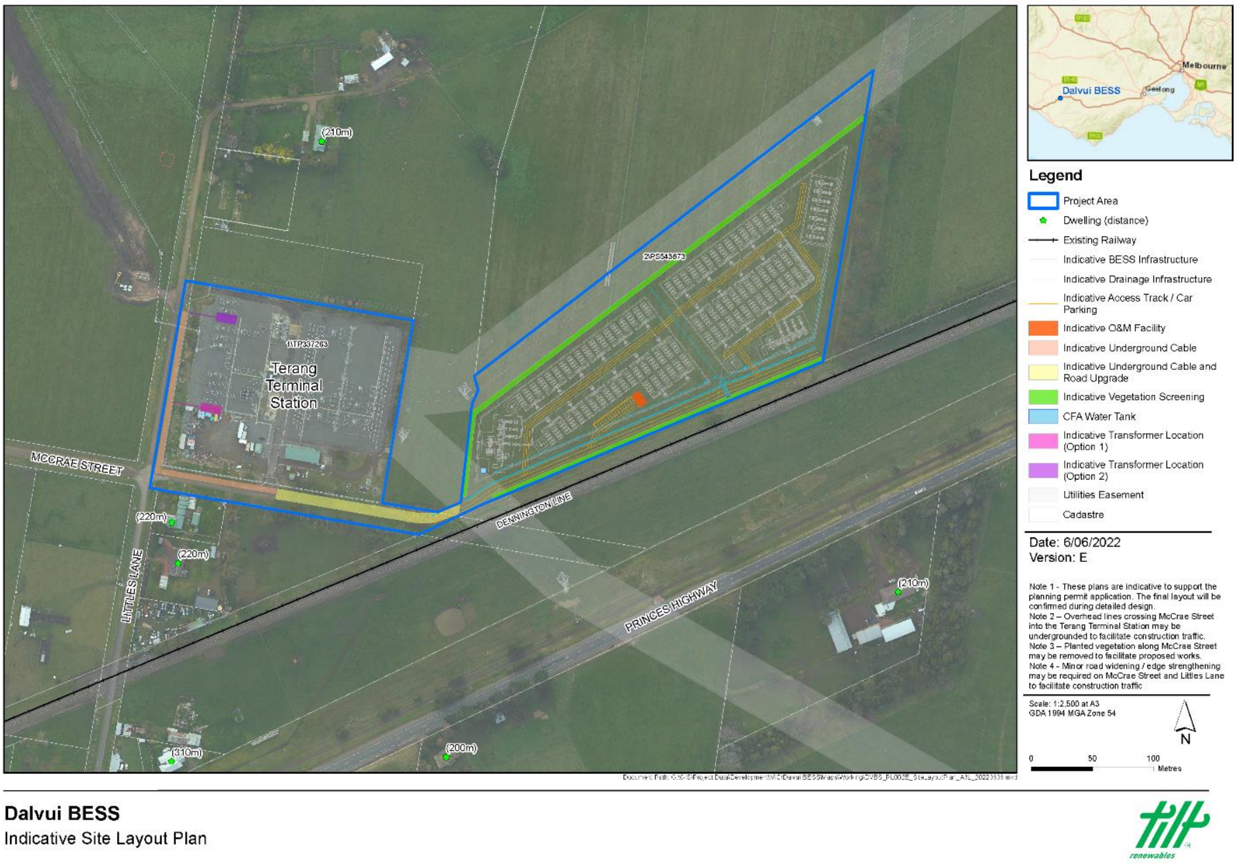

Figure 2-1 Proposed Dalvui BESS Site

2.4 Purpose of PHA

The purpose of the PHA is to identify hazards and assess the associated risks with storage and handling of dangerous goods at the proposed BESS facility. Outcomes from the PHA which include identified design and operational risks with appropriate mitigations to be incorporated as part of the planning application for the BESS facility.

The Project is required to comply with the Victorian CFA Guidelines (1) as it applies to BESS facilities and all referenced Regulations and Acts. The CFA guideline outlines the proposed risk assessment methodology and key emergency and safety mitigations required for Renewable Energy installations including BESS facilities. The Project also triggers referral to WorkSafe in accordance with the planning scheme (2) and the PHA contains information to support this referral to WorkSafe Victoria (Refer to section 5).

Regulatory compliance requirements related to BESS facilities in Victoria are summarised in Table 1.

Table 1: Required Regulatory Compliance for the Dalvui BESS Facility

Regulation / Act	Guideline Requirement	Relevance
Dangerous Goods Act 1985 Dangerous Goods (Storage and Handling) Regulations 2012	CFA Guidelines*	Where the facility includes a battery energy storage system, emergency services written advice under Regulations 54 and 55 of the Dangerous Goods (Storage and Handling) Regulations 2012 may be required. Regulation 54/55 states that “An occupier of premises where dangerous goods are stored and handled in quantities that exceed the relevant quantities specified” must request written advice of emergency services authority in relation to the design/alteration of the fire protection system and an emergency plan to reduce the risk of a catastrophic scenario.
Building Regulations 2018	CFA Guidelines*	All buildings on site are required to comply with the National Construction Code. Where fire safety matters as listed in the Building Regulations 2018 do not meet the deemed to satisfy provisions of the NCC, the report and consent of the fire authority Chief Officer is required.
Victorian Occupational Health and Safety Act 2004 (OHS Act) Occupational Health and Safety Regulations 2017	CFA Guidelines*	Section 28 of the OHS Act states the following in relation to the duty of designers: “A person who designs a building or structure or part of a building or structure who knows, or ought reasonably to know, that the building or structure or the part of the building or structure is to be used as a workplace must ensure, so far as is reasonably practicable, that it is designed to be safe and without risks to the health of persons using it as a workplace for a purpose for which it was designed.” Persons who have management or control of workplaces have obligations under the OHS Act to ensure the health and safety of people ‘so far as is reasonably practicable’. This legislation requires consideration of risk control measures and safe systems of work, which for renewable energy installations may relate to the development of systems and activities for: ▪ Housekeeping, including management of vegetation ▪ Security (fencing, monitoring, alarms, etc.) ▪ Undertaking hot works ▪ Ignition source control ▪ Vehicle, plant and equipment maintenance requirements.

* See Appendix B for a gap assessment conducted for the BESS facility against CFA guidelines.

3 PHA Methodology

3.1 Step 1: Screening Assessment

The screening assessment considers all legislative and planning criteria to determine if the BESS facility triggers any specific screening criteria in relation to the storage and handling of dangerous goods and fire risk. In particular the preliminary screening assessment will be in accordance with *Dangerous Goods (Storage and Handling) Regulations 2012* to determine if the BESS facility is potentially hazardous through the trigger of any Placarding Quantity, Manifest Quantity or Fire Protection Quantity or land use threshold distance requirements within the Victoria Planning Provisions.

The screening assessment for the Project includes:

- Identify type of dangerous goods and estimate the quantity including any storage, transport, or handling activities as outlined in Part IV – Information on Dangerous Goods at Licensed Premises in *Dangerous Goods Act 1985.*
- Screen the identified dangerous goods by referring to the Placarding Quantity, Manifest Quantity or Fire Protection Quantity requirements as outlined in Schedule 2 – Quantities of Dangerous Goods in *Dangerous Goods (Storage and Handling) Regulations 2012*.

3.2 Step 2: Preliminary Hazard Analysis

Following the screening assessment, a Preliminary Hazard Analysis is conducted to identify and categorise additional hazards that could pose Occupational Health and Safety (OHS) risk to personnel. This further assessment includes additional hazard scenario development and consequence analysis.

WorkSafe Victoria's published guide, A Guide to Risk Control Plans, aligns to a process for preparing PHAs which can be seen in Figure 3-1 below.

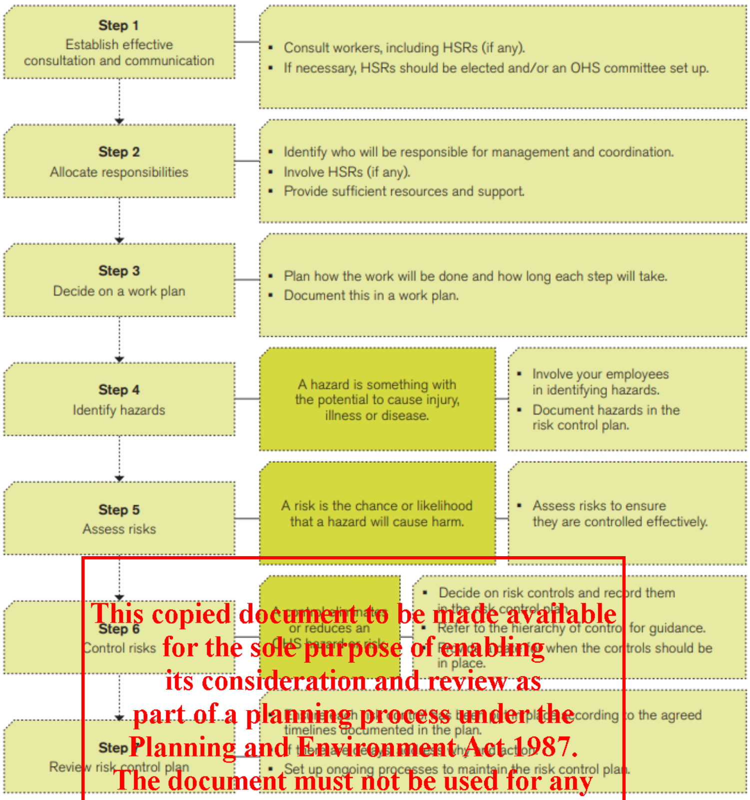

Figure 3-1: Risk Control Plan Preparation Guide (3)

Tasks involved in a Preliminary Hazard Analysis include:

- Identify key client contact and other stakeholders for consultation and communication to the risk assessment.
- Identify type of materials (dangerous goods) and estimate the corresponding quantity, including storage, transportation or handling activities.
- Identify additional significant hazards that may pose an off-site risk to understand the potential sources of fire including on-site hazards (e.g. electrical faults, operational faults, chemical releases, errors in operational practices/ processes, animal management); off-site hazards (e.g. bushfire, grassfire, storm, lightning, flood), and any other operational, financial or strategic risks that could affect the ability of the organisation or operation to meet objectives.
- Document the identified key hazards associated with the operation of the BESS facility through the development of a risk assessment table by identifying the nature of risk and its characteristics and identifying controls for risks based on the hierarchy of controls, and industry good practice.
- Assess the consequences of each identified hazard and determine where consequences may impact adjacent facilities or sensitive receptors. Screen out those hazards with no significant impacts and carry forward only those hazards identified to have a possible impact on adjacent sites or sensitive receptors.
- Assess the frequency of those hazards carried forward from the consequence assessment.

- Assess the risk by evaluating the consequence and frequency analysis for those hazards identified to have an off-site or significant impact.
- Determine if the BESS facility is potentially hazardous and document any proposed mitigation measures.

A qualitative assessment is considered appropriate to assess the potential impacts to neighbouring land uses based on the following:

- Expected types and quantities of chemicals stored and handled at the BESS facility and
- Non-sensitive surrounding land use (i.e. no schools, hospitals, aged care and childcare facilities)

This is dependent on the Proponent having implemented appropriate technical safeguards and a risk management system, that is supported by organisational management at all levels, underpinned by organisational policy, and integrated into organisational decision-making.

Risk assessment is a continuous process throughout the lifecycle of the BESS facility. The preliminary hazard analysis and risk assessment should be continuously reviewed and updated when the Project's detailed design has been finalised, prior to construction.

3.3 Step 3: Recommendations

Generic recommendations and appropriate mitigation measures are identified based on the risk reduction measures identified in the Preliminary Hazard Analysis. Mitigation measures are drawn from Australian standards and guidelines such as CFA Guidelines for Renewable Energy Installations, AS/NZS 5139-2019: Electrical installations – Safety of battery systems for use with power conversion equipment; AS 3780-2008: The storage and handling of corrosive substances; and AS 1940-2017: The storage and handling of flammable and combustible liquids. A gap analysis of the BESS facility against the CFA guidelines was also conducted and can be found in Appendix B. These recommendations will also include the additional requirements and studies (such as fire safety study) for BESS facilities as listed under the applicable policy considerations (Table 1). The identified recommendations and mitigation measures should be considered during detailed design and while developing the Emergency Management Plan for the Project.

4 Screening Assessment

Step 1 of the assessment involves a preliminary risk screening as per the *Dangerous Goods Act 1985 and Dangerous Goods (Storage and Handling) Regulations 2012.* This section identifies the types and quantities of dangerous goods that are associated with the Project and screens them against the allowable quantities of dangerous goods stated within Schedule 2 of the Regulations. This enables the identification of any outstanding hazards that pose significant off-site risks based on the site location.

4.1 Hazardous Materials

Table 2 shows the allowable quantities outlined in Schedule 2 of the Dangerous Goods (Storage and Handling) Regulations 2012 for a Lithium-Ion battery. Where the Placarding Quantities are exceeded, a “HAZCHEM” outer warning placard is required to be displayed at the entrance road for vehicles and every rail entrance (if applicable). Where the Manifest Quantities are exceeded, WorkSafe Victoria must be notified of the presence of the dangerous goods and a manifest of dangerous goods must be kept on the premises in a place where it is easily accessible to the emergency services authority. Where the Fire Protection Quantities are exceeded, a fire protection system for the premises must be established with regard to written advice from the emergency services authority.

Lithium-Ion batteries fall under ADG Class 9: Miscellaneous Dangerous Goods, and for a 392 MWh battery the total quantity of dangerous goods was estimated to be approximately 2,600 tonnes. The principal hazard presented by Lithium-Ion batteries is not a particular hazardous material such as lithium, but rather the potential for thermal runaway effects under certain conditions, leading to fire and explosion hazards [2]; risks and mitigation measures for Lithium-Ion batteries are discussed further in Section 5.

Table 2: Threshold Quantities for Lithium-Ion Battery

Hazardous Material	UN Number	ADG Class / Packing Group	Estimated Quantity	Dangerous Goods Quantity Requirements			Threshold Exceeded?
				Placarding Quantity	Manifest Quantity	Fire Protection Quantity	
Lithium-Ion: Overall thermal overload hazard	3480	9 (Misc) / PG II	2,600 tonnes	1000 kg or L	10 000 kg or L	20 000 kg or L	Yes – Fire Protection Quantity

Table 3 provides a list of non-battery hazardous materials which are expected to be present in various quantities on site and may be part of adjacent infrastructure (e.g. transformers) to the BESS facility. In cases where the packing group is ambiguous, the worst-case scenario is assumed.

Table 3: Other Possible Hazardous Materials

Hazardous Material and Purpose	UN Number	ADG Class / Packing Group	Estimated Quantity	Dangerous Goods Quantity Requirements			Threshold Exceeded?
				Placarding Quantity	Manifest Quantity	Fire Protection Quantity	
Petrol: Fuel for minor maintenance machinery	1203	3 (Flammable Liquids) / PG II	< 100 L	250 kg or L	2500 kg or L	10 000 kg or L	No
Diesel: Fuel for minor maintenance machinery	1202	N/A: C1 Combustible Liquid. Treated as 3 / PG III if stored with Petrol	< 100 L	1000 kg or L	10 000 kg or L	20 000 kg or L	No
Pesticides: Weed and pest control	2588	6.1 (Toxic Substances) / PG I	<100kg	50 kg or L	500 kg or L	2000 kg or L	Yes – Placarding Quantity
Transformer Oil: Transformer coil insulation	Various	9 (Misc) / PG II	>1000 L ≤2000 L for Core Transformer & Auxiliary Transformer >60 000 L for Power Transformer	5000 kg or L	10 000 kg or L	20 000 kg or L	Yes – Fire Protection Quantity
Miscellaneous cleaning chemicals: Various minor maintenance activities (e.g. cleaning)	Various	5.1 and 8 / PG I	<100kg	50 kg or L	500 kg or L	2000 kg or L	Yes – Placarding Quantity

The risk screening identified ADG Class 9 (Miscellaneous) materials in the form of Lithium-Ion batteries and Transformer Oil as materials that posed the biggest risk to safety. The quantities of these materials were found to far exceed the Fire Protection Quantity Threshold

The largest anticipated delivery of dangerous goods will be during construction when the batteries are delivered. There is no significant ongoing transport of hazardous goods beyond occasional battery module replacements to site as part of the operational requirements of the Project.

5 Preliminary Hazard Analysis

5.1 Hazard Identification

All potential significant hazards that may pose a risk to the Project or an off-site risk were identified and documented in a Risk Register (refer to Appendix A: Hazard Identification Table / Risk Register). The consequences of each of the identified hazards were assessed to determine if such consequences may impact off-site adjacent facilities or sensitive receptors.

5.1.1 Natural Hazards

There are several potential natural hazards which pose a risk to the Project. These hazards include extreme ambient temperatures, bushfires, seismic activity, lightning, wind and flooding and are included in the Risk Register located in Appendix A: Hazard Identification Table / Risk Register.

5.1.2 Lithium-Ion Hazards

Referring to DNV's recommended practice for the *Safety, Operation and Performance of Grid-Connected Energy Storage Systems* (4), the primary consideration for Lithium-Ion batteries is for adequate cooling and management of temperature excursions. In most cases, the temperature of the Lithium-Ion batteries should not be higher than 70°C to prevent thermal runaway, which causes propagation of increasing temperatures, pressures, and fire towards neighbouring cells. Similarly, the temperature of the Lithium-Ion batteries in most cases should not drop below 0°C to prevent lithium plating around the anode during charging which can cause internal shorts. Although the choice of anode-cathode chemistry can result in different thermal stability and volatility, all Lithium-Ion batteries are flammable when exposed to fire. Lithium-Ion fires are a unique class of fire and may result in emissions of large volumes of toxic or combustible gases, which need to be managed accordingly. These hionazards are described in the Risk Register located in Appendix A: Hazard Identification Table / Risk Register.

5.1.3 Transformer Hazards

Access to equipment, safe operation and maintenance, safe personal egress, equipment clearance, electrical safety and fire safety system need to be considered for transformer installations. AS 2067: 2016 Substations and high voltage installations exceeding 1 kV a.c. outlines the risks and safety measures for these hazards (5). Contact with live parts, arc flashing and transformer fires are the most common hazards associated with transformers.

The causes of fire hazards relating to transformers are typically categorised as one of the following:

- Plant and equipment containing combustible insulating liquids may rupture due to internal failure; there may be an explosion and ignition may occur with a serious fire risk.
- Plant and equipment without combustible insulating liquids may rupture due to internal failure; there may be an explosion and modest fire risk.
- Other plant and equipment such as cables, batteries, and drainage pipes may catch fire and spread the fire.

These hazards are further described in the Risk Register located in Appendix A: Hazard Identification Table / Risk Register.

5.2 Risk Assessment Matrices

The matrices set out in Table 4, Table 5 and Table 6 were used to complete a qualitative risk assessment of the hazards identified in Section 5.1. Consistent with standard risk assessment methodology the risk rating for a given hazard is a product of likelihood and consequence of their occurrence. As such, the potential consequence for each identified hazard carried forward due to posing significant off-site risk was first assessed (Table 4), followed by an assessment of their estimated likelihood of occurrence (Table 5). Finally, the overall current risk rating was then calculated by using likelihood and consequence as inputs.

Table 4: Hazard Consequence Assessment Matrix

Consequence	*People*	*Property*	*Environment*	*Community*
A - Catastrophic	Single or multiple fatality	Virtual complete loss of plant or system	Permanent / irreversible widespread ecological damage not able to be remediated	Outrage by a sizeable community or many communities. Riots.
B - Major	Disabling injury or illness i.e. amputation and/or permanent loss of bodily function, or any kind of permanent health impact	Extensive damage to plant or system	Extensive ecological damage, lengthy remediation process	Community/NGO legal actions. Pickets, demonstrations.
C - Moderate	Any Lost Time Incident (LTI), i.e. an illness or injury resulting in one or more consecutive days or shifts off work	Significant damage to plant or system	Substantial ecological damage but able to be remediated	Persistent formal community complaints. Formal complaints to politicians or comparable representatives.
D - Minor	A medical treatment case (MTC) / or restricted work case (RWC)	Damages impact on budget and program	Localised ecological damage, easily remediated	Formal complaints from local Community complaints locally
E - Incidental	First Aid case, or an injury or illness not requiring treatment	Minor damage to plant or system	Negligible ecological damage, may not require remediation	No Informal community complaints &/or negative comments / views.

Table 5: Hazard Likelihood Assessment Matrix

Likelihood	*Descriptor*	*Probability*	*Industry Incidences*
5 - Almost Certain	The threat is expected to be realised.	90% < Likelihood ≤ 100%	Common incident
4 - Likely	The threat is likely to be realised.	5% < Likelihood ≤ 90%	Several incidents nationally
3 - Possible	The threat may be realised.	1% < Likelihood ≤ 5%	One or a few incidents nationally
2 - Unlikely	The threat is not expected to be realised.	0.1% < Likelihood ≤ 1%	No known national incidents. One or a few incidents in comparable international operating regimes.
1 - Rare	The threat may be realised in reasonably foreseeable but exceptional circumstances.	0% < Likelihood ≤ 0.1%	No known incidents in comparable international operating regimes.

Table 6: Risk Rating Matrix

		Likelihood				
		1 - Rare	***2 - Unlikely***	***3 - Possible***	***4 - Likely***	***5 - Almost Certain***
Consequence	***A - Catastrophic***	High	Critical	Critical	Critical	Critical
	B - Major	High	High	Critical	Critical	Critical
	C - Moderate	Medium	Medium	High	High	Critical
	D - Minor	Low	Low	Medium	High	High
	E - Incidental	Low	Low	Low	Medium	Medium

5.3 Risk Register

Eight (8) different hazards associated with the Project and associated infrastructure were identified and recorded in the Risk Register in Table 7. Six (6) of these hazards were identified to have potential off-site risks. All hazards associated with the Project and associated infrastructure were assessed to have an initial risk rating of 'High' or 'Critical' as detailed in Appendix A: Hazard Identification Table / Risk Register. After consideration of technical and design controls, the residual risk ratings were all reduced. All hazards were rated again as unlikely to pose significant risk, with all potential risks mitigated.

Table 7: BESS Facility Hazards identified in Risk Register

Hazard	Cause	Off-Site Risk Potential	Residual Off-Site Risk
Arcing or short-circuit	Cable or equipment fault	Unlikely	Unlikely
Battery cell fire hazard	Fire hazard arising from combustible materials used in the storage system	Potential	Unlikely
Battery cell thermal hazard	Thermal hazard, due to thermal properties of the system or components Thermal runaway hazard, causing propagation of increasing temperatures, pressure and fire towards neighbouring cells	Potential	Unlikely
Explosion hazards	Cooling system failure and/or overcharging of battery causing rapid expansion and confinement of gases	Potential	Unlikely
Dropping of battery cell(s) during installation	Faulty equipment or procedure during battery installation	Unlikely	Unlikely
Vandalism damage	Unauthorised access	Potential	Unlikely
Transformer arcing / fire /explosion	Insufficient insulating oil maintenance, equipment fault	Potential	Unlikely
Live contact with transformer	Insufficient enclosure or barricading around transformer	Potential	Unlikely

The complete Risk Register with likelihood and consequence analysis for both current and residual risks for all identified hazards are attached in Appendix A: Hazard Identification Table / Risk Register.

The risk assessment detailed above has shown that, whilst there is potential for major consequences, implementation of risk controls will make these consequences unlikely, particularly for off-site effects. The current and recommended technical and management safeguards set out in Section 5.4 are intended to reduce the residual risk such that no identified hazards will pose a significant risk. Additional safeguards during construction and operations have been proposed to ensure the risks are managed so far as is reasonably practicable.

5.4 Technical Safeguards

There are several international standards which govern the best practice design and installation of BESS facilities. The current and recommended technical safeguards for the proposed BESS facility outlined in the following sub-sections will reduce the residual risk such that no identified hazards pose a significant risk.

5.4.1 Natural Hazards Safeguards

It is anticipated that no natural hazards will impact the Project and pose as a significant off-site risk once appropriate controls, as set out in Table 8, are designed and implemented.

Table 8: Natural hazards

Hazard	Description of Controls
Extreme ambient temperatures	The temperature data at the Terang weather station from 1897--1975 were as follows: mean annual maxima and minima were 25.3ºC in February and 4.1ºC in July respectively, whilst the highest and lowest temperatures in the past 30 years were 41.2ºC and -2.4ºC (6). The proposed Lithium-Ion battery for the Project should be designed for safe operation at the highest historical temperature of 41.2 ºC, plus appropriate temperature buffer determined during detailed design.
Bushfires	The proposed BESS location is in a designated Bushfire Prone Area (2; 7). A fire management plan and fire mitigation measures should be implemented to reduce the potential consequences in accordance with the Fire Management Plan. A 10m fire break is planned to be incorporated around the BESS location.
Seismic activity	The Project is not located in a severe seismic activity zone, according to Geoscience Australia. According to the National Seismic Hazard Assessment 2018, the peak ground acceleration for a 10% exceedance in 50 years of mean hazard levels is 0.16-0.2 m/s^2 (8). This is considered light seismic activity with potential damage highly unlikely. Risk of seismic activity is assumed to be minimal.
Flooding	A Surface Water Assessment conducted on the proposed site anticipated potential flooding impact. This was due to the proposed site having a history of flooding (9). Applicable site flood risk levels are to be utilised during the detailed design phase to minimise flood risk to the Project.
Lightning	There have been approximately 18 recorded severe lightning events within the Western District in the last 100 years. The last recorded severe lightning event was in 1997 (10). The Project should satisfy the applicable requirements for lightning protection specified in AS/NZ 1768 (11).
Wind	The final BESS design should be in accordance with *AS/NZS 1170.2:2021 Structural design actions Wind actions* (12).

5.4.2 Lithium-Ion Battery Safeguards

Management of operating temperature is the primary consideration in the design and installation of Lithium-Ion BESS facilities, given that fire and runaway thermal overload are the primary hazard with these systems (4). The primary reference Standard is *IEC 62619 Safety Requirements for Secondary Lithium Cells and Batteries, for use In Industrial Applications* (13). This Standard describes protection measures against all major hazards identified in this PHA, and provides safety requirements for the installation, use, maintenance, and disposal of Lithium-Ion batteries.

Further requirements to be followed are outlined in the CFA Renewable Energy Installation Guidelines to mitigate the thermal and fire hazards associated with BESS facilities.

- Design of the Lithium-Ion BESS should consist of modular, insulated battery cells and the container should be kept free of extraneous and combustible materials to mitigate the risk of fire or thermal overload spreading to multiple battery cells.
- Wiring must be closed, and cables for battery energy storage systems must be buried, except where required to be above-ground for grid connection.
- Appropriate cooling systems should be designed and installed to keep the Lithium-Ion BESS within a safe operating temperature range to prevent the potential release of toxic or combustible gases.
- A fire protection system should be designed and installed to mitigate the consequences of a fire or thermal runaway hazard event. A Lithium-Ion battery fire presents multiple hazards including fire damage to buildings and personnel, gas release, chemical damage and reactions, and hazardous material contamination.
- Containers/ infrastructure for BESS must be clear of vegetation, including grass, for at least ten (10) metres on all sides. CFA requires non-combustible mulch such as crushed rock or mineral earth within this ten (10) metre area.
- Containers/infrastructure for BESS must be located so as to be directly accessible to emergency responders through provision of a suitable access road. The Project's access road requirements shall be assessed during detailed design through appropriate consultation.
- Where appropriate, containers and infrastructure for BESS must be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of firewater runoff.

5.4.3 Transformer Safeguards

AS2067:2016 Substations and high voltage installations exceeding 1 kV a.c. outlines the risks and safety measures for primary hazards presented by transformers which includes live contact, arc flashes, and fire and explosion (5). The BESS (including transformer) design should comply to this standard. The transformers should also be separated from other transformers, control rooms and office complexes based on the separation distances in the standard. Details of the requirements for this standard is listed below:

- Protection against live contact of a transformer is generally achieved with the following mitigation measures:
  - Protection by enclosure
  - Protection by barrier
  - Protection by obstacle
  - Protection by placing out of reach.

- Protection against arc faults between transformers and other equipment or people is generally achieved with the following mitigation measures:
  - Protection against operating error through:
    - load break switches
    - short-circuit rated fault-making switches
    - interlocking devices; or
    - non-interchangeable key locks.
  - Operating aisles as short, high and wide as possible
  - Solid covers as an enclosure or protective barrier
  - Equipment tested to withstand internal arc fault
  - Arc products to be directed away from operating personnel and vented outside the building if necessary

  - Use of current-limiting devices
  - Very short tripping time
  - Operating of the plant from a safe distance
  - Prevention of re-energisation by use of manually resettable devices which detect internal equipment faults and which incorporate pressure relief and provide external indication
- To mitigate the risks associated with a transformer fire, the following steps should be followed:
  - Minimise the risk of a fire starting
    - The transformer specification should consider insulation levels, operating temperatures, cooling systems, protection systems, operation (including the effect of prolonged overloading) and maintenance practices
  - Minimise the risk of transformer failure developing into an oil fire
    - Consideration should be given to insulating liquid type, tank strength, low explosion risk bushings, and pressure relief
  - Minimise the impact of a transformer fire on the environment, other assets, and humans
- If a transformer failure has developed into a transformer fire, the following control measures should be in place to minimise the damage resulting from the fire:
  - Minimise risk of loss of life and injury to humans by:
    - providing adequate clearance around transformers, particularly those with sound enclosures
    - providing adequate access for firefighting equipment, and
    - providing adequate egress routes.
- Minimise the risk of the fire spreading or causing damage to adjacent transformers, control building, structures and other items of plant and equipment. Fire damage can be minimised by:
  - Providing passive protection systems in the form of: adequate separation distances, fire barriers, constructing buildings of fire resisting materials; and
  - Providing active suppression systems such as deluge, water mist, or gas flooding
- Minimise contamination and damage to the environment by provision of oil containment systems and bunding

5.4.4 Summary of Design Recommendations

- Applicable site flood risk levels will be utilised during detailed design phase to minimise flood risk to the Project
- The project should satisfy the applicable requirements for lightning protection specified in AS/NZ 1768
- Confirm the cooling system allows the BESS facility to operate in all temperature conditions expected for the location
- Where appropriate, containers and infrastructure for BESS facility must be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of fire water runoff

5.5 Safety Management System

The following recommendations relate to safety management systems which should be implemented to ensure safe operations of the Project:

5.5.1 Operational and Maintenance Recommendations

- The Project should be installed correctly and commissioned/ tested to ensure safe function, in accordance with IEC 62619: Safety requirements for secondary lithium cells and batteries, for use in industrial applications
- Asset Management Plans and Assurance activities should be prepared. In addition, conduct a comprehensive and regular program of maintenance and inspections, covering the BESS and related infrastructure (i.e. transformers, HVAC, civil structures) to ensure the system is serviced and maintenance should be undertaken as per the manufacturer's requirements.
- The Project should be kept free of extraneous materials
- Placarding and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2012 and the relevant Australian Standards must be provided.
- Proper storage and handling of corrosive substances that are classified as dangerous goods of Class 8, shall comply with *AS 3780-2008: The storage and handling of corrosive substances* where applicable.
- Appropriate material (including absorbent, neutralisers, tools and personal protective equipment) for the clean-up of spills must be provided and available on-site.

5.5.2 Safety Management Plans Recommendations

The following safety management plans for the project should be developed during detailed design of the BESS facility:

- Emergency Management Plan including:
  - Safe operating conditions for temperature
  - Details of the electrical safety hazards
  - Details of the effects of fire on the battery energy storage system
  - The shut-down procedures if the batteries are involved in fire
  - A plan for partial and full decommissioning of the BESS in the event of an emergency incident that renders the facility inoperable or unsafe, prior to its anticipated end-of-life
- A Fire Management Plan to minimise fire risks
- An Emergency Information Book within the Emergency Information (Manifest) Container; including the following:
  - The safe operating conditions (e.g. temperature) of the BESS
  - The details of any emissions or toxic gases, including during a fire,
  - All dangerous goods stored on-site must have a current Safety Data Sheet (SDS).
  - Other manifest requirements as listed in the Dangerous Goods (Storage and Handling) Regulations 2012

6 Conclusion and Recommendations

This PHA has been prepared to identify hazards and assess the risk associated with storage and handling of dangerous goods at the proposed Project site.

The preliminary hazardous materials risk screening process concluded that the quantity of Lithium-Ion batteries expected to be present on site exceeds the Placarding, Manifest and Fire Protection Quantity Thresholds. This implies necessary steps need to be taken in order to adhere to the regulations for this dangerous good. Several of the other materials expected to be present on site also require steps to be taken to adhere to the required regulations.

Subsequent hazard identification and Preliminary Hazard Analysis were conducted in accordance with WorkSafe Victoria's published guide: *A Guide to Risk Control Plans.* The process identified eight (8) hazards associated with the BESS and associated equipment, of which six (6) potential hazards had potentially significant off-site risks. All identified hazards are manageable through appropriate technical and management safeguards which reduce the residual risk to a manageable level and make it unlikely that a significant off-site risk is posed.

From the PHA, it was determined that subject to the implementation of recommended risk mitigations, technical and safety measures, the Project will not constitute a hazardous industry. The PHA recommends that the following appropriate technical safeguards are implemented in the detailed design of the BESS:

- Containers and infrastructure for BESS must be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of fire water runoff.
- Confirm the cooling system allows the BESS to operate in all temperature conditions expected for the location.
- Applicable site flood risk levels will be utilised during detailed design phase to minimise flood risk to Project.
- The Project should satisfy the applicable requirements for lightning protection specified in AS/NZ 1768.

Further appropriate safety management systems will be implemented as described in Section 5.5 to ensure the safe operation of the Project.

7 References

1. **CFA.** *Guidelines for Renewable Energy Installations.* Melbourne : CFA, 2021.
2. **Department of Environment, Land, Water and Planning, Victoria State Government.** Planning Property Report - Corangamite Planning Scheme. [Online] 7 December 2021. https://planning-schemes.api.delwp.vic.gov.au/__data/assets/pdf_file/0011/463943/Corangamite_PS_Ordinance.pdf?_ga=2.126607501.1085601999.1644544936-1745051428.1638854118.
3. **WorkSafe Victoria.** A Guide to Risk Control Plans. [Online] June 2017. Available: https://content.api.worksafe.vic.gov.au/sites/default/files/2018-06/ISBN-Risk-control-plans-guide-2017-06.pdf.
4. **DNV.** *Safety, operation and performance of grid-connected energy storage systems.* Oslo : DNV, 2017.
5. **Standards Australia.** *AS2067 Substations and high voltage installations exceeding 1 kV a.c.* Sydney : Standards Asutralia, 2016.
6. **BOM.** Climate statistics for Australian locations. [Online] 2 June 2021. http://www.bom.gov.au/climate/averages/tables/cw_090077_All.shtml.
7. **VPP.** Victoria Settlement Framework. [Online] 2021. : https://planning-schemes.api.delwp.vic.gov.au/__data/assets/pdf_file/0007/481723/VPPs_All_Clauses.pdf?_ga=2.193591533.1533031224.1638854118-1745051428.1638854118.
8. **Geoscience Australia.** National Seismic Hazard Assessment 2018. [Online] 2018. https://geoscience-au.maps.arcgis.com/home/webmap/viewer.html?webmap=490e068f37494dbc997a2f7e55d4cc4d.
9. **SES.** Corangamite Flood History. [Online] August 2020. https://www.ses.vic.gov.au/plan-and-stay-safe/flood-guides/corangamite-shire-council.
10. **BOM.** Severe Storms Archive - Lightning. [Online] 3 June 2021. http://www.bom.gov.au/australia/stormarchive/.
11. **Standards Australia.** *AS/NZS 1768 Lightning Protection.* Sydney : Standards Australia, 2007.
12. —. *AS/NZS 1170.2 Structural Design Actions Part 2: Wind Actions.* Sydney : Standards Australia, 2021.
13. —. *IEC 62619 Safety Requirements for Secondary Lithium Cells and Batteries, for use In Industrial Applications.* Sydney : Standards Australia, 2017.

Appendix A: Hazard Identification Table / Risk Register

No.	Compponent	Hazard	Cause	Consequence	Current Risk			Does the hazard pose a potential off-site significant risk?	Preliminary Concept Design Controls - Technical / Design	Residual Risk			Proposed Controls- Safety Management	Does the hazard pose a potential off-site significant risk?
					Likelihood	Consequence	Risk			Likelihood	Consequence	Risk		
1	Natural Hazard	Grass or scrub fire	Bushfire	- Damage to BESS;	3 - Possible	B - Major	Critical	Potential	10m asset protection zone shall be incorporated during detailed design	2 - Unlikely	B - Major	High	A Fire Management Plan with appropriate mitigations to minimise risks	Unlikely
2	Natural Hazard	Battery fire hazard	Extreme ambient temperatures	- Personnel injury due to burns or smoke/chemical inhalation; - Damage/destruction of battery cell	2 - Unlikely	B - Major	High	Potential	BESS designs should safely operate between -2.4ºC and 41.2ºC which are the historical peaks of the proposed site	1 - Rare	B - Major	High	Implement a cooling system that allows the BESS to be safely operated in all temperature conditions expected for the location	Unlikely
3	Natural Hazard	Battery damage	Excessive wind	Damage to battery casings, cells and other infrastructure	1 - Rare	C - Moderate	Medium	Unlikely	- The site is located in an A5 wind region which is considered "normal". - The BESS should be designed in accordance with AS/NZS 1170.2	1 - Rare	C - Moderate	Medium		Unlikely
4	Natural Hazard	Battery damage	Seismic activity	Damage to battery casings, cells and other infrastructure	1 - Rare	B - Major	High	Unlikely	Not a seismic area	1 - Rare	B - Major	High		Unlikely
5	Natural Hazard	Battery damage	Flooding	Damage to battery casings, cells and other infrastructure	1 - Rare	B - Major	High	Unlikely		2 - Rare	B - Major	High	Applicable site flood risk levels to be utilised during detailed design phase to minimise flood risk to Project	Unlikely
6	Natural Hazard	Battery fire hazard	Lightning strike	- Personnel injury due to burns or smoke/chemical inhalation; - Damage/destruction of battery cell	3 - Possible	B - Major	Critical	Potential	Ensure no BESS equipment is located underneath the power lines.	3 - Possible	B - Major	Critical	The project should satisfy the applicable requirements for lightning protection specified in AS/NZ 1768	Unlikely
7	Lithium-ion Battery	Arcing or short-circuit	Cable or equipment fault	Electrocution resulting in injury or fatality	1 - Rare	A - Catastrophic	High	Unlikely (in terms of electrical shock hazard affecting public)	-	-	-	-	-	-
8	Lithium-ion Battery	Battery cell fire hazard	Fire hazard arising from combustible materials used in the storage system	- Personnel injury due to burns or smoke/chemical inhalation; - Damage/destruction of battery cell.	2 - Unlikely	B - Major	High	Potential	-Battery systems modular and compartmentalised to minimise damage; - Batteries and associated balance of plant certified and designed to Australian or other applicable standards; - Battery Management System provides functional safety of electronic safety-related systems; - Appropriate offsets between BESS and other infrastructure to be optimised during detailed design; - Fire risk evaluation to be conducted as part of design to ensure Fire radiation effects do not impact on adjacent infrastructure; - Fire detection System included in the BESS design; - Emergency Shutdown incorporated into BESS design; - Containers/infrastructure for BESS located to be directly accessible to Emergency responders.	1 - Rare	C - Moderate	Medium	- Safety system maintenance, testing and inspections; - Safety Management Plans; - Containers and infrastructure for BESS should be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of fire water runoff.	Unlikely
9	Lithium-ion Battery	Battery cell thermal hazard	Thermal hazard, due to thermal properties of the system or components Thermal runaway hazard, causing propagation of increasing temperatures, pressure and fire towards neighbouring cells	- Personnel injury due to burns or smoke/chemical inhalation; - Damage/destruction of battery cell.	2 - Unlikely	B - Major	High	Potential	-Battery systems modular and compartmentalised to minimise damage; - Batteries and associated balance of plant certified and designed to Australian or other applicable standards; - Battery Management System provides functional safety of electronic safety-related systems; - Appropriate offsets between BESS and other infrastructure to be optimised during detailed design; - Fire risk evaluation conducted as part of design to ensure Fire radiation effects do not impact on adjacent infrastructure; - Fire detection and suppression System included in the BESS design; - Containers/infrastructure for BESS should be located so as to be directly accessible to Emergency responders' - Emergency Shutdown incorporated into BESS design.	1 - Rare	C - Moderate	Medium	- Safety system maintenance, testing and inspections - Safety Management Plans - Containers and infrastructure for BESS should be provided with appropriate spill containment (bunding or otherwise) that includes provision for management of fire water runoff.	Unlikely
10	Lithium-ion Battery	Explosion hazards	Cooling system failure and/or overcharging of battery resulting in off gas situation and confinement of flammable gases	- Personnel injuries or fatalities; - Damage/destruction of battery cell.	2 - Unlikely	A - Catastrophic	Critical	Potential	- Batteries and associated balance of plant certified to relevant international standards (e.g. UL1642, UL1741, UL1973, UL9540); - BESS detailed design to consider separation distance from infrastructure and people; - Detailed design shall consider the use of Deflagration panels compliant with NFPA 68that are used to direct the force of any internal pressure upwards; - Emergency Shutdown incorporated into BESS design; - Containers/infrastructure for BESS located so as to be directly accessible to emergency responders.	2 - Rare	A - Catastrophic	High	- Safety system maintenance, testing and inspections - Safety Management Plans.	Unlikely
11	Lithium-ion Battery	Dropping of battery cell(s) during installation	Faulty equipment or procedure during battery installation	- Personnel injury; - Damage of battery cell.	2 - Unlikely	B - Major	High	Unlikely - Anticipated impact on single unit cell	-	-	-	-	-	-
12	Lithium-ion Battery	Vandalism damage	Unauthorised access	- Damage to battery cell and/or other infrastructure; - Electrolyte emission; - Electrocution resulting in injury or fatality.	2 - Unlikely	A - Catastrophic	Critical	Potential	- BESS and auxiliary equipment to be surrounded by security fencing, locked gates and other security measures as necessary (e.g. CCTVs, barbed wire).	1 - Rare	A - Catastrophic	High	- Regular and appropriate operations and maintenance covering inspections of the facilities as well as continuous remote monitoring.	Unlikely
13	Transformer	Transformer arcing / fire / explosion	Insufficient insulating oil maintenance, equipment fault	- Electrocution causing injury or fatality - Damage to transformer - Ignition source for BESS fire	2 - Unlikely	A - Catastrophic	Critical	Potential	- Transformers shall be designed to AS2067:2016; - Sufficient separation between transformers and the BESS, other transformers, and structures to be considered during detailed design; - Fire modelling to be conducted as part of design to ensure fire radiation effects do not impact on adjacent infrastructure.	1 - Rare	A - Catastrophic	High	- Maintain transformer as per OEM recommended regime, including regular insulation and function testing.	Unlikely
14	Transformer	Live contact with transformer	Insufficient enclosure or barricading around transformer	Electrocution causing injury or fatality	2 - Unlikely	A - Catastrophic	Critical	Potential	- Transformers shall be designed to AS2067:2016; - Transformer surrounded by security fencing, locked gates and other security measures as necessary (e.g. CCTVs, barbed wire).	1 - Rare	A - Catastrophic	High	- Maintain transformer as per OEM recommended regime, including regular insulation and function testing.	Unlikely

Appendix B: CFA Gap Assessment

The table below outlines an assessment of the current Project against all relevant guidelines within the CFA guidelines, and requirements to be addressed during the Project's detailed design

CFA Guideline	The Project Design
1. Location and siting within landscape (Section 5.3.1)	The Project site is a grassland used historically for agriculture. It is assumed that no peat is found in the Project Area or surrounding areas. However, the site is within a BPA and hence additional controls to prevent bush fire damage will be considered.
2. Layout (Section 5.3.1)	The final design and layout will contain easily accessible fire service infrastructure and safe evaluation points in accordance with NFPA 855 as per Section 6.5. The fire safety study results and model requirements from Section 6.2.1 of the CFA guidelines will also be incorporated into the final design.
3. Fuel Load and vegetation on site (Section 5.3.1)	There is limited vegetation in the Project Area, mostly grassland. The vegetation screening will consider vegetation with fire-retardant properties. The grass on site will be maintained at or below 100 mm during Fire Danger Period. All vehicles will be equipped with appropriate firefighting equipment.
4. Infrastructure (Section 5.3.1)	The BESS infrastructure will comply with UL 9540 and NFPA855. The site will be appropriately signed for dangerous goods as per CFA and NFPA 855 guidelines.
5. Site activities and Operations (Section 5.3.1)	Site activities may pose a fire hazard during construction and commissioning phases. These hazards will be managed through design and installation of appropriate de-energising and isolation systems during the detailed design phase for compliance with NFPA 855.
6. Site occupancy (Section 5.3.1)	Construction period (initial 18 months): approximately 5 4 personnel per day Operation period (25 years post construction): approximately 2 personnel per day. These personnel will be considered vulnerable occupants. They will be trained fire mitigation personnel as per NFPA 855. The site administrative buildings and car parks will be built with adequate separation from the battery farm and adequate fire mitigation equipment and evacuation points will be in place as per NFPA 855.
7. Local weather conditions (Section 5.3.1)	Please see section 5.4.1 of the report body for natural hazard safeguards. Fire danger period for Corangamite Shire is typically from December to April. This will be taken into consideration when tasks with high fire risk are to be performed.
8. Electrical hazards (Section 5.3.1)	Addressed in Section 5.4.2 of report body.
9. Chemical hazards (Section 5.3.1)	Addressed in Section 5.4.2 of report body
10. Potential fire spread (Section 5.3.1)	The site will be designed to comply with NFPA 855 which outlines battery separation, containment, fire detection and suppression systems and explosion control system requirements. The BESS will be equipped with a BMS. Fire safety study results will also be incorporated to the final design.
11. Mechanical damage (Section 5.3.1)	Fencing and battery containment barriers to be designed as per NFPA 855 to prevent mechanical damage to batteries. Please see section 5.4.2 of report body.

12. Landscape hazards (Section 5.3.1)	Ember protection to be implemented in battery containment facilities and the vegetation screening to prevent embers creating internal fires on site. For additional hazards please see item 7 of this table.
13. Fire Safety Study and modelling (Section 5.3.1)	Fire safety study to be undertaken during detailed design stages to confirm the adequate fire mitigation system requirement and fire water requirement.
14. Facility Location (Section 6.1.1)	Please see item 1 in this table. An assessment against Clause 13.02-1S is not required for this Project as this Project does not fit the types of facilities listed in the clause.
15. Emergency Vehicle Access (Section 6.2.1)	Please see item 2 in this table.
16. Firefighting water supply (Section 6.2.2)	The fire water system is yet to be designed. Water supply volume required is to be determined during detailed design post afire safety study. Potential to install a ring main fire water supply and locate fire hydrants as per NFPA 855 and CFA requirements. The final design will incorporate the model requirements from Section 6.2.2 of CFA including fire hydrant model requirements.
17. Landscape Screening and On-Site Vegetation (Section 6.2.3)	Please see items 3 and 12 in this table.
18. Fire Breaks (Section 6.2.4)	A 10m fire break is to be implemented as part of the Projects detailed design. The fire break is to meet NFPA 855 compliance standard. Please see section 5.4.2 of the report body.
19. Design Specific to BESS (Section 6.2.5)	Non-combustible, floor to ceiling partition walls (thermal barriers between battery racks (stacked modules) within battery containers will be considered The facility will be designed to comply with FM Global Property Loss Prevention Data Sheet 5-33 (2020) Electrical Energy Storage Systems
20. Fire Detection and Suppression Systems (Section 7.1.1)	Please see items 5 and 10 in this table.
21. Fire Risk Management (Section 7.1.2)	In accordance with the CFA guidelines, fire risk management is to be implemented by adhering to any conditions during the Fire Danger Period. Conditions include remaining on designated tracks for driving and restricted smoking areas. Appropriate permits to be obtained if required.
22. Personnel Training (Section 7.1.3)	Site personnel to be equipped with first aid and fire mitigation training including CFA's training modules for bushfire safety.
23. Emergency Management (Section 7.1.4)	Emergency Management Plan to be prepared as per the CFA guidelines prior to commissioning. Reliable communication devices to be installed for use in the event of a power failure. CFA to be notified at least 7 days prior to commissioning.
24. Occupational Health and Safety (Section 7.1.5)	Safe work procedures and standard operating procedures to be developed for on-site personnel encompassing hazard management, security, ignition source control, maintenance and emergency procedures.
25. Vegetation and Fuel Management (Section 8.1)	Please see item 3 in this table.
26. Maintenance (Section 8.2)	Maintenance to be conducted to meet Australian standards and manufacturers requirements. Any work that may create an ignition source will be under 'hot work' permits.
27. Dangerous goods storage and handling (Section 8.3)	Appropriate signage to be used as per CFA and NFPA 855.

28. Facility and System Monitoring (Section 8.4)	Please see item 10 of this table.
29. Risk Management Review (Section 8.5)	Facility operators to develop or review the Risk, Fire and Emergency management plans.
30. Fire Management Plan (Section 9)	Will be developed per CFA guidelines during detailed design.
31. Emergency Management Plan (Section 10.1)	Will be developed per CFA guidelines during detailed design.
32. Emergency Information for Responders (Section 10.2)	Will be developed per CFA guidelines during detailed design.
33. Personnel Training (Section 10.3)	Will be done per CFA guidelines during onboarding of operators for commissioning and operation.
34. Emergency Exercises (Section 10.4)	Will be done per CFA guidelines during onboarding of operators for commissioning and operation.
35. Reviewing Emergency Management Plans (Section 10.5)	Will be performed per CFA guidelines during commissioning and site operation.
36. Bushfire Emergency Planning (Section 11)	Will be performed per CFA guidelines during commissioning and site operation.

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