

EMERGENCY MANAGEMENT PLAN

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Charam Solar Farm Charam, VIC

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EMERGENCY MANAGEMENT PLAN

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Charam Solar Farm, Goroke-Harrow Rd, Charam, VIC

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A handwritten signature in black ink, appearing to read 'HMacC'.

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Abbreviations

Term	Meaning
APZ	Asset Protection Zone
AS 3959:2018	Australian Standards, Construction of Dwellings in Bushfire Prone Areas
BAL	Bushfire Attack Level
BESS	Battery Energy Storage System
BMO	Bushfire Management Overlay
BPA	Bushfire Prone Area
CFA	Country Fire Authority
EMP	Emergency Management Plan
FBI	Fire Behaviour Index
FDR	Fire Danger Rating
FMP	Fire Management Plan
FRA	Fire Risk Assessment
PCS	Power Conversion System
PV	photovoltaic
RMU	Ring Main Unit
VFRR	Victorian Fire Risk Register

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Glossary Of Terms

Term	Meaning
Asset Protection Zone	(APZ) A buffer zone of modified fuel and vegetation to reduce the threat to life and property adjoining key community assets and critical infrastructure. Also referred to as a 'fire break'.
Battery Energy Storage System	(BESS) BESS is a dedicated battery and associated components housing, often shaped like a shipping container.
Bushfire	Unplanned fire in natural or managed vegetation.
Bushfire Prone Vegetation	Vegetation that is vulnerable to fire, either through specific adaptation or by inherent characteristics such as high levels of fine fuels, volatile oils or dead material retention.
Crown Fire	Fire that reaches and burns the tree canopy, which can be spread to neighbouring trees by wind.
Defendable Space	An area of managed vegetation surrounding an asset to protect it from radiant heat and direct flame contact.
Fire Behaviour Index	(FBI) is a potential fire intensity scale running from 0 to 100 and beyond, with increasingly high values indicating increasingly dangerous fire behaviour and therefore fire danger risk.
Fuel Load	The amount of fire fuels available to burn in a given area, usually described in Tons per hectare.
Fuel Reduction	The process of removing/reducing fuel loads through mechanical, burning or chemical means.
Minimum Fuel Condition	Describes managed landscapes where fuel reduction or management such as mowing, watering or spraying has occurred to restrict the severity, impact and spread of fire.
Solar Energy Facility	A facility where solar energy is converted to electricity, often connected to the electricity grid. They can be photovoltaic or solar thermal technology.
Spotfire	Fires that occur ahead of the main fire front during a bushfire, usually started by embers carried ahead of the fire by strong winds.

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1 Introduction

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1.1 Objective

The purpose of this Bushfire Emergency Management Plan is to assess the bushfire risk and advise appropriate management measures to increase the safety of all workers, contractors and visitors involved with the solar farm. The primary directive of this plan is the protection of life and property. This EMP has been prepared with guidance from Section 10 and Section 11 of the *Renewable Energy Facilities Design Guidelines and Model Requirements* (CFA 2022).

The Solar Farm Emergency Management Plan addresses specific risks, prioritises the safety and protection of personnel and equipment, and minimises environmental impacts. The objectives are:

Risk Identification and Assessment:

- Identify potential emergencies relevant to solar farms, such as fires, electrical hazards, severe weather (e.g. storms and lightning), equipment failures, and potential environmental impacts.

Emergency Response Procedures:

- Develop clear and effective emergency response procedures tailored to the unique risks of the solar farm environment.
- Establish protocols for responding to emergencies, including evacuation procedures, fire suppression measures, medical response plans, and containment strategies for hazardous materials or spills.

Communication and Notification:

- Establish robust communication systems and protocols for promptly alerting personnel, emergency responders, and relevant stakeholders in case of an emergency.
- Ensure communication methods account for potential challenges such as remote locations.

Personnel Training and Preparedness:

- Provide comprehensive training programs for all personnel involved in the operation and maintenance of the solar farm.
- Conduct regular drills and exercises to practice emergency response procedures, improve coordination among teams, and familiarise personnel with evacuation routes and assembly points.

Resource Management and Allocation:

- Identify and allocate necessary resources, including firefighting equipment, first aid supplies, personal protective equipment (PPE), and communication devices.
- Establish agreements with emergency services and local authorities to support resource sharing and coordination during larger-scale emergencies.

Environmental Protection and Contingency Planning:

- Develop contingency plans to mitigate environmental impacts from emergencies, such as fire emerging from site operations or spills of hazardous materials or chemicals used in solar panel maintenance.

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1.2 Review and Continuous Improvement:

This EMP will be reviewed to ensure the procedures and plans are current. Reviews will be carried out by the **Emergency Planning Committee** (to be appointed). Reviews and updates shall be conducted annually, or when:

- Any changes in risk to the site occur (based on identified risks in the Risk Management Plan).
- Any changes to management procedure arising from amendments to the Fire Management Plan.
- Any improvements to the emergency management procedures arise.
- Any incidents that activate the EMP occur and an After Action Review is conducted.
- Incorporating lessons learned from drills, exercises, and actual emergency events.
- Seeking feedback from personnel, stakeholders, and regulatory agencies to identify opportunities for improvement and ensure compliance with relevant laws and regulations.

By focusing on these objectives, the solar farm facility will enhance its preparedness, response capabilities and resilience in managing emergencies effectively while safeguarding the well-being of personnel and minimising environmental impacts.

Reviews of Emergency Plans for the facility should be conducted in conjunction with reviews of the Risk Management Plan and the Fire Management Plan.

See Section 3 for the organisational structure for emergency management.

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2 Site Overview

2.1 Location

The site is located approximately 10km west of the township of Edenhope, Victoria on the intersection of Charam-Wombelano Road and Goroke-Harrow Road in the West Wimmera Local Government Area. Primary access to the site is via Charam-Wombelano Road, with a secondary access on the Goroke-Harrow Road. Both access roads are sealed.

The surrounding landscape is primarily open farming land (grazing and cropping) with bushland areas to the west and south of the facility. The topography is gently undulating and relatively benign.



Fig.1 Site location within the broader landscape showing 5km and 20km respectively from the site).

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3 Organisational Structure

The organisational framework for managing emergency preparation, compliance, and emergency response procedures is as follows:

3.1 Emergency Planning Committee (EPC)

The Emergency Planning Committee will be comprised of representatives and stakeholders in the facility. The EPC will be made up of:

- Senior Green Gold management
- Staff
- Chief Warden
- Specialist facility personnel e.g. maintenance engineer

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3.2 Emergency Control Organisation (ECO)

The ECO will implement onsite emergency procedures, including evacuation of site occupants, on the declaration of an emergency.

The ECO will be responsible for emergency training, evaluation and record keeping.

At this stage Green Gold Energy are yet to appoint the positions for the construction and operation of the facility. The ECO structure will most likely include:

- Senior Green Gold management
- Site Manager/Construction Manager (construction phase)
- OHS Manager (Operation Phase)

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Fig.1 Organisational structure based on Australian Standard 3745:2010 (First 5 Minutes, 2024)



4 Infrastructure

The proposed development consists of the following components:

- 10,287 Photovoltaic modules (solar panels) capable of generating up to 4.95 MW.
- Up to 4 BESS container systems each with 2752 kWh capacity, with fire safety systems including liquid cooling, Aerosol suppression, explosion prevention and ventilation IDLH gases.
- A central inverter station (one inverter).
- A laydown area, site storage and amenity facilities, only on-site during the construction phase.
- HV Switchboard facility.
- Access via multiple entry points from all-weather roads, with the main entrance providing direct access to a perimeter fire break track and hardstand area.
- A firefighting water supply (288 kL).
- A 2.3m high chain link security fence around the solar farm.
- 10m APZ around the BESS.
- 10m traversable perimeter fire break around the entire solar farm facility. Peripheral landscaping buffer surrounding the site.
- New 22kV high voltage transmission line connecting the solar farm facility to the existing electricity distribution network.
- New internal DC and AC cabling for electrical reticulation to connect solar modules to the PCS and to connect the solar farm facility to the 22kV high voltage transmission line.

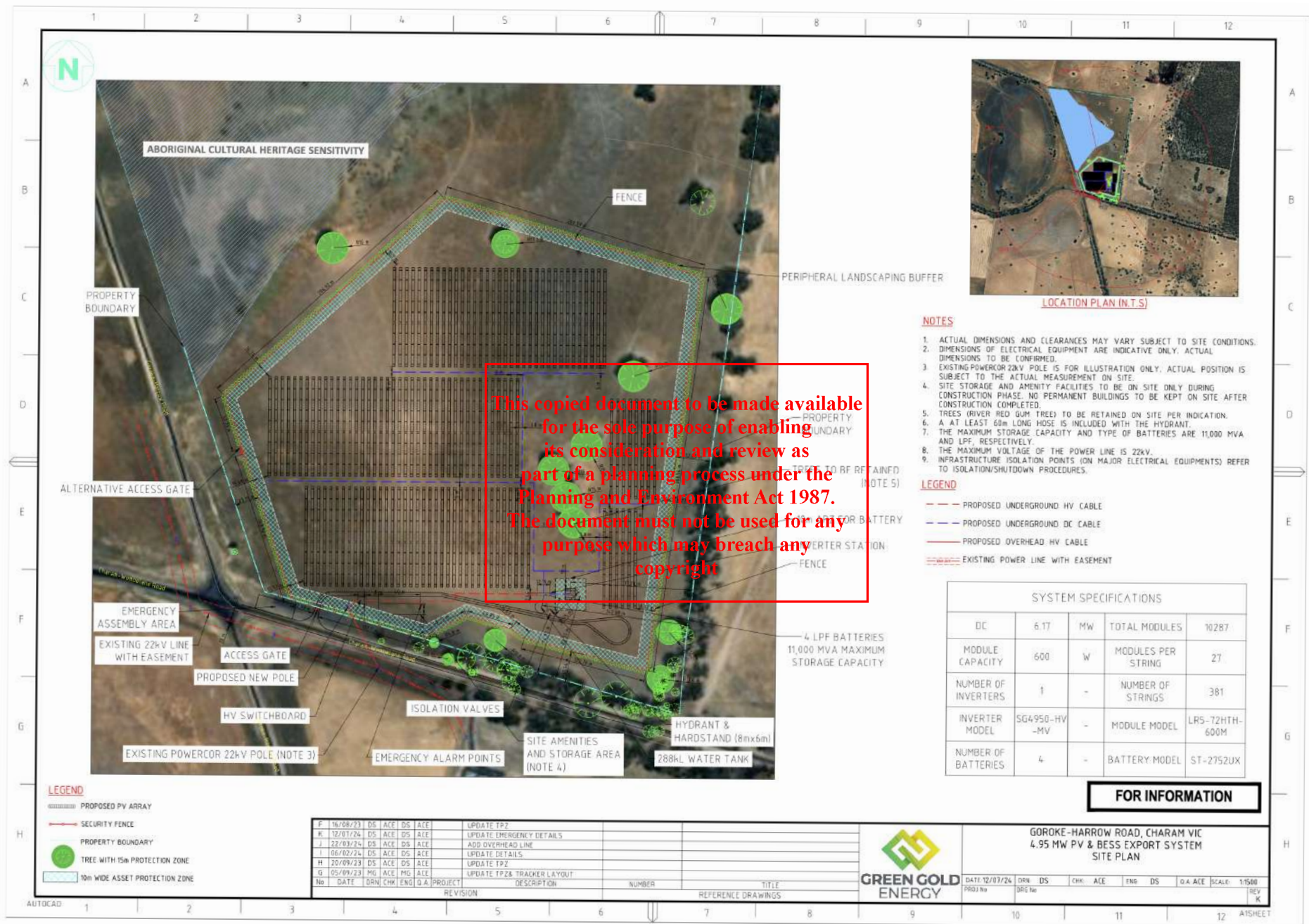
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4.1 Construction Phase Infrastructure

The construction phase of the project will require initial earthworks before infrastructure installation occurs. Key components to establish that will assist with emergency management are:

- Perimeter and access roads.
- Fire break Asset Protection Zone.
- Hardstand area and static water supply tank.
- Perimeter fencing and access gates.

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Fig.2 Site plan for Charam Solar Farm.



The key solar farm components will then be added, including:

- Temporary buildings (offices and amenities for the construction phase)
- Electrical Infrastructure (PV arrays, BESS, Inverter)

Ideally, the construction phase would occur outside of the Fire Danger Period to reduce the chance of on-site fire ignitions from construction works. There will be workers, and periodically visitors, present at the facility during working hours. It is not expected that work will continue at night, however occasional maintenance or management of equipment at night may occur.

4.2 Operational Phase Infrastructure

The amenities and office facilities will be removed for the operational phase. The move to the operational phase will see the undertaking of infrastructure monitoring and maintenance activities, including:

- Routine maintenance and inspections of electrical infrastructure for visible damage or defects.
- Routine checking of monitoring and control systems (including software and storage devices).
- Routine inspection of the static water supply.
- Routine inspection of the fire suppression equipment.
- Routine inspection and maintenance of the APZ and fire breaks.
- Routine inspection of the access and perimeter roads.
- Routine inspection of the gates and fencing.

No personnel will be based on-site during the operational phase and the facility will be remotely operated and monitored. Occasional operational and maintenance activities will be required on-site by authorised personnel under the supervision of operational staff.

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5. Identification of fire risks

Potential fire risks to the site can emerge from either within the facility or from external sources. Specific fire risks can occur both during the construction phase and during the operational phase.

5.1 Fire Risks Within the Facility

5.1.1 Construction Phase

It is expected that up to 20 workers could be on site during the construction phase. Potential fire risks emerging from within the facility during the construction phase at the site include:

- Electrical fires resulting from incorrect installation, physical damage or faulty components within the PV panels, BESS, inverter, cabling or connections.
- Machinery fires resulting from irregular or poor maintenance, vehicle accidents or driving over/idling in dry grass, slashing during high fire danger days etc.
- Structural fires resulting from incorrect operation of electrical equipment, electrical faults etc.
- Flammable liquid fires resulting from the incorrect handling and storage of flammable liquids.

5.1.2 Operational Phase

The facility will be unoccupied during the operational phase, apart from routine inspections and maintenance tasks. Due to the facility being remotely operated and monitored, potential fire risks emerging from within the facility during the operational phase are the same as for the construction phase, however fires emerging from non-anthropogenic sources (such as failure of electrical components) are more likely to occur when there are no workers on-site. Fire risk will be less during the operational phase due to:

- The removal of on-site facilities for workers will reduce the likelihood of structure fires.
- Less hot works and construction activity with high ignition risks.
- No flammable liquid storage or use on-site.

The Fire Management Plan outlines the fire mitigation measures required to keep fire risks from within the site to a minimum. The emergency procedures and evacuation plans established in this EMP will reduce the impact of fire and therefore risk to life and property to an acceptable level.

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Emergency Management Plan - Charam Solar Farm

5.2 Fire Risks External to the Facility

Fire from the surrounding landscape will be primarily from bushfire arising from either anthropogenic ignitions (slashing or harvesting machinery, accidents, arson, escaping controlled burns etc) or from lightning strikes.

The landscape immediately adjacent to the site and up to 450 metres surrounding the site is predominantly grassland vegetation managed for pasture grazing. The expected fuel loads would vary, but an average estimate for fully cured grassland, 20-30cm high with 70% cover and moderate thatching would be 2.5-3 t/ha. Grassland fuels are relatively easy to treat to reduce the available fuels during the season by slashing and grazing. Fuel buffers and APZs are relatively easy to establish with machinery or grazing. Fire breaks and control lines can readily be established as part of direct attack strategies during grassfire firefighting.

Bushfire can approach from multiple directions. The prevailing bushfire weather sectors (northwest and southwest) are predominantly grassland vegetation. There is fragmentation of the grassland by sealed roads that offer a reasonable buffer, although it would be expected that in severe bushfire conditions, especially when driven by stronger winds (>25km/h), fire would likely jump control lines and buffers due to embers starting spotfires ahead of the front.

The primary forest vegetation near the site is over 400m to the east. The eastern sector is less likely to drive severe fire behaviour, therefore wind-driven embers and radiant heat from this sector are less likely to impact the site.

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6. Emergency Procedure Planning

6.1 Overview

There are several key steps to planning comprehensive and effective Emergency Response Procedures:

Identification and Assessment:

- Identify Potential Emergency: Determine the type of emergency that could occur at the facility (e.g. fire, medical emergency, natural disaster).
- Risk Assessment: Evaluate the likelihood and potential impact of each identified emergency scenario. Consider factors such as location, seasonality, and the nature of operations.
- Prioritisation: Rank emergencies based on their likelihood and severity to prioritise resources and planning efforts.

Communication Protocols:

- Establish clear communication channels and protocols for disseminating emergency information. This includes methods for alerting personnel (e.g. alarms, announcements), contacting emergency services, and communicating with external stakeholders (e.g. families, media).



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Emergency Management Plan - Charam Solar Farm

- Notify emergency services, provide situation report and seek advice.
- Decide the appropriate response strategy in collaboration with emergency services.

Response:

- Formulate emergency response procedures: Define specific actions and procedures to mitigate, respond to, and recover from the identified emergency. This includes evacuation procedures, medical response protocols, communication plans, etc.
- Communicate the emergency response to all persons on-site and notify emergency services.
- Identify and allocate necessary resources (e.g., equipment, personnel) to support emergency response efforts effectively.
- Monitor the emergency situation and confirm when appropriate to stand down, following direction from emergency services.

Review:

An After Action Review (AAR) is crucial for evaluating and learning from an emergency response. Here are the key steps to conduct an effective AAR:

- **Gather Information:** Collect detailed information about the emergency event, including what occurred, how it unfolded, and the actions taken by individuals and teams during the response.
- **Review Objectives and Performance:** Compare the actual outcomes of the emergency response with the established objectives and performance metrics. Identify successes, shortcomings, and areas for improvement.
- **Identify Lessons Learned:** Discuss and document the key lessons learned from the emergency response. This includes analysing what worked well, what could have been done better, and any unexpected challenges encountered.
- **Recommendations for Improvement:** Develop actionable recommendations based on the lessons learned. Prioritise these recommendations and outline steps for implementing changes to enhance future emergency responses.
- **Document and Share Findings:** Document the findings and recommendations from the AAR in a formal report or summary. Share this information with relevant stakeholders, including leadership, emergency response teams, and others involved in emergency planning and execution.
- **Implement Changes:** Ensure that identified recommendations are implemented into updated emergency plans, procedures, training programs, and resources. Monitor progress and evaluate the effectiveness of these changes over time.



6.2 Roles and Responsibilities

This section defines the Emergency Management duties, responsibilities, accountabilities and authorities of key persons during the construction and operation phase.

6.2.1 Senior Management

The Senior Management/Project Director should identify the possible types of emergencies and identify the emergency roles and responsibilities during the construction and operation of the facility. The key emergency management roles should be undertaken by:

- The Construction Manager/Chief Warden during the construction phase of the project.
- The OHS Manager during the operation phase of the project.

The roles will be determined by the Emergency Planning Committee, who will be responsible for ensuring that:

- Sufficient support and resources are provided for the implementation and review of the Emergency Management Plan.
- Refresher training will be provided where necessary.
- Systems are implemented to ensure sufficient support and resources are provided for the implementation and review of the Emergency Management Plan.

6.2.2 Construction Manager/ Chief Warden

During the construction phase the Construction Manager/Chief Warden should:

- Ensure workers are familiar and comply with the Emergency Management Plans and Procedures.
- Be responsible for coordinating any emergencies and oversee any evacuation orders.
- Be responsible for ensuring emergency drills and exercises are well coordinated.

and additionally, during the Fire Danger Period, the Construction Manager/Chief Warden should:

- Ensure preparation for the Fire Danger Period is undertaken in a timely manner.
- Ensure appropriate vegetation management and building maintenance is undertaken.
- Monitor the Fire Behaviour Index Four Day Forecast.
- Monitor Bushfire Warnings and Alerts.
- Follow communication plans for elevated Fire Danger Days.

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7 Standard Emergency Response Procedures

The following emergency procedures are associated with specific types of emergency that may impact the solar farm facility:

7.1 Bushfire

Hazard Type	Response Procedure
Bushfire- External to the site	<ul style="list-style-type: none"> • Report to the Chief Warden or Deputy Warden any fires sighted or detected external to the site deemed to be potentially uncontrolled.
	<ul style="list-style-type: none"> • Call '000'- Fire If deemed necessary, the Chief Warden will report the fire to emergency services.
	<ul style="list-style-type: none"> • Communicate Immediately inform all workers of the potential risk.
	<ul style="list-style-type: none"> • Assess the fire's proximity, severity, direction of travel, likelihood of spread, and potential impact on workers and facility infrastructure.
	<ul style="list-style-type: none"> • Enact evacuation procedures, or if it is deemed unsafe to evacuate, enact shelter-in-place procedures if there is likely impact from fire (see Evacuation Plan).

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Hazard Type	Response Procedure
Bushfire- Within the site	<ul style="list-style-type: none"> • Report to the Chief Warden or Deputy Warden any fires sighted or detected within the site, especially during the Fire Danger Period and elevated fire danger days.
	<ul style="list-style-type: none"> • Call '000'- Fire The Chief or Deputy Warden will report the fire to Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety.
	<ul style="list-style-type: none"> • Assess the likelihood of spread, potential impact on workers and the facility infrastructure, direction of travel and severity of the fire. • Assess if the fire is likely to remain onsite or spread further offsite.
	<ul style="list-style-type: none"> • Extinguish fire where safe to do so with a fire extinguisher
	<ul style="list-style-type: none"> • Enact evacuation procedures if there is likely impact from the fire (see Evacuation Plan).



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7.1.1 Trigger Points

The trigger points for this site are based on the forecast fire danger ratings for the Wimmera District. The previous Victorian fire danger rating system has been replaced by the nationwide Australian Fire Danger Rating System (AFDRS). The AFDRS provides a consistent form of fire danger rating communication to the community, and a more detailed Fire Behaviour Index (FBI) which runs from 0 to 100 and beyond, with increasingly high values indicating increasingly dangerous fire behaviour and therefore increasing fire danger risk. The FBI allows users to make decisions that require finer detail than the four Fire Danger Rating categories allow.

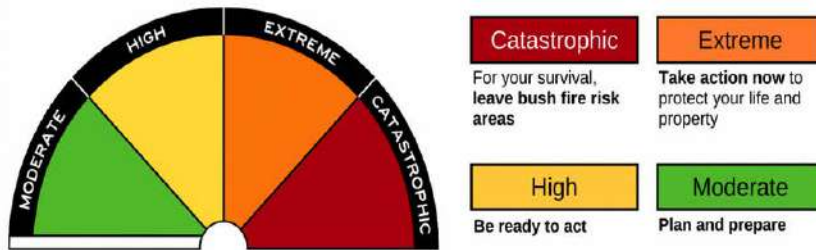


Fig.3 The AFDRS is a predictor of fire behaviour and the difficulty in suppressing it.



Fig.4 The Fire Behaviour Index (FBI) is scaled according to expected severity of fire behaviour.

7.1.2 Bushfire Evacuation and Shelter-In-Place Procedures

It is expected that no work during the construction phase will occur on Extreme or Catastrophic Fire Danger days.

The trigger for evacuation will be if there is fire likely to impact the site, and there is time to evacuate to a safer place. Evacuation warnings can come from multiple sources, such as through the Fire Warden, Police, CFA and VicEmergency app notifications. In the event that evacuation is not possible, the amenities building will be used as the shelter-in-place building. This building will be the building able to withstand potential radiant heat exposure from the nearest bushfire vegetation. The building should be capable of providing at least 1.5 sq.m of space for each person on-site. Evacuation procedures are detailed in section 9 of this plan. Grassfire is the biggest threat to the site and can travel at speeds in excess of 26 km/h. Be prepared to shelter-in-place if evacuation is not possible. A grassfire within 10km could likely impact the site with no time to evacuate safely, requiring shelter-in-place procedures as the safest option.



Risk	Fire Behaviour Index (FBI)	Actions
Pre-Fire Danger Period	-	Grounds maintenance and building maintenance as per the FMP.
Moderate FBI	12-23	Chief Warden to monitor the VicEmergency app (use the 20km and 50km watch zone).
High FBI	24-49	Implement Communications Plan. Chief Warden to monitor the VicEmergency app (use the 20km and 50km watch zone).
Extreme FBI	50-100	Implement Communications Plan. Chief Warden to monitor the VicEmergency App (use the 20km and 50km watch zone). Cancel all work and visitors to the facility.
Catastrophic FBI	100+	Implement Communications Plan. Chief Warden to monitor the VicEmergency App. Cancel all work and visitors to the facility.
A Local Bushfire or Grassfire Event within 20km of the site.		Implement Communications Plan. Chief Warden to monitor the VicEmergency app. Prepare for evacuation procedures.
A Local Bushfire or Grassfire Event within 10km of the site.		Implement Communications Plan. Chief Warden to monitor the VicEmergency app and bushfire information sources. Prepare for Evacuation/Shelter-In-Place procedures.

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7.2 All Other Fires and Emergencies

Hazard Type	Response Procedure
Liquid Fuel Fires	<ul style="list-style-type: none"> • Remove yourself and others from immediate danger
	<ul style="list-style-type: none"> • Notify the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Call '000'- Fire The Chief Warden will report the fire to emergency services. Seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety.
	<ul style="list-style-type: none"> • Assess the likelihood of spread, potential impact on workers and the facility infrastructure, direction of travel and severity of the fire. • Assess if the fire is likely to remain onsite or spread further offsite.
	<ul style="list-style-type: none"> • Enact evacuation procedures if there is likely impact from the fire and worker safety is compromised (see Evacuation Plan).
Hazard Type	Response Procedure
BESS Fire	<ul style="list-style-type: none"> • Remove yourself and others from immediate danger
	<ul style="list-style-type: none"> • Notify the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Call '000'- Fire The Chief Warden will report the fire to emergency services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety. Keep workers out of smoke and gasses.
	<ul style="list-style-type: none"> • Assess the likelihood of spread, potential impact on workers and the facility infrastructure and severity of the fire. Assess if the fire is likely to remain onsite or spread further offsite.
	<ul style="list-style-type: none"> • Contact the technical support team to initiate or provide instruction to enable BESS to be isolated and shut down. Ensure the fire suppression systems are operational.
<ul style="list-style-type: none"> • Enact evacuation procedures if there is likely impact from the fire and worker safety is compromised (see Evacuation Plan). 	

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Hazard Type	Response Procedure
Solar PV Array Fire	<ul style="list-style-type: none"> • Remove yourself and others from immediate danger
	<ul style="list-style-type: none"> • Notify the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Call '000'- Fire The Chief Warden will report the fire to emergency services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety. Keep workers clear of smoke and gasses.
	<ul style="list-style-type: none"> • Assess the likelihood of spread, potential impact on workers and the facility infrastructure and severity of the fire. Assess if the fire is likely to remain onsite or spread further offsite.
	<ul style="list-style-type: none"> • Contact the technical support team to initiate or provide instruction to enable the PV panels to be isolated and shut down.
	<ul style="list-style-type: none"> • Enact evacuation procedures if there is likely impact from the fire and worker safety is compromised (see Evacuation Plan).

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Hazard Type	Response Procedure
Electrocution	<ul style="list-style-type: none"> • Remove yourself and others from immediate danger • Do not touch the electrocuted person(s).
	<ul style="list-style-type: none"> • Notify the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Call '000'- Fire & Ambulance and electricity company (Powercor 132 412). The Chief Warden will report the incident to emergency services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety.
	<ul style="list-style-type: none"> • Follow the instructions of the Chief or Deputy Warden and Emergency Services.
	<ul style="list-style-type: none"> • Enact evacuation procedures if worker safety is compromised (see Evacuation Plan).

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Hazard Type	Response Procedure
Structural Fire	<ul style="list-style-type: none"> • Remove yourself and others from immediate danger
	<ul style="list-style-type: none"> • Close doors / windows of building in which fire is located, if safe to do so.
	<ul style="list-style-type: none"> • Activate fire alarm and Notify the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Shut off power and gas supplies to the building.
	<ul style="list-style-type: none"> • Call '000'- Fire The Chief Warden will report the fire to emergency services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate immediately to all workers the potential risk. Monitor the work area to ensure worker safety. Keep workers clear of smoke and gasses.
	<ul style="list-style-type: none"> • Assess the likelihood of spread, potential impact on workers and the facility infrastructure and severity of the fire. Assess if the fire is likely to remain onsite or spread further offsite.
	<ul style="list-style-type: none"> • Extinguish the fire with fire extinguisher if trained, and if it is safe to do so.
<ul style="list-style-type: none"> • Enact evacuation procedures if there is likely impact from the fire and worker safety is compromised (see Evacuation Plan). 	

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Hazard Type	Response Procedure
Motor Vehicle Accident	<ul style="list-style-type: none"> • Remain calm, assess the incident and avoid moving any injured persons if there is no immediate risk of further injury.
	<ul style="list-style-type: none"> • Notify the Chief or Deputy Warden of the incident, the vehicles involved, location and extent of injuries.
	<ul style="list-style-type: none"> • Call '000'- Ambulance & Fire The Chief Warden will report the accident to emergency services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate to Emergency Services if there is a person trapped or if there is a potential for fire to occur.
	<ul style="list-style-type: none"> • Remove yourself and others from potential danger.
	<ul style="list-style-type: none"> • Contact the technical support team to initiate or provide instruction to enable the PV panels to be isolated and shut down.

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Hazard Type	Response Procedure
Medical Emergency	<ul style="list-style-type: none"> • Assess the immediate area for potential dangers
	<ul style="list-style-type: none"> • Obtain immediate and adequate treatment for injured person(s) from qualified First Aid staff.
	<ul style="list-style-type: none"> • Call '000'- Ambulance The Chief Warden will report the incident to Emergency Services. Give clear situation report and seek and follow advice from Emergency Services.
	<ul style="list-style-type: none"> • Communicate the immediately to the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Assess the accident site and secure to prevent risk of further injury.

Hazard Type	Response Procedure
Bomb Threat (phone/letter/suspicious package)	<ul style="list-style-type: none"> • Remain calm.
	<ul style="list-style-type: none"> • Record information through notes, voice recording or photographs/video.
	<ul style="list-style-type: none"> • Ask key questions, finding out as much as you can about the location and nature of the threat.
	<ul style="list-style-type: none"> • Stay on phone, even if they hang up.
	<ul style="list-style-type: none"> • Call '000' - Police The Chief Warden will report the threat to emergency services. Give clear situation report and seek and follow advice from emergency services.
	<ul style="list-style-type: none"> • Communicate the potential risk immediately to the Chief or Deputy Warden and all workers.
	<ul style="list-style-type: none"> • Enact evacuation procedures (see Evacuation Plan).

Hazard Type	Response Procedure
Personal Threat (Intruders/ other)	<ul style="list-style-type: none"> • Do Not attempt to corner or apprehend the intruder.
	<ul style="list-style-type: none"> • Remove yourself and others from potential danger.
	<ul style="list-style-type: none"> • Call '000'- Police The Chief Warden will report the threat to emergency services. Give clear situation report and seek and follow advice from emergency services.
	<ul style="list-style-type: none"> • Communicate the hazard immediately to the Chief or Deputy Warden.
	<ul style="list-style-type: none"> • Enact evacuation procedures if worker safety is compromised, if safe to do so (see Evacuation Plan).



7.3 Procedures for Isolation and Shutdown of Solar Panels and Related Infrastructure

The purpose of these procedures, which are based on Isolation/Shutdown Procedures (Ace Microgrid/Green Gold Power), is to minimise the impact of a fire occurrence on solar panels and related infrastructure and to limit the potential for fire spread through the facility and offsite. These procedures will be updated to be site and infrastructure specific for the Emergency Information Book and will be provided as an update to this EMP when the information becomes available.

PV DC Isolation

- Switch the pile-mounted DC isolators for each tracker row to the OFF position and lock them out if possible. There are three strings with two DC isolators per tracker, and a total of 113 rows.

- Switch the DC disconnectors for each DC Combiner Box to the OFF position.

There are a total of 20 DC Combiner Boxes: 10 for inverter INV-01 (SCB-1A-01, SCB-1A-02, SCB-1A-03, SCB-1A-04, SCB-1A-05, SCB-1B-01, SCB-1B-02, SCB-1B-03, SCB-1B-04, SCB-1B-05) and 10 for inverter INV-02 (SCB-2A-01, SCB-2A-02, SCB-2A-03, SCB-2A-04, SCB-2A-05, SCB-2B-01, SCB-2B-02, SCB-2B-03, SCB-2B-04, SCB-2B-05).

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- Open the front panels of inverters INV-01 and INV-02 and press the circuit breaker (CB) open buttons to open the DC switch disconnectors.

- DO NOT disconnect DC strings under load; ALWAYS switch off DC isolators before working on downstream string repairs.

Battery Storage Isolation

- Switch DC SWITCH 1 to OFF position for 8 DC-DC converters SD1, SD2, SD3, SD4, SD5, SD6, SD7, and SD8 for each battery container.

- Switch DC SWITCH 2 to OFF position for 2 DC-DC converters SD4 and SD5 for each battery container. (DC SWITCH 2 of SD1, SD2, SD3, SD6, SD7, SD8 are not connected on load side).

HV Isolation

- All HV switching and isolation works shall be undertaken by licensed HV switching operators with an approved HV switching sheet.

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7.4 BESS Emergency Systems and Procedures

7.4.1 BESS General Information

Type designation	ST2752UX-US
Battery Data	
Cell type	LFP
Battery capacity (BOL)	2752 kWh
Battery voltage range	1160 ~ 1500 V
General Data	
Dimensions of battery unit (W * H * D)	9340*2600*1730mm
Weight of battery unit	25,400kg
Degree of protection	IP 54/Type 3R
Operating temperature range	-30 to 50 °C (> 45 °C derating)
Relative humidity	0 ~ 95 % (non-condensing)
Max. working altitude	3000m
Cooling concept of battery chamber	Liquid cooling
Fire safety	Fused sprinkler heads, NFPA 69 explosion prevention and ventilation IDLH gases
Communication interfaces	RS485, Ethernet
Communication protocols	Modbus RTU, Modbus TCP
Compliance	UL 9540, UL 9540A/NFPA 855
2 HOURS APPLICATION-ST2752UX*4-5000UD-MV-US	
BOL kWh(DC/AC LV Side)	1100kWh DC/10,379kWh AC
ST2752UX Quantity	4
PCS Model	SC5000UD-MV-US
4 HOURS APPLICATION-ST2752UX*8-5000UD-MV-US	
BOL kWh(DC/AC LV Side)	216kWh DC/21,448kWh AC
ST2752UX Quantity	8
PCS Model	SC5000UD-MV-US
Grid Connection Data	
Max.THD of current	< 3 % (at nominal power)
DC component	< 0.5 % (at nominal power)
Power factor	> 0.99 (at nominal power)
Adjustable power factor	1.0 leading ~ 1.0 lagging
Nominal grid frequency	60 Hz
Grid frequency range	55 ~ 65 Hz
Transformer	
Transformer rated power	5,000 kVA
LV/MV voltage	0.9 kV / 34.5 kV
Transformer cooling type	ONAN (Oil Natural Air Natural)
Oil type	Mineral oil (PCB free) or degradable oil on request

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- The Battery Management System (BMS) monitors internal coolant/oil leaks, and/or gas releases.
- The BESS units contain a deflagration panel.
- The BESS container is rated to IP54 and each battery pack is IP65.
- The BESS has a Heating Ventilation and Air-Conditioning (HVAC) system (integrated with the BMS) within the BESS for airflow/temperature control.
- The battery allowable operating temperature is from -30° to 60°, which will cover the expected ambient temperatures for the facility location. For detailed alarm levels for temperature and heat, consult the accompanying document:

Fault and Alarm Guide, ST2752UX.



Remote PV DC Isolation

- The DC coupled inverter, shared between PV and BESS, can be switched off remotely to isolate electrical equipment upstream to PV and BESS in the event of emergency.
- Each of the DC-DC converters within the BESS can be switched off remotely either individually or all together in the event of emergency.

7.4.2 Emergency Systems for BESS Thermal Runaway and Fires

Battery Cabinet Fire Protection System Composition

The fire protection system of the energy storage system battery cabinet takes into account four aspects: fire separation, fire extinguishing, fire detection, and explosion prevention. Five subsystems are set up, namely:

- Gas fire extinguishing system
- Automatic fire alarm system
- Combustible gas detection system
- Emergency ventilation system
- Aerosol fire extinguishing system (No sprinkler systems are proposed for this unit).

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Gas fire extinguishing system (Aerosol)

The gas fire extinguishing system includes gas fire extinguishing agent, gas cylinder, solenoid valve, signal feedback device (pressure switch), release hose, delivery pipeline, gas nozzle. The gas fire extinguishing system employs a full flooding pipe network, i.e. within the specified time, a concentration of fire extinguishing agent is evenly sprayed to fill the battery cabinet and extinguish the fire within the cabinet.

Automatic fire alarm system

The automatic fire alarm system includes a gas fire extinguishing controller/fire alarm controller, fire detector, emergency start/stop button/manual automatic conversion switch, sound alarm, sound and light alarm, and deflation indicator light. The automatic fire alarm system of each battery cabinet is equipped with a gas fire extinguishing controller/fire alarm controller, and each battery cabinet and compartment is equipped with a smoke detector and temperature detector.

Combustible gas detection system

The combustible gas detection system includes combustible gas detectors and combustible gas alarm.



Emergency ventilation system

The emergency ventilation system consists of an air inlet, exhaust fan and an electric fire damper. The electric fire damper is normally open and will be closed when the automatic fire alarm system detects a fire. When the combustible gas detection system detects that the concentration of combustible gas in the battery compartment reaches the set alarm value, the emergency ventilation system is activated.

Aerosol fire extinguishing system

The battery cabinet fire protection system has the following three working modes:

Automatic control method:

When the liquid-cooled energy storage system is in operation, the fire protection system should be set to “automatic control”.

When a fire occurs in the battery cabinet, the fire protection system automatically completes the entire process of fire detection, alarm linkage control and jet fire extinguishing in the battery cabinet. After a fire alarm signal is detected in the battery cabinet, the fire alarm controller/gas fire extinguishing controller activates the sound and light alarm installed outside the battery cabinet, and provides a fire pre-alarm signal to the BSC. After a second fire alarm signal is detected in the same battery compartment in the battery cabinet, the fire alarm controller/gas fire extinguishing controller activates the sound alarm of the battery cabinet and links to shut down the ESS system. After a 30s delay, the control solenoid valve is opened, and the fire extinguishing agent is released into the battery cabinet through the injection pipe and nozzle. The fire alarm controller/gas fire extinguishing controller receives the feedback signal of the pressure switch and controls the deflation indicator light.

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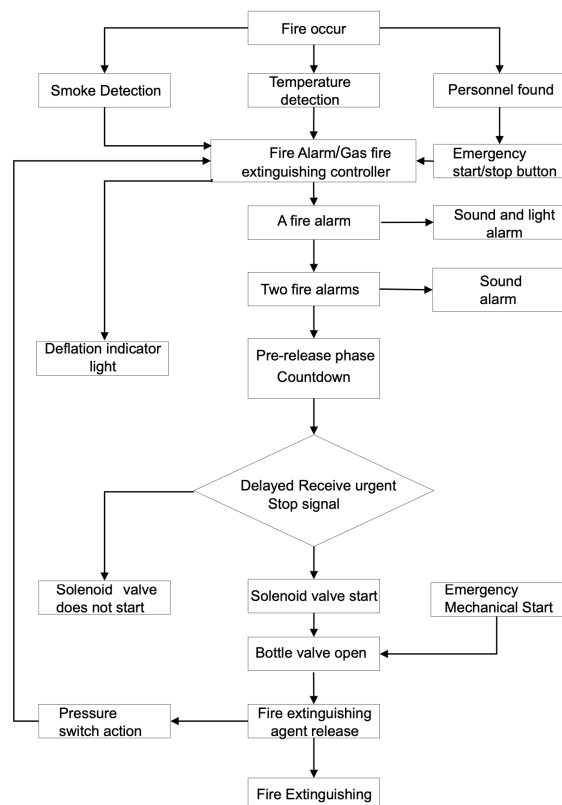


Fig.5 BESS Emergency response flow chart (Sungrow BESS Emergency Response, 2024)



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7.5 Procedures and Actions for BESS Incidents (Operational Phase)

As the facility is unstaffed during operation (apart from regular maintenance schedules), this section will cover specific triggers and the actions/procedures taken to manage incidents involving BESS where thermal runaway has, or is likely to occur. Smoke is usually the first sign (other than an alarm trigger) that a thermal runaway event is occurring. Security cameras at the site should be monitored to detect signs of smoke from the BESS. Contact **Emergency Services '000'** if there are any signs of smoke issuing from the BESS.

Note, all alarms are monitored remotely by the Facility Manager or representative (this role is yet to be appointed). See Appendix for a detailed **Fault and Alarm Guide, ST2752UX**.

Incident/Alarm Type	Action/Procedure	By Whom
High Temperatures	<ul style="list-style-type: none"> Check if ambient temperature is exceeding equipment operating temperature. Check status of the liquid cooling unit. Follow shut down procedures (Emergency Stop Button) and monitor temperatures. Check for other indications of thermal runaway. Contact Sungrow if alarm is not restored. Contact Emergency Services if signs of thermal runaway are occurring. 	Facility Manager
High Humidity	<ul style="list-style-type: none"> Report the Alarm. Contact Sungrow if alarm is not restored. 	Facility Manager
Water Ingress	<ul style="list-style-type: none"> Report the Alarm. Contact Sungrow if alarm is not restored. 	Facility Manager
High Gas Detection	<ul style="list-style-type: none"> Report the Alarm. Contact Sungrow if alarm is not restored. Activate the Emergency Stop button to isolate the system. Contact Emergency Services if signs of thermal runaway are occurring. 	Facility Manager
Overcharge Detection	<ul style="list-style-type: none"> Reduce charging power to 0% Reduce discharging power to 50% of the maximum power Check whether the SOC of the system is within the protection range. If the SOC protection upper limit is set too high, try lowering this value. Try discharging the system with low power to eliminate this alarm. Check for other possible signs of thermal runaway. Contact Emergency Services if signs of thermal runaway are occurring. 	Facility Manager
Smoke/Vapour Detection	<ul style="list-style-type: none"> Report the Alarm. Follow shut down procedures (Emergency Stop Button) and monitor temperatures. Contact Sungrow. Contact Emergency Services immediately as signs of thermal runaway are occurring. Keep Emergency Services informed of any intervention actions. 	Facility Manager
Thermal Runaway Detection	<ul style="list-style-type: none"> Report the Alarm. Follow shut down procedures (Emergency Stop Button) and monitor temperatures. Contact Sungrow. Contact Emergency Services immediately as signs of thermal runaway are occurring. Keep Emergency Services informed of any intervention actions. Facility Manager (or delegate) to attend site to assist emergency response. 	Facility Manager



Incident/Alarm Type	Action/Procedure	By Whom
Fire Safety System Activation (Aerosol suppression)	<ul style="list-style-type: none">• Report the Alarm.• Follow shut down procedures (Emergency Stop Button) and monitor temperatures.• Contact Sungrow.• Contact Emergency Services immediately as signs of thermal runaway are occurring.• Keep Emergency Services informed of any intervention actions.• Facility Manager (or delegate) to attend site to assist emergency response.	Facility Manager

The Facility Manager (or representative) is responsible for :

- Ascertaining and confirming if thermal runaway is occurring.
- Taking the appropriate actions to remotely manage the incident.
- Activating the Emergency Shutdown procedures.
- Attending the site to assist with BESS technical support (when triggered).
- Notifying Emergency Services (when triggered).
- Communicating with Emergency Services when managing an incident involving BESS

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7.6 Risk Controls for Arc Flash Hazards

Identify the Hazard

Electrical hazards may arise from the type of equipment used, how and where it is operated, and how well it is maintained. Arc flash hazards are typically present in areas where high-voltage (HV) or low-voltage (LV) high-current switching takes place.

Assess the Risk of Arc Flash – Refer to IEEE 1584 or Similar Standards

Conduct an arc flash or fault study.

If internal expertise is lacking, engage a third party with the necessary competence and experience in this field. A thorough arc flash study will quantify the risk and provide details about the potential consequences of exposure.

Evaluate the likelihood of personnel being exposed to an arc flash incident.

The risk assessment should consider areas where employees frequently work near or are in close proximity to high-energy switchgear or rooms. Higher-risk activities include live work, switching, racking, fault finding, and installing isolation/earths. Even in the absence of direct interaction with energised boards, employees in the vicinity may still be at risk when automatic protective systems are triggered.

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Guidance can be found in the **Australian Energy Council's *Electrical Arc Flash Hazard Management Guideline*** and the **IEEE 1584-2018 Standard for performing arc-flash hazard calculations**.

Address the Risk – Apply the Hierarchy of Controls

Eliminate personnel exposure by working only on de-energised and isolated equipment.

Replace manual operating systems with automated arc fault detection and protection systems. Devices like Arc Flash Relays (AFRs) and Arc Fault Circuit Interrupters (AFCIs) can automatically detect arc flash conditions and isolate the faulty section of the system, reducing the likelihood of escalation during emergencies.

Isolate personnel from hazards by implementing physical barriers between them and energised equipment or conductors. Switchboards can be designed to contain the energy released during an arc flash event.

Personal Protective Equipment (PPE) Ensure that all personnel working near high-voltage equipment are provided with appropriate arc-rated PPE, including face shields, flame-resistant clothing, gloves, and insulated tools. In emergencies, this equipment provides an additional layer of protection against the intense heat and energy of an arc flash. Although PPE is effective in reducing residual risk, PPE does not prevent injury, but may reduce severity.



Administrative controls

Label all switch rooms, plant and relevant locations to identify incident energy levels and the appropriate actions/precautions that need to be taken:

- Demarcation of arc boundaries
- Make arc flash registers and diagrams available for employees and contractors
- Establish effective policy and procedures that reduce exposure, including training and inductions

Signage and Warning Labels

Place clear and visible arc flash hazard warning labels on all relevant equipment, such as switchboards, inverters, and transformers. These labels should include detailed information on the arc flash boundary, potential risks, and required PPE to ensure personnel are aware of the dangers before entering hazardous zones.

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	! DANGER Flash & Shock Hazard with Covers or Doors Open Appropriate PPE Required	
Flash Protection	Shock Protection	614 Vdc
Incident Energy (cal/cm²)	4.4	Shock Hazard when covers removed
Working Distance	45.7 cm	Limited Approach Boundary
Arc Flash Boundary	4.04 m	Restricted Approach Boundary
Level C Min.PPE Requirements		PPE Glove Class 0 V-Rating 1500 Vdc
Equipment 3Module connected node	Source Protective Device	
Equipment Name		
Contract #	Engineer	Date 30-05-2021
Changes in equipment settings or system configuration will invalidate the calculated values and PPE requirements which may result in a hazardous condition.		

Fig.6 Warning signage for Arc Flash Hazards (supplied: Sungrow ST2752UX Arc Flash Study Report V14)

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8. Emergency Preparedness

8.1 Emergency Equipment

All emergency equipment needs to be checked and maintained regularly, and following an emergency. Emergency Equipment at the facility will include:

- Fire Extinguishers
- First Aid Kit
- Firefighting Water Supply
- Emergency Signage
- Emergency Information Book

Vehicles operating on the site should be supplied with:

- Personal Fire Blanket, one for each person
- Fire Extinguisher or 9L water for firefighting

Personal Emergency Equipment should include:

- Hi-Vis clothing/vest
- Notebook and Pen
- Fire Blanket
- Whistle
- UHF Radio

8.2 Emergency Information Book

An Emergency Information Book inside an Emergency Information Container will be available at the entrances to the facility. The EMP will also be available along with other relevant information for emergency responders. Specific information to be provided in the Emergency Information Book is as follows:

- A description of the facility, infrastructure and operations.
- Site plan with north orientation detailing the site layout, including roads, infrastructure, fire protection systems, dangerous goods storage area, BESS, substations, grid connections and isolation valves.
- Up-to-date contact details for facility personnel, relevant authorities and site neighbours.
- Safety Data Sheets for all dangerous goods stored at the facility.

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- A manifest of dangerous goods (if required) as per Schedule 3 of the Dangerous Goods (Storage and Handling) Regulations 2012.
- Procedures for management of emergencies, including evacuation, shelter-in-place, containment of spills and leaks, and fire (infrastructure fire and bushfire).

Emergency Information Containers will be available at all vehicle access points to the facility and are required to be:

- Painted red and clearly marked in white lettering at least 25mm high 'EMERGENCY INFORMATION'.
- Installed to a height of 1.2 - 1.5 metres.
- Locked and accessible with a standard emergency services '003' key.
- Kept clear of all obstructions and hazards, including vegetation.

8.3 Bushfire Preparedness

8.3.1 Seasonal Outlook

The Chief Warden is required to be aware of the outlook for the Fire Danger Period and ensure that preparations for the fire season are commensurate with the forecast risk.

Seasonal Outlooks are reported through the AFAC website at:

<https://www.afac.com.au/auxiliary/publications/seasonal-outlook/>

8.3.2 Pre Fire Season Preparations

Fuel management around the grounds is critical to reducing the impact of bushfire on the site. The Chief Warden is responsible for assessing the fuel on and adjoining the site and ensuring that vegetation management is undertaken to keep the site in a minimum-fuel condition in the lead up to the Fire Danger Period.

Liaising with the relevant grounds staff may be required to ensure work on the site is completed in a timely manner. Vegetation management around the site should be in accordance with the Fire Management Plan prepared for the site.

Section 11 of the CFA Guidelines (CFA 2022) recommends bushfire preparedness inspections be to be conducted at least twice prior to the Fire Danger Period. Inspection should focus on facility access, fire protection systems and equipment and the firebreaks and asset protection zones.

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8.4 Training and Exercises

The Chief Warden and Deputy Wardens must be familiar with the EMP and the procedures and communications plan required on and in the lead up to fire danger days. The Chief Warden must ensure that the Deputy Warden understands:

- Bushfire awareness,
- Evacuation procedures,
- Warnings and alerts, and
- Understands their own role in an emergency.

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The Chief Warden should ensure that staff are familiar with the location of firefighting equipment and have contact details for the Chief Warden and Deputy Wardens in their mobile phones.

Ensure all staff know:

- The location of hydrants and extinguishers.
- How to access hose reels, deploy hoses and turn on water to the hydrants.
- Ensure all relevant staff have working radios (mobile phones can fail during bushfire events).
- Facility and operations risks and hazards.
- Facility emergency management roles, responsibilities as per the EMP.
- On-site emergency warning systems and assembly areas.
- Safe and effective use of fire fighting equipment.
- Storage, handling and emergency procedures for dangerous goods at the facility
- First aid facilities and use.
- Use of the VicEmergency application.
- Warning levels and messages issued by the CFA and Emergency Management Victoria.
- Completion of the CFA's free 'Bushfire Safety for Workers' e-learning module

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Exercises should be developed in accordance with *AS 3745-2010: Planning for emergencies in facilities*. Exercises should be designed to test emergency structures, prescribed activities, personnel knowledge, and any assumptions built into the EMP.

A summary record of training and exercises should be completed to ensure any valuable lessons learned from training can be incorporated into the EMP. Any valuable lessons should be a trigger for reviewing the EMP to ensure they are incorporated into the plan.



8.5 Staff communication

- Ensure staff have the VicEmergency app downloaded on their mobile phone with a 20km watch zone set for the site.
- Ensure all staff have the contact details for the Chief Warden and Deputy Wardens in their mobile contacts list.
- Ensure lists of all staff and occupants on site are available during fire danger days.

8.6 Shelter-In-Place Building(s)

It is expected that sheltering-in-place is a last resort, used if evacuation to an area deemed BAL-LOW is not possible. During the construction phase, the facilities building will be used to shelter-in-place if evacuation is not possible.

- Ensure vegetation is tidy and in a low-threat condition around the designated building.
- Ensure doors are not locked and are able to be shut securely.

8.7 Firefighting Equipment

Firefighting equipment must be audited and checked for condition before the Fire Danger Period is declared.

- Check all hydrants and fire reels are easily accessed.
- Check all hoses and nozzles are in working order.
- Check all radio communications systems are working.
- Check all relevant staff have appropriate fire protection PPE.

Personal fire protection PPE should include:

- Fire Blanket (woollen)
- Thick cotton long-sleeved shirt and pants
- Leather gloves
- Hat
- Boots
- Goggles

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9 Communications Plan

The following communications plan demonstrates how the site will communicate with staff and site visitors on, and in the lead up to, forecast Catastrophic and Extreme Fire Danger days.

Facility management need to ensure that the contact details for all staff and site visitors are readily accessible in the event of an evacuation or shelter-in-place procedure.

Arrangements will be made well in advance to ensure that personnel are not on site on days of elevated fire risk.

The site manager will send out key messages to all staff, contractors and visitors so they are alerted to upcoming extreme and catastrophic forecast fire weather and informed of the restricted site access or closure. See tables below for staged timing of notifications.

Stage One: 3-4 Days prior to an Extreme or Catastrophic Day			
Audience	Comms method	Key Message (FBI 50-100)	Key Message (FBI 100+)
All Staff	Phone, SMS and email	<p>An Extreme Fire Danger Day has been declared for (insert date)</p> <ul style="list-style-type: none"> Please ensure you are aware of the Fire Safety Procedures for the Facility. Do not attend work if you are not required on a declared Extreme Fire Danger Day. 	<p>A Catastrophic Fire Danger Day has been declared for (insert date)</p> <p>The Facility is Closed on Catastrophic Fire Danger Days.</p> <ul style="list-style-type: none"> Do not attend work on a declared Catastrophic Fire Danger Day.
Contractors and Visitors	Phone, SMS and email	<ul style="list-style-type: none"> An Extreme Fire Danger Day has been declared for (insert date) Please ensure you are aware of the Fire Safety Procedures for the Facility. Do not attend work if you are not required on a declared Extreme Fire Danger Day. 	<ul style="list-style-type: none"> A catastrophic Fire Danger Day has been declared for (insert date) The Facility is closed to contractors and visitors on Catastrophic Fire Danger Days.

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Stage Two: 1 Day prior to an Extreme or Catastrophic Day			
Audience	Comms method	Key Message (FBI 50-100)	Key Message (FBI 100+)
All Staff	Phone, SMS and email	<ul style="list-style-type: none"> An Extreme Fire Danger Day has been declared for (insert date) Please ensure you are aware of the Fire Safety Procedures for the Facility. Do not attend work if you are not required on a declared Extreme Fire Danger Day 	<ul style="list-style-type: none"> A Catastrophic Fire Danger Day has been declared for (insert date) The Facility is Closed on Catastrophic Fire Danger Days. Do not attend work on a declared Catastrophic Fire Danger Day.
Contractors and Visitors	Phone, SMS and email	<ul style="list-style-type: none"> An Extreme Fire Danger Day has been declared for (insert date) Please ensure you are aware of the Fire Safety Procedures for the Facility. Do not attend work if you are not required on a declared Extreme Fire Danger Day 	<ul style="list-style-type: none"> A Catastrophic Fire Danger Day has been declared for (insert date) Please ensure you are aware of the Fire Safety Procedures for the farm.
Stage Three: Extreme or Catastrophic Day			
Audience	Comms method	Key Message (FBI 50-100)	Key Message (FBI 100+)
All Staff	Phone, SMS and email	<ul style="list-style-type: none"> An Extreme Fire Danger Day has been declared for today. Do not attend work if you are not required on a declared Extreme Fire Danger Day. A TOTAL FIRE BAN is in place. Stay informed by following the VicEmergency app or tuning into ABC Local Radio. Please ensure you are aware of the Fire Safety Procedures for the Facility. 	<ul style="list-style-type: none"> A Catastrophic Fire Danger Day has been declared for today. Do not attend work on a declared Catastrophic Fire Danger Day. A TOTAL FIRE BAN is in place. Stay informed by following the VicEmergency app or tuning into ABC Local Radio.
Contractors and Visitors	Phone, SMS and email	<ul style="list-style-type: none"> An Extreme Fire Danger Day has been declared for today. A TOTAL FIRE BAN is in place. Stay informed by following the VicEmergency app or tuning into ABC Local Radio. Please ensure you are aware of the Fire Safety Procedures for the Facility. 	<ul style="list-style-type: none"> A Catastrophic Fire Danger Day has been declared for today. A TOTAL FIRE BAN is in place. Stay informed by following the VicEmergency app or tuning into ABC Local Radio. The facility is closed to visitors and contractors on Catastrophic Fire Danger Days.

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Stage Four: Likely Impact from Bushfire		
Audience	Comms method	Key Message
All Staff	Phone, SMS	<ul style="list-style-type: none"> A bushfire has been identified and is likely to impact the site. Do not attend work if you are not already on-site. If you are on-site, contact the Chief Warden. The Fire Warden has activated the Emergency Management Plan. Stay informed by following the VicEmergency app or tuning into ABC Local Radio.
Guests/Visitors	Phone, SMS and email	<ul style="list-style-type: none"> A bushfire has been identified and is likely to impact the site. The Fire Warden has activated the Emergency Management Plan. Stay alert and follow the instructions of the Emergency Management Plan. The Chief Warden will advise and notify if evacuation or sheltering is appropriate. Stay informed by following the VicEmergency app or tuning into ABC Local Radio.

9.1 Notifications to Regulatory Authorities

Early notification to CFA during emergencies via 000 allows CFA the best opportunity to provide safe and timely response in the event of rapid escalation.

Outside of emergencies, the local CFA district must also be notified by phone or email at least seven days prior to:

- The commissioning of battery energy storage systems (BESS).
- Annual servicing of battery energy storage systems (BESS).

Annual servicing of battery energy storage systems should not take place on days of High or above Fire Danger Rating, except where the system is experiencing malfunction or abnormal behaviour.

Fire protection system outages (e.g. water-off due to faults or maintenance activities) must be notified as far in advance as possible to ESTA at burnoffs@esta.vic.gov.au or 1800 668 511.

For any incident involving the leaking or spill of dangerous goods, or collection or disposal of contaminated fire water, the EPA must be notified.

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Emergency Management Plan - Charam Solar Farm

10 Bushfire Information

Throughout the declared Fire Danger Period the Chief Warden is required to check the four-day forecast for the Fire Danger Rating (FDR), Fire Behaviour Index (FBI) and Total Fire Ban (TFB) status for the Wimmera District.

During the declared Fire Danger Period the Chief Warden and Deputy Warden must continually monitor the Emergency Management Victoria website or VicEmergency app for fire activity.

10.1 Bushfire and Fire Weather Information Sources

Agency/ Resource	Phone		
Emergency (Police/Fire/ Ambulance)	000		
Bushfire Information	Vic Emergency Hotline: 1800 226 226 National Relay Service: 133 677 (if you are deaf, hard of hearing or have a speech impediment) Translating and Interpreting Service: 131 450		
SES	132 500		
Agency/Resource	Website Address	Phone	Service Description
VicEmergency	www.emergency.vic.gov.au	1800 226 226	Warnings, incidents and planned burns are all displayed on the VicEmergency website.
Department of Energy, Environment and Climate Action	www.deeca.vic.gov.au	136 186	Information on current fires on public land.
Bureau of Meteorology	www.bom.gov.au/vic/forecasts/fire-danger-ratings.shtml		Weather forecasts. Four-day Fire Behaviour Index Forecast. Seasonal outlooks. BOM provide a number of bushfire related services.
Vicroads/ Victraffic	https://traffic.vicroads.vic.gov.au/		Interactive maps detailing road closures across the state.
Country Fire Authority	www.cfa.vic.gov.au	000 1800 668 511	Advice, warnings and restrictions. Burnoff Hotline
Australian Red Cross	www.redcross.org.au		Includes information about relief centres, registering and comforting evacuees, and first aid care.
Environment Protection Authority Victoria	https://www.epa.vic.gov.au/	1300 372 842	Report pollution or contamination incidents



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11 Bushfire Threat Assessment and Response

11.1 Identifying Bushfire Risk

When an incident within 20km of the site has been identified, either by visual identification or an alert from the relevant app, the Chief Warden is to be notified.

The Chief Warden must assess the risk and implement the appropriate action.

Threat Response	Action
No Threat	Continue to monitor the incident; the facility will operate as normal. Activate the Comms Plan.
Under Threat	Initiate the Bushfire Emergency Plan. Assess the threat level response and enact the appropriate procedure: <ul style="list-style-type: none"> • Activate the Comms Plan • Prepare to evacuate if sufficient time is available before the expected impact. • Prepare to shelter in place if there is not sufficient time to evacuate.

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11.2 Risk Assessment Process

Decision making in a bushfire emergency will depend on the specific information gathered from the seasonal outlook, current weather (temperatures, relative humidity and wind speeds), Fire Behaviour Index, location, speed, and direction of travel of the fire.

Some of these factors require specialist knowledge and the available information can be combined with the messaging from Emergency Services.

- The northern and northwestern and southwestern sectors beyond the farm are the highest risk sectors for bushfire.
- Wind from these directions could drive fire rapidly towards the site.

The VicEmergency app provides an appropriate framework for assessing risk to the site, when combined with knowledge of the fire danger for the day:

ADVICE

- An incident is occurring or has occurred in the area
- Access information and monitor conditions.

Description	Action
Notifying an uncontrolled bushfire has occurred that may escalate to impact life and property.	Continue monitoring wind direction and forecast bushfire weather.



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Emergency Management Plan - Charam Solar Farm

WATCH AND ACT

- An emergency is developing nearby.
- You need to take action now to protect yourself and others.

Description	Action
Notifying an uncontrolled bushfire has occurred that is likely to impact the community. Action needs to be taken immediately.	Increase monitoring of wind direction, forecast bushfire weather and bushfire information sources. Activate evacuation procedures in the event of an evacuation.

EMERGENCY WARNING

- You are in imminent danger and need to take action now.
- You will be impacted.

Description	Action
Issued when the community is in imminent danger from an incident and action needs to be taken now.	Assess whether Sheltering-in-Place or Evacuating is appropriate, and enact either evacuation or sheltering procedures accordingly.

Evacuation

An evacuation is recommended or procedures are in place to evacuate.

Description	Action
Issued when the community is recommended to immediately leave, or processes are in place to evacuate communities.	Activate evacuation procedures if safe to do so.

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11.3 Evacuation Procedures

In the event of a bushfire emergency, the following procedures are to be followed:

1. The Fire Warden is to notify staff and visitors of the situation.
2. Notify Emergency Services early (CFA District Duty Officer) that evacuation of the facility is occurring.
3. Account for all persons on site.
4. Make arrangements for transportation of evacuees and account for people leaving in private vehicles.

11.3.1 Post-Evacuation Procedures

1. Staff can re-enter the facility only when the Emergency Services Incident Controller gives permission for the facility to re-open.
2. All staff must be accounted for on their return by the Chief Warden.



11.4 Shelter-In-Place

During the construction phase, the facilities building would be used as a place of shelter **only if** evacuation to the nearest Neighbourhood Place of Last Resort (NPLR) is **not** possible.

11.4.1 Shelter-In-Place procedures

Shelter-In-Place procedures are as follows:

1. The Fire Warden is to notify staff and visitors of the situation and decision to shelter-in-place.
2. The Fire Warden is to account for all personnel.
3. Notify Emergency Services early (CFA District Duty Officer) that sheltering at the facility is occurring.
4. Close all windows and doors to the building.
5. Stay inside until the Chief or Deputy Warden declare it is safe to leave the building.

Triggers to commence Shelter In Place are:

When evacuation is not possible due to the proximity of a bushfire.

When advice from emergency services is to shelter-in-place.

When direction from the Chief Warden is to shelter-in-place.

When high levels of smoke and embers would impede safe egress for evacuation.

When ABC 774 AM advises there is a fire front close and evacuation is not possible.

11.4.2 Post-Shelter-In-Place Procedures

1. Remain within the shelter until the Chief Warden or Emergency services declare it safe to exit.
2. Account for all persons on site.
3. Inform the Chief Warden of any actions taken (such as leaving the site).

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12 Appendix

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12.1 Emergency Contacts

Police/Fire/Ambulance	000
West Wimmera Shire Council (WWSC)	13 99 72
Powercor	132412
DEECA (Hamilton).	03 5551 0300
Parks Victoria.	13 1963
Bushfire Information Line.	1800 240 667
Nurse On Call	1300 60 60 24
Grampians Health (Edenhope)	(03) 5585 9800
Interpreter Service – TIS (24 Hours)	13 14 50
CFA District 17 Headquarters Horsham	(03) 5362 1700
Charam CFA	TBC
Edenhope CFA	TBC
Green Gold Energy (Head Office)	(08) 8212 0459

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12.2 Evacuation Point and Bushfire Place Of Last Resort Map

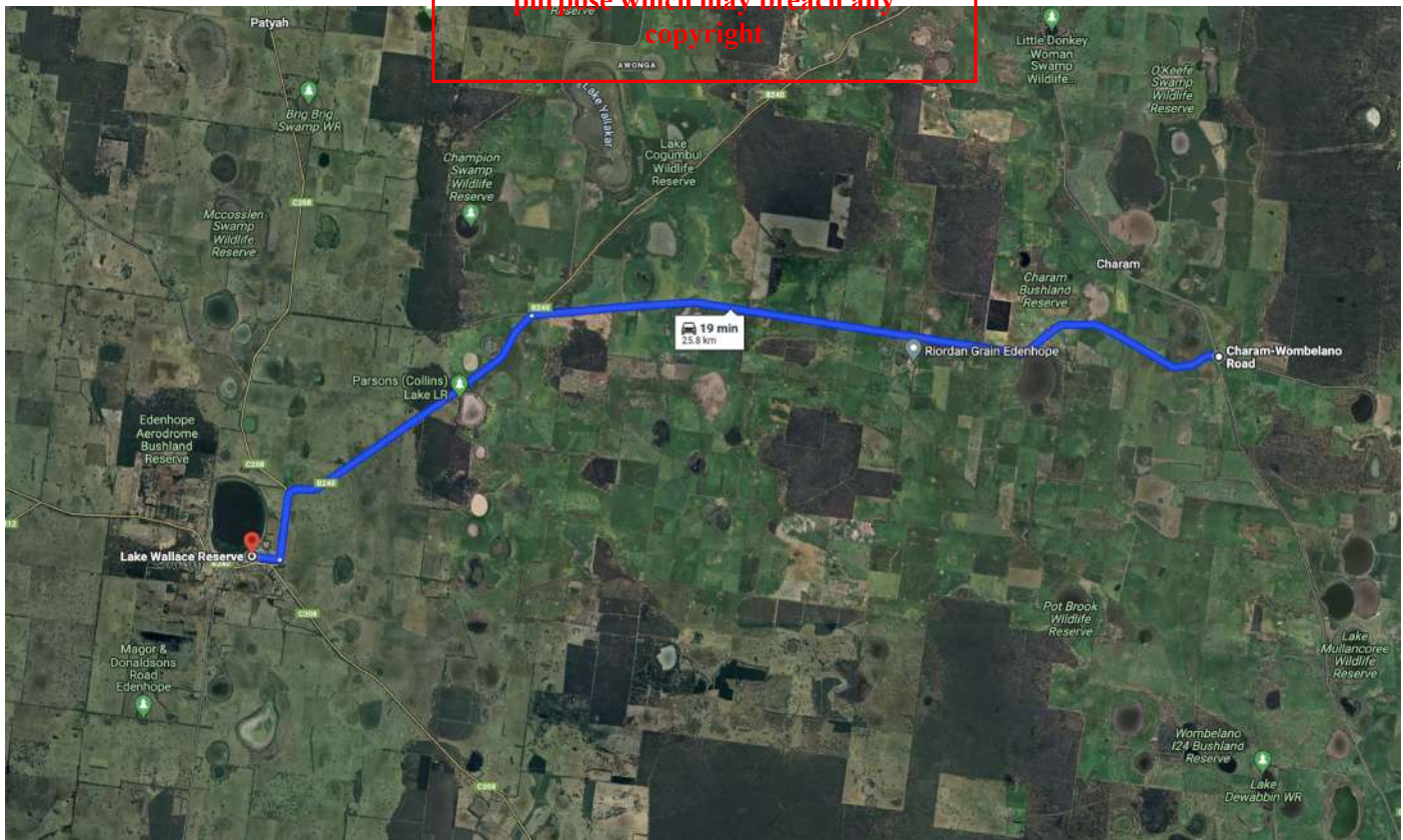


Fig.5 NPLR, Lake Wallace Reserve, Corner Lake Street and Anzac Avenue, Edenhope



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12.3 Visitor Bushfire Emergency Plan Instructions

Visitors to the facility should be provided with instructions for evacuation and sheltering in the event of a bushfire emergency:

BUSHFIRE EMERGENCY PLAN

Charam Solar Farm is located in a Bushfire Prone Area. Uncontrolled bushfire events are possible here. We do everything we can to provide you with up-to-date alerts to ensure everyone is aware of any potential bushfire threat.

Evacuation and Shelter Procedures

If you are here and a fire is in the area that may threaten the facility, our first action is to safely evacuate to a designated safer place:

- Lake Wallace Reserve, Corner Lake Street and Anzac Avenue, Edenhope, is the Designated Place of Last Resort for the facility and offers facilities and shelter from bushfire (or other emergencies requiring evacuation).

If you are required to evacuate, please move to the emergency assembly point (Site Laydown Area) and contact the Chief Warden or Deputy Warden to inform them of your whereabouts during the emergency. You will then make your way to the Neighbourhood Place of Last Resort for the duration of the emergency.

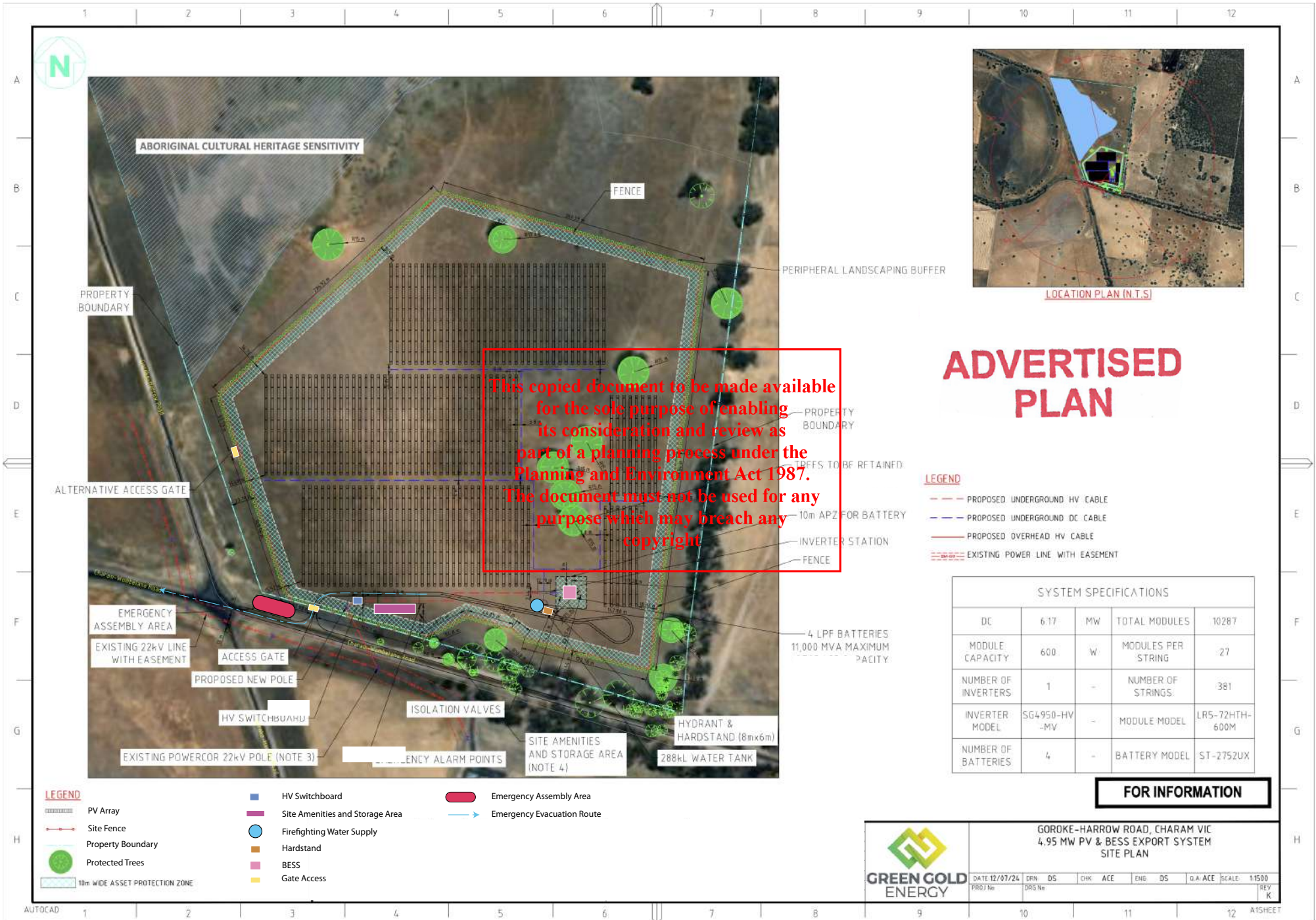
Shelter-In-Place Procedures

During the construction phase, if you are directed to shelter-in-place by the Chief Warden, please follow their directions to take shelter at the nearest appropriate facility and remain there until instructed by the Chief Warden or Emergency Services.

The main Shelter-In-Place facility is the NPLR at Lake Wallace Reserve, Corner Lake Street and Anzac Avenue, Edenhope. However, if evacuation during the construction phase is not possible, the Chief or Deputy Warden will notify all persons of the need to seek immediate shelter on site in the facility building within the temporary construction compound and activate the EMP.

Occupants must remain inside buildings unless instructed by Emergency Services.

If you are remote from a building, or in the absence of temporary on-site buildings and unsafe to relocate, personnel are to take shelter within vehicles with windows and doors closed, completely covering oneself with a fire blanket (fire related incidents only). Park vehicle (where safe to do so) in a cleared visible area, such as a fire break, and as far away from the fire as possible, with vehicle hazard lights on. Keep below window height and turn on air-conditioning and air recirculation.



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12.3 Emergency Training Exercise Schedule

The table below offers suggested emergency training exercises to be conducted at least annually for all staff, contractors and site management. The Emergency Control Organisation will be responsible for conducting and reviewing exercises. CFA recommends the Australian Institute for Disaster Resilience Handbooks, particularly:

- Managing Exercises (2017) for further guidance on the designing, conducting and evaluating of practical exercises.
- Lessons Management (2019) for further guidance on applying learning experiences from events and exercises.

Training Exercises							
Description	Responsibility	Schedule	2024	2025	2026	2027	2028
Site Induction	Emergency Control Organisation	Annually					
Evacuation Procedures	Emergency Control Organisation	Annually					
On-site Emergency Warning Systems	Emergency Control Organisation	Annually					
Use of Firefighting Equipment	Emergency Control Organisation	Annually					
Storage, Handling and emergency procedures for dangerous goods	Emergency Control Organisation	Annually					
First Aid	Emergency Control Organisation	Annually					
Scenario with local CFA	Emergency Control Organisation	Annually					
CFA 'Bushfire Safety for Workers' e-learning Module	Emergency Control Organisation	Annually and as part of induction process.					
Arc flash safety protocols	Emergency Control Organisation	Annually					
Facility Shutdown Procedures	Emergency Control Organisation	Annually					

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Fault and Alarm Guide

ST2752UX ST2752UX-US

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1 Introduction

This document provides detailed explanations and recommended actions for failure and alarm signals associated with the LC200 communication protocol (AC-Coupled System).

This document applies to ST2752UX, ST2752UX-US and nonstandard capacity configurations.

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2 Overview of an ESS Block

Figure 1 shows the communication framework of an Energy Storage System (ESS) block. The block consists of three main components: The BSC (define acronym) serves as the communication interface for the battery cabinet. SCU (define acronym) acts as the communication interface for the PCS-MV (define acronym). Local Controller (LC200) functions as the controller and communication interface of the ESS block. All information exchanged in the ESS block goes through the LC200.

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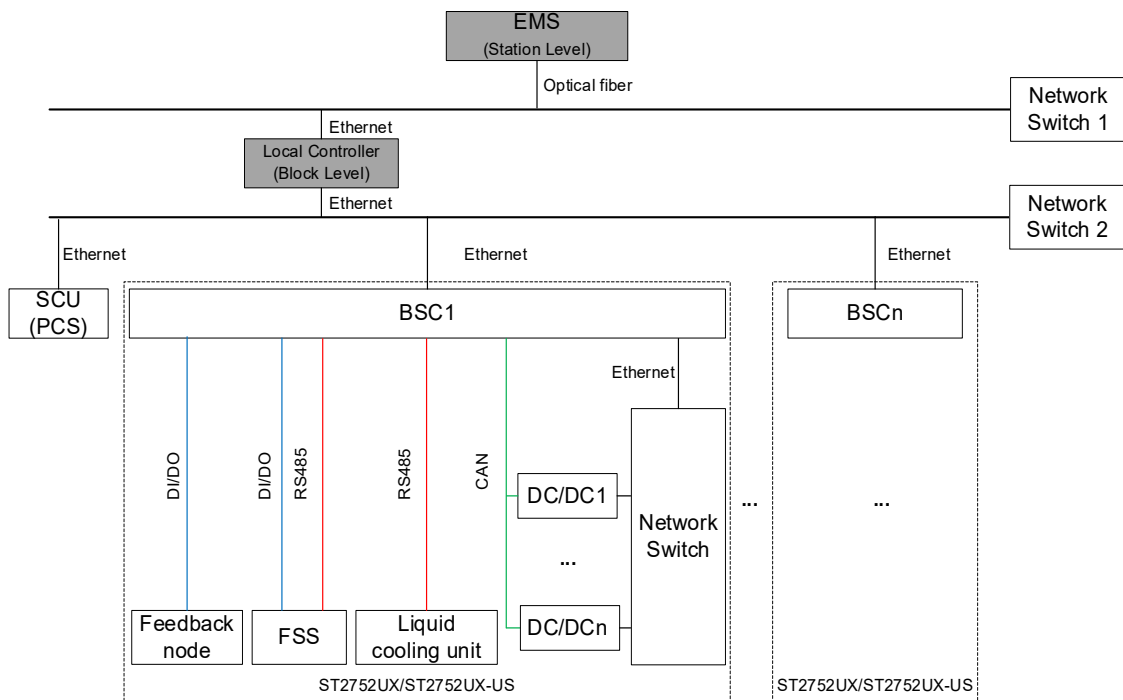


Fig. 1 Communication framework of block

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3 System Summary Info-3x

3.1 System Fault State 1

Register address 10150&10151 (for example). The register contains fault signals in the ESS block.

BIT	Fault Name	Possible Fault Reasons	Resolution Requirements	Troubleshooting Steps	Troubleshooting Tips (Content in red requires SUNGROW engineers to execute)
BIT0	PCS failure	Any PCS failure in the system.	Resolution of all PCS failure	Report the fault and shut down the system.	Check each PCS in the system for faults. Resolve PCS faults using the PCS manual.
BIT1	LC-PCS com. fault	Abnormal communication between PCS and the Local Controller. Common issues: 1. PCS not powered on. 2 Improper communication cable connection 3. Communication error caused by an incorrect PCS address in LC. 4. The equipment works abnormally.	Communication restored.	Report the fault and shut down the system.	1. Check the startup status of the PCS 2. Check the communication cables between the LC and all PCS units in the system and whether their networks are in the same local area network. 3. Using the operation manual, check whether the IP address of PCS configured in LC is consistent with that of the actual equipment. 4. Check whether the network switch inside the

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BIT	Fault Name	Possible Fault Reasons	Resolution Requirements	Troubleshooting Steps	Troubleshooting Tips (Content in red requires SUNGROW engineers to execute)
					<p>system is working properly, whether the indicator lights are flashing or there are any other abnormalities.</p> <p>5. Contact SUNGROW if the fault is not resolved after the previous steps.</p>
BIT2	BSC fault	Any BSC failure in the system.	BSC fault resolved.	Report the fault and shut down the system.	Check whether each BSC under the system has faults then resolve the faults according to 4.4.
BIT3	LC-BSC com. fault	<p>Abnormal communication between the BSC and LC systems.</p> <ol style="list-style-type: none"> BSC not powered on. Improper communication cable connection Communication error caused by an incorrect BSC address in LC The equipment works abnormally. 	Communication restored.	Report the fault and shut down the system.	<ol style="list-style-type: none"> Check whether the 24V auxiliary power supply functions normally. Check whether the working state of BSC is normal (whether the power light is always on, whether the run light is flashing) Check the communication cables between the LC and all BSC under the system and whether their networks are in the same local area network. Using the operation manual, check whether the IP address of BSC configured in LC is consistent with that of the actual equipment. Contact SUNGROW if the fault is not resolved after

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BIT	Fault Name	Possible Fault Reasons	Resolution Requirements	Troubleshooting Steps	Troubleshooting Tips (Content in red requires SUNGROW engineers to execute)
					the previous steps.
BIT4	Host computer com. fault	Heartbeat of the host computer not received. 1. Improper communication cable connection 2. EMS system not operational or misconfigured	Communication restored.	Report the fault and shut down the system.	<p>1. Check the communication cable between the LC and EMS systems under the system and whether their networks are in the same local area network. Confirm whether the IP address of LC configured in EMS is correct.</p> <p>2. Check whether the communication settings for LC in EMS system are correct and EMS working status is normal.</p> <p>3. Check whether the communication cable connection between EMS equipment and LC is tight and loose.</p> <p>4. Contact SUNGROW if the fault is not resolved after the previous steps.</p>

3.2 System Alarm State 1

Register address 10154&10155 (for example). The register contains alarm signals in the ESS block.

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BIT	Fault Name	Possible Fault Reasons	Resolution Requirements	Troubleshooting Steps	Troubleshooting Tips
BIT0	PCS unit fault	Faults in one or more PCS units.	PCS fault(s) resolved.	Report the alarm to stop the corresponding subunit.	Check for fault information in PCS subunit and follow the PCS manual accordingly.
BIT1	PCS unit alarm	Alarms in one or more PCS units.	PCS alarm cleared.	Report the alarm.	Check for alarm information in PCS subunits and follow the PCS manual accordingly
BIT2	LC-PCS com. alarm	<p>Abnormal communication between one or more PCS and the LC1. PCS not powered on.</p> <p>2. Improper communication cable connection</p> <p>3. Configuration error of PCS address in LC.</p> <p>4. The equipment works abnormally.</p>	<p>Communication resolved.</p>	Report the alarm to stop the corresponding subunit.	<p>1. Check the startup status of the PCS. and whether LC and PCS networks in the system use the same local area network.</p> <p>2. Check the communication cables between the LC and all PCS units in the system.</p> <p>3. Using the operation manual, check whether the IP address of PCS configured in LC is consistent with that of the actual equipment</p> <p>4. Check whether the status of the network switch between LC and PCS is normal.</p> <p>5. Contact SUNGROW if the fault is not resolved after the previous steps.</p>
BIT3	BSC unit fault	One or more BSC faults.	BSC fault(s) cleared.	Report the alarm and take corresponding actions according to the specific	Check BSC fault points and resolve faults according to 4.4.

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BIT	Fault Name	Possible Fault Reasons	Resolution Requirements	Troubleshooting Steps	Troubleshooting Tips
				fault points.	
BIT4	BSC unit alarm	One or more BSC alarms.	BSC alarm cleared.	Report the alarm.	Check BSC alarm points and resolve faults according to 4.3.
BIT5	LC-BSC com. alarm	<p>Abnormal communication between one or more BSC and the LC.</p> <ol style="list-style-type: none"> 1. BSC not powered on. 2. Improper communication cable connection 3. Configuration error of BSC address in LC. 4. The equipment works abnormally. 	<p>Communication restored.</p>	<p>Report the alarm to stop the corresponding subunit</p>	<ol style="list-style-type: none"> 1. Check whether the 24V auxiliary power supply for the battery box functions normally, and whether the LC and BSC are operating normally (whether the Power light is always on). 2. Check whether the LC and BSC networks in the system use the same local area network. 3. Check the communication cables between the LC and all BSC units in the system. 4. Check whether the network switch between LC and BSC works normally. 4. Using the operation manual, check whether the IP address of BSC configured in LC is consistent with that of the actual equipment. 5. Contact SUNGROW if the fault is not resolved after the previous steps.

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4 BSC200 Info-3x

4.1 CMU Alarm Word

Register address 18035&18036 (for example). The register contains alarm signals in battery rack.

BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT0	Cell over voltage alarm	The voltage of the single cell is continuously higher than the set alarm threshold.	<p>The unit voltage is continuously lower than the set release threshold.</p> <p>Yes/</p>	<p>Report the alarm, reduce the charging power to 0%, and reduce the discharging power to 50% of the maximum power in the current status.</p>	<p>After the alarm, the system stops charging, and after the system is rested for a period*, the alarm is automatically cleared without affecting the operation of the system.</p> <p>* It is certain that due to the characteristic voltage of the battery, this voltage will decrease. But many factors affect this period, such as temperature and voltage, so there is no exact time.</p> <p>You can do the following to troubleshoot:</p> <ol style="list-style-type: none"> 1. Check whether the SOC of the system is within the protection range. If the SOC protection upper limit is set too high, try lowering this value. 2. Try discharging the system with low power to eliminate this alarm. 3. Use the CMU host computer software to connect the

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>corresponding CMU to check whether the voltage of each core is normal. If the voltage of a single core is too high, it is necessary to further check whether the core is abnormal.</p> <p>4. Check whether the sampling circuit of the system is normal, including sampling cable, Communication terminal, etc.</p>
BIT1	Cell under voltage alarm	<p>The voltage of the single cell is continuously lower than the set alarm threshold.</p> <ol style="list-style-type: none"> The battery system has not been charged for a long period. After the discharge SOC of the battery system reaches 0, it is not compensated (charged) in time. 	<p>Yes/</p> <p>The unit voltage is continuously higher than the set release threshold.</p>	<p>Report the alarm, reduce the discharging power to 0%, and reduce the charging power to 50% of the maximum power in the current status.</p>	<p>1. Charge the battery system, and the system can run normally after the alarm is cleared.</p> <p>2. Check the SOC protection lower limit setting of the system to see if it is too low and check if the SOC of the system is within the SOC protection range. If the SOC protection lower limit is set to 0%, try to modify the value higher.</p> <p>3. If the alarm has not been cleared after charging (more than 1 hour), please contact SUNGROW.</p> <p>4. Use the CMU host computer software to connect to the CMU to view the data of each cell to see if it is a single cell with low voltage, if it is a single cell with low voltage, you need to further check the problem of the individual cell.</p> <p>5. Check whether the sampling circuit of the system is</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					normal, including sampling cable, Communication terminal, etc.
BIT2	Total over voltage alarm	RACK total voltage continuously exceeds the set alarm threshold.	Yes/ RACK voltage continuously below set release threshold.	Report the alarm, reduce the charging power to 0%, and reduce the discharging power to 50% of the maximum power in the current status.	<ol style="list-style-type: none"> 1. Charging stops for 5 minutes (or the system starts discharging), check whether the alarm is automatically released; 2. Check whether the BSC parameters are set correctly; 3. Check whether the voltage of the electric core is abnormal. 4. Check that the voltage sampling circuit of the system is normal.
BIT3	Total under voltage alarm	RACK total voltage is continuously lower than the set alarm threshold. The battery system has not been charged for a long period.	Yes/ RACK voltage is continuously higher than the set release threshold.	Report the alarm, reduce the discharging power to 0%, and reduce the charging power to 50% of the maximum power in the current status.	<ol style="list-style-type: none"> 1. Discharge stops for 5 minutes (or the system starts charging), check if the alarm is released automatically; 2. If the alarm has not been cleared after charging (more than 1 hour), please contact SUNGROW. 3. Check whether the BSC parameters are set correctly; 4. Check whether the voltage of the electric core is abnormal. 5. Check that the voltage sampling circuit of the system is

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					normal.
BIT4	Cell voltage difference alarm	The cell voltage difference in RACK is continuously greater than the set alarm threshold. The battery system is unbalanced.	Yes/ The voltage difference is continuously lower than the set release threshold.		<p>1. Check whether the SOC of the battery system is low. If so, after the battery system is charged, the alarm will be automatically cleared.</p> <p>2. Connect the CMU-Monitor to Check whether the battery cell is unbalanced (refer to the maintenance manual for the maintenance of the battery system if the battery cell is unbalanced).</p> <p>3. Check whether the voltage sampling circuit of the battery with unbalance problem is normal or not, some abnormal voltage sampling problems may also cause voltage unbalance alarm.</p>
BIT5	Cell over temperature alarm	The cell temperature is continuously higher than the set alarm threshold. 1. Continuous high-rate charging and discharging of the system. 2. Abnormal liquid cooling unit leads to insufficient cooling capacity. 3. Over ambient temperature.	Yes/ The cell temperature is continuously lower than the set release threshold.	Report the alarm.	<p>1. After charging and discharging is stopped, the temperature returns to normal without affecting the normal operation of the system.</p> <p>2. The ambient temperature exceeds the operating temperature range of the equipment. After the equipment stops running, the temperature returns to normal without affecting the normal operation of the system.</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>3. Check the status of the liquid cooling unit and control the operation of the liquid cooling unit according to the troubleshooting manual of the liquid cooling unit.</p> <p>4. If the alarm is not restored after the above operation, contact the SUNGROW.</p> <p>5. Check the battery temperature trend, does the over-temperature problem involve only a single cell? If so, you need to further investigate if the temperature sampling wires inside the Pack are soldered or if the NTC itself is the problem.</p>
BIT6	Cell low-temperature alarm	The battery cell is continuously charged or discharged at low temperature (the temperature is lower than the set alarm threshold). First low temperature start-up of equipment.	<p>Yes/ The cell temperature is continuously greater than the set release threshold.</p>	Report the alarm.	<p>1. When the ambient temperature is low, check whether the liquid cooling unit is heating normally, and control the operation of the liquid cooling unit according to the troubleshooting manual.</p> <p>2. Under extreme low temperature conditions, heating will last for more than 48 hours, and the alarm will be automatically clear after the temperature rises.</p>
BIT7	Cell temperature difference alarm	The temperature difference of RACK cell is continuously greater than the set alarm threshold.	<p>Yes/ The temperature difference is</p>	Report the alarm and reduce the power to 50% of the maximum power in the	1. In extremely cold environments, check that the system's cabinet doors are closed tightly.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
			continuously lower than the set release threshold.	current status.	<p>2. When the system is in a low temperature environment, it is necessary to wait for the heater to run for a period, and then check whether the low temperature alarm is eliminated.</p> <p>3. If the battery temperature on the controller interface has no rising trend, according to the operation manual of liquid cooling unit, check whether the liquid cooling unit starts up normally, check that there is no abnormality, and restart the liquid cooling unit.</p> <p>4. If the above steps do not solve the problem, please contact SUNGROW engineer.</p>
BIT14	Over current alarm	The current is continuously greater than the set alarm threshold.	<p>Yes/ The current is continuously lower than the set release threshold.</p>	Report the alarm and reduce the power to 50% of the maximum power in the current status.	<p>1. Whether the alarm occurs at the moment of lower discharge SOC, SOC recovery automatically disappears, it is recommended to reduce the depth of discharge;</p> <p>2. Check that the system's power cable connections are tight.</p> <p>3. Check the system for a battery temperature differential alarm, check that the system's liquid-cooled unit is working properly.</p> <p>4. Whether RACK is not balanced, the first time the</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>installation is not balanced, the system standby quiescent ≥ 24 hours;</p> <p>5. Check whether the DC/DC current sampling of the system is normal, if the current sampling is abnormal, you need to replace the CMU board or DC/DC.</p>
BIT18	Pack over voltage alarm	PACK voltage continuously exceeds the set alarm threshold.	<p>Yes/ PACK voltage is continuously below set release threshold.</p>	<p>Report the alarm, reduce the charging power to 0%, and reduce the discharging power to 50% of the maximum power in the current status.</p>	<p>1. Check the maximum and minimum as well as the average voltage values of the Pack to determine if there is an abnormal voltage of a single Pack. If there is a large area of over-voltage of the Pack, it is necessary to check whether the system is over-charged, and if it is over-charged, it is necessary to discharge the system to eliminate the alarm.</p> <p>2. Charging stops for 5 minutes (or the system starts discharging), check whether the alarm is automatically released;</p> <p>3. Check whether the BSC parameters are set correctly;</p> <p>4. Check whether the voltage of the electric core is abnormal.</p>
BIT19	Pack under voltage	PACK voltage is continuously below the set alarm threshold.	Yes/	Report the alarm, reduce the	1. Check the maximum and minimum as well as the

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
	alarm	1. The battery system has not been charged for a long period. 2. After the discharge SOC of the battery system reaches 0, it is not compensated (charged) in time.	PACK voltage is continuously higher than the set release threshold.	discharging power to 0%, and reduce the charging power to 50% of the maximum power in the current status.	average voltage values of the Pack to determine if there is an abnormal voltage of a single Pack. If there is a large area of under-voltage of the Pack, it is necessary to check whether the system is over-discharged, and if it is over-discharged, it is necessary to charge the system to eliminate the alarm. 2. Discharging stops for 5 minutes (or the system starts charging), check whether the alarm is automatically released. 3. Check whether the BSC parameters are set correctly. 4. Check whether the voltage of the electric core is abnormal.
BIT20	Pack voltage difference alarm	The PACK voltage difference is continuously greater than the set alarm threshold.	Yes/ The voltage difference is continuously lower than the set release threshold.	Report the alarm.	1. Check the system SOC and Pack maximum and minimum voltage on the BSC interface to determine whether the PACK cell is over-discharged and over-charged; Check the system SOC and Pack maximum and minimum voltage on the BSC interface to determine whether the PACK cell is over-discharged and over-charged. 2. Check whether the communication line of the Pack is

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					connected properly and whether the system reports abnormal voltage sampling. 3. Check the BMU board and CMU board for abnormalities (replace).

4.2 CMU Fault Word

Register address 18037&18038 (for example). The register contains fault signals in battery Racks.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT0	Cell over voltage fault	The voltage of the single cell is continuously higher than the set alarm threshold. 1. High battery capacity. 2. The equipment works abnormally.	No/ The unit voltage is continuously lower than the set release threshold, and the fault clearing command is received.	Report the fault and reduce the power to 0%.	1, Charging stops for 5 minutes (or the system starts discharging), check whether the alarm is automatically released; 2. Check whether the BSC parameters are set correctly; 3. Check whether the voltage of the cell is abnormal. 4. Check whether the voltage sampling line is abnormal.

BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					5. After logging into the web interface of BSC, you can see the max cell voltage position in the RACK info interface, to locate the position of the faulty cell. 6. Running records and fault records can be exported from the BSC History records screen.
BIT1	Cell under voltage fault	The voltage of the single cell is continuously lower than the set fault threshold. 1. The battery system has not been charged for a long period. 2. After the discharge SOC of the battery system reaches 0, it is not compensated (charged) in time.	No/ The unit voltage is continuously higher than the set release threshold, and the fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Discharge stops for 5 minutes (or the system starts charging), check whether the alarm is automatically released; 2. Check whether the BSC parameters are set correctly. 3. Check whether the voltage of the electric core is abnormal. 4. Check whether the voltage sampling line is abnormal. 5. After logging into the web interface of BSC, you can see the min cell voltage position in the RACK info interface, to locate the position of the faulty cell. 6. Running records and fault records can be exported from the BSC History records screen.
BIT2	Total over voltage	RACK total voltage is continuously higher than the set alarm threshold.	No/	Report the fault and reduce	1. Charging stops for 5 minutes (or the system starts

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
	fault	1. The equipment works abnormally.	The RACK voltage is continuously lower than the set release threshold and a fault clearing command is received.	the power to 0%.	discharging), check whether the alarm is automatically released. 2. Check whether the BSC parameters are set correctly. 3. Check whether the voltage of the electric core is abnormal. 5. After logging into the web interface of BSC, you can see the max RACK voltage position in the Battery info interface, so as to locate the position of the faulty Rack. 6. Running records and fault records can be exported from the BSC History records screen.
BIT3	Total under voltage fault	RACK total voltage is continuously below the set fault threshold. 1. The battery system has not been charged for a long period.	No/ The RACK voltage is continuously higher than the set release threshold and the fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Discharge stops for 5 minutes (or the system starts charging), check whether the alarm is automatically released. 2. Check whether the BSC parameters are set correctly. 3. Check whether the voltage of the electric core is abnormal. 5. After logging into the web interface of BSC, you can see the min RACK voltage position in the Battery info interface,

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					to locate the position of the faulty Rack. 6. Running records and fault records can be exported from the BSC History records screen.
BIT5	Cell over temperature fault	The cell temperature is continuously higher than the set alarm threshold Liquid cooling unit abnormality.	No. If the cell temperature is continuously lower than the set release threshold, and the fault clearing command is received.	Clear the fault and reduce the power to 0%.	1. check whether the liquid cooling unit is enabled for refrigeration. 2. check whether the sealing of the battery compartment is good. 3. check whether the battery power connection row is good. 4. check whether the NTC is abnormal. 5. check whether there is false welding of the battery cells in the PACK. 6. After logging into the web interface of BSC, you can see the max cell temperature position in the Battery info interface, to locate the position of the faulty cell. 7. Running records and fault records can be exported from the BSC History records screen.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT6	Cell low temperature fault	The battery cell is continuously charged or discharged under low temperature (lower than the set threshold). First low temperature start-up of equipment.	No/ The cell temperature is continuously greater than the set release threshold, and the fault clearing command is received.	Report the fault and reduce the power to 0%.	<ol style="list-style-type: none"> 1. Determine whether the container system is not fully activated; after the activation is completed, check whether the alarm is automatically released; 2. Check whether the liquid-cooled unit is enabled for heat production. 3. Check whether the battery compartment sealing is good; 4. Check whether the NTC is abnormal. 5. After logging into the web interface of BSC, you can see the min cell temperature position in the Battery info interface, so as to locate the position of the faulty cell. 6. Running records and fault records can be exported from the BSC History records screen.
BIT9	CMU-BMU communication fault	Communication between BMU and CMU remains disconnected. 1. The communication cable is disconnected. 2. Poor contact of communication cables.	No/ Communication is restored and a fault clearing command is received.	Report the fault and reduce the power to 0%.	<ol style="list-style-type: none"> 1. check whether the communication line is connected properly and whether the communication line wire sequence is correct. 2. check whether the first BMU without communication is damaged (communication line connection skips this module).

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>3. Check whether CMU in DCDC is damaged.</p> <p>4. After logging into the web interface of BSC, you can see the CMU-BMU in the Fault records interface.</p> <p>5. Running records and fault records can be exported from the BSC History records screen.</p>
BIT10	Voltage sample fault	The sampled voltage is abnormal.	<p>No/ Sampling is restored and the fault clearing command is received.</p>	<p>Report the fault and reduce the power to 0%.</p>	<p>1. Check if the BMU is damaged, replace the BMU if damaged.</p> <p>2. Check whether the voltage sampling line is off.</p> <p>3. After logging into the web interface of BSC, you can see the abnormal voltage sample position in the Rack info interface, so as to locate the position of the fault.</p> <p>4. Running records and fault records can be exported from the BSC History records screen.</p>
BIT11	Temperature sample fault	The sampled temperature is abnormal.	<p>No/ Sampling is restored and the fault clearing command is received.</p>	<p>Report the fault and reduce the power to 0%.</p>	<p>1. Check whether the BMU is damaged or not and replace the BMU if damaged.</p> <p>2. Check whether the temperature sampling line is off.</p> <p>3. check whether the NTC is invalid.</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>4. After logging into the web interface of BSC, you can see the Temperature sample fault position in the RACK info interface, to locate the position.</p> <p>5. Running records and fault records can be exported from the BSC History records screen.</p>
BIT12	Current sample fault	Current sample exceeds CMU range.	<p>No/</p> <p>Communication is restored and a fault clearing command is received.</p>	<p>Report the fault and reduce the power to 0%.</p>	<p>1. Check whether the current sampling line is off.</p> <p>2. After logging into the web interface of BSC, you can see the Current sample fault in the Fault records interface.</p> <p>3. Running records and fault records can be exported from the BSC History records screen.</p> <p>4. Check the CMU board current sampling circuit if it is normal.</p>
BIT13	BSC-CMU communication fault	<p>Communication between CMU and BSC remains disconnected.</p> <p>1. The communication cable is disconnected.</p> <p>2. Abnormality of the 24V auxiliary power supply of battery box.</p> <p>3. CMU or BSC equipment is damaged.</p>	<p>No/</p> <p>Communication is restored and a fault clearing command is received.</p>	<p>Report the fault and reduce the power to 0%.</p>	<p>1. check whether the BSC and CMU communication line is connected.</p> <p>2. Check whether the CMU matching resistance is abnormal, the bus resistance value is about 62 ohms.</p> <p>3. After logging into the web interface of BSC, you can see the BSC-CMU communication fault in the RACK info</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					interface. 3. Running records and fault records can be exported from the BSC History records screen. 4. Check whether the corresponding CMU board and BMU board hardware is normal.
BIT14	Over current fault	The current is continuously greater than the set fault threshold. 1. Energy storage system abnormality. 2. Current Sample abnormality.	No/ The current is continuously lower than the set release threshold and a fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Check whether the BSC parameter setting is correct. 2. Check whether the system power connection row is normal. 3. After logging into the web interface of BSC, you can see the Over current fault in the Fault records interface. 4. Running records and fault records can be exported from the BSC History records screen.
BIT18	Pack over voltage fault	PACK voltage is continuously higher than the set alarm threshold. 1. The equipment works abnormally.	No/ The PACK voltage is continuously lower than the set release threshold and a fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Check whether the BSC parameters are set correctly. 2. Check whether the voltage sampling line is abnormal. 3. After logging into the web interface of BSC, you can see the Max cell voltage position in the Battery system info interface to locate the position.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					4. Running records and fault records can be exported from the BSC History records screen. 5. Use a multimeter to measure whether the actual Pack voltage level is normal.
BIT19	Pack under voltage fault	PACK voltage is continuously below the set fault threshold. 1. The battery system has not been charged for a long time. 2. After the discharge SOC of the battery system reaches 0, it is not compensated (charged) in time.	No/ The PACK voltage is set release threshold and the fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Check whether the BSC parameters are set correctly. 2. check whether the voltage of the cell or pack is abnormal. 3. After logging into the web interface of BSC, you can see the Min cell voltage position in the Battery system info interface, to locate the position. 4. Running records and fault records can be exported from the BSC History records screen. 5. Check whether the system is over-discharged. If the SOC of the system is 0, you can try to charge the system with low power to eliminate the fault.
BIT22	Fuse fault	CMU detects an open fuse node.	No/ The fuse is restored and the fault clearing command is received.	Report the fault and reduce the power to 0%.	1. Measure whether the fuse is an open circuit, replace the fuse under abnormal conditions. 2. check whether the wiring is loose.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>3. the above are not abnormal, please change the DCDC.</p> <p>4. After logging into the web interface of BSC, you can see the Fuse Fault in the Fault records interface.</p> <p>5. Running records and fault records can be exported from the BSC History records screen.</p>
BIT23	Total voltage difference fault	<p>The difference between accumulated total voltage and sampled total voltage is greater than the set fault threshold.</p> <p>1. The power line is not connected.</p>	<p>No/ The voltage difference is eliminated and the fault clearing command is received.</p>	<p>Report the fault and reduce the power to 0%.</p>	<p>1. rule out other system faults such as communication faults, voltage sampling faults.</p> <p>2. Check whether the total voltage sampling line is loose.</p> <p>3. the above are not abnormal, please change the DCDC.</p> <p>4. After logging into the web interface of BSC, you can see the Total voltage difference fault in the Fault records interface.</p> <p>5. Running records and fault records can be exported from the BSC History records screen.</p>

4.3 BSC Alarm Word

Register address 18041&18042 (for example). The register contains alarm signals of BSC.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT1	DC/DC alarm	DC/DC alarm reported.	Yes/ Alarm cleared.	Limited Operation.	See details in 4.6.
BIT2	Liquid cooling unit alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	See details in 4.5.
BIT3	Breathing light communication alarm	<p>Communication between BSC and breathing light remains disconnected.</p> <ol style="list-style-type: none"> 24V auxiliary power supply abnormality 485 communication cable is loosely connected or disconnected. BSC breathing light communication parameters configuration error. 	<p>Yes/ Communication restored.</p>	Report the alarm.	<ol style="list-style-type: none"> Check the 24V auxiliary power supply according to the operation manual. Check the communication cable connection according to the operation manual. Observe the appearance of the breathing light for damage to determine if there may be a problem with the breathing light itself. Check that the BSC is connected to the breathing light communication wire. After logging into the web interface of BSC, you can see the "Breathing light communication alarm" alarm occurrence time in the Alarm Records interface, and you can export the running records in the alarm occurrence

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					period for SUNGROW to analyze.
BIT4	Dry contact alarm	<p>Node input signal alarm is triggered.</p> <p>1. A fault occurs and the node signal is triggered.</p> <p>2. The node detection signal line is loose.</p>	<p>Yes/ When the signal is restored, the reported fault points are eliminated.</p>	Report the alarm.	<p>1. Check according to Node Fault Alarm List.</p> <p>2. Check the connection status of signal lines according to the operation manual.</p> <p>3. Observe whether there are any problems with the devices connected to the node. (For example, if smoke sensors, temperature sensors and other devices in the fire protection system report node alarms, you can directly observe whether there are problems and damages on the surface of the said devices.)</p> <p>4. After logging into the web interface of BSC, you can see the " Dry contact alarm "alarm occurrence time in the Alarm records interface, and you can export the running records in the alarm occurrence time period for SUNGROW to analyze.</p>
BIT5	CMU alarm	CMU alarm reported.	<p>Yes/ Alarm cleared.</p>	Report the alarm.	See details in 4.1.
BIT6	BSC-DC/DC	Communication between BSC and DC/DC remains disconnected.	Yes/	Report the alarm.	1. Check the 24V auxiliary power supply according to the

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
	communication alarm	1. 24V auxiliary power supply abnormality. 2. The communication cable is loosely connected or disconnected. 3. The DC/DC address in BSC is configured incorrectly.	Communication restored.		operation manual. 2. Check the communication cable connection according to the operation manual. 3. Check whether the IP address of DC/DC configured in BSC is correct according to the operation manual. 4. After logging into the web interface of BSC, you can see the " BSC-DC/DC comm alarm "alarm occurrence time in the Alarm records interface, and you can export the running records in the alarm occurrence time period for SUNGROW to analyze.
BIT7	CMU communication alarm	Communication between BSC and CMU remains disconnected. 1. Abnormal 24V auxiliary power supply. 2. The communication cable is loosely connected or disconnected.	Yes/ Communication restored.	Report the alarm.	1. Check the 24V auxiliary power supply according to the operation manual. 2. Check the communication cable connection. 3. Check the CMU matching resistor for abnormality, the bus resistor value is about 62Ω. 4. After logging into the web interface of BSC, you can see the " CMU comm alarm "alarm occurrence time in the Alarm records interface, and you can export the running records in the alarm occurrence time period for SUNGROW to

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					analyze.
BIT8	Branch exception alarm	Alarm is triggered when branch circuit is abnormal 1. PCS fuse is blown. 2. The power line between PCS and battery box is disconnected.	No/ The fault is eliminated and the fault clearing command is received.		<p>1. Check whether the DC/DC fuse is damaged.</p> <p>2. Check whether DCDC current sampling is abnormal.</p> <p>3. Check whether DCDC bus voltage acquisition is abnormal.</p> <p>4. After logging into the web interface of BSC, you can see the " Branch exception alarm "alarm occurrence time in the Alarm records interface, and you can export the running records in the alarm occurrence time period for SUNGROW to analyze.</p> <p>5. Try to restart the system.</p>
BIT12	Combustible gas detecting device communication alarm	Communication between BSC and combustible gas detection equipment is continuously disconnected. 1. Abnormal auxiliary power supply. 2. 485 communication cable is loosely connected or disconnected. 3. BSC combustible gas detection equipment communication parameters configuration error.	Yes/ Communication restored.	Report the alarm.	<p>1. Check the auxiliary power supply according to the operation manual.</p> <p>2. Check the communication cable connection according to the operation manual.</p> <p>3. Observe combustible other detectors for cosmetic damage.</p> <p>4. After logging into the web interface of BSC, you can see</p>

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					the "Combustible gas detecting device comm alarm" alarm occurrence time in the Alarm Records interface, and you can export the running records in the alarm occurrence time-period for SUNGROW to analyze.

4.4 BSC Fault Word

Register address 18043&18044 (for example). The register contains fault signals of BSC.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT2	BSC-PCS communication fault	The communication between BSC and PCS remains disconnected. 1. PCS is not powered on. 2. The communication cable is loosely connected or disconnected. 3. BSC address configuration error in PCS. 4. The equipment works abnormally.	Yes/ Communication returns to normal.	Report the fault and shut down the unit.	1. Check whether the PCS is normally powered on and operating. 2. Check the communication cable between BSC and PCS according to the operation manual, and check whether the PCS and BSC networks under the system are in the same local area network. 3. According to the operation manual, check whether the BSC IP address of the PCS is consistent with that of the

BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					actual equipment. 4. After logging into the web interface of BSC, you can see the " BSC-PCS comm fault " fault occurrence time in the Fault records interface, and you can export the running records in the fault occurrence time period for SUNGROW to analyze.
BIT6	Dry contact fault	Node input signal alarm is triggered. 1. A fault occurs and the node signal is triggered. 2. The node detection signal line is loose.	Yes/ When the signal is restored, the reported fault point is eliminated.	Refer to hardware node fault.	1. Check according to Node Fault Alarm List. 2. Check the connection status of signal lines according to the operation manual. 3. Contact SUNGROW if the fault still persists. 4. Observe whether there are any problems with the devices connected to the node. (For example, if smoke sensors, temperature sensors and other devices in the fire protection system report node alarms, you can directly observe whether there are problems and damages on the surface of the said devices.) 5. After logging into the web interface of BSC, you can see the " Dry contact fault " fault occurrence time in the Fault records interface, and you can export the running records in the fault occurrence time period for SUNGROW to

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT7	BSC-LC communication fault	Communication between BSC and LC remains disconnected. 1. LC is not powered on. 2. The communication cable loosely connected or disconnected. 3. BSC address configuration error in LC. 4. Equipment abnormality.	Yes/ Communication returns to normal.	Report the fault and shut down the unit.	analyze. 1. Check whether the LC is normally powered on and operating. 2. Check the communication cable between BSC and LC according to the operation manual, and check whether the LC and BSC networks under the system are in the same local area network. 3. According to the operation manual, check whether the BSC IP address of LC is consistent with the actual equipment. 4. After logging into the web interface of BSC, you can see the " BSC-LC comm fault " fault occurrence time in the Fault records interface, and you can export the running records in the fault occurrence time period for SUNGROW to analyze.
BIT8	DC/DC all fault	DC/DC fault occurs and the system is inoperable 1. See the "DC/DC Fault Alarm" list.	Yes/ DC/DC Fault Complete Elimination.	Report the fault and shut down the unit.	Operate according to DC/DC equipment operation instructions.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
BIT9	CMU all fault	CMU fault occurs and the system is inoperable 1. See the "DC/DC Fault Alarm" list.	Yes/ CMU Fault Complete Elimination.	Report the fault and shut down the unit.	Identify specific faults according to CMU fault information list.
BIT15	Low voltage circuit fault	Low voltage circuit fault is detected. 1. A short circuit occurred in the 24V auxiliary power supply circuit.	No/ Manual restarting after fault is cleared.		1, According to the user manual to check whether the contactor coil power supply is disconnected; 2, According to the user manual to check whether the UPS output is normal; 3, Check whether there is a short circuit in the low-voltage power supply circuit; 4. After logging into the web interface of BSC, you can see the " Low voltage circuit fault " fault occurrence time in the Fault records interface, and you can export the running records and fault records in the fault occurrence time period for SUNGROW to analyze.
BIT16	Emergency stop	The emergency stop button of BSC is pressed.	Yes/ The emergency stop button is restored.	Report the fault and shut down the unit.	1. Check whether the wiring of emergency stop signal is normal based on user manual. 2. Check whether the emergency stop button of the battery box is pressed.

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BIT	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					3. Check that the emergency shutdown feedback node of the BSC is not loosely connected according to the user manual.
BIT17	1# High combustible gas concentration alarm	It is detected that the concentration of combustible gas reaches the alarm value.	Yes/ Fault Cleared.	Report the alarm, stop the unit and start the exhaust fan.	The system automatically starts the exhaust fan, and after the alarm is cleared, the system resumes operation.
BIT18	2# High combustible gas concentration alarm	It is detected that the concentration of combustible gas reaches the alarm value.	Yes/ Fault Cleared.	Report the alarm, stop the unit and start the exhaust fan.	The system automatically starts the exhaust fan, and after the alarm is cleared, the system resumes operation.

4.5 LCU Alarm Word

LCU (liquid cooling unit). The register contains alarm signals in the LCU.

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ADVERTISED PLAN

Register Address	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
18099	High outlet water pressure alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	<p>1. Check for foreign objects in the circulatory system piping.</p> <p>2. Open the drain valve to discharge a small amount of coolant.</p>
18100	Low outlet water pressure alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	<p>1. There is less coolant, Connect the injection tool for injection</p> <p>2. Check the condensation line for fluid leaks.</p>
18101	1#System alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	After logging into the web interface of BSC, you can see the LCU information in the Sun-device info interface, and you can find more specific alarm locations.
18102	2#System alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	After logging into the web interface of BSC, you can see the LCU information in the Sun-device info interface, and you can find more specific alarm locations.

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Register Address	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
18107	System water shortage alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	<p>1. Check whether the detection of water inlet sensor of liquid cooling unit is deviated.</p> <p>2. Check whether the liquid-cooled unit is short of water.</p> <p>3. After logging into the web interface of BSC, you can see the other alarm code in the Sub-device info interface, and you can find the corresponding alarm information according to the user manual, and you can export the running records in the alarm occurrence time-period for SUNGROW to analyze.</p>
18108	1#High condensing pressure alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	<p>1. Check the ambient temperature.</p> <p>2. Tighten the electric control wiring or replace the cable based on user manual.</p> <p>3. Clean the condenser.</p> <p>4. Clean the dirty blockage in front of the</p>

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Register Address	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					<p>unit's return air outlet.</p> <p>5. Repair or replace the fan when it is not the cause of power failure.</p>
18109	2#High condensing pressure alarm	Liquid cooling unit alarm reported.	<p>Yes/ Alarm cleared.</p>	Report the alarm.	<p>1. Check the ambient temperature.</p> <p>2. Tighten the electric control wiring or replace the cable based on user manual.</p> <p>3. Clean the condenser.</p> <p>4. Clean the dirty blockage in front of the unit's return air outlet.</p> <p>5. Repair or replace the fan when it is not the cause of power failure.</p>
18110	Power fault alarm	Liquid cooling unit alarm reported.	<p>Yes/ Alarm cleared.</p>	Report the alarm.	<p>1. Check the liquid-cooled unit's power supply connection wires for breaks according to the user manual.</p> <p>2. Check for problems with the external power supply.</p>

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Register Address	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Action	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
					3. If the above check is normal, please contact SUNGROW.
18111	1#Total alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	After logging into the web interface of BSC, you can see all the LCU alarm information in the Sun-device info interface, and you can find more specific alarm locations.
18112	2#Total alarm	Liquid cooling unit alarm reported.	Yes/ Alarm cleared.	Report the alarm.	After logging into the web interface of BSC, you can see all the LCU alarm information in the Sun-device info interface, and you can find more specific alarm locations.

4.6 DC/DC Alarm/Fault Word

This section of information is not included in the communication protocol, and it only can be seen on the website of BSC.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
1	Battery Average Undervoltage Fault	Total battery voltage in non-charging mode is lower than minimum operating voltage.	Yes/ Total battery voltage returns to normal.	Reset and run again. If the fault occurs again, restart the machine. If the fault still exists: 1. Check whether the voltage at both ends of the battery meets the requirements 2. Check whether the battery filter board and the control board sampling line off. 3. Confirmation of non-above reasons, consider whether the battery voltage sampling is abnormal, it is recommended to replace the control board, battery filter board.
2	Battery Average Overvoltage Fault	Battery port voltage exceeds set value.	Yes/ Battery port voltage is lower than the set value.	Check whether the battery over-voltage setting value in the Sunny Cloud APP is correct, if the setting is correct, the fault still exists: 1. Check whether the voltage at both ends of the battery meets the requirements. 2. Confirmation of non-above reasons, consider whether the battery voltage sampling is abnormal, it is recommended to replace the battery filter board, the control board.
3	Battery Side Voltage Imbalance	Unbalanced positive and negative battery voltages inside the machine.	Yes/ The fault is caused by unbalanced positive and negative battery voltages	Generally, wait a few minutes to return to normal the machine will run again, if the fault recurs: 1. Check the battery side of the half-bus is short-circuited, the amount of control board on the BAT +, BAT- and N is short-circuited; If the above problems, consider whether the IGBT module is straight through, it is recommended to replace the

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
			inside the machine.	<p>main power board.</p> <p>2. To confirm that the reasons are not the above, consider driving abnormalities, check the control board and the power of the wiring between the wiring is correct, if it is normal, it is recommended to replace the main power board, the control board.</p>
4	Battery Side Overcurrent	Battery side overcurrent.	<p>Yes/ The fault is caused by bus side current exceeding the rated or current protection setting value.</p>	<p>Generally, wait a few minutes to return to normal after the machine will run again, if the fault recurs: consider sampling anomalies, check whether the shunt resistance value is abnormal, if not then replace the control board;</p>
5	Bus Average Undervoltage	Bus voltage is lower than preset protection value.	<p>Yes/ Bus voltage returns normal.</p>	<p>Generally, the machine will run again after the bus voltage returns to normal, if the fault recurs:</p> <ol style="list-style-type: none"> 1. Check whether the load switch is closed based on the user manual. 2. Confirm whether the two-pole mode is open. 3. Confirmation of non-above reasons, consider sampling line abnormalities, it is recommended to replace the control board.
6	High Bus Voltage	Average bus voltage in the machine is higher than protection	Yes/	Generally, the machine will resume operation when the bus voltage is restored to

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
		value.	Bus voltage returns normal.	normal condition. If the fault persists: 1. Check the system voltage to make sure it is not too high. Optimize the battery configuration if it exceeds the maximum allowable voltage. 2. Check whether the voltage protection value in Sunny cloud APP is set correctly. Confirmation of non-above reasons, consider sampling line abnormalities, it is recommended that the replacement of the control board.
7	Bus Voltage Imbalance	Unbalanced positive and negative bus voltages inside the machine.	Yes/ Bus voltage returns normal	Generally, wait a few minutes to return to normal after the machine will run again, if the fault recurs: 1. Consider whether the PV-side half-bus is short-circuited, whether the PV-side module is straight-through, the use of a multimeter to measure the PV + and PV N or PV - and whether the PV N is short-circuited. 2. The module driver is abnormal, check the driver wiring. If the above problems are found, it is recommended that the replacement of the main power board.
8	Software Version Mismatch	The dialing switch does not match the machine type to be set.	No	If the fault occurs repeatedly: 1. Check whether the machine dial switch matches with the setup model based on the user manual.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
				2. If it matches, consider re-burning the program and setting up APP as required.
9	Bus Side Overcurrent	Bus side overcurrent.	Yes/ The fault is caused by bus side current exceeding the rated current or the setting value.	Generally, the machine will recover and resume operation in several minutes. If the fault occurs repeatedly: 1. check whether the maximum charging and discharging current setting in APP is correct or not. 2. constant voltage mode, if the actual power is out of range, may also cause this phenomenon, it is recommended to reasonably deploy the power. Confirmation of non-above reasons, consider sampling anomaly, it is recommended to replace the control board.
10	DC/DC Inductive Current 1 Overcurrent	Inductor current 1 overcurrent.	Yes/ Wait for 3 minutes and then the fault will recover by itself.	If the fault occurs repeatedly: 1. If and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment power. 2. Confirmation of non-above reasons, consider sampling anomalies, it is recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
11	DC/DC Inductive Current 2 Overcurrent	Inductor current 2 overcurrent.	Yes/ Wait for 3 minutes and then the fault will recover by itself.	<p>threshold, then consider replacing the inductor L3 and L6.</p> <p>If the fault occurs repeatedly:</p> <ol style="list-style-type: none"> 1. If and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment of power. 2. Confirmation of non-above reasons, consider sampling anomalies, it is recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current threshold, then consider replacing the inductor L2 and L5.
12	DC/DC Inductive Current 3 Overcurrent	Inductor current 3 overcurrent.	Yes/ Wait for 3 minutes and then the fault will recover by itself.	<p>If the fault occurs repeatedly:</p> <ol style="list-style-type: none"> 1. if and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment of power. 2. Confirmation of non-above reasons, consider sampling anomalies, it is

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
				recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current threshold, then consider replacing the inductor L1 and L4.
13	DC/DC Inductive Current 4 Overcurrent	Inductor current 4 overcurrent.	Yes/ Wait for 3 minutes and then the fault will recover by itself.	<p>If the fault occurs repeatedly:</p> <p>1. If and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment of power.</p> <p>2. Confirmation of non-above reasons, consider sampling anomalies, it is recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current threshold, then consider replacing the inductor L1 and L4.</p>
14	DC/DC Inductive Current 5 Overcurrent	Inductor current 5 overcurrent.	Yes/ Wait for 3 minutes and then the fault will recover by itself.	<p>If the fault occurs repeatedly:</p> <p>1. If and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment</p>

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
				<p>of power.</p> <p>2. Confirmation of non-above reasons, consider sampling anomalies, it is recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current threshold, then consider replacing the inductor L2 and L5.</p>
15	DC/DC Inductive Current 6 Overcurrent	Inductor current 6 overcurrent.	<p>Yes/ Wait for 3 minutes and then the fault will recover by itself.</p>	<p>If the fault occurs repeatedly:</p> <p>1. If and bus-side current overcurrent, battery-side current overcurrent and other faults occur at the same time, consider whether the machine is running in constant voltage mode, the system deployment power is greater than the maximum power of the machine, it is recommended to rationalize the deployment of power.</p> <p>2. Confirmation of non-above reasons, consider sampling anomalies, it is recommended to replace the main power board and control board, if it cannot be resolved, whether it occurs at the same time with the fault 1102, may be too small inductor inductance leads to a larger ripple to exceed the inductance current threshold, then consider replacing the inductor L3 and L6.</p>
16	DC/DC Inductor Current 1 Imbalance	DC/DC inductor current 1 is unbalanced. Hardware abnormality.	Yes/ The current returns to	<p>1. Power off and restart.</p> <p>2. If the fault still exists, replace the power board.</p>

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
			balance.	
17	DC/DC Inductor Current 2 Imbalance	DC/DC inductor current 2 is unbalanced. Hardware abnormality.	Yes/ The current returns to balance.	1. Power off and restart. 2. if the fault still exists, replace the power board
18	DC/DC Inductor Current 3 Imbalance	DC/DC inductor current 3 is unbalanced. Hardware abnormality.	Yes/ The current returns to balance.	1. Power off and restart. 2. if the fault still exists, replace the power board
19	Battery Side Contactor Fault	Check whether the relay circuit is opened or shorted according to the test logic (Internal and external sample voltage difference exceeds 30V).	Yes/ Automatic fault clearing after 10s.	1. Try to power down and restart the equipment; 2. Check whether the contactor operates: replace the contactor 3. whether the wiring is correct 4. 12V power supply is normal and slow start MOS board: replace the control board 5. Check whether the power board BAT + and BAT - short circuit: replace the power board
20	Bus Side Contactor	Check whether the relay circuit is opened or shorted according to the test logic (Internal and external sample voltage difference	Yes/ Automatic fault clearing after	1. Try to power down and restart the equipment.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
	Fault	exceeds 30V).	10s	2. Check whether the contactor operates: replace the contactor 3. Whether the wiring is correct 4. 12V power supply is normal and slow start MOS board: replace the control board 5. Check whether the power board PV + and PV - short circuit: replace the power board
21	Battery Soft Start Fault	Battery side soft start error during boot (internal and external sampling voltages exceeded 150V).	Yes/Restart.	Restart the device if the fault still exists: 1. The battery side of the full bus short circuit \ battery side module straight through: replace the power board. 2. Confirm that not the above reasons, and the failure still exists, consider the soft start driver board damage, it is recommended to replace the control board.
22	Bus Soft Start Fault	Bus side soft start error during boot (internal and external sampling voltages exceeded 150V).	Yes/Restart.	Restart the device if the fault still exists: 1. PV-side bus short circuit, PV-side module through: replace the power board 2. Check the line and 12V power supply is normal: replace the core board after the problem still exists, then replace the control board 3. Slow start contactor action: replace the slow start contactor.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
23	Bus Side Polarity Reversed	When the PCS is not running, voltage sampling for the battery is found to be less than -200V and lasts for 1s.	No/ Exchange polarity.	Restart the unit if the fault persists: 1. Check whether the wiring on the busbar (PV) side is correct after power failure 2. Check if the polarity of the busbar is correct.
24	Battery Side SPD Sault	AC SPD is found to be damaged.	Yes/	Check if the SPD is loose or damaged. Replace it if so.
25	DC/DC Hardware Fault	Hardware protection signal is detected and the protection is triggered. The causes could be battery overcurrent, bus overcurrent, bus overvoltage, battery overvoltage, CPLD abnormality, inductive overcurrent, and low control voltage.	Yes/ The condition that triggered hardware protection is restored to the normal range.	Generally, do not need to deal with will be automatically restored, if the fault occurs repeatedly: Consider battery overcurrent, bus overcurrent, bus overvoltage, battery overvoltage, CPLD abnormality, inductor overcurrent, control electric low voltage fault, battery overcurrent, please contact SUNGROW.
26	Module Overheat	Power module temperature exceeds the protection value.	Yes/ Module temperature returns to normal	Generally, the PCS will resume operation when the internal or module temperature returns to normal. If the fault persists: 1. Check whether the ambient temperature of the machine is too high. 2. Check whether the machine is in a place that is well ventilated. 3. Check whether the machine is under direct illumination. If so, please shade it properly.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
				4. Check whether the fan is running normally. If no, please replace the fan. 5. If the above reasons are excluded and the fault still exists. Please contact SUNGROW.
27	Bus side SPD fault	Bus side SPD is found to be damaged.	Yes/	Check if the SPD is loose or damaged. Replace it if so.
28	Low Battery Insulation Resistance	Insulation impedance of battery to ground is less than the pre-set value.	Yes/ Insulation impedance returns to normal.	Generally, the fault will be cleared automatically without handling. If it appears repeatedly, the machine cannot start normally. 1. Check whether the ISO impedance protection value of the equipment is too high and confirm that it meets the requirements. 2. Check whether the impedance of the battery is too low in rainy days or in the morning and evening, and measure whether the insulation impedance value of the positive and negative poles of the battery to ground is too low. 3. If the above reasons are excluded and the fault still persists. Please contact SUNGROW.
29	Analog Bias Abnormal	1. The offset value of channel sampling exceeds the theoretical reference value by 15%. 2. Before starting-up, the sampling values of DC current and AC current exceed the rated value by 15%.	No/ Reset the analog to clear the fault.	1. Reboot the equipment. 2. Check the internal wiring to make sure there are no loose connections. 3. core board indicator is normal, if not normal, then replace the core board

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
				4. Confirmation of the above reasons, re-burn program, if it cannot be resolved, then replace the control board.
30	Parallel Machine Communication Failure	Parallel machine communication abnormality.	Yes/ Communication returns to normal.	1. Try to power down and restart the equipment. 2. Check the parallel machine communication cable for any loose connections. 3. If the preceding causes are excluded and the fault persists, please contact SUNGROW.
31	High Ambient Temperature	Temperature in the chassis is too high. Operating ambient temperature is too high.	Yes/ The temperature in the cabinet returns to normal.	Generally, the machine will resume operation when the internal or module temperature returns to normal. If the fault persists. 1. Check whether the ambient temperature of the machine is too high. 2. Check whether the machine is in a place that is well ventilated. 3. Check whether the machine is under direct illumination. If so, please shade it properly. 4. Check whether the fan is running normally. If no, please replace the fan. 5. Detect whether the core board indicator is correct, if not normal, please replace the core board, if normal re-burning program, if it cannot be solved, consider the ring temperature sampling anomaly, need to replace the control board.

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No.	Fault Name	Fault Reason	Automatic Fault Recovery/Reason	Troubleshooting Advice (Content in red requires SUNGROW engineers to execute)
32	Battery Polarity Reversed	When the PCS is not running, voltage sampling for the battery is found to be less than -200V and lasts for 1s.	No/ Exchange polarity	If the fault recurs: 1. Check the battery side wiring, input polarity is correct. 2. Check the battery filter board and the control board wires are plugged in reverse. 3. Confirmation is not the above reasons, consider sampling anomaly, it is recommended to replace the battery filter board and control board.
33	Fan Alarm	When the fan speed is detected to be lower than the minimum duty cycle speed, it will be reported.	Yes/ Fan speed returns to normal.	1. Check the machine fan, shut down the machine, disconnect the power supply and remove any foreign particles. 2. Replace the fan if it is damaged.

5 PCS Info-3x

Please refer to the PCS manual.

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