ecology & heritage partners

Final Report

Fire Impact Assessment for the Meadow Creek Solar Farm: 1033 Oxley-Meadow Creek Road, Meadow Creek, Victoria

Prepared for

Urbis Pty Ltd

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Ecology and Heritage Partners acknowledge the Traditional Owners of the country we live and work on, and we pay our respect to Elders past, present and emerging.

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1 INTRODUCTION

1.1 Background

Ecology and Heritage were engaged by Urbis Pty Ltd to prepare a Fire Impact Assessment for a solar farm at 1033 Oxley-Meadow Creek Road, Meadow Creek. The development includes solar panels and associated infrastructure, a Battery Energy Storage System (BESS), terminal substation, collector substation, overhead transmission lines from the terminal substation to the collector substation, BESS site office, carparking, internal road network, site access points and planted vegetation screening.

The purpose of this report is to undertake a bushfire risk assessment and address the implications of the development against the Country Fire Authority's (CFAs) Design Guidelines and Model Requirements for Renewable Energy Facilities document (Design Guidelines) (CFA 2023).

A separate report addressing the requirements of Clause 13.02-1S Bushfire has been prepared (Ecology and Heritage Partners 2024) which includes a bushfire hazard assessment from the landscape scale, i.e. within 20 kilometres of the study area, down to the site scale.

1.2 Study Area

The study area is approximately 594.07 hectares in area, which includes 566.15 hectares as part of the solar farm site (i.e. 1033 Oxley-Meadow Creek Road, Meadow Creek) and 27.92 hectares immediately north of the solar farm site that contains the terminal substation and overhead transmission lines (i.e. 193 Docker-Carboor Road, Docker [SPI 2-42\PP3359] and Docker-Carboor Road, Milawa [SPIs 1\TP753880 and 3\TP753880]). The study area is approximately 20 kilometres south-east of Wangaratta and 190 kilometres north-east of Melbourne. It is bound by Whorouly-Bobinawarrah Road to the north, Allans Lane to the east, agricultural land to the south and Oxley-Meadow Creek Road to the west (Attachment 1).

The study area is generally flat and largely composes agricultural grazing land, with some dams, densely planted linear treed strips and scattered trees throughout. The study area is within the Wangaratta City Council municipality, zoned Farming Zone (FZ) and covered by the Bushfire Prone Area (BPA) (Department of Transport and Planning [DTP] 2023).

The study area was assessed on 29 February and 1 March 2024.

1.3 Project Overview

The project will comprise the following infrastructure:

- 566.1ha site area on generally flat land.
    - Predominantly grassland with retention of significant trees.
    - Perimeter external vegetation buffer.
    - Perimeter and internal road network.
    - Enclosed wildlife corridors (unmanaged vegetation) within and through the site.

  - Existing dams for cattle and stock.
- 332MWp solar array with associated infrastructure, including:
  - 592,752 x solar modules.
  - 24 modules per string.
  - 68 x solar inverters.
  - 68 x solar transformers.
- Up to 1000MW battery energy storage system, including:
  - 98 x inverters.
  - 98 x transformers.
  - Battery Management Systems to UL1973.
  - Surge protection devices and DC-fuses.
  - Warning and alarm systems for faults, status, smoke, off-gassing and fire.
  - Fire alarm control panel
  - Fire and smoke detection (2 x smoke and 2 x thermal detectors in battery compartments).
  - Hydrogen gas detector in the BESS container.
  - Automatic mechanical gas exhaust.
  - Dry-pipe water suppression system in the battery compartment.
  - OVEC1230 automatic fire suppression system in battery pack.
  - 120 minutes FRL fire wall
  - Thermal runaway protection to UL9540 or UL1973.
- 220kV substation with 2km overhead 220kV transmission lines.
- New Meadow Creek Terminal Station.
- On-site vegetation management to include:
  - Non-combustible ground cover and/or managed grassland below the solar arrays (grazed and/or slashed during the Fire Danger Period).
  - Maintained fire breaks around the site's perimeter, wildlife corridors, control rooms, electricity compounds, substations, and all other buildings.
- Firefighting provisions:
  - Emergency Site Access Gateways to all elevations and internal access roads.
  - 6 x 45,000L static water tank and hardstand areas (one at each perimeter Emergency Site Access Gate).

- All weather construction access roads with passing bays to CFA standard planning permit conditions.
- An AS2419.1 fire hydrant system protecting the BESS, including a ≥288,000L water tank and pumps.
- Firefighting water runoff bunding and retention tank around the BESS.

1.4 Aims and Objectives

This Fire Impact Assessment has the following aims and objectives:

- Reduce the likelihood of a bushfire impacting, or spreading to, the site. Note that the term bushfire also includes grassfires;
- Reduce the likelihood of a fire igniting on site;
- Ensure appropriate bushfire mitigation measures are in place with respect to emergency access and egress and static water supplies for firefighting;
- Ensure appropriate levels of vegetation management are undertaken to manage the fuel loads and associated bushfire risk;
- Prioritising the protection of human life in the event of a fire impacting the site; and,
- Protect fire-fighters in the event of a fire impacting the site.

Furthermore, all ten fire risk management principles contained within the Design Guidelines (CFA 2023, p5) will be addressed, which are:

- '*Effective identification and management of hazards and risks specific to the landscape, infrastructure, layout and operations at the facility.*
- *Siting of renewable energy infrastructure so as to eliminate or reduce hazards to emergency responders.*
- *Safe access for emergency responders in and around the facility, including to renewable energy and firefighting infrastructure.*
- *Provision of adequate fire-fighting infrastructure for safe and effective emergency response.*
- *Vegetation sited and managed so as to avoid increased bushfire and grassfire risk.*
- *Prevention of fire ignition on-site and spreading to adjoining properties.*
- *Prevention of fire spread between site infrastructure (solar panel banks, wind turbines, battery containers/enclosures).*
- *Prevention of external fire impacting and igniting site infrastructure.*
- *Provision of accurate and current information for emergency responders during emergencies.*
- *Effective emergency planning and management, specific to the site, infrastructure, operations and hazards (including bushfire).'*

2 RISK MANAGEMENT PLAN

A Risk Management Plan identifies and manages fire risk to protect site personnel, firefighters and the community. The plan addresses the occupational health and safety requirements for eliminating or reducing risk so far as is reasonably practicable via the following strategies:

1. Risk identification – identifying the potential sources of fire ignition;
2. Risk analysis and evaluation – identifying the nature of the risk and its characteristics and an analysis of controls for all identified risks;
3. Risk treatment/mitigation measures – the selection and implementation of controls for each identified risk
4. Monitoring and review, recording and reporting – involves regular and comprehensive review of risks and controls.

These above-mentioned elements are discussed in the following sections.

2.1 Risk Identification

There is the potential for several on-site and off-site hazards to impact the safe operation of the solar farm. These hazards and the risks associated with them are identified in Table 1.

Table 1. Potential fire hazards and their ignition sources.

Hazard Category	Ignition Risk
On-site electrical/structural hazard	• Electrical fault • Structural fault/damage to equipment • Equipment/technological failure • BESS failure • Solar panel system failure
On-site fire event spreading throughout site and/or off-site	• Escalation of on-site fire event from electrical/structural fault • Non-electrical/structural fire event, i.e. human induced (i.e., equipment mismanagement, arson, car accident etc.) or natural event (i.e. lightning event)
Landscape fire event entering site	• Non-electrical/structural fire event, i.e. human induced (i.e., equipment mismanagement, arson, car accident etc.) or natural event (i.e. lightning event)

2.2 Risk Analysis and Evaluation

Risk analysis scores the potential consequence of each risk and its likelihood of occurrence. A risk matrix has been developed (Table 2) to analyse and evaluate the risks associated with the potential hazards identified in Table 1. The results of the analysis and evaluation, as well as the potential mitigation measures to effectively mitigate the threat to an appropriate level are provided in Table 3.

Table 2. Risk analysis matrix. Green indicates a Low (L) risk, yellow indicates a Moderate (M) risk and red indicates a High (H) risk.

Consequences				Increasing Likelihood				
Severity Rating	People	Infrastructure	Natural Environment	A	B	C	D	E
				Rare/Low chance of occurrence	Moderate chance of occurrence	High chance of occurrence	Very High chance of occurrence	Almost certain chance of occurrence
0	No injury	No damage	No effect	L	L	L	L	L
1	Slight injury	Slight damage	Slight effect	L	L	L	M	M
2	Minor injury	Minor damage	Minor effect	L	L	M	M	H
3	Major injury	Local damage	Local effect	L	M	M	H	H
4	Single fatality	Major damage	Major effect	M	M	H	H	H
5	Multiple fatalities	Extensive damage	Massive effect	M	H	H	H	H

Table 3. Summary of the risk analysis, evaluation and mitigation strategies for each hazard identified in Table 1.

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
On-site fire	Electrical fault	• Injury and/or death • Reduced/ceased output for component/structure with fault • Adverse environmental impacts • Loss of revenue	Moderate (A4)	Low (A3)	Low (A1)	• Ensure appropriate Personal Protective Equipment (PPE) is available at all times • All employees to ensure safe work practices are implemented • Operation, maintenance and routine checks of relevant equipment to be undertaken by suitably trained staff • Equipment to be checked and serviced regularly • Familiarity with the Fire Management Plan and Emergency Plan • Ensure all staff on site have undergone the appropriate bushfire-related training • Report all potential hazards, damage, accidents and/or injuries and unsafe work practices to relevant authority
On-site fire	Structural damage	• Injury and/or death • Reduced/ceased output for component/structure with fault • Adverse environmental impacts • Loss of revenue	Moderate (A4)	Low (A3)	Low (A1)	• Ensure appropriate Personal Protective Equipment (PPE) is available at all times • All employees to ensure safe work practices are implemented • Operation, maintenance and routine checks of relevant equipment to be undertaken by suitably trained staff • Equipment to be checked and serviced regularly • Familiarity with the Fire Management Plan and Emergency Plan • Ensure all staff on site have undergone the appropriate bushfire-related training • Report all potential hazards, damage, accidents and/or injuries and unsafe work practices to relevant authority

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
On-site fire	Equipment/ technological failure	• Injury and/or death • Reduced/ceased output for component/structure with fault • Adverse environmental impacts • Loss of revenue	Moderate (A4)	Low (A3)	Low (A1)	• Ensure appropriate Personal Protective Equipment (PPE) is available at all times • All employees to ensure safe work practices are implemented • Operation, maintenance and routine checks of relevant equipment to be undertaken by suitably trained staff • Equipment to be checked and serviced regularly • Familiarity with the Fire Management Plan and Emergency Plan • Ensure all staff on site have undergone the appropriate bushfire-related training • Report all potential hazards, damage, accidents and/or injuries and unsafe work practices to relevant authority
On-site fire	BESS failure	• Injury and/or death • Reduced/ceased output for component/structure with fault • Adverse environmental impacts • Loss of revenue	Moderate (A4)	Moderate (A4)	Low (A1)	• Ensure appropriate Personal Protective Equipment (PPE) is available at all times • All employees to ensure safe work practices are implemented • Operation, maintenance and routine checks of relevant equipment to be undertaken by suitably trained staff • Equipment to be checked and serviced regularly • Familiarity with the Fire Management Plan and Emergency Plan • Ensure all staff on site have undergone the appropriate bushfire-related training • Report all potential hazards, damage, accidents and/or injuries and unsafe work practices to relevant authority

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
On-site fire	Solar panel system failure	• Injury • Reduced/ceased output for component/structure with fault • Adverse environmental impacts • Loss of revenue	Low (A2)	Moderate (A4)	Low (A3)	• Ensure appropriate Personal Protective Equipment (PPE) is available at all times • All employees to ensure safe work practices are implemented • Operation, maintenance and routine checks of relevant equipment to be undertaken by suitably trained staff • Equipment to be checked and serviced regularly • Familiarity with the Fire Management Plan and Emergency Plan • Ensure all staff on site have undergone the appropriate bushfire-related training • Report all potential hazards, damage, accidents and/or injuries and unsafe work practices to relevant authority

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
On-site fire event spreading throughout site and/or off-site	Escalation from electrical/structural fault	• Injury and/or death on-site and/or in wider community • Damage to other structures and associated infrastructure in the facility • Reduced/ceased output across some or all of the facility • Local or landscape scale fire • Community infrastructure damage • Adverse environmental impacts	Moderate (A4)	High (B5)	Moderate (B4)	• Solar farm infrastructure to be checked and serviced regularly • Ensure appropriate Personal Protective Equipment (PPE) is available at all times • Ensure all staff on site have undergone the appropriate bushfire-related training • Familiarity with Fire Management Plan and Emergency Plan • Review and revise of the Fire Management Plan and Emergency Plan annually, before the fire season • Internal external road network is accessible and provides travel away from the fire / fire's path. • Ensure vegetation is managed in a suitable condition during the Fire Danger Period • Ensure fire breaks are maintained in a low fuel condition • Ensure firefighting tanks are full, maintained and accessible

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
On-site fire event spreading throughout site and/or off-site	Human induced or natural fire event	• Injury and/or death on-site and/or in wider community • Damage to other structures and associated infrastructure in the facility • Reduced/ceased output across some or all of the facility • Local or landscape scale fire • Community infrastructure damage • Adverse environmental impacts	Moderate (A4)	High (B5)	Moderate (B4)	• Solar farm infrastructure to be checked and serviced regularly • Ensure appropriate Personal Protective Equipment (PPE) is available at all times • Ensure all staff on site have undergone the appropriate bushfire-related training • Familiarity with Fire Management Plan and Emergency Plan • Review and revise of the Fire Management Plan and Emergency Plan annually, before the fire season • Ensure vegetation is managed in a suitable condition during the Fire Danger Period • Ensure fire breaks are maintained in a low fuel condition • Ensure firefighting tanks are full, maintained and accessible • Provide site security to prevent unauthorised access

Hazard Category	Ignition Risk	Potential Consequence	Risk Assessment Matrix Score (refer to Table 2)			Recommended Mitigation Measures
			People	Infrastructure	Environment	
Landscape fire event entering site	Human induced or natural fire event	• Injury and/or death on-site • Minor to extensive damage to/destruction of facility infrastructure • Reduced/ceased output across some or all of the facility • Adverse environmental impacts	Low (A2)	High (B5)	Moderate (B4)	• Solar farm infrastructure to be checked and serviced regularly • Ensure appropriate Personal Protective Equipment (PPE) is available at all times • Ensure all staff on site have undergone the appropriate bushfire-related training • Familiarity with Fire Management Plan and Emergency Plan • Review and revise of the Fire Management Plan and Emergency Plan annually, before the fire season • Monitor conditions, ABC radio and emergency applications during the Fire Danger Period • Ensure vegetation is managed in a suitable condition during the Fire Danger Period • Ensure fire breaks are maintained in a low fuel condition • Ensure firefighting tanks are full, maintained and accessible • Ensure occupants have access to road vehicles. • Internal external road network is accessible and provides travel away from the fire / fire's path

2.3 Risk Treatment/Mitigation Measures

A series of mitigation measures are being implemented in the facilities design and operations that comply with the Design Guidelines (CFA 2023) and follow industry good practice. The measures are specified in the following sections.

2.3.1 Facility Location

The facility is inland on relatively flat ground and in a Farming Zone comprising paddocks interspersed with isolated trees, linear strips of trees, and roadside vegetation. Several small creeks run through the area, and small areas of riparian vegetation flank these watercourses.

The solar energy facilities are sited on paddocks that will be grazed, maintained in a low fuel condition during the declared Fire Danger Period, or landscaped in parts with non-combustible ground cover, which satisfies the Design Guidelines (CFA 2023, p14).

The entire development area is in the designated Bushfire Prone Area, although they are not subject to a Bushfire Management Overlay or Land Subject to Inundation Overlay.

The BESS and the solar energy facility are *generally* located in a low-risk environment, as defined in the Design Guidelines (CFA 2023, p14):

- '*Grassland;*
- *No continuous other vegetation types within one to 20 kilometres of the study area;*
- *Generally flat topography, some undulation may be present;*
- *Slopes are less than five degrees;*
- *Good road access with multiple routes available to and from the project site; and*
- *No BMO applies*.
- *No Land Subject to Inundation Overlay applies*.'

Except for the presence of '*other vegetation types within 20 kilometers of the study area*', all these low-risk attributes apply to the study area

The site is located north and west of the Great Diving Range, and several fingers and patches of remnant forest are situated within 20 km. The closet is approximately 5km Southeast and 6.5km South of the BESS.

The fingers/patches of remnant forest comprise a relatively large fuel load and are on sloping ground rising to the east (i.e. a fire travelling towards the fire from here would be upslope). This type of vegetation presents a credible fire hazard that can result in a significant fireline intensity and rate of fire spread, including ember attacks driven by the prevailing winds.

However, the vegetation is reasonably distant from the BESS and solar arrays and is upwind from this area's predominant directions of fire spread (DELWP 2017, p. 17). Considering the bushfire strategy (on-site vegetation management and fuel breaks), the fingers/patches are not considered to present an elevated threat of fire spread to the study area. Therefore, the risk of fire spreading from this vegetation is low to moderate.

The facility location is not considered high-risk as defined in the Design Guidelines (CFA 2023, p14). Considering the model requirements that *would* be necessary for a high-risk environment:

- An assessment against Clause 13.02-1s is included in this application and concludes the development can satisfy this policy.
- Due to the on-site fuel management, fuel breaks and the remote/rural location, an ignition from the infrastructure is expected to be contained on-site and not affect nearby communities, infrastructure, or assets.
- The impact of bushfires on the infrastructure is considered low because the BESS units are enclosed and located within a managed area of limited fuel load. The vegetation below the solar arrays will also be managed to a low fuel load, and the arrays contain a very limited fuel load. A fire starting on an array would not generally propagate fire to other arrays.
- The threat of bushfires is expected to be contained on the site due to the on-site fuel management and perimeter fire breaks. A fire travelling within the wildlife corridors will be constrained by the limited width of the vegetation and slashing of the understorey during the Fire Danger Period and is comparable to the risk presented by the existing and surrounding linear strips of vegetation, which is unrelated to the proposed use and infrastructure.

Therefore, the proposed development's risk is considered low-moderate, although it could still satisfy the Design Guidelines (CFA 2023, p. 14) for high-risk environments.

2.3.2 Emergency Vehicle Access

Adequate access to and within the facility will assist CFA in responding to and managing fires on-site. To enable access for fire vehicles, CFA requires that the following provisions be considered:

- A four (4) metre wide perimeter access track should be constructed within the ten (10) metre perimeter cleared fire break.
- Roads are to be of all-weather construction and capable of accommodating a vehicle of 15 tonnes.
- Constructed roads should be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface.
- The average grade should be no more than 1 in 7 (14.4% or 8.1°) with a maximum of no more than 1 in 5 (20% or 11.3°) for no more than 50 metres.
- Dips in the road should have no more than a 1 in 8 (12.5% or 7.1°) entry and exit angle.
- Incorporate passing bays at least every 600m which must be at least 20m long and have a minimum trafficable width of 6m. Where roads are less than 600m long, at least one passing bay is to be incorporated.
- Road networks must enable responding emergency services to access all areas of the facility.
- The provision of at least two (2) but preferably more access points to the site, to ensure safe and efficient access to and egress from areas that may be impacted.

The site is designed over several land parcels and divided into four parts by vegetation corridors. Each parcel has multiple entry points from a public road and internal access roads. The vegetation corridors also have crossing points that connect all parts.

Two access gates from public roads and internal circulation roads are bound and intersect the individual BESS units, providing access to the BESS facility.

2.3.3 Firefighting Static Water Supply

The location of firefighting water access points and the quantity of water supply have been established through a comprehensive risk management process that considers the credible hazards. In the event of a fire (either structural fire or bushfire), sufficient water is available and accessible to fire trucks to ensure that fire suppression activities are not hindered. Water access points must be clearly identifiable and unobstructed to ensure efficient access.

Static water storage tank installations are to comply with Australian Standard 2419.1 Fire hydrant installations System design, installation and commissioning and the following conditions.

- The static water storage tank shall be of not less than 45,000 litres effective capacity. The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel. The location and number of tanks should be determined as part of the site's risk management process and in consultation with a CFA delegated officer.
- The static storage tanks shall be capable of being completely refilled automatically or manually within 24 hours.
- The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (solar panels, wind turbines, battery energy storage systems, etc.).
- The hard-suction point shall be provided, with a 150mm full bore isolation valve (Figure 1) equipped with a Storz connection, sized to comply with the required suction hydraulic performance. Adapters that may be required to match the connection are 125mm, 100mm, 90mm, 75mm, 65mm Storz tree adapters (Figure 4) with a matching blank end cap to be provided.
- The hard-suction point shall be positioned within 4m to a hardstand area and provide clear access for fire personnel.
- An all-weather road access and hardstand shall be provided to the hard-suction point. The hardstand shall be maintained to a minimum of 15 tonne GVM, 8m long and 6m wide or to the satisfaction of the relevant fire authority.
- The road access and hardstand shall be kept clear at all times.
- The hard-suction point shall be protected from mechanical damage (i.e. bollards) where necessary.
- Where the access road has one entrance, an 8m radius-turning circle shall be provided at the tank.
- An external water level indicator is to be provided to the tank and be visible from the hardstand area.
- Signage (Plate 2 (A)) shall be fixed to each tank.

- Signage (Plate 2 (B)) shall be provided at the front entrance to the site, indicating the direction to the static water tank and being to the satisfaction of a CFA delegated officer.

Figure 1 The 150mm full bore isolation valve (shown on the left) and the 125mm1 90mm, 75mm and 65mm Storz tree adapters (shown on the right)

(A)

(B)

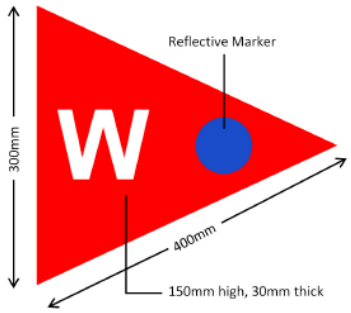

Figure 1 Fire water signage to comply with AS 2419.1 section 5.4.5 (A), and Directional signage: fade resistant, fixed to a rigid post in contrasting lettering, white sign writing on red background, with a circle reflective marker. "W" in 150mm upper case lettering (B)

The 566ha site has six (6) x 45,000L static water tanks with one (1) at each entrance, equivalent to one (1) per 100ha, in accordance with the Guidelines (CFA 2023, p. 20) for solar energy facilities.

The BESS facility is also provided with a fire hydrant that will comply with AS2419.1-2021 and the Design Guidelines (CFA 2023, p. 20) for BESS facilities, including:

- Fire water supply not less than 288,000L.
- Water storage is to be calculated from the number of hydrants required to flow by AS2419.1-2021 Table 2.2.5(D).
- Fire hydrants must be provided and located so that every part of the BESS facility is located within 10m stream from a 60m length of hose connected to a fire hydrant outlet.

- The fire water supply must be located at the facility's vehicle entrance (to the BESS), at least 10m from any infrastructure (electrical substations, inverters, battery energy storage systems, buildings).
- The fire water supply must be reasonably adjacent to the battery energy storage system and accessible without undue danger in an emergency. (e.g., Fire water tanks are to be located closer to the site entrance than the battery energy storage system).
- The fire water supply must comply with AS 2419.1-2021: Fire hydrant installations, Section 5.

2.3.4 BESS Specifications

The design incorporates a fire break and perimeter and internal road network bounding the BESS enclosures and a fire break bounding the substation and other supporting infrastructure, which:

- Minimises the potential for bushfires and grassfires to affect the BESS.
- Minimised the potential for BESS container fires to impact on-site and off-site infrastructure.
- Provides safe operating locations and distances from the infrastructure for emergency responders, with multiple access points connected by the road network.

This design incorporates a minimum of six (6) metres separation distance between the battery containers/enclosures and:

- Other battery containers/enclosures.
- On-site buildings.
- Substations.
- The site boundary.
- Any other site buildings.
- Vegetation.

The design also incorporates a fire break of a minimum of ten (10) metres around the BESS and related infrastructure, which will be concrete, mineral earth or non-combustible mulch.

The BESS enclosures are located nearby and adjacent to the site entry from Oxley-Meadow Creek Road. The firefighting pumps and tanks are located south-west of the BESS enclosures. A fire originating in the BESS units should be upwind based on the predominant (north-westerly and south-westerly) wind directions.

The BESS systems will be provided with:

- In-built fire and gas detection systems. Where these systems are not provided, measures to effectively detect fires within containers must be detailed within the Risk
- Explosion prevention via sensing and venting or explosion mitigation through deflagration panels.
- Suitable ember protection to prevent embers from penetrating battery containers/enclosures.
- Suitable access roads for emergency services vehicles, to and within the site, including to battery energy storage system(s) and fire service infrastructure.
- A non-combustible surface such as concrete.

- Suitable ventilation.
- Impact protection to at least the equivalent of a W guardrail-type barrier, to prevent mechanical damage to battery containers/enclosures.
- Enclosed wiring and buried cabling, except where required to be above-ground for grid connection.
- Spill containment that includes provision for management of fire water runoff.

2.3.5 *Landscape Screening and On-site Vegetation*

A 5m wide vegetation screen will be planted around the facility's boundary to screen visual impacts.

Several connected wildlife corridors will also transect the site. The understorey of the wildlife corridors will be slashed during the Fire Danger Period to maintain understorey heights ≤100mm in height.

The ground below the solar energy facilities is sited on paddocks that will be grazed, maintained in a low fuel condition during the declared Fire Danger Period, or landscaped in parts with non-combustible ground cover, which satisfies the Design Guidelines (CFA 2023, p14). It's not proposed to plant vegetation below the solar panel arrays.

2.3.6 *Fire Breaks*

A 10m fire break will be established and maintained around:

- The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary.
- The perimeter of the wildlife corridors.
- The perimeter of control rooms, electricity compounds, substations and all other buildings onsite.
- A fire break must be established and maintained around battery energy storage systems and related infrastructure.

The fire breaks must be non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock, and free of vegetation and obstructions at all times. No plant or equipment of any kind is to be stored in fire breaks.

Note, the depth of the wildlife corridors will be up to 30m, which exceeds the standard 20m depth recommended in the Design Guidelines (CFA 2023, p. 24) for open-density vegetation; however, CFA has agreed to the proposal (email from J. Blyth to S. Diesel dated 10 May 2024) based upon the maintained fire break separating the corridor from the solar arrays and infrastructure.

2.3.7 *Fire Detection and Suppression Equipment*

Suitable fire detection and suppression equipment must be provided:

- For on-site buildings and structures, according to the requirements of the relevant National Construction Code.
- For storages of dangerous goods, according to the requirements of any Australian Standards for storing and handling of dangerous goods.

- For electrical installations, a minimum of two (2) suitable fire extinguishers must be provided within 3m-20m of each PCU.
- In all vehicles and heavy equipment, each vehicle must carry at least a nine (9) litre water stored-pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.

2.3.8 Dangerous Goods Storage and Handling

This is not a Dangerous Goods report prepared in accordance with the Dangerous Goods Act 1985. However, the following will be provided per the Design Guidelines (CFA 2023, p. 36):

- The requirements of the relevant Australian Standards must be complied with, e.g. (DR) Australian Standard 5139: *Electrical installations – Safety of battery systems for use with power conversion equipment*; Australian Standard 3780: *The storage and handling of corrosive substances*; and Australian Standard 1940*: The storage and handling of flammable and combustible liquids*.
- Signage and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2022, and the relevant Australian Standards is to be provided.
- All dangerous goods stored on-site must have a current safety data sheet (SDS). Safety data sheets must be contained in the site's emergency information book, in the emergency information container.
- Appropriate material (including absorbent, neutralisers, equipment and personal protective equipment) for the clean-up of spills is to be provided and available on-site.

If the site is subject to requirements under Dangerous Goods legislation, a suitably qualified and experienced practitioner should prepare a report.

2.4 Risk Monitoring, Reviewing, Recording and Reporting

An ongoing risk management process will be developed for the facility in accordance with AS/ISO 31000: 2018 to identify and address fire safety risks.

3 OTHER PLANS TO BE PREPARED

The Design Guidelines (CFA 2023) specify three plans that must be prepared as part of a renewable energy development, being the Risk Management Plan, Fire Management Plan and Emergency Plan. The Risk Management Plan is required as part of a planning permit application, where the other two plans can be prepared following the issuing of a planning permit but before development commences. The Risk Management Plan has been prepared in Section 2 of this document, with the other two plans being prepared at a later stage.

3.1 Fire Management Plan

A Fire Management Plan will be developed for the facility in accordance with Section 6.1 of the Design Guideline (CFA 2023), which details the fore hazards and risks within and to the facility. It specifies the activities and responsibilities for developing and implementing appropriate and effective risk control measures. The proponent is committed to preparing the Fire Management Plan prior to development commencing in consultation with CFA.

The Fire Management Plan will include (CFA 2023, p32):

- '*A summary of fire hazards and risks to and from the site, specific to its location, infrastructure, activities and occupancy.*
- *Description of control measures to prevent fire occurring and limit the consequences of fire at the facility.*
- *Description of control measures to prevent and reduce the consequences of external fire impacting the facility.*
- *Details of equipment and resources to manage fire at the facility.*
- *Policies and procedures that ensure all control measures are appropriate and effective, and remain so.*
- *Procedures for review of the Fire Management Plan.*

3.2 Emergency Plan

An Emergency Plan will be developed for the facility in accordance with Section 7 of the Design Guideline (CFA 2023). This plan provides for the safety of site personnel, emergency responders and the community when preparing in the event of an emergency. The proponent is committed to preparing the Emergency Plan prior to development commencing in consultation with CFA.

The Emergency Plan will include:

- Emergency prevention, preparedness and mitigation activities.
- *Activities for preparing for emergencies.*
- *Control and coordination arrangements for emergency response (e.g., evacuation procedures, shelter-in-place arrangements, emergency assembly areas and emergency response procedures).*
- *The agreed roles and responsibilities of on-site personnel (e.g., equipment isolation, fire brigade liaison, evacuation management, shelter-in-place management, if applicable).*

For Solar Energy Facilities, the Emergency Plan must also include:

- *Emergency procedures for isolation and shut-down where solar panels and/or related infrastructure are involved in fire.*
- *Emergency procedures for fires within the vicinity of solar energy facilities.*
- *Specifications for safe operating conditions for temperature and the hazards related to electricity generation at the facility.*

For BESS Facilities, the Emergency Plan must also include:

- *a) Contact information for 24/7/365 specialist technical support for the battery energy storage system.*
- *b) Emergency response procedures based on identified risks and hazards of the battery energy storage system and related infrastructure, including but not limited to:*
    - *Electrical infrastructure faults and fire.*
    - *Battery energy storage system damage or faults, including battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, thermal events/runaway, smoke and fire.*
    - *Bushfire and grassfire.*
    - *The management of fire water runoff.*
- *Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (eg., at the BESS containers, in an on-site control room, off-site monitoring facilities).*
- *A plan for partial and full decommissioning of the battery energy storage system in the event of an emergency incident that renders the facility inoperable or unsafe, before its anticipated end-of-life.*
- *Any information that supports the considerations in Appendix B of the Design Guideline (CFA 2023).*

4 CONCLUSION

This report has assessed the bushfire hazard within the study area and in the wider landscape in response to the Design Guidelines (CFA 2023).

The study area is in a predominantly low-risk environment, except for some continuous forest areas located approximately 5km southeast of the facility, which indicate a moderate risk. However, the on-site controls can manage the bushfire hazard.

Several bushfire mitigation measures will be put in place, including;

- Minimum 10-metre-wide fire breaks around the planted perimeter screening, wildlife corridors, BESS and substations;
- Managed grass within the study area containing the solar panels and associated infrastructure;
- 280,000 litre static water supply for the BESS;
- 45,000 litre static water supply tanks at each site access point; and
- Compliant access roads and associated passing bays.

In addition to the requirements of this Fire Impact Assessment, a Risk Management process for the facility must be developed in accordance with AS/ISO 31000: 2018, including the development of an operational Risk Management Plan, a Fire Management Plan, and an Emergency Plan.

REFERENCES

CFA 2023. Design Guidelines and Model Requirements for Renewable Energy Facilities v4. Country Fire Authority, Burwood East, Victoria.

DELWP 2017. Planning Permit Applications Bushfire Management Overlay, Technical Guide, September 2017. Department of Environment, Land, Water and Planning, East Melbourne, Victoria.

Ecology and Heritage Partners 2024. Bushfire Risk Assessment for the Meadow Creek Solar Farm: 1033 Oxley-Meadow Creek Road, Meadow Creek. Ecology and Heritage Partners, Ascot Vale, Victoria.

Standards Australia 2020. *AS 3959:2018 Construction of buildings in bushfire-prone areas*. Includes Amendments 1 and 2. SAI Global Limited, Sydney, New South Wales.

Standards Australia 2018. *AS 31000:2018 Risk Management*. SAI Global Limited, Sydney, New South Wales.