

Preliminary Bushfire Risk Assessment: Elaine Solar Farm, Elaine, Victoria

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1 Introduction

Ecology and Heritage Partners Pty Ltd was instructed by Elgin Energy Pty Ltd to assess the bush/grassfire risk with respect to the Elaine Solar Farm against the Design Guidelines and Model Requirements for Renewable Energy Facilities v4 (the Guidelines) (CFA 2023) and Clause 13.02-1S of the Victoria Planning Provisions. The solar farm (the study area) will occupy 247.1 hectares of farming land in total, with the eastern site being 76.2 hectares and the western site being 170.9 hectares. Between them, the sites will contain 1,2 and 3-string trackers, solar inverters, a switch room, a Battery Energy Storage System (BESS) compound (including utility substation and solar farm substation), laydown area, internal road network and planted screenings along the property boundaries.

The study area is wholly within the Bushfire Prone Area. No part of the study area is in the Bushfire Management Overlay.

This is a high-level desktop assessment of the bushfire risk at the landscape down to the site scales, with mitigation measures being recommended based on the desktop assessment and supplied concept plans. A full report that responds to the Guidelines (CFA 2023) and Clause 13.02-1S is outside the scope of this assessment.

2 Bushfire Hazard Landscape Assessment

The landscape contains highly modified agricultural land, with smaller patches of natural bush and plantations scattered throughout the surrounding agricultural land in all directions, with the closest stands of these being approximately 750 metres north of the study area. A larger contiguous area of forest is located approximately 1.7 kilometres north-west of the study area. The topography in the wider landscape is hilly/undulating, with the agricultural land and plantations generally occupying flat to slightly undulating land, and the natural bush occupying steeper slopes.

The most likely directions of bushfire attack on severe fire weather days are from the north-west or south-west in Victoria. At the landscape-scale, both directions are dominated by cleared agricultural land, with forests occurring approximately three to five kilometres away. A forest fire travelling from these directions has the potential to generate embers on days of severe bushfire weather that can travel for many kilometres before landing in paddocks close to or within the study area and promoting the ignition of grassfires. Alternatively, a grassfire could ignite through natural or anthropogenic means and travel towards the study area if the wind direction facilitated it. There is, however, a lack of connectivity in the landscape where the

fuel loads would be considered large on a continual basis due to several roads intersecting the land, crops being periodically harvested and farm animals grazing the paddocks, which would likely greatly reduce the amount of fuel available. These factors would likely make it difficult for a fire to build momentum to the severity required to be a significant threat.

The presence of treed areas along roadsides, windrows and creek lines/gullies are not considered to have a significant influence on fire behaviour with respect to impacts to the study area, as they are sparse from a landscape perspective and may at best result in minor flare ups in those locations.

3 Bushfire Hazard Site Assessment

The study area and for 100 metres around it is classified as Grassland under Australian Standard 3959:2018 Construction of buildings in bushfire-prone areas (AS 3959:2018) (Standards Australia 2018). The topography is gently undulating across the landscape. While there are rises and falls within 100 metres of the study area, a conservative approach has been undertaken to account for the 'worst' slope with respect to bushfire behaviour as part of the site assessment methodology. Therefore, where a portion of the slope within 100 metres of each site's boundary rises uphill towards the site, the slope has been classified as Downslope >0 to 5 degrees in all directions. Conversely, where a portion of the slope within 100 metres of each site's boundary goes downhill towards the site, the slope has been classified as Upslope/Flat land. This results in a classification of Downslope >0 to 5 degrees on all sides of the western site. For the eastern site, the slope on the northern, southern and western boundaries have been classified as Downslope >0 to 5 degrees, while the slope on the eastern boundary has been classified as Upslope/Flat land.

Table 2.4 in AS 3959:2018 (Standards Australia 2018) provides separation distances between unmanaged vegetation and buildings/structures based on the classified vegetation (i.e. Grassland) and effective slope under the classified vegetation (i.e. Upslope/Flat land, Downslope >0 to 5 degrees). The separation distance is a space in which the vegetation is managed in a low threat state (i.e. grass maintained at a maximum height of 100 millimetres during the Fire Danger Period). The separation distances based on the site assessment are as per the following:

- Grassland and Upslope/Flat land – Separation distance of 19 metres.
- Grassland and Downslope >0 to 5 degrees – Separation distance of 22 metres.

These distances correspond to a Bushfire Attack Level (BAL) construction standard of BAL-12.5 for habitable buildings, which is the lowest construction standard rating available in Bushfire Prone Areas as per the Building Amendment (Bushfire Construction) Regulations 2011. A large majority of the slopes leading up to the two sites were classified as Downslope >0 to 5 degrees and thus it is recommended to apply single separation distance of 22 metres to any habitable buildings.

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4 Bushfire Mitigation/Management Measures

The development’s concept plan and bushfire mitigation/management measures were assessed against the Guidelines (CFA 2023) and Clause 13.02-1S to determine whether the plan and measures complied with the policy and legislative requirements (Table 1).

Table 1. Bushfire mitigation and management measures for the Elaine Solar Farm assessed against the Guidelines (CFA 2023) and Clause 13.02-1S.

Category	Bushfire mitigation/management measures within the Guidelines (CFA 2023) and/or Clause 13.02-1S	Compliance against the Guidelines (CFA 2023) and/or Clause 13.02-1S?	Document reference
Emergency access/egress	Constructed roads to be a minimum of four metres in trafficable width with a four-metre vertical clearance for the width of the formed road surface.	Yes The internal road network will be five meters in width and is assumed to have a four-metre vertical clearance, including under the overhead power cable at the access point for both sites.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16
	All internal roads will be of all-weather construction and be capable of accommodating a 15-tonne vehicle.	Yes It is assumed that the internal roads will meet this standard and be constructed out of minimum 150mm depth concrete and/or formed gravel.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16
	Roads must incorporate passing bays at least every 200 metres, which must be at least twenty metres long and have a minimum trafficable width of six metres.	Yes The concept plan for each site shows the passing bays being located no more than 200 metres apart.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16
	Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, BESS and related infrastructure, substations and grid connection areas.	Yes The internal road network creates a perimeter road and cuts through the centre of each site. The road also borders the BESS, substation and laydown area compound on three sides, thereby providing ample access to these facilities.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16
	Provision of at least two but preferably more access points to each part of the facility. The number of access points must be informed through a risk management process, in consultation with CFA.	Yes Both sites have two access points.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16

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Category	Bushfire mitigation/management measures within the Guidelines (CFA 2023) and/or Clause 13.02-1S	Compliance against the Guidelines (CFA 2023) and/or Clause 13.02-1S?	Document reference
	For the BESS specifically, at least two access points are to be provided into each section where BESSs are located. The number and location of vehicle access points must be determined in consultation with CFA.	Yes Given the perimeter road borders the BESS on two sides, it is assumed that at least two access points can be accommodated.	Section 4.2.1 Emergency Vehicle (Fire Truck) Access (Battery Energy Storage Systems) in the Guidelines, p18
Firefighting Water Supply	The static water storage tank(s) must be an above-ground water tank constructed of concrete or steel.	- It is assumed the development will be constructed of concrete or steel.	Section 4.2.2 Firefighting Water Supply (All Facilities) in the Guidelines, p18
	The hard-suction point must be positioned within four metres to a hardstand area and provide a clear access for emergency services personnel.	- Ensure the hard-suction point is within four metres to a hardstand area and clear access is provided.	Section 4.2.2 Firefighting Water Supply (All Facilities) in the Guidelines, p19
	An all-weather road access and hardstand must be provided to the hard-suction point. The hardstand must be maintained to a minimum of 15 tonne GVM, eight metres long and six metres wide or to the satisfaction of the CFA.	- Ensure these measurements are complied with.	Section 4.2.2 Firefighting Water Supply (All Facilities) in the Guidelines, p19
	The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least 10 metres from any infrastructure (e.g. solar panels, inverters).	Yes Water tanks are shown at both entrances for the eastern and western sites. The water tanks currently shown on the concept plan are at least 10 metres from any infrastructure.	Section 4.2.2 Firefighting Water Supply (All Facilities) in the Guidelines, p18
	The fire protection system must incorporate at least one 45,000 litre static water supply at the primary vehicle entrance to each part of the facility. Furthermore, additional static fire water tanks of at least 45,000 litre effective capacity must also be incorporated for every 100 hectares. This equates to one additional 45,000 litre water tank for the eastern site and two additional water tanks for the western site.	Yes The eastern and western sites propose five and seven 45,000 litre water tanks respectively, which is above the minimum requirement.	Section 4.2.2 Firefighting Water Supply (Solar Energy Facilities) in the Guidelines, p20

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	<p>For the BESS specifically, the fire protection system must be designed in line with the requirements of AS 2419.01-2021: Fire hydrant installations, Clause 3.9: Open Yard Protection, in consultation with CFA.</p> <p>For the purposes of determining system requirements, the 'yard area' referenced within AS 2419.1, Table 2.2.5(D) may be considered that of the battery installation, including the minimum 10 metre fire break around the battery infrastructure, rather than the entire area of the yard or site.</p>	<ul style="list-style-type: none"> - Review AS 2419.1 to ensure the BESS design complies with its requirements. 	<p>Section 4.2.2 Firefighting Water Supply (Battery Energy Storage Systems) in the Guidelines, p20</p>

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	<p>For facilities with centralised battery energy storage systems and no available reticulated water, the fire protection system must include at a minimum:</p> <ul style="list-style-type: none"> • A fire water supply in static storage tanks. • The fire water supply must be of a quantity no less than 288,000 litres or as per the provisions of AS 2419.01-2021: Fire hydrant installations, Table 2.2.5(D) for open yards flowing for a period of no less than four hours at 20 litres/second, whichever is the greater. • The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.01-2021: Fire hydrant installations, Table 2.2.5(D). • Fire hydrants must be provided and located so that every part of the BESS is within reach of a 10-metre hose stream issuing from a nozzle at the end of a 60-metre length of hose connected to a fire hydrant outlet. • The fire water supply must be located at vehicle entrances to the BESS facility, at least 10 metres from any infrastructure (e.g. BESS, electrical substations, inverters, buildings). • The fire water supply must be reasonably adjacent to the BESS and shall be accessible without undue danger in an emergency. E.g. fire water tanks are to be located closer to the site entrance side of the BESS. • The fire water supply must comply with AS 2419.01-2021: Fire hydrant installations, Section 5: Water storage tanks. 	<ul style="list-style-type: none"> - Review AS 2419.1 to ensure the BESS design complies with its requirements. 	<p>Section 4.2.2 Firefighting Water Supply (Battery Energy Storage Systems) in the Guidelines, pp20-21</p>

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Fire detection and suppression equipment	For electrical installations, a minimum of two suitable fire extinguishes must be provided within 3 to 20 metres of each PCU.	- Ensure fire extinguishers are located close to each PCU.	Section 4.2.3 Fire Detection and Suppression Equipment (All Facilities) in the Guidelines, p23
Landscape Screening and On-site Vegetation	The design must consider any potential increase in fire risk due to the type (species), density, height, location and overall width of the screening.	Yes A 5-metre-wide vegetation screen will be planted around the boundary of each site. They are not considered to be a fire risk due to their narrow width and being at least 20 metres from solar panels and other infrastructure.	Section 4.2.4 Landscape Screening and On-site Vegetation (All Facilities) in the Guidelines, p24
Fire Breaks	<p>A fire break is a non-vegetated area that must be established and maintained around:</p> <ul style="list-style-type: none"> The perimeter of the facility, commencing from the boundary of the facility or from the vegetation screening inside the property boundary. The perimeter of control rooms, electricity compounds, substations and all other buildings on-site. The perimeter road is to be incorporated into the perimeter fire break. <p>It must be a minimum of 10 metres.</p>	<p>Yes A 10-metre-wide fire break is shown on the concept plans for the eastern and western sites around the property boundaries and switch room on the western site. This fire break incorporates the 5-metre-wide perimeter road for both sites.</p> <p>While the build locations within the BESS compound have not been finalised at this stage, a fire break will be provided around these buildings.</p>	<p>Section 4.2.1 Emergency Vehicle (Fire Truck) Access (All Facilities) in the Guidelines, p16</p> <p>Section 4.2.5 Fire Breaks (All Facilities) in the Guidelines, p24</p>
	<p>Based on a landscape screening width of five metres, fire breaks must be:</p> <ul style="list-style-type: none"> A minimum width of 10 metres. Non-combustible and constructed of concrete, mineral earth or non-combustible mulch such as crushed rock. Free of vegetation and obstacles at all times. No plant or equipment of any kind is to be stored in fire breaks. 	- Ensure the fire break meets these requirements.	Section 4.2.5 Fire Breaks (All Facilities) in the Guidelines, p25

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	The eastern site's aerial image shows a planted strip approximately 15-20 metres wide along its southern access corridor and along part of the main area's southern boundary. It is unknown whether this strip will remain, however if it does the separation distance between it and any buildings or infrastructure will need to be a minimum of 22 metres (i.e. based on the site assessment methodology in Section 3).	Yes The solar panels are separated from this planted strip by at least 22 metres.	Section 4.2.5 Fire Breaks (All Facilities) in the Guidelines, p24
	For the BESS specifically, a 10-metre fire break must be established and maintained around the BESS and related infrastructure.	- Ensure the fire break meets this requirement.	Section 4.2.5 Fire Breaks (Battery Energy Storage Systems) in the Guidelines, p24
Solar Panel Banks	A minimum six metre separation is required between solar panel banks. A bank of solar panels may be that which is connected to a single power conversion unit/inverter. CFA recommends that separation wherever possible: <ul style="list-style-type: none"> • Is between each bank of solar panels, or • Is provided so that no unbroken area of solar panels is greater than 25 hectares, or • Is designed in consultation with CFA. 	- Ensure the solar panel banks considers these options and incorporates the best site-specific option for each site.	Section 4.2.6.2 Separation Between Banks (Solar Energy Facilities) in the Guidelines, p27
	The solar bank panel separation area is to be cleared of trees and scrub and grass must be no more than 100mm during the Fire Danger Period.	- Ensure vegetation in the solar bank panels is managed during the Fire Danger Period, including within the separation area and around it borders.	Section 4.2.6.2 Separation Between Banks (Solar Energy Facilities) in the Guidelines, p27
BESS Design	Several requirements have been included specifically for the BESS's design. These include separation distances between battery containers/enclosures and other facility features, in-built fire and gas detection systems, explosion prevention systems, ember protection, guardrails around the battery containers and a spill containment management process.	- While the BESS compound has not been designed yet, it is important that its design comply with the Model Requirements under Section 4.2.6 Design Specific to Facility Type, Battery Energy Storage Systems (p29-30 of the Guidelines)	Section 4.2.6 Design Specific to Facility Type (Battery Energy Storage Systems) of the Guidelines, pp29-30

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	The BESS must be located to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles).	No The BESS is located approximately 500 metres east of the northern end of the primary access track. The BESS and laydown area could be moved further west to be closer to the entrance point. If there are significant constraints in moving the BESS and laydown area, these could be discussed with the CFA.	Section 4.2.6 Design Specific to Facility Type (Battery Energy Storage Systems) of the Guidelines, p29
	The BESS must be located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the BESS).	- The prevailing winds in Victoria are generally of westerly origin. Locating fire water tanks on the western side of the BESS would therefore ensure in most instances they are free from smoke cover in the event a fire occurs within the BESS area.	Section 4.2.6 Design Specific to Facility Type (Battery Energy Storage Systems) of the Guidelines, p29
Vegetation Management	<p>Facility operators must undertake the following measures during the Fire Danger Period:</p> <ul style="list-style-type: none"> Grass must be maintained at or below 100mm in height during the Fire Danger Period. Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation. Restrictions and guidance must be adhered to during the Fire Danger Period, days of High (and above) fire danger and Total Fire Ban days. 	- The sites are largely grass and this can be managed during the Fire Danger Period. Other vegetation management requirement can easily be achieved.	Section 6.2.2 Vegetation Management (All Facilities) of the Guidelines, p35

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Category	Bushfire mitigation/management measures within the Guidelines (CFA 2023) and/or Clause 13.02-1S	Compliance against the Guidelines (CFA 2023) and/or Clause 13.02-1S?	Document reference
Biodiversity values	Ensure settlement growth and development approvals can implement bushfire protection measures without unacceptable biodiversity impacts by discouraging settlement growth and development in bushfire affected areas that are important areas of biodiversity.	<ul style="list-style-type: none"> - The sites have been largely cleared of native vegetation and are used for agricultural purposes. The Biodiversity Assessment (Ecology and Heritage Partners 2023) recorded thin strips of Plains Grassland (<i>Heavier Soils</i>) Ecological Vegetation Class (EVC) (EVC 132_61) and Plains Grassy Woodland EVC (EVC 55) within both sites and along the adjoining road reserves. Furthermore, 35 large and small trees were recorded within the sites and along the adjoining road reserves, with some of them containing hollows. <p>Unacceptable biodiversity impacts should be avoided, however the proposed impacts to native vegetation and whether they are unacceptable are outside the scope of this assessment.</p>	Clause 13.02-1S Areas of biodiversity conservation value

References

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

Ecology and Heritage Partners 2023. *Biodiversity Assessment: Elaine Solar Farm, Elaine, Victoria*. Ecology and Heritage Partners, Ascot Vale, Victoria.

Standards Australia 2018. *Australian Standard 3959:2018 Construction of buildings in bushfire-prone areas*. SAI Global Limited, Sydney, New South Wales.

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