

Bushfire Safety at Renewable Energy Facilities

Jennifer Blyth
Matt Allen

Country Fire Authority,
Melbourne, Victoria.



© 2022 by the authors.
License Australian Institute
for Disaster Resilience,
Melbourne, Australia. This
is an open access article
distributed under the terms
and conditions of the Creative
Commons Attribution
(CC BY) license ([https://
creativecommons.org/
licenses/by/4.0/](https://creativecommons.org/licenses/by/4.0/)).

Introduction

Renewable energy technologies, including wind energy, large-scale solar and battery storage are being developed and implemented rapidly across the country areas of Victoria. The pace of innovation has resulted in new and complex risks for emergency responders and communities, particularly where electrical, chemical and landscape risk intersect. There is an opportunity during planning stages to identify and mitigate fire risk through facility design to enable safe and effective emergency response through the construction and operational stages of facilities. The Country Fire Authority (CFA), in conjunction with industry and regulatory authorities, has developed the Design Guidelines and Model Requirements for Renewable Energy Facilities to support designers and operators of facilities to consider and mitigate fire risk. The operational knowledge gained from recent fires at large-scale renewable energy facilities and the knowledge gained in assessing hundreds of renewable energy developments across the country area of Victoria form the foundation of a third edition of the guidelines. While these were developed in a Victorian context, CFA expertise and the guidelines have been sought for supporting fire safety at renewable energy facilities across Australia and internationally.

CFA and the Specialist Risk and Fire Safety Unit

CFA is a statutory authority accountable to government for the delivery of emergency services through its paid and volunteer workforce (CFA 2022). In addition to emergency response, CFA has responsibilities under the building, planning, dangerous goods and work, health and safety legislative frameworks to support fire prevention and emergency management, for the ultimate purpose of firefighter and community safety.

The CFA Specialist Risk and Fire Safety Unit (SRFSU) supports CFA in meeting these responsibilities, by working with designers, developers and statutory authorities in the provision of advice on fire risk management and emergency management for facilities that pose specialist hazards and risks for emergency responders. With their increasing prevalence and risk over the last 4 years, the role of the SRFSU has expanded to include advocacy for fire safety and emergency management at renewable energy facilities.

Victoria's bushfire and planning environment

Victoria is susceptible to large, intense bushfires that can spread across landscapes. This is due to Victoria's terrain, naturally flammable vegetation and frequent exposure to hot, dry, windy weather (Safer Together 2022). Victoria's Planning Scheme affords CFA involvement in the statutory approval process for planning permits under clauses that recognise the need for bushfire risk to be considered in relation to the protection of human life, where land is used and developed for various purposes.

Until 2017, CFA involvement in renewable energy was limited and ad hoc; CFA was only notified where identified as relevant by planners in municipalities responsible for assessing planning applications for renewable energy facilities. In September 2019, Victoria's Minister for Planning became the responsible authority for new planning

permit applications for all energy generation facilities such as wind, solar, pumped hydro, gas and waste-to-energy; and those that send, distribute or store electricity if the installed capacity is 1 megawatt or greater, such as power lines and battery storage (DELWP 2022). The change to manage and assess applications centrally through the Department of Environment, Land, Water and Planning (DELWP) provided CFA with the critical opportunity to make and maintain connections with the renewable energy team within the department.

Bushfire safety in planning and design of renewable energy facilities

The move towards large-scale renewable energy over the last 5 years has been rapid. The capacity of wind farms currently operating in Victoria is over 3500MW, with another 2300MW having been approved but not yet operating (DELWP 2022a). Large-scale solar (over 5MW) has accelerated with projects of a combined capacity of over 4000MW having been approved since 2018 and 695MW currently operating (DELWP 2022b). Many of these facilities include supplementary battery energy storage systems, and there is also an increasing number of stand-alone battery energy storage facilities proposed, approved, under construction and operating in the state.

The rapid development of facilities, coupled with the differing and constantly evolving technologies they employ, create challenges for fire authorities on 2 fronts. The immediate operational challenge is understanding and planning for the complexity of safe and effective response by firefighters facing incidents at renewable energy facilities. For CFA, this frontline work is critical and urgent and is being addressed across multiple departments, including operational support, training and resourcing, as well as the SRFSU.

Accompanying the operational challenge is the strategic one, where the aim is to reduce risks to emergency responders through the implementation of minimum standards and regulatory safeguards that embed fire safety into the design and operation of facilities. Using the expertise gained from assessing hundreds of planning applications and from supporting renewable energy incident investigations, CFA works with governments, authorities and other stakeholders to raise awareness of the risks to responders and support the development of mechanisms to this end. However, regulation always falls behind technological innovation and the rate of change of fire safety outcomes is dependent on the strength of the fire services, relationships with other regulatory authorities and government departments.

Bushfire safety at renewable energy facilities relies on an accurate understanding of the landscape risk and appropriate siting of facilities. The DELWP guidance for large-scale solar specifies that facility siting should not lead to increased exposure of the area to fire (DELWP 2019) and that site selection should consider exposure to bushfire. The department stops short of recommending locating facilities away from high-risk areas and encourages proponents to engage with relevant fire management authorities such as CFA to ensure a facility 'avoids

unnecessary bushfire risk exposure and has fire management planning in place to avoid fire risks' (DELWP 2019). This engagement with CFA, as early in the process as possible, is critical.

Renewable energy facilities and utility installations are not buildings or works that formally trigger consideration of bushfire risk when sited in areas with bushfire risk. Similarly, the provisions within the planning scheme that govern industry land uses, specifically those that may have off-site effects, do not include renewable energy or battery installations and do not include mandatory referrals to fire authorities.

Design Guidelines and Model Requirements for Renewable Energy Facilities

The increasing involvement by the CFA in renewable energy facility planning during 2017–18 revealed the need for consistency in determining fire risk and its management across developments that varied in size, siting, landscape risk and chemical and technological hazard. While the standard access, defensible space and water supply requirements existing in the planning scheme for facilities with bushfire risk provided a baseline, a comprehensive risk management approach to understand and develop effective mitigations specific to each facility was needed.

The first iteration of CFA's guidelines in 2019 encouraged the incorporation of a risk management approach specific to the technologies being proposed, and minimum recommendations for fire risk controls for solar and wind facilities. This approach was premised on work, health and safety legislation, which places a duty on designers to ensure that buildings and structures are safe and without risks to health; a duty that provides for emergency responders when facilities become their workplace during emergency response activities.

The result was that planning applications would only address the baseline requirements and not provide risk assessments (or supporting information) that would allow planners and CFA to adequately understand the risk from technologies. This became particularly problematic as proposals incorporating battery energy storage systems started to increase. In early 2021, revised guidelines were released; this time embedding the expectation of a risk management approach and expanding the baseline requirements for battery energy storage systems to demonstrate increasing fire risk controls commensurate to the increasing risk. This was marginally successful as risk assessments began appearing with planning applications. However, in almost all cases, the risk assessment only justified, or attempted to roll back, the baseline requirements without adequate supporting evidence.

The fire at the Victorian Big Battery during its commissioning in winter 2021 was a turning point for CFA. The circumstances surrounding the fire and the emergency response was a highly visible demonstration of the potential risks of these types of facilities. Although not the first fire worldwide, the Victorian fire

showed that the collective societal understanding of the safety of the technology was rudimentary. The fire occurred during winter. The most likely root cause was later determined as a leak within the liquid cooling system causing arcing in the power electronics of battery modules (Blum *et al.* 2022). Critically for CFA, it also revealed the requirements and complexities of a safe and effective response. These factors provided the catalyst for developing the third iteration of CFA guidelines.

As technology evolves, the overarching challenge remains access to comprehensive and accurate information. This is true for response (where the information supports operational decision-making to protect firefighters from harm) and for fire risk management in design (where information supports the ability to assess risk and ensure that appropriate fire risk controls are applied) particularly for battery energy storage systems.

Learnings and the future

While the challenges are complex and ongoing, for other jurisdictions facing these or similar challenges, we offer the following advice for consideration based on our experiences.

Adopt a precautionary approach

We have learnt lessons in taking information provided at face value. The current guidelines adopts the precautionary principle towards risk management for battery storage; that is, an evidence-based approach to justify proposed risk controls. CFA recommends permit conditions that will provide the greatest level of safety for emergency responders. The absence of evidence or scientific rigour does not negate requirements for duty holders to effectively control risk, nor does it remove CFA's legislative obligations or social contract to respond to emergencies.

Fire services engagement in planning and design is critical

Whatever the regulatory systems and processes in your jurisdiction, finding a way to be involved in the planning and design of facilities is critical. Incorporating fire risk management controls in facility design is by far the most effective strategy to reduce the potential of fire occurring, reduce the consequences of fires, and protect firefighters and the community. For CFA, the working relationship that has evolved with the state's planning department has ensured that CFA is notified so that it can provide a formal response to the planning permit assessment process. CFA advice and recommendations concern the effective management of fire risk both to and from proposed facilities and their operations. While consideration and integration of CFA advice remains at the discretion of the department and the minister, the opportunity to work through issues and challenges collectively has exponential value.

This is just the beginning.

Whether the current regulatory framework is adequate to manage the risk associated with renewable energy facilities is a topic that must be inclusive of fire services. The current mechanisms in the Victorian planning system treat the potential off-site risks from battery energy storage systems differently than other industry off-site risks. There are ongoing debates as to whether and how battery storage should be regulated under the dangerous goods and electricity safety regulatory frameworks. There are also significant implications for the increasing prevalence of battery storage within buildings. Emergency response is a critical consideration under all of these frameworks.

Access the guidelines at www.cfa.vic.gov.au/plan-prepare/building-planning-regulations/renewable-energy-fire-safety.

References

- Blum A, Benson T, Rogers P, Grant C & Hough G 2022, *Victorian Big Battery Fire July 30 2021: Report of Technical Findings*. At: <https://victorianbigbattery.com.au/wp-content/uploads/2022/01/VBB-Fire-Independent-Report-of-Technical-Findings.pdf> [26 June 2022].
- Country Fire Authority 2022, *CFA: Our mission*. At: www.cfa.vic.gov.au/about-us/our-mission [26 June 2022].
- Safer Together 2022, *Understanding risk*. At: www.safertogether.vic.gov.au/understanding-risk [26 June 2022].
- Victorian Department of Environment, Land, Water and Planning (DELWP) 2019, *Solar Energy Facilities – Design and Development Guidelines*, DELWP, Melbourne.
- Victorian Department of Environment, Land, Water and Planning (DELWP) 2022, *Solar Energy Facilities*. At: www.planning.vic.gov.au/permits-and-applications/specific-permit-topics/solar-energy-facilities [26 June 2022].
- Victorian Department of Environment, Land, Water and Planning (DELWP) 2022a, *Wind Energy Projects*. At: www.planning.vic.gov.au/permits-and-applications/specific-permit-topics/wind-energy-facilities/wind-energy-projects-planning [26 June 2022].
- Victorian Department of Environment, Land, Water and Planning (DELWP) 2022b, *Solar Energy Projects*. At: www.planning.vic.gov.au/permits-and-applications/specific-permit-topics/solar-energy-facilities/solar-energy-projects [26 June 2022].