

Wind Farms and Bushfire Operations



FUNDAMENTAL

GUIDELINE

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Contents

Acknowledgements	1
Source of authority.....	1
Purpose	1
Scope	1
Statement of engagement.....	1
Audience	1
Definitions, acronyms and key terms	1
Introduction.....	2
AFAC’s guideline	2
Bibliography.....	6
References.....	6

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Source of authority

Approved by AFAC Council on 25 October, 2018.

Purpose

This position is to state AFAC member agencies approach towards wind farms, their development and operations in relation to bushfire prevention, preparedness, response and recovery. It seeks to clarify the bushfire risks posed by planned and existing windfarms, risks to emergency responders operating in and around wind farm facilities and risks to windfarms as critical infrastructure from external fire. It also provides guidance for AFAC member agencies, wind farm developers, wind farm operators and other stakeholders in planning for bushfire prevention, preparedness, response and recovery activities in and around existing and planned wind farm facilities.

Scope

This position highlights issues and provides guidance relating to planning for bushfire prevention, preparedness, response and recovery operations in and around existing and planned wind farm facilities. It excludes the environmental, social and economic issues associated with wind farms. It does not provide any judgments on the values or otherwise of wind farms.

Meteorological monitoring towers are often installed on planned wind farm sites for pre-construction investigative activities. Unmarked meteorological monitoring towers and guy ropes present greater risks for aerial firefighting operations than wind turbines. Therefore, this position considers bushfire operations in planned wind farm sites as well as wind farms that are under construction and in operation.

While many wind farms are located on private property, in some jurisdictions and locations land management agencies will be the first agency to respond to a bushfire

in or around a wind farm. Therefore, the guidance in this position relates to land management agencies as well as rural and urban fire authorities.

Statement of engagement

The *2012 Wind Farms and Bushfire Operations* position was developed by the Rural and Land Management Group with input from the Clean Energy Council. In this revised position, the Rural and Land Management Group have incorporated feedback provided by the Australian National Wind Farm Commissioner.

Audience

This position is intended for AFAC member agencies, wind farm developers, wind farm operators, land use planners and relevant regulators.

Definitions, acronyms and key terms

In this position, the following terms have specific meanings.

Preparedness: arrangements to ensure that, should an emergency occur, all those resources and services that are needed to cope with the effects can be efficiently mobilised and deployed. Measures to ensure that, should an emergency occur, communities, resources and services are capable of coping with the effects (AIDR 2018).

Prevention: regulatory and physical measures to ensure that emergencies are prevented, or their effects mitigated (AIDR 2018).

Recovery: the coordinated process of supporting emergency-affected communities in reconstruction of the physical infrastructure and restoration of emotional, social, economic and physical wellbeing (AIDR 2018).

Response: actions taken in anticipation of, during, and immediately after an incident to ensure that its effects are minimised, and that people affected are given immediate relief and support (AIDR 2018).

Introduction

Wind power is a rapidly expanding mode of renewable energy production in Australia with installed capacity doubling in the past five years. Approximately 80 wind farms were in operation by the end of 2017, with another 13 wind farms under construction and at least another four wind farm projects with financial commitment that are expected to commence construction in 2018 (Clean Energy Council 2018).

In the context of an increasing number of wind farms it is important for AFAC member agencies to clarify their position in relation to windfarm development and operations and highlight some important considerations in risk mitigation.

AFAC's guideline

Bushfire risks in and around wind farm facilities

Wind farms are not expected to adversely affect fire behaviour, nor create major ignitions risks. Fire and land management agencies and wind farm developers and operators have a shared interest in mitigating the following bushfire related risks.

Ignition caused by wind farm infrastructure or operations

Automatic shutdown and isolation procedures are generally installed within the turbine system. However, it is possible that turbines can malfunction and start fires within the unit. This is generally considered a low risk given appropriate protection measures. Operation of winches and machinery during monitoring and maintenance tasks may also lead to ignitions. Subject to relevant national, state and territory legislation, wind farms may operate on days of total fire ban.

Lightning risks

Given that wind turbines can attract lightning during thunderstorms, it is possible that wind turbines may reduce the risk of bushfires caused by lightning, particularly if turbines are located on a ridge. If struck by lightning, turbine towers are generally not expected to start fires as they have built-in protection mechanisms.

Firefighting limitations in and around the wind farm facilities

Wind farms may result in aerial firefighting limitations due to aerial obstacles created by wind turbines and meteorological monitoring towers. The bushfire at the Waterloo wind farm demonstrated that if conditions are clear and wind turbines are turned off, wind turbines are clearly visible from aircraft and are not likely to constrain aerial firefighting operations (Clean Energy Council 2017). However, during this event transmission infrastructure, meteorological towers and guy-ropes were difficult to see (Clean Energy Council 2017); this infrastructure does have potential to limit the effectiveness of aerial firefighting operations. Access and egress challenges on the ground as well as water supply issues can also create firefighting limitations, if not planned for appropriately. Wind farms can also impact response operations by interfering with local and regional radio transmissions (Australian Wind Energy Association 2004a).

Hazards for emergency responders, including aerial personnel

Turbine towers, meteorological monitoring towers and power transmission infrastructure pose risks for aerial firefighting operations. Meteorological monitoring towers and power transmission infrastructure are generally difficult for aerial personnel to see, if they are not marked appropriately. If wind turbines were not shut down, moving blades and wake turbulence would create significant hazards for low flying aircraft, thus the shutting down of wind turbines, in an emergency situation, is defined in wind farm emergency procedures. A wind farm facility's power lines may pose electrocution risks, that are exacerbated due to smoke during a bushfire.

Bushfire spread within wind farm facilities and impacts on wind farms as critical infrastructure

Wind farms are not expected to adversely affect fire behaviour in their vicinity. Local wind speeds and direction are already highly variable across landscapes affected by turbulence from ridge lines, tall trees and buildings. Any potential for wake turbulence from wind turbines influencing fire behaviour is expected to be controlled through the shutting down of wind turbines in a bushfire event. Sufficient planning for access roads and fuel modified buffer zones will reduce the risk of wind farm ignitions spreading beyond the property and reduce the risk of external fire impacting wind farm infrastructure.

Wind farms and bushfire management

Prevention

Bushfire management issues are best treated at the planning stage of a wind farm project. Local planning controls are in place to regulate these issues with respect to any infrastructure development and some local planning controls refer specifically to wind farms. Fire and land management agencies may consider developing guidelines that outline preferred preventative safety measures for wind farm facilities in a manner that is targeted to local legislation and planning regulations.

Access roads should be considered when planning the layout of a windfarm. Appropriately planned access roads can increase the ability of fire and land management agencies to successfully undertake firefighting operations by allowing increased accessibility for emergency vehicles. Access roads and other infrastructure can also reduce the likelihood of fire moving through or leaving the property and can act as an effective firebreak in many circumstances. Naming and marking conventions for access roads should be considered to enhance accessibility. For example, marking an access road as A-B to indicate that it links landmark A with B; landmarks used for this purpose should be identifiable on site and marked on any site mapping. Access road marking should clearly indicate no through roads.

Where wind farms are located in vegetation types other than grassland, the planning for access routes and fuel modified buffer zones should consider:

- potential for bark spotting material to breach control lines
- potential for higher intensity fires associated with higher fuel hazard and more complex fuel arrangement
- fire vehicle off-road access challenges in woody vegetation pre-existing forest roads and fuel modified buffer zones.

Where applicable, buildings located on the site should comply with Australian Standard AS 3959- 2009 *Construction of Buildings in Bushfire Prone Areas* to improve their performance when subjected to burning debris, radiant heat or flame contact generated from a bushfire.

The location of water access points should also be considered when planning the layout of a wind farm. In the event of a fire, water supply should be available and easily identifiable by emergency response personnel to avoid hindering fire suppression efforts.

Planning for ongoing vegetation management in and around the wind farm facility should also be considered in the early stages of a wind farm development.

Other preventative measures relate to the type of

equipment that is used in the development of a wind farm. There are wind farm turbine models that have safe shutdown systems and protection mechanisms in the cases of fire. Installation of these can assist in preventing fires around the wind farm.

Wind farms can interfere with local and regional radio transmissions by physical obstruction and radio frequency electromagnetic radiation (Australian Wind Energy Association 2004a). The risk of radio communications affecting emergency response operations may be considered in the planning stages for a wind farm development. This issue may be considered in wind farm site selection and equipment selection.

Windfarm developers should also be aware that meteorological monitoring towers, which are associated with pre-construction investigative activities as well as operating wind farms, are generally more likely to pose a risk to pilots as they are not easily visible structures. For these structures, developers should record these towers in the Tall Structures Database maintained by Air Services Australia (Civil Aviation Safety Authority 2018) and install warning lights or visible markers (such as orange balls) on all masts to minimise risks during aerial firefighting operations.

During the planning phase of the wind farm, developers and operators should ensure the following by the time construction commences:

- all relevant staff are aware of emergency protocols and procedures
- the wind farm's emergency contact number is readily available online and is attended to at all times by trained staff
- turbines can be rapidly shut down in emergency situations and protocols should be explicit about what party has the authority to direct turbine shut-down procedures
- contingent communication systems are in place in case of failed telephone communication attempts
- relevant fire and land management agencies can gain access throughout the wind farm site during bushfire operations – this may require prior coordination with landowners to ensure access is not constrained
- relevant fire and land management agencies have been provided up-to-date information on the layout and design of the wind farm infrastructure. During the construction period of a wind farm, the developer should provide periodical updates to fire and land management agencies as the wind farm is progressively built.

Preparedness

Wind farm developers and operators should ensure they have effective emergency management procedures and

incident action plans in place in the event of bushfires and other emergencies. Wind farm organisations should ensure that all relevant staff are aware of these plans and procedures and should know their roles and responsibilities.

Wind farm developers and operators should take responsibility for the following:

- preparing emergency management protocols e.g. communications from and with the fire and land management agencies and access to the property
- shutdown and positioning of turbines upon request by the relevant fire or land management agency when the operator becomes aware of a bushfire in the area
- implementing and testing bushfire response plans
- providing appropriate emergency response training and equipment to staff
- proactively liaising with fire and land management agencies and sharing information with communities in the case of an emergency.

It is important that wind farm developers and operators liaise with the relevant fire and land management agencies to prepare appropriate emergency management and response protocols. The wind farm proponent should also provide details of wind farm infrastructure to relevant authorities, such as the layout of wind turbines, wind monitoring towers and transmission lines. Any expected radio interference should also be communicated to relevant fire and land management agencies and be considered in the development of an incident action plan.

Wind farms are an infrastructure development that should be considered by fire and land management agencies through the preparation of incident action plans for the suppression of bushfires in their vicinity. These considerations are routine and wind farms are not expected to present elevated risks to operations compared to other electrical infrastructure.

Agency incident action plans may include:

- key emergency contacts
- site mapping with locations of water supply, wind turbines, meteorological monitoring towers and transmission lines (this information should be sourced available from wind farm operators)
- surrounding vegetation types and the location of fuel modified buffer zones
- access information, e.g. route, gates and locks
- safety considerations and procedures
- procedures for dealing with turbine fires or collapse, collision or damage to turbines agency response protocols and procedures.

Accessibility to the wind farm during bushfire operations may require prior coordination with landowners to ensure access is not constrained.

Wind farm operators, land owners and fire and land management agencies should consider maintenance of access routes and control lines, including vegetation management, in planning for their bushfire preparedness activities.

Response

In the event of a bushfire in and around an existing or planned wind farm facility, fire and land management agencies should follow any relevant incident action plans and response protocols that have been developed. Fire and land management agencies should maintain close communications with designated key contacts for wind farm facilities.

Wind farm operators should be responsible for ensuring that the relevant emergency protocols and plans are properly executed in an emergency event. During an emergency, operators need to react quickly to ensure they can assist and intervene in accordance with their planned procedures.

The developer or operator should ensure that:

- liaison with the relevant fire and land management agencies is ongoing and effective
- access is available to the wind farm site by emergency services response for on-ground firefighting operations
- wind turbines are shut down immediately during emergency operations – where possible, blades should be stopped in the ‘Y’ or ‘rabbit ear’ position, as this positioning allows for the maximum airspace for aircraft to manoeuvre underneath the blades and removes one of the blades as a potential obstacle.

Aerial personnel should assess risks posed by aerial obstacles, wake turbulence and moving blades in accordance with routine procedures.

Recovery

In the period after an emergency event, wind farm operators should be actively involved in recovery activities. This may include supporting and communicating with emergency-affected communities and helping to coordinate the reconstruction of infrastructure as required.

Liaison with wind farm operators and energy industry representatives during and after bushfires should aim to ensure minimal disruption to generation capacity and rapid resumption of essential services to the community. Examination of any learnings should also be discussed with all parties, with any relevant updates to all emergency management plans and protocols to be implemented. Wind farm operators and fire and land management agencies may also wish to share learnings from the event with the wind farm and emergency management sectors as appropriate.

Case study: Waterloo Wind Farm, South Australia¹

In January 2017, a bushfire started on a paddock near the Waterloo Wind Farm in South Australia. Fanned by gusty westerly and north-westerly winds, the fire quickly spread through the area and raced up the ridge where the wind farm was located.

200 Country Fire Service volunteers were involved in firefighting operations and were supported by three water bombing aircraft. By the time fire was declared under control in the early evening, approximately 50 hectares of grassland was burned, including land underneath turbines at the northern end of the Waterloo Wind Farm (Clean Energy Council 2017).

The wind farm operator confirmed that there was no damage to any wind farm infrastructure and no danger at any time to human life as a result of the fire.

However, a number of learnings for emergency management procedures and protocols in relation to wind farms and bushfires arose.

These included:

- the wind farm's access roads were beneficial in helping fight the bushfire on the ground and provided an effective firebreak
- the wind farm's turbines did not present a hazard to aerial firefighting and the turbines were clearly visible to the pilots involved in operations. However, transmission infrastructure, transmission lines and meteorological masts were difficult to see by pilots and did pose a safety risk
- to maximise air space for firefighting between the turbines, turbines should be locked in the 'Y' position
- improved communication protocols need to be in place between wind farm operators and fire and land management agencies to direct turbine shut-down procedures in an emergency situation and initiate emergency response plans
- wind farm operators should ensure that they have the capacity to respond to emergency events
- wind farm operators should ideally select turbines that can be rapidly shut down to the preferred position
- additional precautionary measures should be considered to allow for aerial identification of meteorological masts (measurement towers), guy wires and other infrastructure such as transmission lines that are not easily visible from air.

Normal wind farm operations resumed once the Country Fire Service advised the operator that it was safe to do so.

¹ Clean Energy Council (2017) In Case of Fire: a real-life experience at a wind farm site.

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