Government of South Australia

ENGINEERING FUNCTIONAL SERVICE

SUBMISSION FROM ENGINEERING FUNCTIONAL SERVICE ON LONG TERM METEOROLOGICAL FORECASTING IN AUSTRALIA

AGENCY CONTEXT

The Engineering Functional Service (EFS) undertakes a statutory emergency management role in South Australia. The role of EFS is established in the State Emergency Management Plan, under the provisions of Section 9 of the Emergency Management Act 2004.

EFS role is to:

1. Coordinate the protection restoration and maintenance of essential infrastructure, including:
    - Water and sewerage
    - Energy supplies
    - Public and private buildings
    - Public transport infrastructure
2. Oversee the status of public telecommunications.
3. Provide engineering support to other Functional Services.

SUMMARY

Recent bushfire events in Australia have highlighted the inherent vulnerability of communities in upper-extreme bushfire conditions. When upper levels of risk are reached, the ability to combat or defend, by emergency services and homeowners, is extremely limited.

This submission supports the introduction of upper level bushfire danger levels based on revised meteorological parameters to reduce community exposure to risk. This submission also calls for a clarification of the current meteorological definition of 'heatwave' to assist state jurisdictions in activation of extreme weather emergency planning.

FIRE DANGER INDEX LEVELS

Current fire danger indices, namely Fire Danger Index (FDI) are principally based upon meteorological parameters but do not adequately delineate within upper-extreme fire danger levels. The Bureau of Meteorology determines FDI levels, incorporating temperature, relative humidity, wind direction/velocity and fuel curing indexes.

There is a need to define upper-extreme fire danger levels in order to provide community safety guidance. Following on from a review of current fire danger levels, is a need to enhance community warning schedules and protocols within jurisdictions.

Fire authorities have promoted 'leave early, or stay and defend' principal ich has been interpreted in terms of absolutes without consideration of extreme environmental conditions. Bushfire safety plans should consider conditions when the 'stay and defend' option may no longer be viable even where individual property owners have installed sophisticated fire defence devices and planning.

FDLs, although closely aligned with FDIs, are based upon the premise that fire danger for electricity utilities are significantly allied to wind speed at a time when various other factors combine to give hot dry conditions. FDLs provide a more refined indication of actual bushfire risk conditions. FDLs are used by electricity providers to provide predefined trigger points as they, although based on FDI levels, also pay specific attention to regions of risk and special attention to the significance of wind speed. Electricity utilities rely on FDL levels to provide predetermined levels aligned with bushfire risk management protocols by power providers. It is considered that FDLs could be modified to demarcate upper-extreme fire danger levels and be useful for broader community safety applications (refer following Diagram).

Climate change predictions anticipate more frequent extreme weather events and more prolonged drought conditions across much of Australia. Changing weather conditions, combined with increased population densities in outer metropolitan areas, are driving increased bushfire risk exposure levels.

Table 1 (refer below) shows how FDL is based upon FDI conditions in excess of 50. Extreme weather events in South-eastern Australia, over recent years, have recorded levels well in excess of $\geq$ 200 FDI. FDIs of > 100 have been recorded approximately 10 times in South Australia in summer of 08/09. As previously stated, extreme FDI conditions such as these, in combination with other factors, will exceed the capacity of property owners and emergency services to combat or defend.). Clearly these conditions should supersede normal planning parameters and should highlight the need to establish new trigger points to promote community welfare and safety measures.

Additional environmental and weather data, including Fire Ban area declarations and wind speed data, are incorporated with FDIs to determine Fire Danger Levels (FDLs). Electricity utilities incorporate FDLs to trigger power disconnection protocols as an important bushfire risk management strategy. FDLs are used as predetermined trigger points to activate planned emergency procedures including disconnection of lines.

Fire Danger Level Awareness	Fire Danger Conditions		
	Fire Danger Index (FDI)	Fire Ban Conditions	Mean Wind Speed (kph)
FDL1	Exceeds 50	Total Fire Ban or Special Total Fire Ban	35 to less than 45
FDL2	Exceeds 50	Total Fire Ban or Special Total Fire Ban	45 to less than 63 (strong winds)
FDL3	Exceeds 50	Total Fire Ban or Special Total Fire Ban	63 or greater (gale force winds)

TABLE 1: Summary table of current FDL levels (incorporating FDI) as a risk management framework for high risk bushfire conditions.

Fire Danger Level Awareness	Fire Danger Conditions		
	Fire Danger Index (FDI)	Fire Ban Conditions	Mean Wind Speed (kph)
FDL1	Exceeds 50	Total Fire Ban or Special Total Fire Ban	35 to less than 45
FDL2	Exceeds 50	Total Fire Ban or Special Total Fire Ban	45 to less than 63 (strong winds)
FDL3.1 (i.e. High)	Exceeds 50	Total Fire Ban or Special Total Fire Ban	63 to less than ** (***wind speed to be determined*)
FDL3.2 (i.e. Extreme)	*to be determined*	Total Fire Ban or Special Total Fire Ban	*to be determined*
FDL3.3 (i.e. Potentially Catastrophic)	*to be determined*	Total Fire Ban or Special Total Fire Ban	*to be determined*

TABLE 2: Revised table outlining suggested expanded FDL 3 criteria (refer shaded area) as a consequence of increased likelihood of higher general bushfire risk conditions.

COMMUNITY IMPLICATIONS IN RELATION TO FIRE DANGER LEVELS

The implications of extreme fire conditions extend well beyond the needs of emergency management organisations. Recent experiences reinforce a need to enhance general community safety in relation to bushfire risk. For example, schools within high risk areas, and, or having students commuting within landscape risk areas, are now actively looking for more guidance in relation to school closures when predicted extreme bushfire conditions are predicted. Education organisations have pointed out that it is potentially unsafe to have students commuting from school to home during the highest risk periods of the day and are beginning to liaise with emergency services on a regional basis to ascertain when school closures may be in order.

The addition of more levels within the current FDL 3 band (suggested model provided in Table 2) is proposed to provide an augmented fire danger risk assessment framework with wider potential community safety application. In addition to electricity providers a more comprehensive FDL framework may have potential wider application for the following stakeholders:

- Utility providers with reliance on electricity(i.e. water, sewer)
- Emergency Services
- School communities
- Land-owners/residents in identified bushfire risk regions
- Hospitals and health care providers
- NGOs (i.e. Red Cross)

Recent experiences indicate that reliance on standard fire defence, in certain conditions, may lead to additional risk. This is because homeowners may have undue heightened levels of confidence in the ability to stay and defend without proper regard to extreme conditions. These levels of confidence may be reinforced by an unqualified 'leave early or stay and defend' policy.

Agencies such as the Country Fire Service have promoted 'leave early or stay and defend' policy as absolutes when in fact conditions such as experienced in the recent 'Black Saturday' fires in Victoria as the prediction of more frequent extreme weather events in the future call for a more qualification of this policy message.

Extreme extended hot weather conditions experienced across South Australia, in late January to early February, led to widespread and frequent power outages and also impacted the health of vulnerable people.

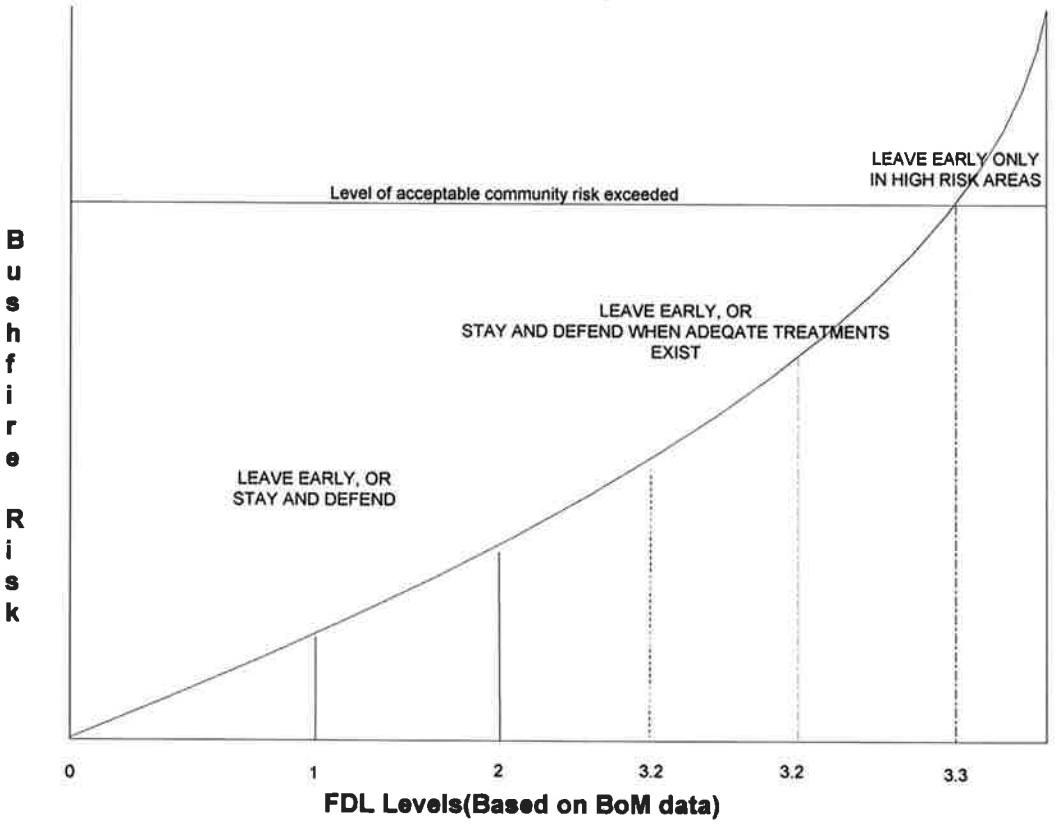

Diagram demonstrating the value of incorporating FDL levels in the form of community information.

DEFINITION OF 'HEATWAVE' AND RELEVANCE TO EMERGENCY PLANNING FOR SEVERE WEATHER EVENTS

Heatwaves are probably the most under-rated weather hazard in Australia[1]. The cost of heatwaves, in terms of lives lost, as well as the associated costs to businesses and communities in general is immense. There is, however, no universal definition of a heatwave event. Although, in a general sense, it can be defined as a prolonged period of excessive heat, there are inherent difficulties in establishing an appropriate heat index with an acceptable event threshold and duration and relating it to the climatology of the area under investigation.

High temperatures in South Australia are typically associated with low humidity. Although tolerance to heat stress (i.e. above core body temperature of 37°C) is variable across the population, further consideration must be given to planning for extended periods of hot weather given climate change modelling predictions and increasing community vulnerabilities.

---

[1] *BoM: http://www.bom.gov.au/weather/wa/sevwx/perth/heatwaves.shtml

When considering the vulnerability of the community to prolonged periods of high temperatures, consideration of demographics should be considered in addition to climate change modelling predictions. Many parts of Australia contain relatively high levels of aged populations. People with chronic illness and other types of disability are also likely to have higher vulnerability to heat in comparison to the general community. Added to this, the effects of the economic downturn will exacerbate community vulnerability. This is due to general increased heat exposure levels directly due to levels of economic disadvantage.

Expert advice about climate change indicates that additional work needs to be undertaken in relation to extreme hot weather. These hazard events are of course exacerbated by resultant disruption to electricity supplies.

The lack of a working indexation for severe and prolonged hot weather ('heatwave') leaves state and territory jurisdictions unsure in determining trigger points for activation of extreme weather emergency protocols such as that undertaken in South Australia in early February 2009.

SUMMARY

Fire danger indices are important aids to emergency risk management planning and response strategies at individual and agency level.

The predicted long term effects of climate change, reinforced by recent experiences, supports a need to re-evaluate current meteorological parameters that are used in determining fire danger levels. Strong consideration should be given to modified FDLs, currently used to define predetermined risk levels by the electricity industry, to provide broader bushfire risk assessment guidance for the wider community.

Changing weather conditions, combined with increased population densities in outer metropolitan areas, are driving increased bushfire risk exposure levels.

Bushfire safety plans should not be promoted in absolute terms (i.e.' leave early, or stay and defend'). Bushfire safety plans should anticipate that there will be times where extreme meteorological and environmental conditions should dictate a more proactive approach to community risk mitigation. The wider application of FDLs should translate to predetermined community safety messages and risk protocols.

Extreme hot weather events, such as experienced across South Australia early in 2009, have broader community implications in addition to increasing fire danger. This includes business continuity actions and public health and safety considerations for scheduled and anticipated power interruptions.

Clarification of the meteorological definition of 'heatwave' is requested to assist emergency jurisdictions in activation of extreme weather emergency planning.

RECOMMENDATIONS

- That existing fire danger levels be expanded and adapted and used to provide wider stakeholder application in relation to extreme levels of fire danger risks and risk management protocols.

- That a broad risk communication strategy, based upon meteorological fire danger parameters, be formed and implemented to better inform stakeholders of mitigation strategies for extreme weather events.

- It is recommended that a working definition for 'heatwave – extreme weather' be formed to provide potential reference points to enact state and territory emergency management protocols.

ENDORSEMENT Peter J Ward

Peter Ward, Head of People and Change (State Controller Engineering)

Date: ~~*day/month 2009*~~ 23/4/09