# 2012/13

# Full Year Network Fire Report

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Manager Network Risk Strategy

## Executive Summary

The 2012/13 season was notable for the record number of network related fires corresponding with a record heatwave across the state of NSW and Australia.

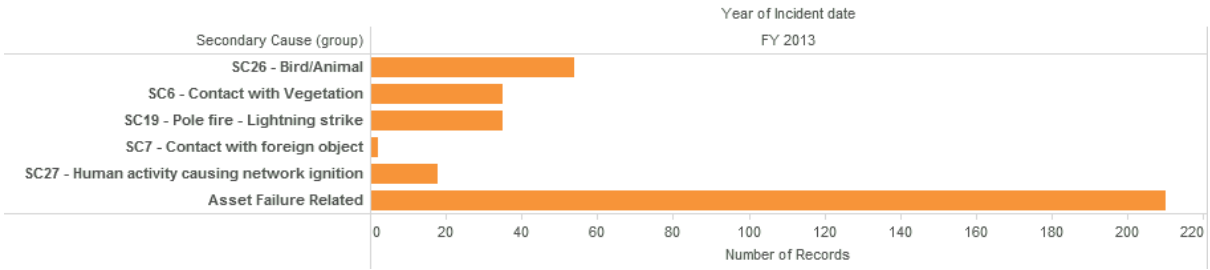
The 2012/13 season was similar in many characteristics to the 2008/09 season with conditions generally much hotter and drier than the recent trends from 2009/10 to 2011/12.

There was a record 354[1] network related fire starts compared to 191 the previous year. As discussed later in the report, weather conditions had a significant influence on these results. The majority of these fires occurred in the Southern part of the state (57%).

| | Year of Incident date | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Fire Ban | FY 2005 | FY 2006 | FY 2007 | FY 2008 | FY 2009 | FY 2010 | FY 2011 | FY 2012 | FY 2013 |
| Yes | 11 | 27 | 14 | 3 | 5 | 52 | 5 | | 42 |
| No | 120 | 120 | 103 | 64 | 89 | 116 | 105 | 191 | 312 |
| Grand Total | 131 | 147 | 117 | 67 | 94 | 168 | 110 | 191 | 354 |

The table below shows 59% of fires were associated with performance of Network Assets. This compares favourably with 63% asset related fires in 2011/12.
The remaining 41% were due to a range of external influences impacting the network. Storm or high winds were commonly associated with the 'Contact with vegetation' and 'Asset Lightning Strike' which combined, account for approximately 20% of fires.

| Secondary Cause (group) | FY 2013 |
|---|---|
| SC26 - Bird/Animal | 15.25% |
| SC6 - Contact with Vegetation | 9.89% |
| SC19 - Pole fire - Lightning strike | 9.89% |
| SC7 - Contact with foreign object | 0.56% |
| SC27 - Human activity causing network ignition | 5.08% |
| Asset Failure Related | 59.32% |
| Grand Total | 100.00% |



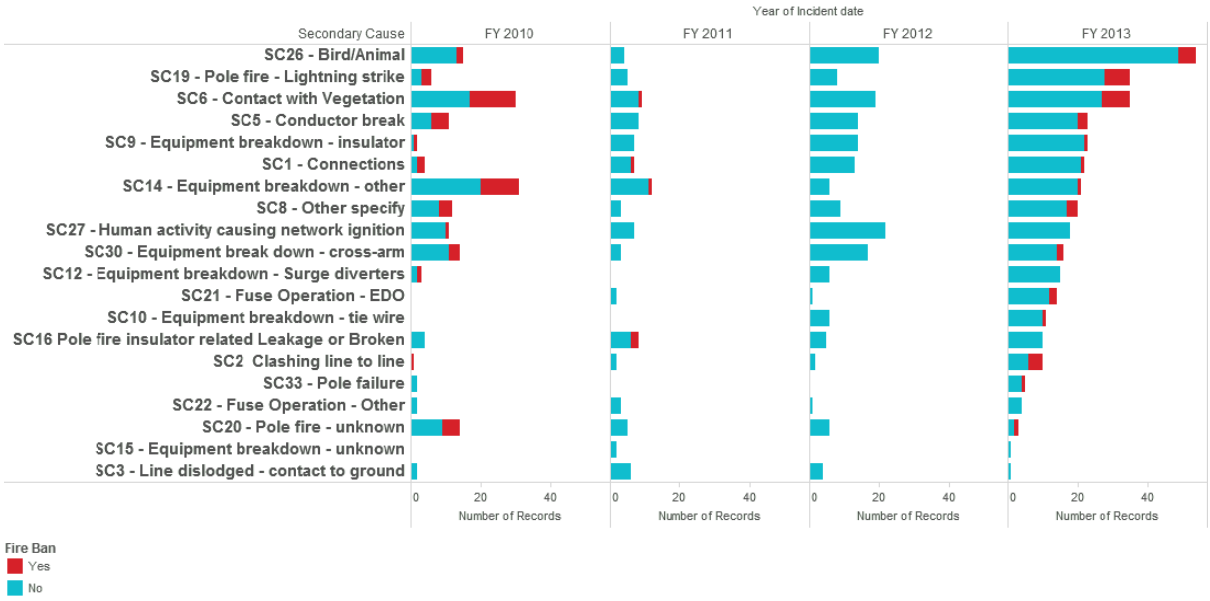

[1] 354 fires include asset damage causing fire from external related influences (vehicles striking assets, animals, storm damage, trees striking assets). It excludes fire damage to assets where ignition came from a non-network source.

## Causes

The leading causes in 2012/13 across all categories were;

1. Bird/Animal contact (54)
2. Lightning related Pole fires (35)
3. Contact with Vegetation (35)

These causes were also attributed to the majority of fires which occurred on a TOBAN days and are among leading causes across all years aggregated.

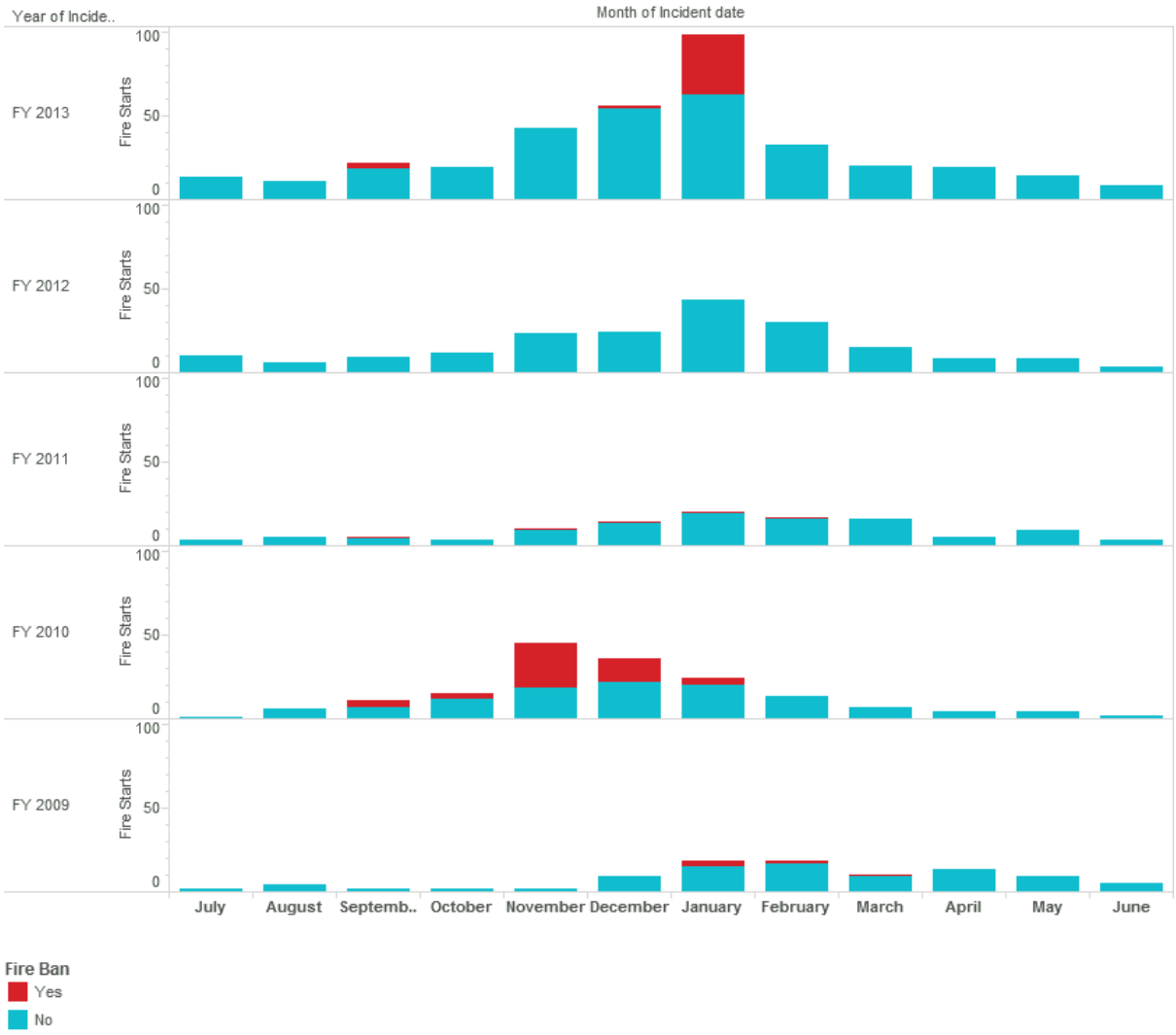



## Statewide Fires Distribution Map

There was a wider distribution of fires across the state in 2012/13 compared with previous years indicative of the unusual weather conditions leading to several Statewide Toban's being declared.

## Monthly trend – 5 year comparisons

The peak activity for network related fires occurred in the fire danger declaration period (Oct-Mar) with a record number in the month of January 2013.



## Season Characteristics

The 2013 fire danger season in NSW, was highlighted by a severe heat wave in January which set new records and resulted in many Total Fire ban declarations including catastrophic ratings for the southern part of the state.

The following information is from the BOM website:
http://www.bom.gov.au/climate/updates/summer-heatwave-2013.shtml


Southern and Inland parts of NSW experienced record temperatures which coincide with a record number of network related fires. As shown in previous season reports, a consistently strong correlation exists between weather patterns and network related fires. This season supports this trend.

Figure 1 shows the temperature anomaly for the January 2013 where mean average temperatures were 4-5 degrees higher.

This was also the month in which Essential Energy experienced a record number of fires in a single month (98).

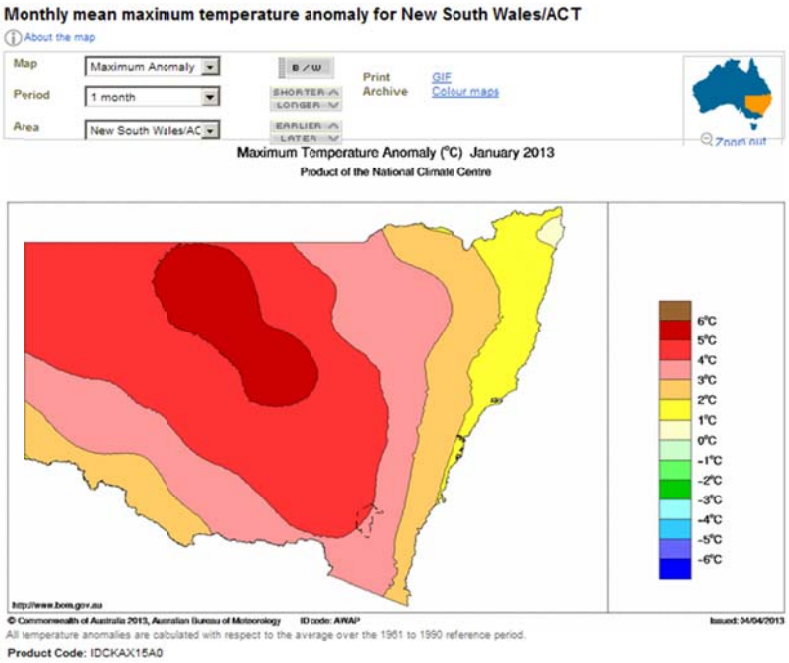



Figure 1

## Total Fire Bans

The 2012/13 bushfire season has seen an increase in Total Fire Ban days declared by the Rural Fire Services when compared to the two previous years. The extreme high temperatures and lack of rain in January resulted in a total of 27 Total Fire Ban days being declared, with 13 of those in the month of January alone.

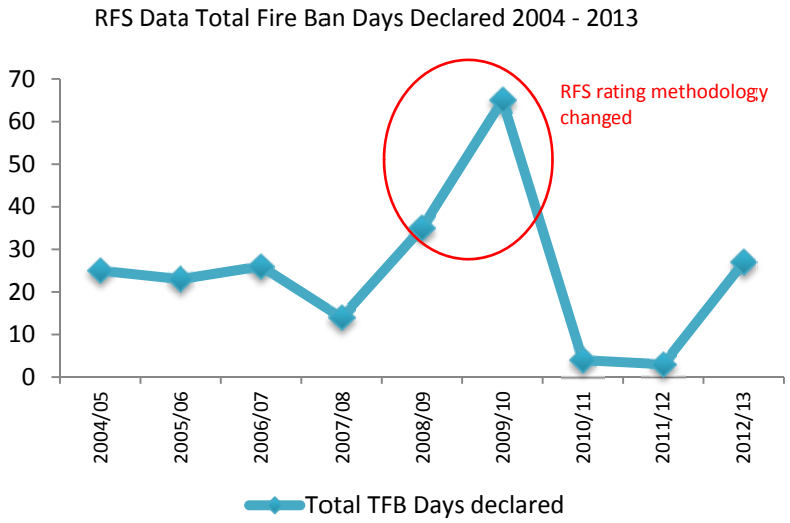



Figure 2

Note: In 2010/11 RFS changed the parameters used for TOBAN declarations. This meant that fewer declarations were likely going forward (for the same conditions) due to the ability to source better data making it possible to pinpoint extreme weather to more specific areas. The main changes revolve around

- Classifying the predominate vegetation and applying the relevant FDI (only using grassland FDI's in areas with no forest vegetation)
- Utilising gridded forecast data that allows projections on 6km grids and forecasting across the entire day. Unless areas have greater than 10% of a given portion of Fire Weather District in severe or above for greater than an hour there will be no TOBAN. This is a guide and can trigger lower TOBANs in the case of heightened activity or risk.
- Utilising gridded satellite curing data. The curing of grass fuel changes the FDI. Using satellite curing data means that the correct reading is given (e.g. South Aus used 100% as a baseline regardless of actual curing this year and this resulted in a greater number of TOBANS within their jurisdiction)

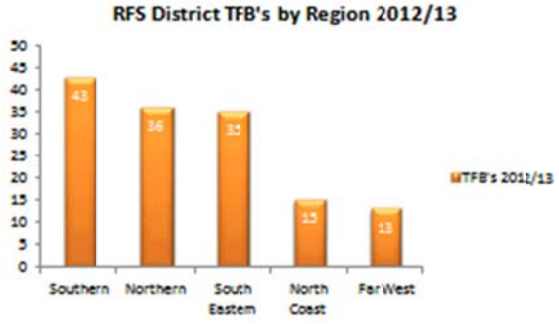



Figure 3

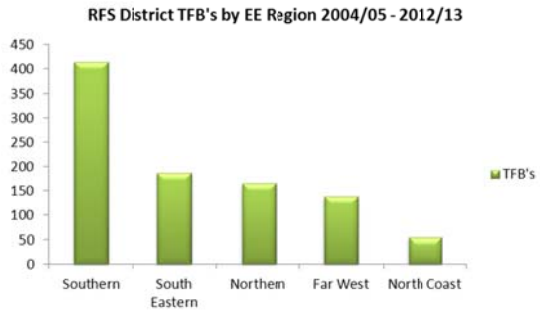



Figure 4

## Fire starts Vs weather conditions

Figure 5 provides a comparison of the network fire starts to the BOM weather patterns for the corresponding quarter (Jan – Mar) and years. The fires are compared to the temperature, NDVI (grass curing rates), and rainfall levels. The larger blue font number is the total number of fire starts for the year while the smaller red font number is the fire starts during the 3 month period (Jan- Mar).

The 2012/13 result highlights the fire potential in a year of hot dry conditions following a year (2011/12) of cooler wetter conditions which results in higher fuel loads.

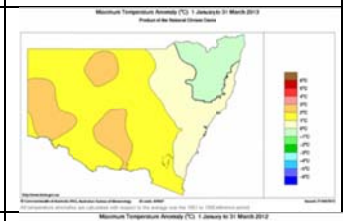
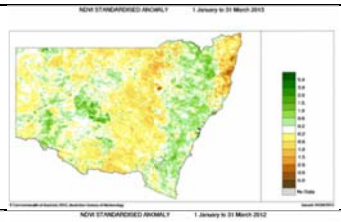
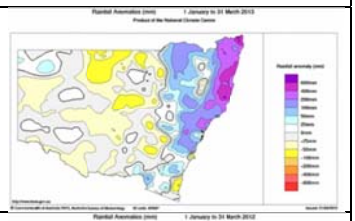
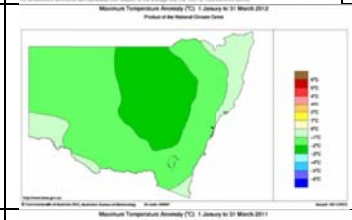
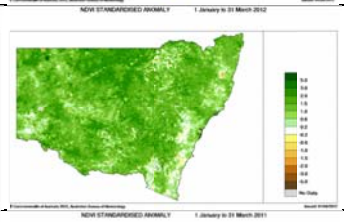
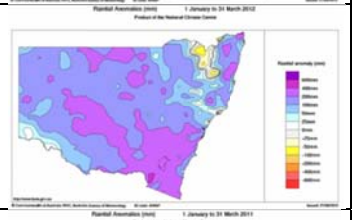
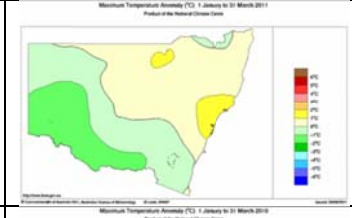
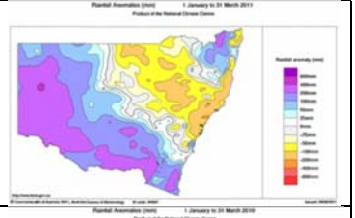
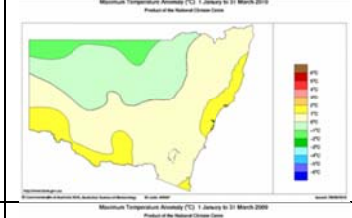
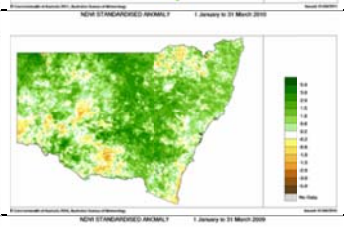
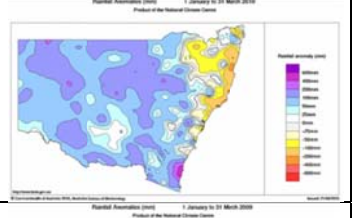
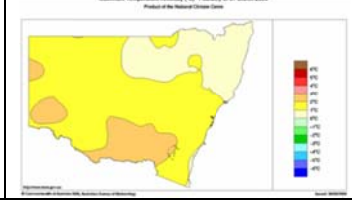
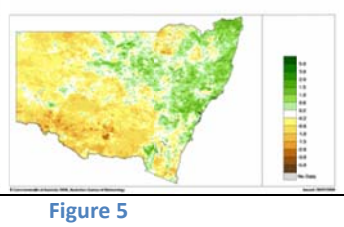
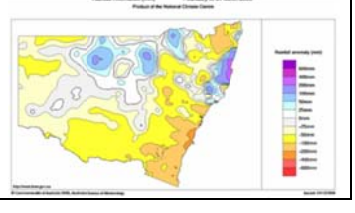
| FY Year | Fires | Temp (Jan - Mar) | NDVI (Jan-Mar) | Rainfall (Jan-Mar) |
|---|---|---|---|---|
| 2013 | 354<br>150 |  |  |  |
| 2012 | 191<br>88 |  |  |  |
| 2011 | 110<br>53 |  |  |  |
| 2010 | 168<br>44 |  |  |  |
| 2009 | 94<br>46 |  |  |  |

Figure 5

The relatively lower than expected fire starts in 2009, given the dry conditions, may be due to (i) the prolonged drought conditions in preceding years, resulting in lower fuel loads and (ii) the quality of network fire reporting then compared to now.

For a full comparison of the climatic conditions over the last 5 years refer to *Appendix A – BOM Summer Weather Patterns.*

# Network Ignition Characteristics

## Total Fires Yearly Trend

Figure 6 provides a comparison for the last 9 years.

These exclude fires which damaged distribution assets caused by ignitions not emanating from the network e.g. ground lightning strike, farm burn-off escapes, arson.

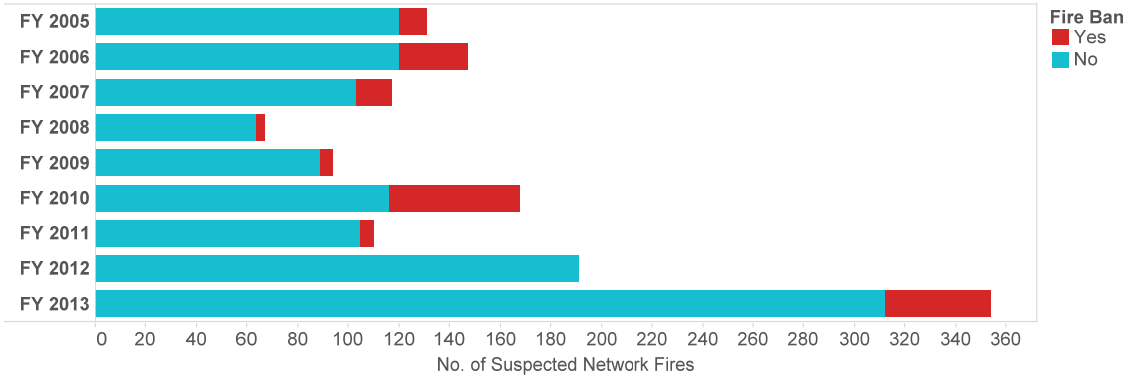



Figure 6

## Regional Performance

Figure 7 highlights regional distribution of fires in 2012/13. The predominant number of fires occurred in the Southern part of the state although this year there was significantly more fires in the Northern, Coastal, and Inland areas compared with ratios of previous years due to the widespread heatwave weather conditions in January.

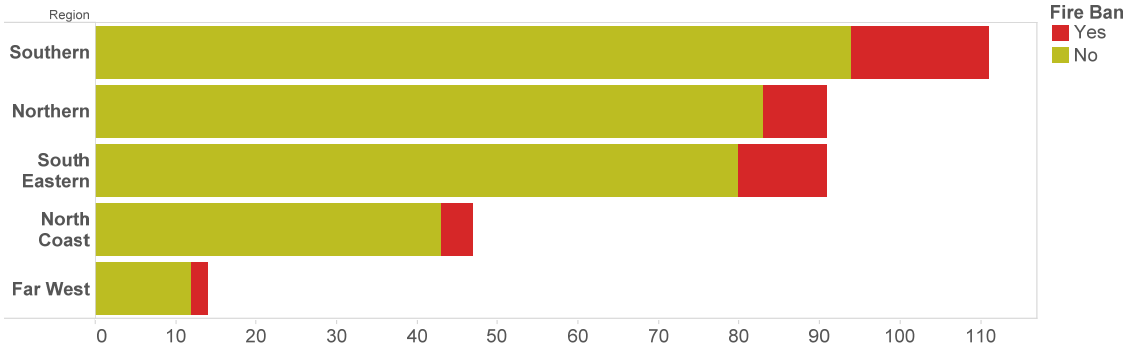



Figure 7

## Causal Analysis

Figure 8 shows the percentage of fires by Totalsafe secondary cause categories and the trend over a 3 year period.

| | Year of Incident date | | | |
|---|---|---|---|---|
| Secondary Cause | FY 2011 | FY 2012 | FY 2013 | Grand Total |
| SC26 - Bird/Animal | 3.64% | 10.47% | 15.25% | 11.91% |
| SC6 - Contact with Vegetation | 8.18% | 9.95% | 9.89% | 9.62% |
| SC19 - Pole fire - Lightning strike | 4.55% | 4.19% | 9.89% | 7.33% |
| SC27 - Human activity causing network ignition | 6.36% | 11.52% | 5.08% | 7.18% |
| SC5 - Conductor break | 7.27% | 7.33% | 6.50% | 6.87% |
| SC9 - Equipment breakdown - insulator | 6.36% | 7.33% | 6.50% | 6.72% |
| SC1 - Connections | 6.36% | 6.81% | 6.21% | 6.41% |
| SC14 - Equipment breakdown - other | 10.91% | 3.14% | 5.93% | 5.95% |
| SC30 - Equipment break down - cross-arm | 2.73% | 8.90% | 4.52% | 5.50% |
| SC8 - Other specify | 2.73% | 4.71% | 5.65% | 4.89% |
| SC16 Pole fire insulator related Leakage or Broken | 7.27% | 2.62% | 2.82% | 3.51% |
| SC12 - Equipment breakdown - Surge diverters | | 3.14% | 4.24% | 3.21% |
| SC10 - Equipment breakdown - tie wire | | 3.14% | 3.11% | 2.60% |
| SC21 - Fuse Operation - EDO | 1.82% | 0.52% | 3.95% | 2.60% |
| SC20 - Pole fire - unknown | 4.55% | 3.14% | 0.85% | 2.14% |
| SC2 Clashing line to line | 1.82% | 1.05% | 2.82% | 2.14% |
| SC3 - Line dislodged - contact to ground | 5.45% | 2.09% | 0.28% | 1.68% |
| SC17 - Pole fire - crossarm related | 1.82% | 1.57% | 1.13% | 1.37% |
| SC22 - Fuse Operation - Other | 2.73% | 0.52% | 1.13% | 1.22% |
| SC4 - Line dislodged - contact with above ground comp.. | 2.73% | 1.57% | 0.28% | 1.07% |
| SC11 - Equipment breakdown - brackets, bolts, steelwork | 1.82% | 1.05% | 0.28% | 0.76% |
| SC25 - Fuse assembly break | | 2.09% | 0.28% | 0.76% |
| SC7 - Contact with foreign object | 1.82% | 0.52% | 0.56% | 0.76% |
| SC33 - Pole failure | | | 1.41% | 0.76% |
| SC18 - Pole fire - groundline | 1.82% | 0.52% | 0.28% | 0.61% |
| SC29 Pole fire Conductor tie Broken | 0.91% | 1.05% | 0.28% | 0.61% |
| SC28 - Pole fire - Conductor on Cross-arm | 2.73% | | | 0.46% |
| SC23 - Fuse overheating or surge | 0.91% | 1.05% | | 0.46% |
| SC15 - Equipment breakdown - unknown | 1.82% | | 0.28% | 0.46% |
| SC24 - Fuse connections | | | 0.56% | 0.31% |
| SC13 - Equipment breakdown - stay | 0.91% | | | 0.15% |
| Grand Total | 100.00% | 100.00% | 100.00% | 100.00% |

Figure 8

Note: Fuses are separated into 3 categories;
SC21 – relates to normal operation of the HV EDO type fuse (element blown)
SC22 – relates to other reasons a HV or LV fuse causes ignition e.g. LV silver link failed, HV switching
SC25 – relates to HV Fuse assembly failure e.g. the fuse device was damaged or failed as opposed to the element activating.

## Vegetation related fires

Trees are a leading cause of fires each year. The predominant portion of these fires occurs in the southern parts of the state partly due to the conditions in the south of the state generally being more conducive to fire ignitions in any case.

2012/13

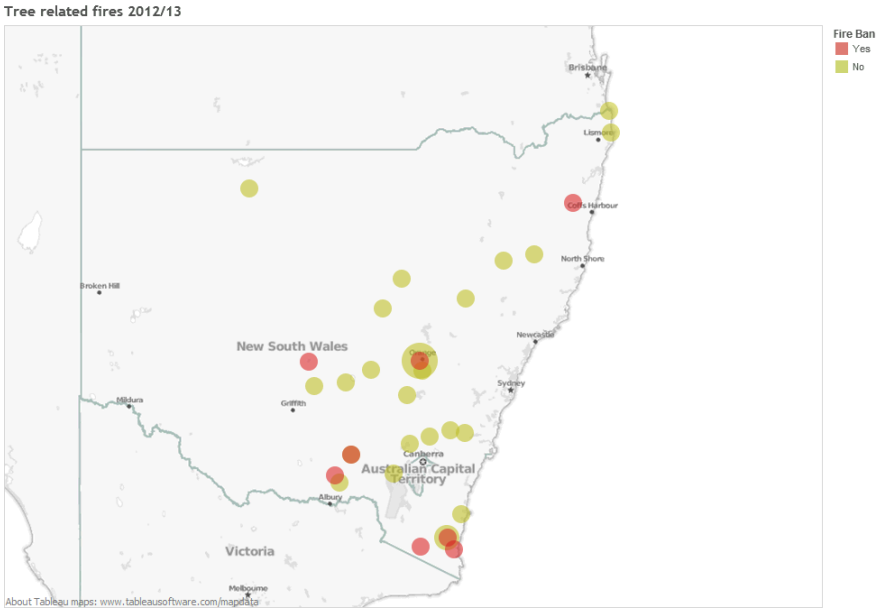



Figure 9

Four Years Aggregated – 2009/10 to 2012/13
Note: this historical view does not take into account the additional focus in all areas in recent years.

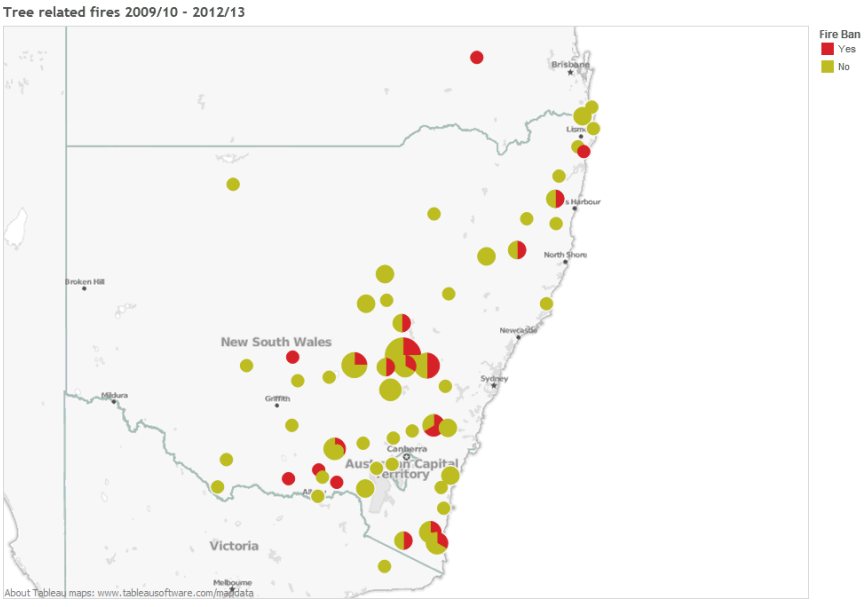
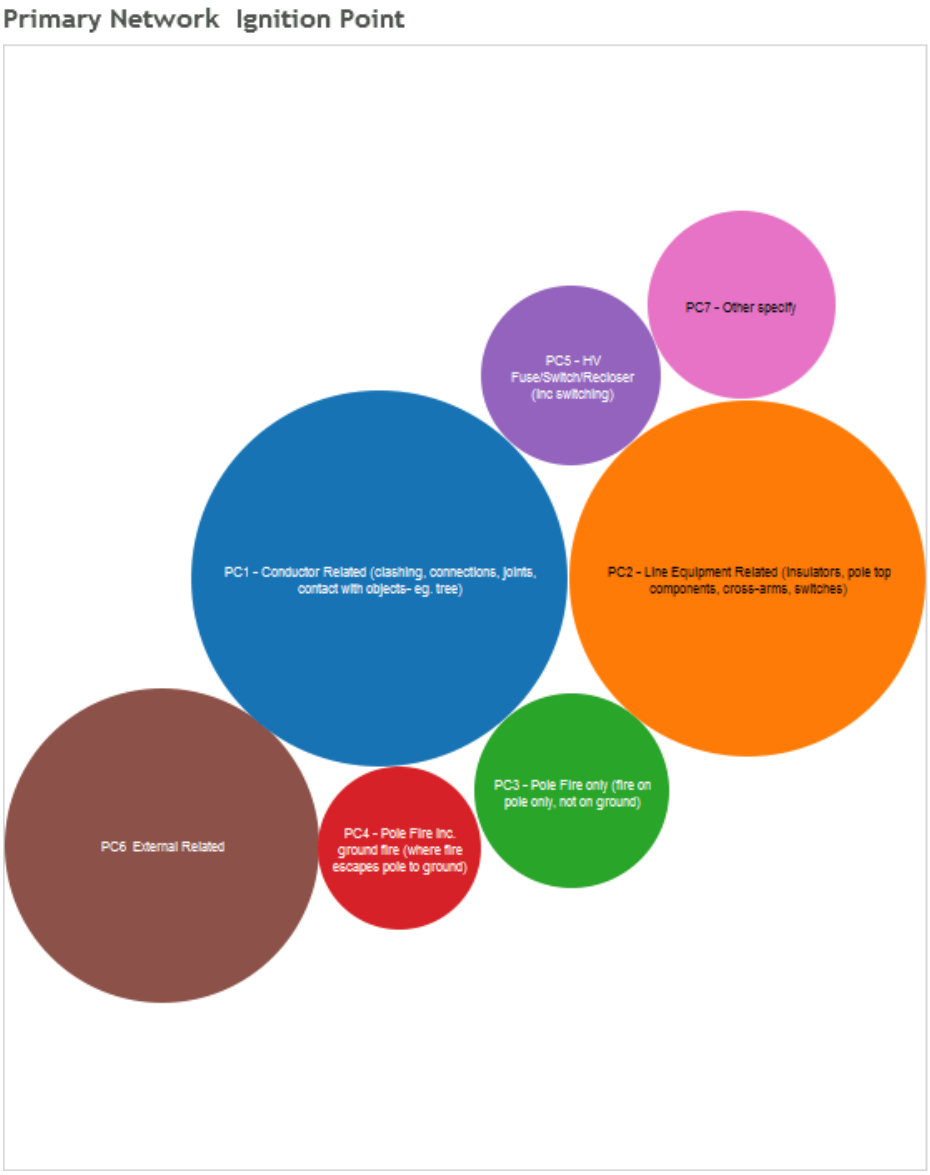



Figure 10

## Asset Group Ignition Points




### Pimary Network Ignition Point table

| Primary Ignition Source | |
|---|---|
| PC1 - Conductor Related (clashing, connections, joints, contact with objects- eg. tree) | 100 |
| PC2 - Line Equipment Related (insulators, pole top components, cross-arms, switches) | 90 |
| PC6 External Related | 70 |
| PC3 - Pole Fire only (fire on pole only, not on ground) | 27 |
| PC7 - Other specify | 25 |
| PC5 - HV Fuse/Switch/Recloser (inc switching) | 23 |
| PC4 - Pole Fire inc. ground fire (where fire escapes pole to ground) | 19 |
| Grand Total | 354 |

Figure 11

## Fires by Voltage

Fig 12 indicates a majority of fires occur from the 11kV lines however this voltage level is also the highest proportion of lines on the network.

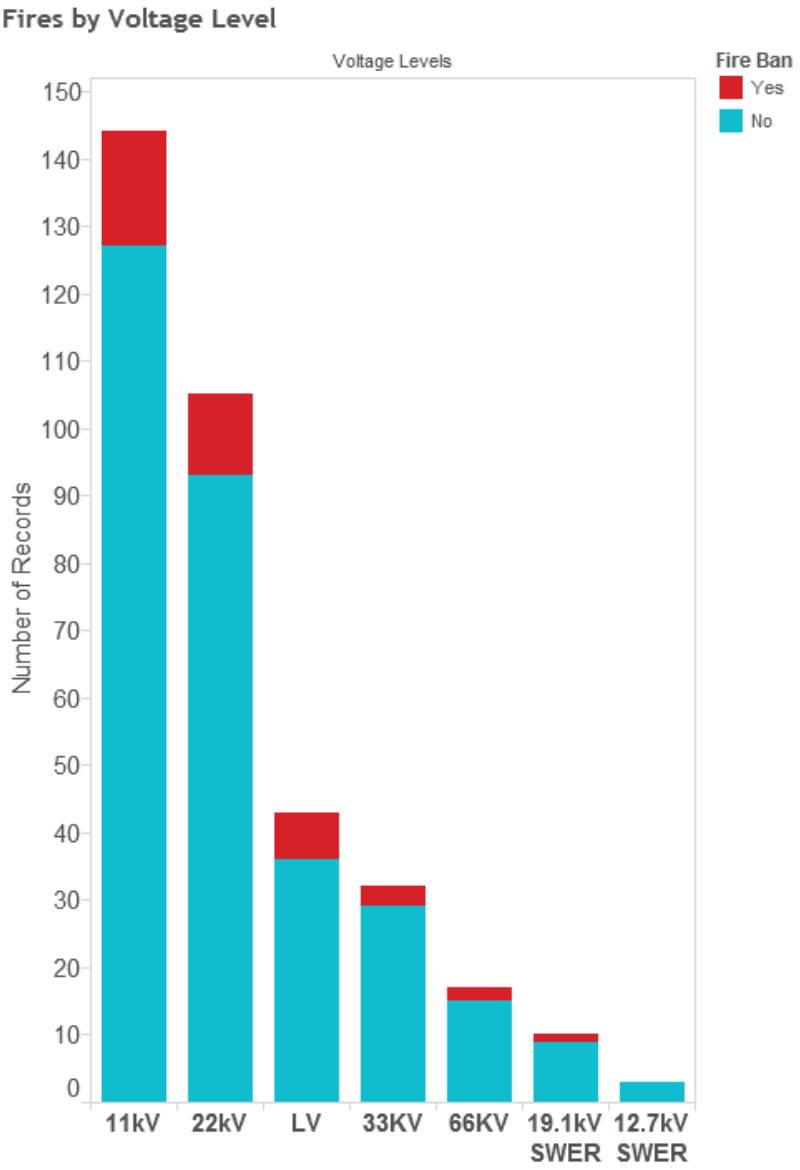



Figure 12

The fires by voltage level are represented as a ratio of their relevant kilometres.

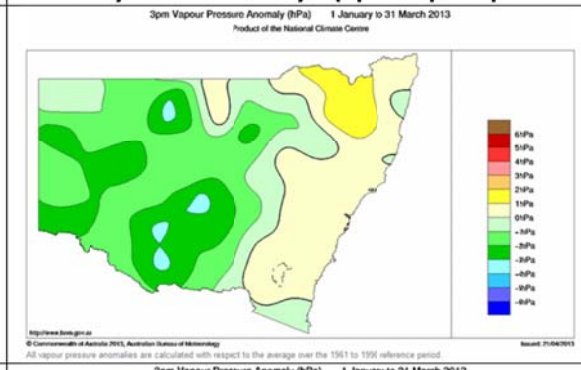
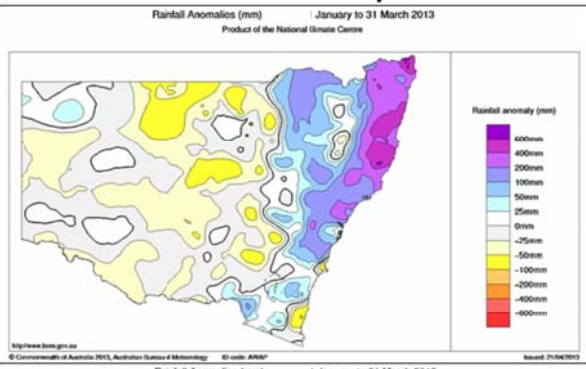
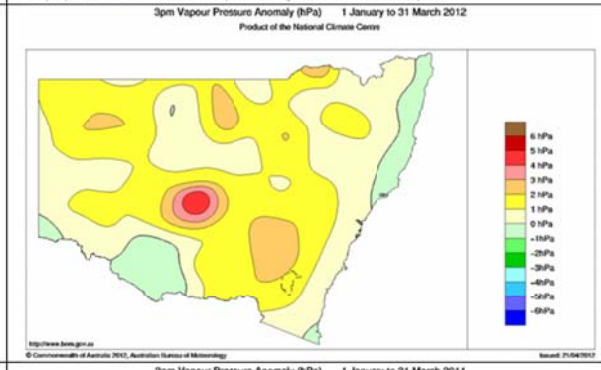
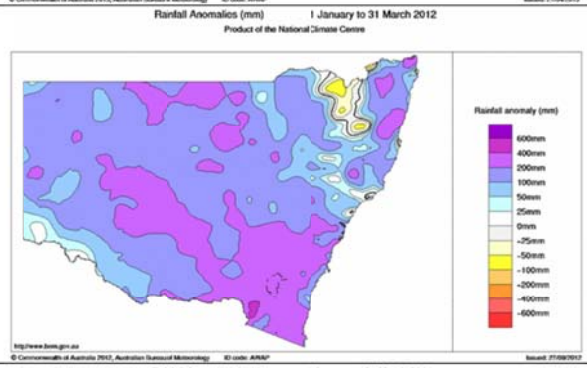
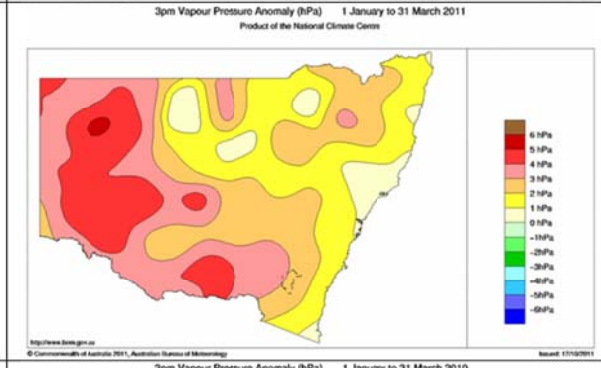
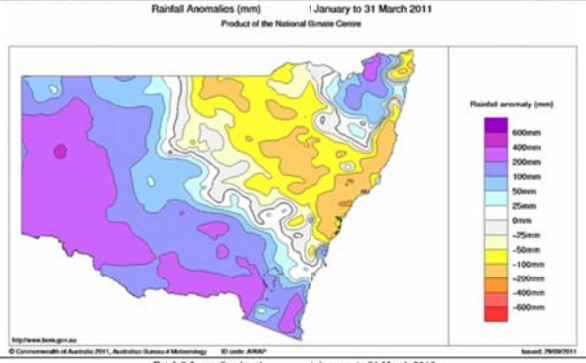
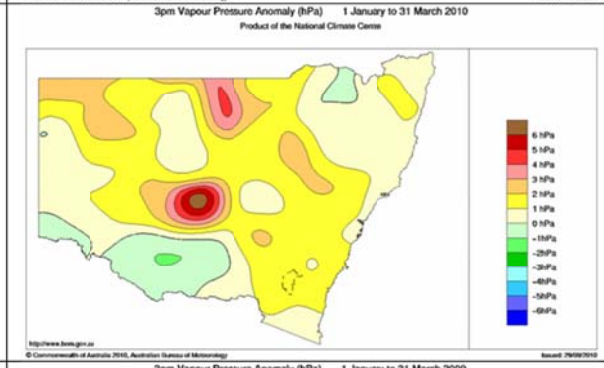
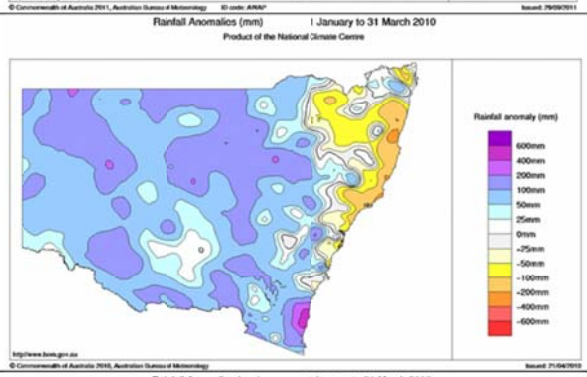
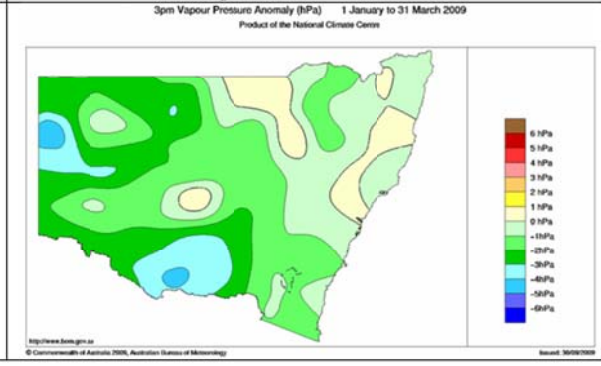
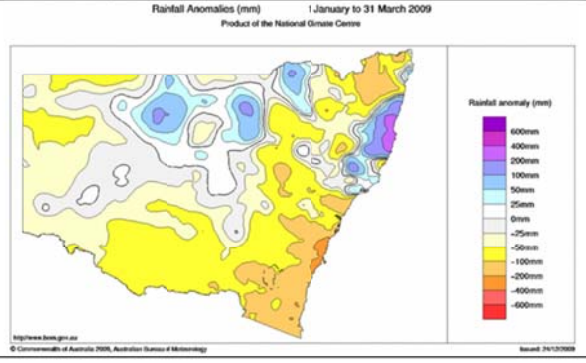
| Voltage | 11kV | 22kV | LV | 33kV | 66kV | SWER | Total |
|---|---|---|---|---|---|---|---|
| Km's | 70,474 | 42,236 | 31,146 | 5,389 | 7,636 | 29,720 | 186,601 |
| Ratio of fires/1000km | 2.04 | 2.49 | 1.38 | 5.93 | 2.23 | 0.44 | 1.90 |

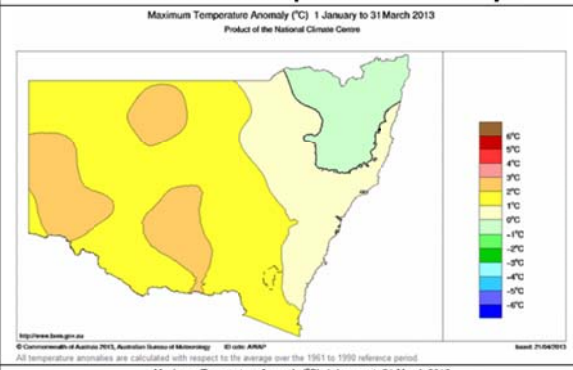
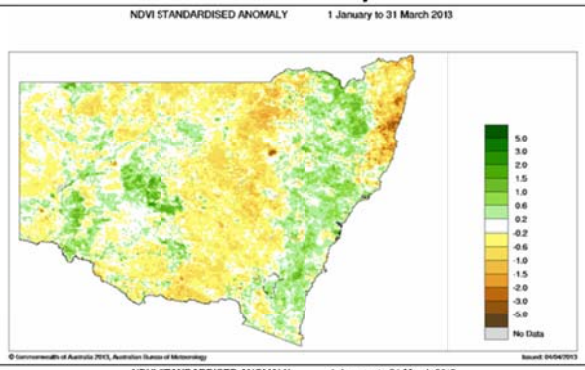
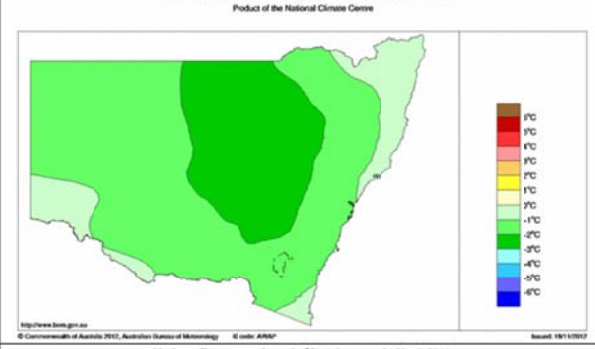
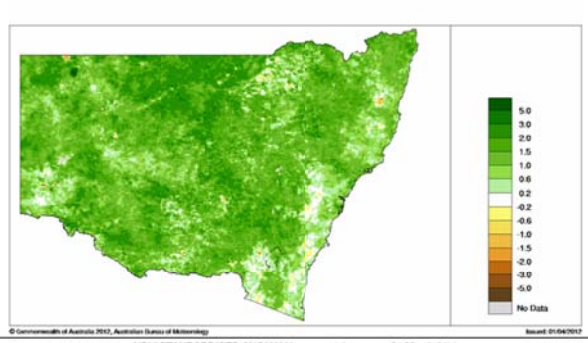
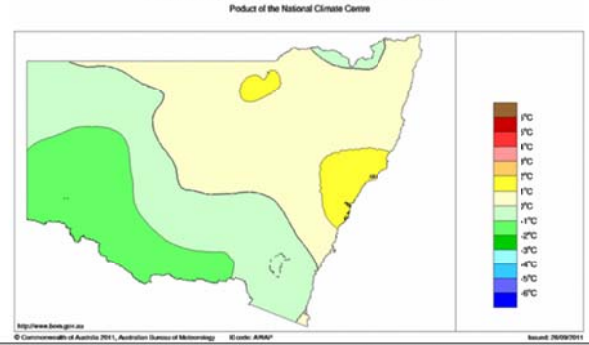
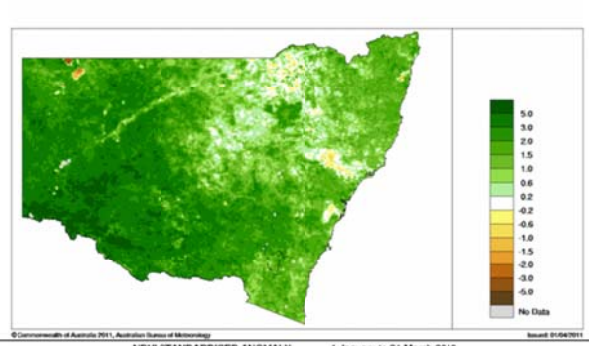
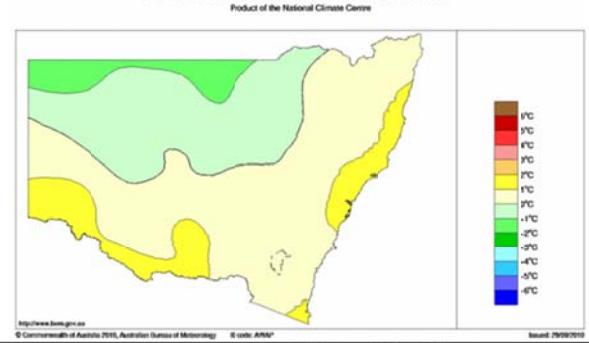
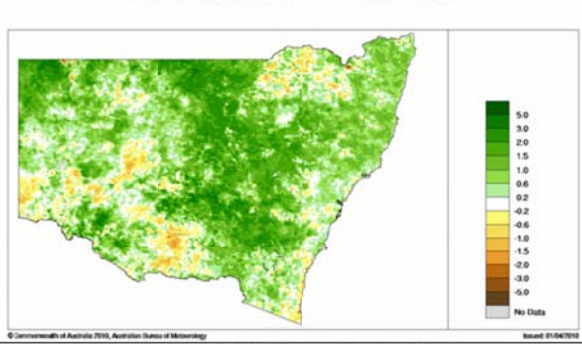
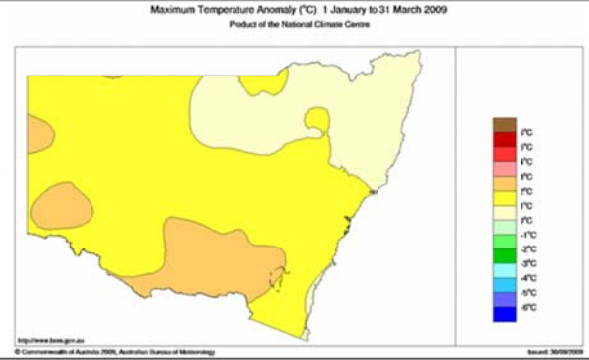
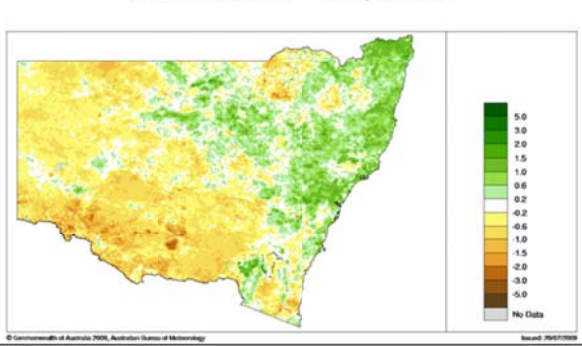
In terms of fire starts per 1000km's of line, the best performing voltage is the SWER system whilst the worst is the 33kV system.

Even with the record number of fire starts in 2012/13, Essential Energy performs well when benchmarked against other rural distributors for number of fires per 1000 kilometres of line e.g. ~2 /1000km's compared with 5 /1000km's VIC.

## APPENDIX A – BOM Summer Weather Patterns

These charts highlight the hotter drier weather in 2012/13 in comparison to other years. It measures humidity levels, temperature, rainfall, and vegetation greenness (NDVI). Weather has the most prominent impact on fire starts.

| Year | Humidity levels Anomaly's (3pm Vapour pressures) | Rainfall Anomaly's |
|---|---|---|
| 2013 |  |  |
| 2012 |  |  |
| 2011 |  |  |
| 2010 |  |  |
| 2009 |  |  |

| Year | Maximum Temperature Anomaly's | NDVI Anomaly's |
|---|---|---|
| 2013 |  |  |
| 2012 |  |  |
| 2011 |  |  |
| 2010 |  |  |
| 2009 |  |  |

Note: These charts measure the difference (Anomaly) to the mean average recorded conditions. Source: Bureau of Meteorology