

2009 VICTORIAN BUSHFIRES ROYAL COMMISSION

SUBMISSIONS – POMBORNEIT FIRE (PERSONS REPRESENTED BY MADDENS LAWYERS)

1. Summary

- 1.1 The Pomborneit fire started as a consequence of “clashing” between conductors just north of the Princes Highway near the Weerite overpass. More precisely, the most probable sequence of events was that the lowest copper conductor in the southern array of the 66kV CLC-CDN line clashed between Poles 927 and 928 (“Span 927-8”) with the south-side aluminium conductor on the 22kV CDN-2 feeder line, that arcing between the conductors caused burning aluminium particles to be thrown off, that the NNW wind blew the particles across the highway and that the particles landed still burning in thick dry grass on the road verge, igniting the grass and initiating a wildfire. The point of origin of the fire was approximately 38m south of the clash point (although backing fire subsequently burned 30-50m west from the point of origin).¹ The electricity assets involved were part of the Powercor network.
- 1.2 There was a notable history of conductor clashing at or near Span 927-8, and moreover a historical association with grassfire starts. Indeed the local CFA unit was en route to Pole 928 before the fire was even reported, because the CFA members noticed a light flicker at the CFA station and immediately assumed there had been clashing (again) along the line in the area east of the Weerite overpass.² While it is noted that Pole 927 was leaning and this may have distorted the clearances between conductors in Span 927-8, more obviously there were no “spreaders” installed along the span (or other spans nearby), either on the 66kV array or the 22kV 3-phase array. Spreaders would have reduced the swinging which led to the contact between

¹ Transcript at T7907.3-8, T7905.11-14 respectively (Gunning, CFA), see also T7913; Blackburn T9902-3.

² Witness statement of RT Hewitt WIT.7512.001.0002 at [17]; Witness Statement of RE Place CORR.0906.0373 at [5].

conductors. At a more fundamental level, however, the need to redesign and reconfigure the conductor array in the area of Span 927-8 had been acknowledged by Powercor well before February 2009. That work should have been undertaken, but had not been.

2. **Immediate cause of fire**

- 2.1 Two eyewitnesses reported “flare” or “flash” observations consistent with a clash event. The observations were consistent between themselves as to the time and location of the clash. They were consistent with Powercor’s fault records both as to time and location.³ They were consistent with other witnesses’ evidence of observing the conductors being pushed by the wind.⁴
- 2.2 The witness accounts were also consistent with the physical evidence at Span 927-8. That physical evidence indicated that the lowest copper conductor on the south side of the 66kV array clashed with the aluminium conductor on the south side of the 22kV array. The “clash marks” comprised freshly “remelted” points in the metal and damage indicating the expulsion of metal particles.⁵ Clashing is invariably associated with the emission of particulate metal.
- 2.3 It is noted, as well, that Powercor’s fault records appeared to support the conclusion that the clashing was between the 66kV and 22kV lines rather than, for instance, between two conductors on the 22kV line. Powercor’s witness, Mr McDonald, listed various fault “events” which had been recognised by Powercor’s fault detection systems on 7 February 2009. Significantly he attributed “Events” 9 and 13 to the same incident. Event 13 records a fault on the 22kV line, whereas Event 9 records a fault notification on the red phase of the 66kV line – and “red” means the lower south conductor on the 66kV array at Pole 928.⁶

³ Polvere T7986.

⁴ Terry Place T7867

⁵ de Vercelli T7971, 7977; Polvere T9848.

⁶ McDonald witness statement 1 September 2009 pars.29, 51, 54. It is noted, however, that Powercor’s subsequent corrections of its various witnesses’ evidence, and eventual concession that

- 2.4 Two mechanisms were suggested at the hearing to explain how a clash at conductor height might lead to the ignition of a grass fire. One was that flying debris might fortuitously have passed through the arc, or a plasma cloud (effectively a cloud of superheated gas), and caught fire then fallen to the ground.⁷ But the wind was blowing very strongly from the NNW;⁸ the landowner Mr Hay gave uncontroverted evidence that there was no debris lying around; no-one reported seeing flying debris;⁹ and if flying *bark* be blamed then we note that the only trees to the north of the clash point seem to have been due north, or slightly NNE, rather than truly upwind.
- 2.5 The second, and more likely, mechanism for first-start was the emission of superheated metallic particles, which stay hot enough for long enough to be blown by the wind across to the southern side of the Princes Highway and start the grassfire.
- 2.6 There is little doubt that this second mechanism is entirely plausible, and indeed can fairly be described as the more conventional explanation. A clash between these two conductors is likely to produce arcing. The arc will generate temperatures in the thousands of degrees centigrade – well above the melting points of aluminium (670°C) or copper (1170°C).¹⁰ The localised air-pressure differentials will blast off the molten metal. And the metal particles then have distinct and important burn behaviours (“exothermic profiles”). Copper requires a higher temperature to melt,

its fault records were consistent with a clash event at Span 927-8, leave the status of Mr McDonald’s evidence in this respect somewhat unclear.

⁷ Powercor suggested a second possible role for flying debris, namely that flying debris might have *initiated* the arc by spanning the two conductors and creating a contact between them. But the eyewitness saw no debris of sufficient size flying in the wind in the general area at the general time: see Terry Place T7883, Ray Place T7898, Lynne-Callow WIT.7511.001.0001 at [7], de Vercelli T7978, Polvere T9851 (note, as well, that no suggestion of substantial flying debris was put to Ms Lynne-Callow by counsel for Powercor). The evidence of the farmer, Mr Hay, was that there was no debris on the property north of the clash point likely to be blown into the conductors by the wind. Moreover the damage on the conductors was aligned as between them, and suggested clashing. Powercor’s various suggestions blaming flying debris (especially the second suggestion noted above) are unlikely to the point of fanciful compared to the more conventional explanation that a wind-induced clash emitted molten aluminium particles.

⁸ Ray Place T7891 and CFA.001.026.0021, BFP.005.001.0026.

⁹ Terry Place T7883; Ray Place T7898; Lynne-Callow WIT.7511.001.0001 [7]; de Vercelli T7978. As noted above, no suggestion of substantial flying debris was put to Ms Lynne-Callow by counsel for Powercor.

¹⁰ Blackburn T9846, 9897; Hensler T7931, 7935.

but copper particles ejected from an arc cool very rapidly. Aluminium may melt and be ejected at lower temperatures, but is still above 670°C and most importantly, *continues burning*.¹¹

- 2.7 Numerous studies have shown that clash events can eject aluminium particles of sufficient size to retain heat capable of igniting dry grass even after travelling relatively vast distances. Tests by SECV following the 1977 fires showed that particles of 1mm ejected horizontally in the direction of a 57kph wind could travel 125 feet (40m).¹² If ejected upward, the increased time-in-air extended the horizontal travel to 190 feet (60m). When the Pomborneit fire started the wind was almost twice the velocity assumed in the SECV studies (113kph not 57kph) and the point of origin was only 38m from the clash point. There is no doubt that such wind could carry burning aluminium particles larger than 1.5mm such a distance. Moreover it would carry smaller particles that distance almost twice as quickly as a 57kph wind, with a concomitant increase in the likelihood that even those particles would retain sufficient heat to start a grassfire when they landed.
- 2.8 Powercor made much of the circumstance that no scorch marks were identified immediately below the clash point or between it and the north edge of the highway.¹³ Other evidence indicated why those observations are unsurprising. The farmer, Mr Hay, had mowed the area for hay in late October 2008, which he then rolled and removed.¹⁴ What was left was *vertical stalks*, not horizontally-arrayed blades of grass. The south side of the highway had not been mowed recently (if indeed it had ever been mowed). It was thick and old phalaris grass, well recognised as an ideal fuel for grassfires in summer. Each of the witnesses who had observed the fire-seat prior to or at the commencement of the fire referred to the ready fuel at the spot.¹⁵

¹¹ Blackburn T9897; Hensler T7431, 7935; see also Prof. A.D. Stokes "*Fire Ignition by Electrically Produced Incandescent Particles*", Appendix E to Australian Standard AS1033.1-1990.

¹² SECV Laboratory Report 13 May 1977 (DOJ.001.001.0081)

¹³ T9847.18-9850.29 (Polvere).

¹⁴ Exhibit 308, Further Witness statement of Peter Winston Hay par.16-19 (see by comparison paragraph 24 regarding the south side of the highway).

¹⁵ Lynne-Callow T7850; Terry Place T7879, 7880; Gunning (CFA) T7903, 7914.

2.9 For completeness we note that Powercor appeared to seek to suggest that its assets might not have been implicated in the ignition of the fire. One suggestion it raised was arson. It was discounted by the CFA fire investigators, and other witnesses described it – understandably – as unlikely given the exposed area and regular passing traffic.¹⁶ A second, even fainter suggestion, was that sunlight might have focused through empty beer bottles discarded on the roadside. This suggestion too was rejected by the CFA experts.¹⁷ In the result, it appeared that even Powercor’s witnesses accepted clashing between conductors as overwhelmingly the most likely cause of the fire.¹⁸

3. **Upstream contributing factors – design and construction**

3.1 By far the most likely explanation for the arc event was clashing between the 66kV and 22kV conductors. There is no serious suggestion that anything caused the clashing other than their movement in the wind, perhaps coinciding with increased sag in one or both conductors as a result of the ambient temperature and current load. Neither the temperature nor the current load were outside reasonable design tolerances.

3.2 Although the line drawings were in evidence¹⁹ there was no evidence regarding the actual tension on or sag of Span 927-8. Evidence given in relation to the Kilmore fire²⁰ raises questions whether, or how, the sag was calibrated when the line was installed.

3.3 Two other features of the span require notice:

- (a) Pole 927 was affected by a noticeable lean.²¹ Plainly a “twisting” of one pole’s array relative to the next pole will reduce the clearances between conductors. This was acknowledged by Powercor’s witnesses;²²

¹⁶ Ray Place BFP.005.001.0029 at [18]; Hewitt WIT.7512.001.0001 at [20].

¹⁷ Gunning T7907.

¹⁸ Polvere T9848.

¹⁹ Statemet of R. Polvere, 4 September 2009, Attachment 1 (WIT.7003.001.0006).

²⁰ See evidence of Brauman and Kazenwadel (Kilmore hearings).

²¹ Ray Place BFP.005.001.0030 at [27], T7867, 7896; also Polvere T9836.

- (b) there were no spreaders installed on the span to maintain separation between conductors on any array or reduce the violence of wind-induced movement of each array.
- 3.4 Plainly the installation between Poles 927 and 928 was defective. Neither the wind, nor the ambient temperature, nor the current load were particularly unusual. Certainly they were not unforeseeable, and even more certainly they were not outside prudent design parameters.
- 3.5 Moreover there was a history of clashing and fire-starts associated with this section of the CLC-CDN line. SECV had paid compensation to Mr Hay for a clash-caused bushfire in 1983 and Mr Hay deposed to the occurrence of three other fires which had started in the same area over the ten years prior to February 2009.²³ Maintenance – or more accurately, attendance – records showed that Powercor’s crews had identified spans near Span 927-8 as having clashed in windy conditions (seemingly shorthanded as “storms”) as early as July 2000 (indeed, possibly some three months earlier than that),²⁴ again in December 2005 (in relation to the immediately adjacent span),²⁵ and as recently as March 2007 – this latter having actually caused a grass fire.²⁶ The records moreover identified the need for re-design of the line. But nothing, it seems, was done.
- 3.6 The Pomborneit fire resulted from a failure by Powercor not only to address a known risk, but moreover to implement the acknowledged solution to that specific known risk – namely to re-design the CLC-CDN and CDN2 lines in the Weerite area.

4. Recommendations

²² Polvere T9837; Vincent Power at T9854. It may be noted as well that the possibility of clashing due to electro-magnetic forces rather than wind was excluded: Blackburn T9905.

²³ Exhibit 308, Statement of Peter Winston Hay par.6 (WIT.092.001.0002). See also TE Place (CORR.0906.0373_R) at [18] and at Transcript T7877; RT Hewitt WIT.7512.001.0001 at [10,11].

²⁴ T9862, PAL.009.001.1022; see also T9863.3-12.

²⁵ T9864.1-25.

²⁶ T9867.6-11, 9867.23; see also PAL.009.001.1176.

4.1 The cause of the Pomborneit fire was so obviously a known risk that recommendations for preventing a recurrence risk sounding trite. Plainly a fire-hazard that has been identified, has occurred repeatedly recurrent, and is amenable to recognised and quite routine design solutions, should be addressed. No explanation has been offered by Powercor as to why the clashing problems along the Weerite section of the CLC-CDN feeder were not addressed. The circumstances giving rise to the Pomborneit bushfire are barely even able to be described as reflecting a systems failure by Powercor: its hazard-identification and reporting systems appear to have recorded the risk and identified the solution. The problem was that Powercor simply failed to respond.