The cause of the interruption was damage to underground cables by a company owned and operated hole borer.

staff of the provider were carrying out an “urgent pole replacement”. At approximately 1.30pm on 13 February 2003 an employee observed that a pole had split and moved significantly resulting in the overhead conductor safety clearance being reduced to an unacceptable level. While the damaged pole had already been scheduled for replacement, the planned replacement was brought forward and implemented immediately.

staff at the worksite although working under pressure to replace the failed pole, exercised caution through checking the area for visible signs of underground services and followed a longstanding practice of hand digging to a depth of 900mm to determine the existence of underground services in an emergency. They were not aware of the existence of underground cables in the area.

There were no company cable plans on site.

a large number of customers in the area and surrounding suburbs were affected by the resulting interruption to supply.

Supply was progressively restored to all customers over the next three hours.

Due to the time required to repair the damaged cables, the provider decided to make temporary alterations to the network configuration to ensure capacity to meet anticipated peak loads was available and an interruption was planned for the early hours of the morning to carry out configuration alterations.

The further interruption to supply occurred at 1.44am on 14 February 2003 and supply was restored at 4.24am.

Investigation by EWON

In the course of our investigation of this matter we considered in detail the following:

Information provided by Dr A
Information provided by Dr A’s repairer
Information provided by the provider
Two reports by an independent electrical engineer.

Technical Advice

EWON obtained independent technical advice from a qualified and experienced electrical engineer on the events leading to the outage. The expert concluded as follows:

It is the "*clear view*" of the expert electrical engineer that "*the precautions taken by [the company] to check for the existence of not only underground cables but any other assets owned by other utilities [were] totally inadequate*" and the initial interruption to supply was a result of the company's failure to take sufficient care in the circumstances.

[the company] should have checked their records regarding the presence of underground cables in the area before taking action to bore the hole for a new pole and their failure to do so amounts to a failure to take adequate care in the circumstances.

[the company's] Network Standards clearly set out the risks involved in carrying out excavation without ensuring adequate checks have been carried out, while Network Standard for Pole Installation and Removal requires that before hole sinking, checks be made beforehand of the underground construction plans of all utilities to identify where assets are located. [The company's] "*long standing practice of field staff digging to a depth of 900mm to determine the existence of underground services in an emergency*", is not an alternative to the fundamental precaution of checking utility records for the presence of assets.

The critical nature, high value, high repair time and high cost of repairing transmission and sub-transmission assets underlines the need for extreme care in monitoring any risks to these assets. The location of the damaged cables is approximately two hundred metres from the 132kV Substation. It seems a reasonable expectation that this would have led the company to give consideration to the possibility of critical infrastructure being present in such close proximity to the Substation.

The second interruption to supply was a direct consequence of the initial event and as such would also have been avoidable had adequate precautions been taken.

The interruptions to supply "*were not beyond the reasonable control of [the company]*".

EWON also obtained technical advice regarding the relationship between the network event and the damage to Mr A's computer equipment. The conclusion of the report was:

[the company] advise that it is estimated that the clearing time of the fault is approx 200ms for each of the cable failures, followed by a trip of the 11kV transformer some minutes after the original fault. As the failure was associated with a long 33kV cable from the Supply Point to Zone Substation, the capacitive reactance of the cable would result in some high-speed transients at the time of the fault.

The circuit breakers utilised on the 33kV and 11kV networks are generally conventional oil circuit breakers which are relatively slow acting and do not cause what is referred to as "current chopping" (as is possible with vacuum circuit breakers). It is unlikely that there are any substantial switching transient voltages on the 11kV network at the time that the circuit breaker is

opened. In any case, as this switching is on the high voltage network, such a voltage disturbance would not be normally transmitted to the low voltage network of any connected transformers, except for high-speed transients that can be transferred through the transformer winding capacitance. The presence of any surge diverters on the 11kV network plus connected load would tend to suppress the voltage spikes.

In [the company's] advice to Mr A dated 18 March 2003, it makes the claim that there were no surges or over-voltages associated with this interruption. It is difficult to see how [the company] could confidently make such an assertion without the use of monitoring equipment at one or both of the Zone Substations. [the company] has submitted no evidence of the presence of such equipment.

The issue is…whether there is a causal relationship between the event on the network and the failure of the…equipment. The fault on the network involved a short-circuit between either phase to earth and/or phase-phase as a result of the hole borer drilling through the cable. During the short period of the short circuit (which may have only lasted 200milli-seconds) the instantaneous voltage on the 33kV system phase-to-phase and phase-to-earth would have been instantaneously suppressed. As a result all customers on this part of the network would have been subject to some sort of transient voltage. Depending on the arcing conditions that would have been experienced during the period of the fault, various high frequency transients would have been present and would have been reflected on the low voltage network. As electricity flow is instantaneous, the electricity supply to the A premises would have been subject to some sort of transient condition.

The computer equipment would have been subject to abnormal transient conditions that undoubtedly would have been outside the CBEMA/ITIC curve. According to [the company's] Electricity Supply Standards, [the company] aims to limit switching transients to less than 2x the nominal system voltage. However, it is not clear as to how [the company] could achieve this objective as there are no specific devices installed on the system that would control transients to this level. The presence of the transient conditions would cause stress on the customer's electrical installation and may result in equipment failure during this period.

If the UPS systems that were installed were operational at the time, they should have provided protection to the computer system. However, depending on the design of the UPS system itself and on the operational capability of the UPS, it is possible that computer equipment is subject to transients that the UPS system is not able to protect.

As other customers in the area serviced by the 33kV system experienced equipment failure at the time of the incident, it is an indication that the transient conditions that were experienced were severe and outside the capability of the equipment to withstand and thus result in equipment failure…The failure rate is much greater than would be expected for random failures occurring coincidentally at the time of the incident on the network.

Conclusion

The company disagrees with the technical advice to EWON by our independent technical adviser. This disagreement is with the conclusion of our adviser rather than with his qualifications or expertise.

Given the available information, EWON is not in a position to comment further on the technical aspects of the claim. However, in a situation where there is credible technical information to support Dr A's position, I believe it is reasonable for the benefit of any doubt to go to the customer. In this case a key consideration is that the interruption to supply was caused by the actions of staff, and as such was within the reasonable control of the supplier.

Under the provision of Clause 6 of the Constitution of the Energy & Water Ombudsman NSW scheme I therefore determine that the company should pay the sum of $2597.10 to Dr A as full settlement of his claim.

Under the EWON Constitution, this decision is binding on the company. Dr A may elect within twenty-one days whether or not to accept this decision. If Dr A accepts the decision, he will fully release the company from all claims, actions, etc in relation to this complaint. In the event that Dr A does not accept my decision, he may pursue his remedies in any other forum he may choose, and the company is then fully released from the decision.

Clare Petre
Energy & Water Ombudsman NSW
27 April 2005