

**SUBMISSION TO THE VICTORIAN ELECTRICITY DISTRIBUTION 2011-2015 PRICE REVIEW**

Responding to the draft Jemena Electricity Networks (Victoria) Ltd Distribution  
Determination 2011–2015

Submitted by:

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EziKey Group Pty Ltd (trading as WireAlert)

August 2010

## **Introduction**

Jemena, in its regulatory proposal dated November 2009, specifically made mention of the WireAlert product, namely seeking step change funding for a pilot of the device alongside all other current operating and maintenance (O&M) costs (section 9). The Australian Energy Regulator (AER) in its draft determination of June 2010 rejected Jemena's request for funding for a WireAlert trial (Appendix L, page 160). This was based, in part, on advice received from EnergySafe Victoria (ESV) which stated that additional funding was not required to meet compliance obligations under the Electrical Safety (Management) Regulations 2009 (Appendix L, page 158). The AER further noted (Appendix L, page 161) a lack of evidence provided by Jemena to support this funding request.

It is of significant concern to WireAlert that the advice from the ESV, and the draft determination by the AER, may be interpreted as a lack of support by those entities for the WireAlert technology. Contrary to that elucidation, high-level discussions held between WireAlert, the AER and the ESV suggest this is not the case. Appendix 1 of this submission, ESV's response to our request for support of a trial of the WireAlert device, is representative of the support for the WireAlert product.

Accordingly WireAlert seeks to address and correct that interpretation. Further, WireAlert believes that a full roll out of its technology in Victoria will produce a step change improvement in public safety, based on the results achieved in the Tasmanian rollout and trials across Australia. Demonstration of that expectation, via a pilot as proposed by Jemena, is consistent with the actions of many other Distribution System Network Providers (DSNP's) around Australia.

This submission seeks to outline the compelling case for the broad adoption of the WireAlert technology and to propose that the AER's draft Jemena Electricity Networks (Victoria) Ltd Distribution determination 2011–2015, as it applies to funding for a trial of that technology, should be reversed.

The submission will also provide background information in relation to the impaired neutral and active risks experienced by all DNSPs across Australia, the capability to mitigate that risk which the WireAlert technology provides, and the associated legal implications. The submission also provides an analysis of alternate solutions and funding offsets that can be achieved. Finally, the submission also articulates the community, business and public benefits that can be delivered by the WireAlert technology.

## **The safety issue**

The significant magnitude of the risk posed to the community by broken, or impaired, neutrals is well understood by the electrical supply industry, and is demonstrated by the death or injury of a number of people across Australia annually. Appendix 2 outlines a sample of the reported electric shock information that is publicly available. DSNP's and safety regulators around Australia receive thousands of shock reports each year. These can be a result of a broken or compromised neutral, which in combination with a poor or degraded earth, results in electricity seeking a different path of return, often through taps, pipes or other conductive item within the house. When humans come into contact with these items, the electrical current passes through them and can result in severe electric shock. Analysis of shock statistics suggests that even an average earth installation is insufficient to prevent shocks being experienced. Based on the Aurora Energy experience, the state of earths in a high number of residences are not effective, and cannot be relied upon as the "back-up" to compromised neutral wires supplied by the DSNP.

A broken or compromised neutral is not the only cause of potential risk to electricity customers. Poor household wiring, impaired active paths, and other failures within the distribution system have the potential to produce life-threatening issues in customers' homes and businesses. Risk assessments by the majority of DSNP's rank an impaired neutral path as one of the major public safety risks they face, along with pole failures and bushfires.

The electrical industry has been searching for some time for a solution to the impaired neutral issue. Until recently, there was no technology available to detect such a condition. Some DSNP's have developed either visual inspection or routine testing regimes to identify issues, neither of which provides effective mitigation, as they are "point in time". Tasmanian distributor Aurora Energy has invested significant resources in research and development, resulting in the WireAlert device. This technology has been successfully rolled out across Tasmania and has demonstrably achieved its objective in significantly mitigating and reducing the broken neutral risk. The technology identifies issues on the distributor's side from transformer to switchboard, high and low voltage supplies as well as having the added benefit of identifying a range of dangerous situations in customer household wiring.

## **Summary of the Jemena case**

Jemena's submission to the AER included a request to fund a pilot of the WireAlert technology. The submission did not include analysis of where potential savings or offsets could be derived from the pilot, nor did it seek to identify the potential for installation of the devices to offset future cost increases arising from, for example, obligations due to new or changed legislative requirements. Subsequently, the request was denied.

The expectation implicit in the decision to deny the pilot funding, that benefits must be demonstrated or justified before the trial, is counterintuitive. One objective of any trial is to seek to verify benefits that can then be incorporated into a subsequent business case or submission.

Decision-making processes within typical DNSP's involve substantial testing and proving of new technologies. Jemena have demonstrated a willingness to investigate new technology that can deliver improvements in their asset management capability and materially reduce the risk to customers.

It could be expected that the AER would endorse both the demonstration of the value of such technology, and the subsequent deployment of the technology. The decision to reject the funding of the proposed pilot would appear to suggest that DNSPs should be discouraged from seeking to investigate the merits of new technology, regardless of the potential benefits which, in the case of WireAlert, involve reduction in public risk at a very low cost or, depending on the DNSP's compliance regime and associated costs, at a reduction in net costs.

### **The Tasmanian experience and the role of the AER**

The successful trial and rollout of the WireAlert product in Tasmania and the resultant reduction of dangerous incidents has raised WireAlert's profile as a potential solution to neutral and active issues across all distribution low voltage systems. With their request for funding to pilot the WireAlert product on their system, Jemena are the only DNSP in Victoria to consider the legal precedents established by the success of the Tasmanian rollout.

The AER's response to the Jemena submission included the following:

*"However, the AER notes that neither Jemena nor SP AusNet provided any evidence from ESV that these actions would be required for their ESMS's to be assessed as adequate. The AER considers that if an ESMS could be assessed as adequate without requiring a particular action then that action is not a regulatory requirement".*

(AER draft decision, Victorian Electricity Distribution Network Service Providers Distribution Determination 2011-2015 Appendices June 2010, p.161)

The AER's judgement does not recognise the relevance of "industry best practice", whereby advances in processes, or technology, render existing procedures inadequate when it comes to establishing higher standards. The reality is that technology is now readily available, at minimal cost, which mitigates a risk borne by DNSPs for which there previously was no alternative. Periodic inspections (also known as point in time tests), which are mandated in Victoria and funded as part of participating DNSP's operating expenditures, are demonstrably inadequate in comparison to what current technologies can offer. Prudent asset management would appear to dictate that application of new technology which mitigates a risk, potentially deadly and reduces costs, should be mandatory.

### **Legal precedent**

Prior to rolling out the WireAlert technology, Aurora Energy sought seek legal advice as to how the technology should be viewed both from a Tasmanian and national perspective. Other DNSP's around Australia have also sought advice on their legal requirements relating to the WireAlert device. While each jurisdiction will have differing legislation in relation to the reduction of risk and

duty of care, in general there is recognition that action should be taken if a risk can be mitigated.

Under the Victorian *Wrongs Act (1958) Division 2 – Duty of Care* (enacted as the *Civil Liability Act* in most other states) three questions are posed relevant to the broken or compromised neutral issue and the WireAlert device:

- *Is the risk foreseeable?*

Yes, the incidence of customer harm due to issues with both the distribution network and customer wiring is well documented. Every DNSP receives hundreds of customer calls each year reporting shocks, tingles, or dimming lights. Three factors contribute to the risk of such incidents being extreme: an impaired neutral path, high impedance earth path (which exists in most residences to begin with) and sufficient load being used in the home. (By way of example, if the neutral becomes ineffective and a customer has an average earth of 8 ohms, and that customer turns on their toaster and their kettle, there will be approximately 160 volts present within their house. This is sufficient voltage to kill a person).

- *Is the risk significant?*

Yes, instances of death, injury, and damage to homes and their contents have resulted from high impedance issues (including those arising from ineffective neutrals) on distribution networks across the country.

- *Would a reasonable person (or entity, in this instance) have taken precautions in similar circumstances?*

Yes, Aurora Energy has led the way in researching, designing and providing a technology to all its customers to mitigate the risk.

It is also important from a regulatory and financial perspective that the response to the risk should not be disproportionate to the magnitude of the risk in cost, difficulty or inconvenience. Again, Aurora Energy, one of the smallest DNSP's in the nation, proved that this could be achieved in a reasonable timeframe, at a reasonable cost, with a reasonable level of effort to the business. At an average cost of \$50 per household incurred by Aurora Energy during their rollout of the WireAlert device, the financial outlay was well within the boundaries of reasonable expenditure given the significance of the risk posed to customers.

Against this business expense, various economic estimates for the cost of a life have been developed for use in risk mitigation and cost benefit analysis, available from the Australian Government Department of Finance, Office of Best Practice Regulation (*Best Practice Regulation Guidance Note – Value of statistical life*). Two alternative methods are provided being the average method or the cost per statistical year and the figures used reflect 2010-dollar value terms.

The average method places of value of \$3.7 million as the average cost of losing a life, while the value per statistical year is \$161,314. DNSPs, in considering the cost (or as noted, potential cost reduction) of implementing the WireAlert technology, are in a position to use that information when conducting their usual risk assessments. Using these estimates to provide an example, the economic cost of a 10-year child losing their life from an electric shock would be estimated at approximately

\$11.3m, more than the total cost of providing the device to every customer in Tasmania.

Some DNSPs have raised the issue that the effectiveness of the risk mitigation provided by WireAlert maybe flawed, given the active role required by customers, to plug in the device and notify the DNSP when an alarm is triggered. The decision by a small number of customers to not use the device as intended does not, however, relieve the DNSP of its responsibilities. On the contrary, legal advice received suggests that the DNSP needs to show that they provided a device, and have taken all reasonable steps to educate the customer of the risk. If the customer receives the device and still decides not to use it as advised, the DNSP has met its obligations and cannot be held fully liable for the implication of the customer's decision.

### **Alternative solutions**

Three alternatives are available to DNSPs to detect issues on the neutral and active paths into a residence. These are:

- Visual inspection programs (VI);
- Point in time testing at the switchboard (PIT); and
- WireAlert.

(note - DSNP's in Victoria are required to perform a PIT test to verify neutral integrity across their system once every ten years, and are funded to perform this activity).

Appendix 3 provides an overview of a case study performed in Tasmania to compare the results of the three available alternatives. In summary, these results clearly demonstrate that the WireAlert device is not only a lower cost alternative for DNSPs, in comparison to PIT testing or a VI program, it is also provides better customer outcomes overall.

### **Potential cost savings**

In addition to the potential cost savings noted above, the WireAlert technology can also reduce expenditure further. Aurora Energy's experience has seen it able to offset costs in other O&M and capital programs such as faulty fuse replacements, aged service replacement programs and visual inspection programs. Application of the technology allows the adoption of a "run to failure" strategy for a number of assets on the low voltage network that would otherwise not be possible.

DNSPs in Victoria face a particular challenge with neutral screen service cables, with significant replacement programs proposed to address this risk. Appendix 4 provides an example of the cost benefit analysis of using the WireAlert device to mitigate this risk, against the alternative replacement program. This analysis shows that WireAlert can be a lower cost option to managing the risk neutral screen service cable risks pose to the DSNP and ultimately, the customer.

## **Additional benefits**

The WireAlert technology provides a number of benefits in addition to mitigating the broken neutral risk:

- WireAlert is the only product or distribution strategy that can provide hourly assessments inside and outside the home. This 24/7 monitoring ensures that any changes to the system can be determined in a far shorter space of time than any other approach. This is particularly useful during times of storm or bushfire. With customers able to call in alarms, distributors can quickly identify issues on their system and put resolution plans into action in an appropriate timeframe, ensuring that the risk to customers during these times can be minimised.
- The device checks the house's internal wiring system as well as the distribution system. This internal analysis is a key tool in keeping customers safe. A customer's safety profile in their house can change quickly and dramatically, whether by their own wiring degradation, through the actions of others such as contractors or through the affects of nature, such as changing ground conditions where their earth stake is. In Tasmania, the device has revolutionised the way that plumbers and electrical contractors do their work and ensure the safety of the customer. Tasmania has multiple examples where a plumber, using PVC piping, has effectively destroyed the earth connection, which was bonded to the water piping of the house. Additionally, the education of the electrical contractors has risen, for example, in understanding the risks of creating long circuits in the house.
- Compensation payments made to customers due to shocks, house or content damage or loss of life can be significantly reduced.
- WireAlert includes functionality in addition to the broken neutral alarm device – it assists in collating data in relation to the asset low voltage base allowing the DNSPs to enhance asset performance. For example, Aurora has discovered low voltage asset issues simply by analysing information where multiple customers are receiving alarms in the same area.

## **The Aurora Energy Experience**

Aurora Energy did not consider it was appropriate to take a “do nothing” approach in relation to the inherent risk to the customer arising from broken or impaired neutrals.

The WireAlert device was trialled first by Aurora employees, then later rolled out to the Tasmanian community by late 2009. The device was found to have an initial 86% “plug in” rate by customers, and more importantly it provided Aurora with a testing regime that was far advanced of any other distribution network elsewhere in Australia, testing for changes in impedance conditions every hour, every day. That testing highlighted not only compromised neutral issues, but also active lines, switchboard issues, internal wiring, and quality supply issues.

210,000 devices were deployed to the Tasmanian community. Of the 2,017 faults identified to 31 July 2010 by the device:

- 44% were customer wiring faults;
- 26% were related to voltage fluctuations;
- 24% were active fault on the network; and
- 6% were neutral fault on the network.

Therefore, over half of all reported faults highlighted by the device were related to the distribution network. The risk profile of these faults was also analysed as part of this program and identified:

- 62% possibly dangerous safety issues;
- 33% dangerous electrical fire hazards; and
- 5% potentially lethal fault conditions.

Workplace Standards Tasmania actively endorses the WireAlert technology, while ESV is fully supportive and understanding of the need to perform technology trials, particularly given the potential to surpass the current PIT testing risk mitigation outcomes.

There are also expectations that with ongoing publicity campaigns over the next two to three years, the take up rate for WireAlert in Tasmania is likely to reach 90%. These campaigns will target customers who have not understood the benefit provided by the device.

## **Conclusion**

The current risk management strategies applied by most DNSP's throughout Australia for broken neutral issues are no longer industry best practice. The WireAlert device is the only currently available and tested technology that allows for immediate identification and prioritisation of high impedance issues on distribution networks, as well as operating as a safety mechanism within the home for customers.

Jemena have shown foresight in deciding to conduct a pilot of the device. The Jemena draft submission has recognised that since the technology for a superior loop impedance test now exists, their duty of care obligations have changed.

The AER's draft decision does not give adequate recognition to the change in duty of care obligations that the availability of the WireAlert device introduces or the benefits, including cost reductions, of the technology. Further, it fails to recognise the value of conducting trials in order to demonstrate the merits of new technology to both DNSPs and customers.



## Appendix 1 – Letter from Energy Safe Victoria



Our ref: G58013 / im

18 July 2010

Mr Greg Mannion  
Chief Executive Officer  
WireAlert  
GPO Box 2161  
Hobart  
TAS 7001

Dear Greg

### WIREALERT SAFETY DEVICE

Thank you for the recent presentation and explanation of the operation of the WireAlert safety device. As discussed, Energy Safe Victoria (ESV) supports in principle the introduction of new technology where it can be demonstrated that this results in improved safety outcomes.

From the material provided and its own assessment, ESV has formed the view that the WireAlert device would be effective in identifying potentially hazardous situations involving broken or high impedance neutrals. ESV considers that the installation of devices such as WireAlert would lead to improved safety outcomes.

ESV views the WireAlert device as emerging technology and considers that it would be appropriate to gain experience in the operation of the device on the Victorian network by conducting a trial.

Please contact Mr Neil Fraser on telephone (03) 9203 9771 should you have any further queries.

Yours sincerely

A handwritten signature in blue ink, appearing to read "Paul Fearon".

Paul Fearon  
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## Appendix 2 – Electric Shock Data in Australia

### South Australia

Extract taken from Annual Report of the Technical Regulator - Electricity 2008/09 (page 40)

[South Australian Technical Regulator Annual Report 2008/09 Link](#)

#### Total Shocks Reported

|                    | 2006/07    | 2007/08    | 2008/09    |
|--------------------|------------|------------|------------|
| Electrical workers | 45         | 31         | 42         |
| Other trades       | 20         | 162        | 21         |
| Employees          | 137        | 52         | 184        |
| General Public     | 590        | 714        | 598        |
| <b>TOTAL</b>       | <b>792</b> | <b>959</b> | <b>845</b> |

#### Major causes of shocks for 2008/09

|                                |     |
|--------------------------------|-----|
| Defective Insulation           | 13% |
| Direct contact with live parts | 21% |
| Electrical Faults              | 1%  |
| Electrostatic                  | 2%  |
| ETSA MEN                       | 51% |
| Inadequate circuit design      | 4%  |
| Lack of earthing               | 1%  |
| Loss of earthing               | 1%  |
| Other                          | 6%  |

## New South Wales

### **Energy Australia**

*Extract from Energy Australia's Annual Network Performance Report 2008-09 (pages 46-47)*

[Energy Australia Annual Network Performance Report 2008/09 Link](#)

Customer installation shock investigations in 2008/09 follow similar trends to previous years with two predominant causes:

- Failure of Part of Installation (23.95%), and
- Defective Neutral on Service Line (11.33%).

Shocks reported on customer premises:

| 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---------|---------|---------|---------|---------|
| 328     | 319     | 402     | 311     | 309     |

A trial of the "WireAlert" device that was developed by Aurora Energy and being rolled out in Tasmania will commence in early 2009/10. The WireAlert device is a supply-monitoring device that plugs into a power point and detects potentially dangerous situations arising from faulty neutral or earth connections. The trial will involve providing 2500 devices to customers and 500 devices to EnergyAustralia staff with older higher risk electrical installations.

## **Integral Energy**

*Extract from Integral Energy Annual Network Performance Report 2008-09 (pages 72-82)*

[Integral Energy Annual Network Performance Report 2008/09 Link](#)

### Prevention Initiatives Moving Forward

In 2009-10, Integral Energy will address key public electricity safety issues through 5 core programs. The programs include Member of Public Electric Shock to reduce the risk of customer/public worker electric shock from faulty neutral systems.

43% of the reported shocks were directly related to Integral Energy's Distribution Network.

Shocks reported on customer premises:

| 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---------|---------|---------|---------|---------|
| 253     | 274     | 223     | 203     | 194     |

1 fatality caused by supply failure at customer connection causing an open circuit at consumer's mains neutral.

## **Western Australia**

*Extract from Energy Safety Western Australia Bulletin Issue No. 49 January 2010 (pages 7-8)*

[Western Australian Energy Safety Bulletin Link](#)

Number of reported electrical shock for 2008-09 was 818.

Serious electrical related accidents (including shocks requiring medical treatment) per million population:

| 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---------|---------|---------|---------|---------|
| 23      | 15      | 10      | 21      | 18      |

## **Queensland**

### **Ergon Energy**

*Extract from Creating a Safer Community – Ergon Energy 2008/09*

[Ergon Energy Creating a Safer Community Brochure Link](#)

Tragically, each year people are seriously injured, or die, due to contact with electricity in their home and business, and in some cases through accidents involving our electrical assets.

There are hundreds of electric shocks each year and near misses – and everyone has the capacity to take someone’s life. In total, 439 community electrical incidents were reported in 2008-09, down from the 585 reported in 2007-08.

### ***Energex***

*Extract from Community Safety Plan – Energex 2009 (page 12)*

[Energex Community Safety Plan Link](#)

ENERGEX carries out a number of programs aimed at minimising risk to the community of electric shock arising from defective earthing components or neutral connectivity with an annual cost of over \$25 million. In conjunction with the continuous pole inspection program, ENERGEX verifies earthing on all electrical assets through a five-year cycle. This comprises a combination of visual inspection and electrical testing. In addition, ENERGEX conducts ongoing sampling activities to proactively identify areas, which may present systemic equipment failures in the future.

## Victoria

Extract from EnergySafe Victoria Annual Report (pages 48)

[ESV Annual Report 2008/09 Link](#)

|  | 2006-07 | 2007-08 | 2008-09 |
|--|---------|---------|---------|
| Electricity caused deaths                                | 2       | 1       | 1       |
| Electricity involved deaths                              | 2       | 0       | 0       |
| Electricity involved serious injury                      | 44      | 75      | 56      |
| Electricity involved non-serious injury                  | 670     | 753     | 614     |
| Electricity involved serious incident without injury     | 69      | 85      | 198     |
| Electricity involved non-serious incident without injury | 618     | 410     | 426     |
| Electricity related fires                                | 2844    | 3738    | 3261    |

\*note – causes of each category were not provided

Extract from Electrical Inspections Victoria, March 2007 Newsletter

[Electrical Inspections Newsletter Link](#)

### **BROKEN OR HIGH RESISTANCE NEUTRALS**

The most common electric shocks received are from water taps and earthed appliances. In the first instance these shocks are often extra-low voltage and the recipient only feels a sharp needle type prick. Consequently they are often dismissed or tolerated for a period of time until the voltage increases causing more serious physiological effects. Unfortunately putting it off will not fix the cause and the second shock may be the last.

Common causes are when a neutral begins to fail at the mains box connection, within an aluminium neutral screened service cable or supply authority pole junction box resulting in an increase in the neutral circuit resistance. This creates more current to flow in the earthing system (dependent on the resistance of the passage of current to ground) via the MEN connection. The earthing system then becomes live in relation to the general mass of earth. This is called earth potential rise and the voltage level is dependent on the circuit impedance and the circuit load at the time.

### **COMMON CAUSES OF NEUTRAL FAULTS**



Loose connection at Mains Box



Service rubbed thru by tree



Service rubbed thru by tree



Damage at roller bracket

Service rubbed thru by tree



Loose connection at pole

## Tasmania

*Extract from Workplace Standards Tasmania publication Connections Issue 1 February 2010 (page 7)*

### [Workplace Standards Tasmania Connections Link](#)

In the last 12 months, Aurora Energy compliance inspectors attended to more than 330 shocks complaints. Many of these were a result of defective neutral or earthing systems.

If the high impedance of an electrical circuit is created by a break or high impedance in a main neutral (or submain with a downstream MEN) then the earthing system via the MEN point attempts to carry the circuit current. In the majority of cases, the earthing system via the earth stake (or metallic piping) is too high a resistance to permit the correct current to flow. Subsequently, every metallic object (including switchboards, equipment and metallic pipes) connected to the earthing system can rise in potential (with respect to the general mass of earth/ground). A shock can be received if a person touches any conductive part connected to the earthing system and another conductive item that is not at that same potential as the current seeks any fortuitous return path. There is a misconception at times that the earthing system will carry the current when the neutral cannot. The reality is that with the sometimes ineffectiveness of an earth stake and many modern installations using non-metallic water piping, the earthing system can not pass sufficient current to operate the protective device. Subsequently, there is no automatic disconnection of supply and the earthing system sits there live. Unfortunately, these shocks can be sufficient enough to be fatal.

NOTE: Please encourage all home occupants to plug in their WireAlert provided by Aurora Energy.





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## **APPENDIX 3 - COMPARISON OF METHODS OF DETECTING ISSUES WITH SUPPLY OF ELECTRICITY TO RESIDENCES**

### **TASMANIAN CASE STUDY**

This case study outlines a comparison of the effectiveness of the currently available methods of testing the integrity of the electricity supply to a low voltage resident. Recently, Aurora Energy distributed 210,000 WireAlert devices to every customer in Tasmania. The resulting alarms have been analysed to assess if another method would have been as effective in detecting the issues uncovered by the device.

#### Methods of testing currently available and used in this study

- Point in time (PIT) test at the switchboard (using Victorian standard testing procedure);
- Visual inspection regime (VI); and
- WireAlert device (WA).

#### Assumptions made in the case study

- PIT and VI would be completed over a 10 year period;
- PIT cost is \$100 per inspection;
- VI cost is \$20 per inspection;
- WireAlert device cost is \$50 for full roll out (this is the actual amount spent by Aurora);
- WireAlert device life is 10 years; and
- WACC used by AER is 7%.

### Methodology used to conduct this case study

- All alarm reports from Aurora Energy’s WireAlert roll-out over a twelve month period were analysed to determine the cause of the alarm;
- All faults were also classed as pre-existing or degrading assets depending on when they were identified;
- An assessment was then made on whether such an issue could have been determined by a PIT or VI regime;
- Although network load is required to identify some faults (eg. hot joints) it was assumed the load was favourable during PIT and VI tests (which isn’t normally the case when these tests are conducted);
- Given no earth readings were provided by the reports, our database of earth readings were used to establish the average earth readings, and then applied to the case in the study; and
- The above assumptions were then applied to establish over results on effectiveness, cost, and risk reduction.

### Results of the Study

| WireAlert vs Point in Time vs Visual Inspection              |        |      |     |
|--|--------|------|-----|
|  | WA     | PIT  | VI  |
| Neutral faults found over one year                           | 82     | 8    | 1   |
| Active faults found over one year                            | 396    | 21   | 1   |
| Customer installation faults found over one year             | 728    | 4    | 0   |
| Supply voltage issues (<200V or >270)                        | 360    | 0    | 0   |
| Number of tests per installation over ten years              | 87,000 | 1    | 1   |
| Distributor risk reduction over one year                     | 85%    | 5%   | <1% |
| Cost to cover over ten years (\$ millions)                   | 10.0   | 21.0 | 4.2 |
| Cost to customer through tariff prices – year 1 (\$millions) | 1.7    | 2.1  | 0.4 |

|   |     |           |     |
|---|-----|-----------|-----|
| Cost to customer through tariff prices – year 10 (\$millions)                                   | 1.0 | 2.1       | 0.4 |
| Chances of testing an installation after a spontaneous network fault. (ie weather related etc.) | 85% | 0.000095% |     |

Primary findings of the study

- In relation to neutral faults, neither PIT nor VI could have detected a large percentage of cases as they only test 10% of the installations per year. PIT would also miss a large number of degrading assets that may be under the failure threshold at the time of test. VI would only pick up broken or obvious defects on the neutral, of which a very small component make up the number of actual alarms;
- In relation to active faults, neither PIT nor VI could have detected a large percentage of cases as they only test 10% of the installations per year. PIT would also miss a large number of degrading assets that may be under the failure threshold at the time of test. VI would only pick up obvious defects on the active, of which a very small component make up the number of actual alarms;
- Both PIT and VI perform poorly in detecting degrading asset faults due only completing one test at the installation over ten years;
- WireAlert is constantly monitoring the residence, and therefore has a significantly better chance of identifying degrading asset faults or workmanship issues; and
- Based on the assumptions used in this case study WireAlert also has a much better chance of picking up load related issues (ie hot joints) compared to either PIT or VI regimes.

## APPENDIX 4: SOLVING THE NEUTRAL SCREEN SERVICE CABLE RISK



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### ASSUMPTIONS

- Distributor has 100,000 neutral screen cables and has a program to replace them all over 10 years;
- Assume failure rate is 5%;
- Assume replacement cost is \$750 per cable;
- Assume 90% take up of WireAlert plug in; and
- Switchboard device available 5 years from now which detects all issues.

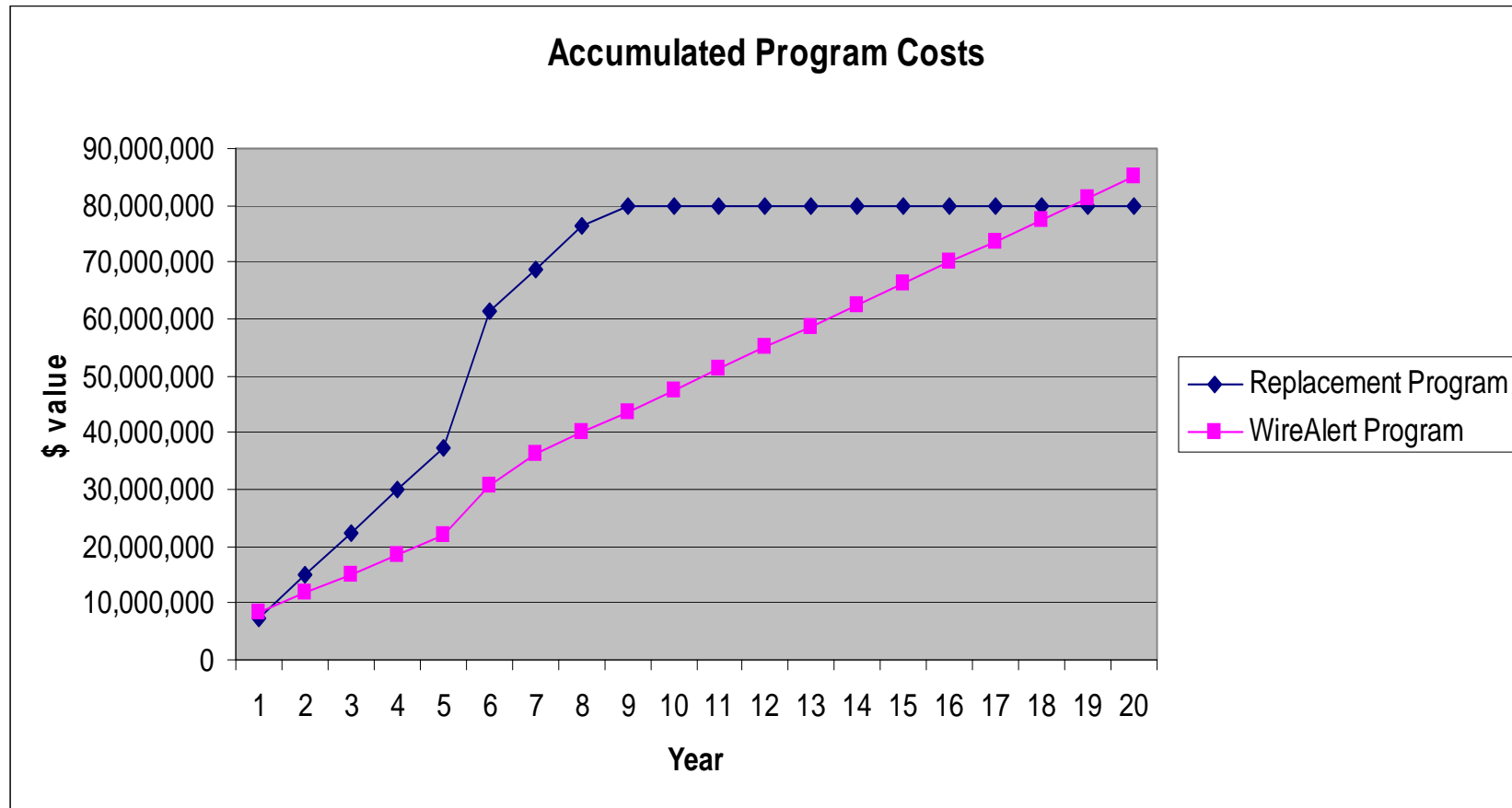
### CURRENT PROGRAM

- In year one, the DNSP replaces 10,000 cables, of which 500 are defective. They spend \$7.5m and replace 9,500 “good cables” and still have 4,500 defective cables remain posing a risk.
- In year two, the DNSP replaces 10,000 cables, of which 950 are defective. They spend \$7.5m and replace 9,050 “good cables” and still have 8,050 defective cables remain posing a risk.
- Year 6 a switchboard technology is available which detects all undetected issues and requires replacement in that year.

### WIREALERT PROGRAM

- 90% of customers plug in WireAlert device, or 90,000 customers.
- In year one, the device detects and the DNSP replaces 4,500 of the faulty cables and 500 remain posing a risk. The cost is \$6m for the roll out and \$3.4m to replace the faulty cables.
- In year two, the device detects and the DNSP replaces 4,500 of the faulty cables and 1,000 remain posing a risk. The cost is \$3.0m to replace the faulty cables.
- Year 6 a switchboard technology is available which detects all undetected issues and requires replacement in that year.

# CASHFLOW AND NPV



|             | Replacement Program | WireAlert Program |
|-------------|---------------------|-------------------|
| TOTAL SPEND | \$80,000,000        | \$85,000,000      |
| NPV         | \$50,775,014        | \$38,834,315      |

# RISK PROFILE – Number of faulty units in field

