**Regulation and business strategy** 

# Report – Capital Expenditure Victorian Electricity Distribution Revenue Review Revised Proposals

A report to the AER

**Public - Final Report** 

26 October 2010

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Nuttall Consulting does not take responsibility in any way whatsoever to any person or organisation other than the AER in respect of information set out in this report, including any errors or omissions therein, arising through negligence or otherwise.

# **10** Appendix G – Unit cost review

This appendix addresses the review of unit costs for works that have been recommended by Energy Safe Victoria (ESV).

In response to regulatory changes, the Victorian Bushfires of 2009 and the Bushfire Royal Commission report, the DNSPs have identified a range of new or increased activities. The ESV has reviewed these activities and provided the AER with a recommendation as to the volume of works that are required by each business.

The ESV has also provided volume recommendations related to changes to regulatory obligations including the safety management scheme and line clearance. The unit costs of these items are also discussed in this section.

The AER has requested that Nuttall Consulting review and advise on the unit costs associated with these volumes.

### **10.1** CitiPower

CitiPower has proposed additional work volumes and unit rates associated with the introduction of the Electricity Safety (Electric Line Clearance) Regulations 2010. These regulations contain a number of changes to the way the DNSPs undertake their business activities.

#### 10.1.1 Electricity Safety (Electric Line Clearance) Regulations

CitiPower is claiming additional expenditure due to changes to the Electricity Safety (Electric Line Clearance) Regulations:

- removal of LBRA clearance exemptions
- reduced clearances for insulated conductors
- environmentally or culturally significant (native) trees.

ESV has supported the need for additional work activity in each of these three areas.

The Nuttall Consulting assessment of the unit costs associated with the above additional works are provided in the following sections.

The total value of the additional vegetation management expenditures proposed by CitiPower is \$6.53 million over the next regulatory period. This represents a 130% increase compared with current vegetation management costs<sup>397</sup>.

397

#### **10.1.1.1** Maintenance of the Clearance Space – LBRA

Clause 11 of the Electricity Safety (Electric Line Clearance) Regulations 2010 (the Code) establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 regulations<sup>398</sup>. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 regulations. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

states that maintenance of the increased clearances will involve additional work in the nature of more spans to be cut relative to the cutting undertaken under the 2005 Code and more aggressive cutting of trees in spans.

estimates that there are 3,000 spans in the CitiPower network which will need to be cut due to the removal of the allowance under the 2005 Code for reduced clearance spaces for powerlines other than ABC or insulated cables<sup>399</sup>.

CitiPower is proposing that compliance with the revised clearance spaces will be established in 1 year.

For the remaining years of the next regulatory period, **control** estimate that there will be 1,800 spans each year which will require cutting to maintain the required clearance spaces.

has used a unit rate of a span in calculating the cost to comply with clause 11. This rate has also been used by a span in determining the equivalent unit rate for Powercor.

The equivalent unit rate proposed by **Exercise** is **per span for both LBRA and HBRA** areas. **Interview** is proposing an annual program for vegetation management of HBRAs and this will result in a reduced cost per span due to the lesser regrowth time.

is proposing a unit rate of per span for LBRA areas.

is also proposing a unit rate of per span for LBRA areas.

Nuttall Consulting notes that **and the same unit cost for the exemption** removal for CitiPower as for Powercor. **Consultation** notes elsewhere that urban areas are more likely to incur consultation and complaints than rural areas. It is not clear why **consultation** has assumed that the unit costs associated with the exemption removal are the same for both companies. One possible explanation is the longer travel times required to get to worksites in rural and remote areas.

The CitiPower/Powercor unit costs are considerably higher than those of the other Victorian DNSPs.

<sup>&</sup>lt;sup>398</sup> Electricity Safety (Electric Line Clearance) Regulations 2005

<sup>&</sup>lt;sup>399</sup> CitiPower does not have any designated High Bushfire Risk Areas (HBRA).

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with the removal of the 2005 Code exemptions is \$210 per span<sup>400</sup>.

#### 10.1.1.2 Reduced clearances for insulated conductor - ABC

The unit costs associated with reduced clearances for insulated conductors relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. CitiPower has identified two asset types that are impacted by the changed regulations: Aerial Bundled Conductor (ABC) and service lines. CitiPower have also identified annual and bi-annual clearing requirements associated with the Electricity Safety (Electric Line Clearance) Regulations.

In support of the additional costs, CitiPower has provided a <sup>401</sup>. <sup>401</sup>. <sup>401</sup> are the current providers of vegetation management services to Powercor and CitiPower. Nuttall Consulting notes that **and any continue to provide vegetation management services to CitiPower and** Powercor. This means that **are likely to be contracted to deliver the additional workloads described in the and are likely to be contracted to deliver the additional where possible to identify third party estimates of the unit cost of meeting these obligations.** 



In 2009 CitiPower incurred costs of per span. However the CitiPower information is not clear as to whether this included the cost of clearing for services or not. If so, this would reduce the cost per span considerably.

400 Noting the rate may be lower due to annual cutting. 401

<sup>402</sup> Bid p22.

<sup>&</sup>lt;sup>403</sup> Powercor and CitiPower response Step change Electricity Safety.pdf. Dated1 September 2010.

Nuttall Consulting notes the higher customer density of the CitiPower franchise area and the associated traffic management costs that are inherent with this territory. Nuttall Consulting also notes that the **second** unit rates provided are considered by **second** to be conservative.

Unit rate information provided by **Particular** identified costs associated with an elevated work platform and 2 crew to be **Particular** per hour. The cost associated with a wood chipper<sup>404</sup> vehicle and two crew was estimated at **Particular** per hour. These values suggest that CitiPower is estimating that the clearing of an ABC span will require in excess of 1 hour per span for both crews. Nuttall Consulting does not consider that the clearance of a single span of conductor would require both crews for more than an hour; particularly the chipper vehicle.

The **determinant** assessment of the number of LV spans does not appear to differentiate between stand-alone spans of ABC and those spans that are run on the same poles as other conductors. The CitiPower network is one of the most densely populated network areas in Australia and has a very significant proportion of poles with multiple circuits. The reduced costs associated with the clearing of ABC that is on the same span as another circuit does not appear to be recognised or considered by the **determinant**.

The **Sector** also assumes an average span length of 50m for insulated conductor. This assumed span length is actually 25% greater than the actual average span length. The identifies that CitiPower has 191km of ABC and 4,703 spans. This works out as an average of 40.6m per span. The reason why the longer span assumption was used when actual span length information was available is not clear. The assumption of a 25% increase in average span length would presumably impact the **Sector** assessment of cost per span.

CitiPower was requested to describe the level of scale efficiencies adopted in forecasting these costs. The CitiPower response to this question was: "Refer to sections 82 to 143 of the Witness Statement."<sup>405</sup> This reference is to the whole of the witness statement concerning insulated cables and does not contain any specific reference to scale efficiencies.

CitiPower was also requested to "describe and justify the savings that the DNSP anticipates associated with the 2010 Electric Line Clearance regulations". CitiPower responded that "There are no savings anticipated due to the omission of reduced clearances for aerial bundled and insulated cables"<sup>406</sup>.

Nuttall Consulting notes that CitiPower is proposing to more than double (130% increase) the amount of expenditure on vegetation management. Given the compact territory of the CitiPower franchise, it is difficult to see how scale efficiencies would not be reasonable and significant when more than doubling the current level of activity.

<sup>&</sup>lt;sup>404</sup> Vehicle for turning the cut vegetation into woodchips and transport of woodchips.

 <sup>&</sup>lt;sup>405</sup> Powercor and CitiPower response Step change Electricity Safety.pdf. Dated1 September 2010.
 <sup>406</sup> Ibid

CitiPower was requested to quantify the impact that the step changes proposed would have on fault and emergency opex. In response, CitiPower stated that "The 2005 Regulations and HBRA/LBRA Exemption have been successful in establishing an achievable and practicable regulatory regime which does not compromise on safety. Consequently, there would appear to be significant costs and little community benefit, safety or performance justification for the change in the Regulations and the removal of the Exemption."<sup>407</sup>

Nuttall Consulting does not agree with the CitiPower position that there will be no impact on reliability outcomes from more than doubling the amount of expenditure associated with vegetation management. The trimming of vegetation has been proved to reduce vegetation related outages and also reduce damage to the network assets from contact and abrasion. The removal of more vegetation adjacent to powerlines will therefore have a resultant impact on vegetation related outages and network asset integrity. Nuttall Consulting recognises that the incremental removal of vegetation will have a lesser impact than the original trimming requirements.

Noting that CitiPower has applied the same unit rate for the clearance of insulated conductor (per span) as it has for the removal of the LBRA exemptions, it is reasonable to compare the CitiPower removed exemption unit rates with those of Jemena, United Energy and SP AusNet. The equivalent unit rate proposed by **Security** is **Security** per span.

Based on the above considerations, the CitiPower proposed unit rate of per span is not considered efficient. Nuttall Consulting recommends a unit rate of \$210 per span as an efficient average unit rate.

#### **10.1.1.3** Reduced clearances for insulated conductor - Services

The unit costs associated with reduced clearances for insulated conductor relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. CitiPower has identified two asset types that are impacted by the changed regulations: Aerial Bundled Conductor (ABC) and service lines.

has calculated that the average unit rate per service line would be **100**, in either the annual initial cut or for ongoing recuts. This cost includes the cost of the cutting and clean-up of vegetation required as a result of the omission of clauses 9.2.1, 9.2.2 and 9.3 of the 2005 Code from the 2010 Code. The information provided by CitiPower did not provide any further breakdown of these costs or time required for the proposed works.

also assessed the unit cost per service for compliance with the Electricity Safety (Electric Line Clearance) Regulations to be for Powercor. Considered that there were likely to be

407 Ibid

In comparison, the initial cut and the initial cut and the initial cut cost of the initial cut cost comprises and the ongoing recuts are costed at the initial cut cost comprises and the ongoing recuts are costed at the initial cut cost comprises and the ongoing recuts are costed at the initial cut cost comprises and the ongoing recuts are costed at the initial cut cost comprises and the ongoing recuts are costed at the initial cut cost comprises and the initial cut cost comprises are costed at the initial cut cost comprises and the initial cut cost comprises are costed at the initial cut cost compri

as with an ongoing rate of the per service.

has also estimated the unit rate for the initial establishment of clearance space as with an ongoing rate of the per service.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for a four-fold increase in ongoing service recuts in the CitiPower and Powercor areas.

The man-hour assessments provided by SP AusNet appear reasonable, as do the assumptions in relation to approximate times and crew numbers.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate for clearance of CitiPower insulated services to comply with the Electricity Safety (Electric Line Clearance) Regulations are as follows:

- initial clearance of services: \$94.66
- ongoing clearance of services: \$47.40.

Nuttall Consulting is recommending the higher initial clearance rate for CitiPower based on the **second** observation of increased consultation and complaints in more highly urban areas.

#### **10.1.1.4** Environmentally or culturally significant (native) trees

Clause 2(3) of the 2010 Code requires that a responsible person must, as far as practicable, restrict the cutting or removal of native trees or trees of cultural or environmental significance to the minimum extent necessary to ensure compliance with the 2010 Code.

The cost impact of clause 2(3) on CitiPower arises from the requirement in respect of native trees. There was no provision in the 2005 Code that restricted the cutting or removal of native trees.

has proposed a unit rate of per span in calculating the cost of complying with clause2(3) of the 2010 Code. This represents the average cost per span of the additional work activity required as a result of the restriction on the ability to remove native trees introduced by the 2010 Code.

The unit rate for CitiPower of **cuttor** is higher than that for Powercor of **cuttor** based on the higher number of customer complaints and objections that are likely in CitiPower's predominantly urban network.

Jemena, United Energy and SP AusNet have not requested additional expenditure in relation to this obligation. As such, there are no costs to benchmark the CitiPower or Powercor unit rates against.

CitiPower and Powercor have not provided a breakdown of the proposed unit costs, so it is not possible to assess how the final unit rates were arrived at.

Neither the ESV assessment<sup>408</sup> or the CitiPower and Powercor information provide any indication of the sort of work that is anticipated to be undertaken in this cost category.

CitiPower and Powercor were requested to provide a detailed description of the physical change in work practices and other physical requirements relating to each area of change relating to the Electricity Safety (Electric Line Clearance) Regulations. The CitiPower and Powercor response referred to sections 170 to 181 of the **Electricity**. These sections do not provide any quantification of the costs that are used as inputs to the unit rate. Nuttall Consulting does not consider that the CitiPower response is adequate. The CitiPower response does not provide a detailed description of the unit cost.

In the absence of a clear explanation of what constitutes the unit rate, it is not possible for Nuttall Consulting to comment on whether this rate is efficient or not.

Nuttall Consulting notes that the **exercise** information relating to native trees or trees of cultural or environmental significance does not identify a cost reduction associated with the halt on the removal of this vegetation.

## 10.2 Jemena

Jemena is claiming addition expenditures for the next regulatory control period associated with the Electricity Safety (Electric Line Clearance) Regulations 2010. The main areas of additional expenditure are as follows:

- Strategic program expenditures
  - ESMS Process Compliance Costs
  - Replacement of Non-Preferred Services

<sup>&</sup>lt;sup>408</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, ESV, 14 September 2010

- Installation of Neutral Condition Monitors
- Removal of Public Lighting Switch Wires
- Ground Fault Neutralisers and Removal of SWER
- Pole Top Fire Mitigation
- Pole Top Replacement (Age & Condition)
- Pole Replacement
- Overhead Conductor Replacement
- HV Installation Replacement
- Distribution Substation & Overhead Switch Maintenance
- Zone Substation Asset Conditioning Monitoring
- Zone Substation Transformer Replacement
- Zone Substation Circuit Breaker Replacement
- Electricity Safety (Electric Line Clearance) Regulation expenditure
  - Maintenance of the Clearance Space
  - Notification & Consultation
  - Service Line Clearance
  - Habitat Trees
  - Hazard Trees

Each of these expenditure items are covered in the following sections.

#### **10.2.1** Strategic planning expenditures

Jemena has prepared a number of strategic planning papers targeted at specific asset classes. The papers identify additional expenditures associated with changes to the historical approach to managing these assets. The individual review of the ESV approved volumes for these strategies are considered below.

The ESMS compliance assessment has been grouped in this category for the sake of simplicity.

#### **10.2.1.1** ESMS Process Compliance Costs

Jemena has identified the need for additional resources to meet its obligations under the new Electricity Safety (Management) Regulations. These regulations require Jemena to submit a risk-based Electricity Safety Management Scheme (ESMS).

ESV notes that the additional resources claimed by Jemena equate to less than 1 additional FTE over the five year period. ESV does not consider the level of resources to be material.

The following table provides the summary costs associated with the revised obligation.

Table 82 - Jemena	process	compliance cos	ts
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	2011	2012	2013	2014	2015
Jemena process compliance	\$257,204	\$166,068	\$166,068	\$166,068	\$186,321

The Jemena unit rates are based on an internal labour rate of per day. Nuttall Consulting notes that this is a relatively high rate and equates to an annual salary of approximately **based**. This level of remuneration is more consistent with a senior management or executive role, rather than a technical or administrative role.

On this basis, Nuttall Consulting recommends an annual FTE rate of \$150k.

#### **10.2.1.2** Replacement of Non-Preferred Services

Under its ESMS, Jemena is proposing a planned replacement program for non-preferred services. ESV noted that the need for the program was identified in the risk assessments conducted by Jemena in preparing its ESMS. The replacement of neutral screen services has been identified as a priority by the industry for more than a decade. The previous owner of the Jemena franchise area (AGL) identified that "particular attention" would be paid to neutral screen service replacement in 2004<sup>409</sup>.

ESV note that the need for the program is supported by Jemena's statistics arising from defects detected during its Neutral Service Testing program and through the increasing trend in electric shocks reported by the public.

The majority of issues relate to neutral screened and twisted service cables. Both of these types of service cable are reaching the end of their service life and present levels of risk that require attention. ESV strongly supports the need for the proposed replacement program, which is expected to take 15 years.

The ESV supports the planned non-preferred service replacement and height replacement of services, but not the fault replacement. The ESV considered that fault replacement represented business as usual practice.

Nuttall Consulting notes that both the non-preferred service replacement and the height replacement programs are ongoing. It will be necessary to assess the historical volumes of service replacements and deduct these from the proposed replacement programs to determine the incremental volumes for the next regulatory period.

Jemena has proposed a unit rate for service replacement of

Nuttall Consulting has reviewed the proposed replacement cost of **per service**. The proposed per unit rate of **per service** is not consistent with current Jemena prices to provide a new service. The new service and meter price charged by Jemena is currently **per service**.

<sup>&</sup>lt;sup>409</sup> 2006 Electricity Distribution Price Review Submission By AGL Electricity Limited, 2004, page 49.

This service includes the installation of a service (single phase) and meter and will typically involve greater travel distances between jobs than a programmed replacement schedule.

An efficiently run replacement program would be undertaken to minimise travel time through undertaking all replacements within close proximity to each other where possible. As these services were often installed as suburbs were developed, many will be in adjacent houses.

The current **charges** to install a temporary single phase service is **charges** and this includes the disconnection and removal of the service at a later date. The cost for a temporary service installation with a coincident disconnection is **charges**. This is essentially the same physical requirements as for a service replacement, with the additional costs of connecting a meter.

Nuttall Consulting notes that a percentage of neutral screen services may be three phase and that the connection time for these services may be a little longer than for a single phase service. The cost of the service materials may also be slightly higher.

To allow for the slightly higher three phase costs, Nuttall Consulting recommends a per unit amount of \$160 for each service replacement.

#### **10.2.2** Installation of Neutral Condition Monitors

Jemena has proposed a program to trial the effectiveness of a neutral condition monitor that will continuously monitor the integrity of the supply neutral, and provide an alarm when the integrity of the neutral is compromised. The aims of the program are:

- to trial the effectiveness of the monitors in the Jemena territory
- to target areas with high Neutral Screen Testing (NST) failure rates/public reported shocks
- to provide a targeted education campaign.

Jemena proposes to install 5,000 neutral condition monitors for each year of the forthcoming regulatory period, giving a total of 25,000 for the period.

The ESV supports the trial program.

Nuttall Consulting understands that the Neutral Condition Monitors are also commonly referred to as "WireAlert" monitors and, in Tasmania, as "Cable PI".

Jemena has provided a unit costs of per neutral condition monitor<sup>410</sup>.

The distributors of WireAlert made a submission to the AER indicating a unit cost of \$50<sup>411</sup>.

In the absence of any additional information, Nuttall Consulting concludes that the proposed per unit cost of **second** is reasonable.

<sup>&</sup>lt;sup>410</sup> Jemena Electricity Networks (Vic) Ltd Revised Regulatory Proposal 2011-2015, Appendix 8.36, Strategic Planning Paper - Trial of Neutral Condition Monitor - 20 July 2010

<sup>&</sup>lt;sup>411</sup> 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: Greg Mannion, Chief Executive Officer EziKey Group Pty Ltd (trading as WireAlert) - August 2010

#### 10.2.3 Removal of Public Lighting Switch Wires

As identified by the ESV, public lighting switch wires have been largely redundant since the mid 1980's as lighting control was transferred to photo electric switching. On the Jemena network, the switch wires were not removed when luminaires were replaced and in many places have still remained in place for over 30 years as an unmaintained asset.

Jemena has opportunistically removed switch wires during other programmed work, but it is estimated that around 5,100 spans remain on the Jemena network (based on experience). The presence of unmaintained switch wires represents a hazard (there have been several fatalities and near misses) and ESV strongly supports Jemena's program to remove the remaining spans of switch wire on a planned basis.

The ESV supports this program.

The Jemena proposed approach to switch wire removal is to:

- continue and reinforce the opportunistic removal of switch wire during major maintenance
- identify the extent and presence of switch wire during the 4 yearly pole and line inspections
- remove the remaining sections of obsolete public lighting switch wire over a three year period to 2015. This is expected to require one line crew with traffic control for approximately 50% of the time over a three year period and would be co-ordinated with major maintenance and renewal activities as far as practicable.

Nuttall Consulting has assessed the per unit requirement for switchwire and concludes that the costs of a crew and traffic management for half a year for three years is reasonable. This provides a unit rate of approximately per span.

Switchwires are typically uncovered copper, steel or aluminium conductors. These materials have a positive value when sold as scrap, particularly copper. Jemena has not identified a recovery price for these materials.

The size and the type of the switchwire conductors is not known. It would be necessary to know the lengths, gauge and type of conductors to determine the recovery value of the materials.

Jemena also identifies that there are costs of leaving the unmaintained asset on the network. These include the costs of failure of the asset as well as the time required to identify and make safe the switchwire every time a crew is working on or near these assets.

Nuttall Consulting considers that the unit rate identified (implicitly) by Jemena of per span is a reasonable unit rate for this work. However, the unit rate does not recognise the benefits of removal of this asset as identified by Jemena.

#### **10.2.4** Ground Fault Neutralisers and Removal of SWER

Jemena is proposing the removal of the remaining SWER lines in its service territory and the installation of Ground Fault Neutralisers (GFNs) in zone substations.

The ESV supports the volumes proposed for both of these works. These are the replacement of 13km of SWER and the installation of GFNs in three zone substations.

Jemena has provided the following unit rates to support the cost build up for this project.

#### Table 83 – GFN and SWER unit rates

Area	Item	Unit	Source	Unit rate
Zone Substation	GFN Unit	Per installation	FSH Actual Project	
Zone Substation	Directional Relays	Per relay	Benchmark Price	
Zone Substation	Unearth Cap Bank	Per cap bank	FSH Actual Project	
Zone Substation	Other Costs	Per installation	FSH Actual Project	
Distribution Network	SWER -Line	Per km	Benchmark Price	
Distribution Network	SWER -Tx	Per km	Benchmark Price	
Distribution Network	SA – Replace	Per 3 phase set	Benchmark Price	
Distribution Network	SA -Retire	Per 3 phase set	FSH Actual Project	
Distribution Network	Other Costs	Per installation	FSH Actual Project	

Jemena states that they have also verified the pricing used to establish these unit rates and that actual costs have been back-calculated from an already complete GFN installation.

Nuttall Consulting has assessed the unit rates against the unit rates contained in the DNSP RIN submissions. Although not directly comparable in many cases, Nuttall Consulting considers that the proposed unit rates fall within the reasonable range of expected costs.

Nuttall Consulting recommends the following unit costs:

- \$175,000 per km of SWER replacement
- \$1.7m per zone substation for GFN installation.

Nuttall Consulting notes that the following unit rate does not make allowances for any of the following benefits:

• Bush fire start risk reduction - Significant reduction in the size of the phase to ground fault level reduces the risk of arcing for a conductor on ground and

therefore reduces fire start risk. This will result in less fault and emergency work for Jemena and reduced claims.

- Improved safety Significant reduction in the size of the phase to ground fault current reduces step and touch potentials during fault conditions.
- Improved reliability The self-extinguishing capability of the GFN for transient faults will see a reduction in MAIFI. Jemena has valued this at \$10k per annum per zone substation. The reduction in fault current will also have an impact through reduced wear of circuit breaker contact points and less strain on line fittings and fixtures. This value was not quantified by Jemena.
- Surge arrester end of life Surge arrestors need to be replaced at their end of life. Upgrading surge arresters to cater for GFN operation will defer the need for the next replacement. Jemena has valued this at \$75k per annum per zone substation.
- SWER constraints Many SWER systems have significant constraints in terms of voltage and capacity. Retiring the SWER will alleviate these constraints. This value was not quantified by Jemena.
- Standardisation Removal of SWER will mean that spare parts for this type of network will no longer be required. This value was not quantified by Jemena.

#### **10.2.5** Pole Top Fire Mitigation

Jemena is proposing a targeted program for reducing the incidence of pole top fires. The Jemena program of targeted inspection and replacement involves the refurbishment of HV and subtransmission pole top structures, including inspection, cleaning, tightening and replacement of crossarms and insulators where there is evidence of deterioration, charring or burning.

Jemena's 2011-2015 Capital and Operating Works Plan identifies a total of pole fire mitigation over the period 2011 to 2015. This allows for the targeted replacement of approximately 3,000 pole top structures.

The unit rate for this activity is calculated at per pole top structure. Nuttall Consulting considers that this is a very high rate for the described works. Mitigating this cost is the non-sequential nature of the replacement. Jemena's description of the proposed program is that it will be based on inspections and driven by observed condition triggers. On this basis, pole tops will be replaced in a relatively sporadic fashion with limited ability to aggregate and gain efficiencies through adjacent works.

In these cases, the majority of unit costs may relate to labour and vehicle requirements, rather than the material costs.

Based on the above, Nuttall Consulting considers that the proposed unit rate of reasonable.

Nuttall Consulting notes that this unit rate does not account for the following items:

- The reduction in emergency maintenance (identified by Jemena as \$5,227 in the next regulatory period).
- The reduction in "pole fire events (that) have caused widespread impact on network performance and exposed JEN to significant potential reliability penalties (in the order of \$1.9m in 2008)"<sup>412</sup>.

#### **10.2.6** Pole Top Replacement (Age & Condition)

Jemena proposes to replace crossarms in targeted areas based on their age and condition, to achieve a reduction in the number of pole fires. This program has been considered in conjunction with the pole top fire mitigation program discussed in the preceding section.

This Jemena program is aimed at reducing the risk of fire initiation, reducing the number of pole fire related interruptions, reducing the risk of electrocution/injury to the public and reducing the risk of high voltage injection.

Jemena is proposing to replace an additional 14,117 cross-arms (and associated assets) in the next regulatory period. The ESV supports these work volumes.

To assess the unit costs that Jemena has used to produce its capex forecast for this item, we have undertaken a comparative analysis exercise using:

- the replacement units costs provided by the DNSPs for the repex modelling exercise
- derived historical actual and forecast unit costs from the relevant pole top activity codes, which were provided by the DNSPs and used in our RQM review.

Based upon this analysis, the Jemena unit costs appear high based upon a number of comparisons:

- Jemena's unit costs are much higher than other DNSP's unit costs provided for our repex modelling exercise
- Jemena's unit costs are 2<sup>nd</sup> highest, based upon the forecast activity code data
- Jemena's average forecast unit costs are approximately 30% greater than its historical average, based upon the activity code data.

However, counter to this:

- it is noted that the Jemena historical average is much lower than other DNSPs equivalent historical average, possibly indicating this is not a reasonable metric to compare its costs
- Jemena's average forecast unit costs are near the lower end of the historical average of other DNSPs only Powercor appears lower.

Based upon the above, we consider there is still a good case to reject the Jemena unit costs, and consider that the unit costs should be reduced by 15%. This brings Jemena's

<sup>&</sup>lt;sup>412</sup> Jemena Electricity Networks (Vic) Ltd Revised Regulatory Proposal 2011-2015 Appendix 8.26. Strategic Planning Paper - Pole Top Fire Mitigation - 20 July 2010

unit costs more in line with its historical unit costs, and places these at the median of other DNSPs average forecast unit costs.

#### **10.2.7** Pole Replacement

This Jemena program is aimed at reducing the risk of fire initiation, reducing the number of pole fire related interruptions, reducing the risk of electrocution/injury to the public, reducing the risk of high voltage injection and reducing OH&S issues for electrical workers.

Sound wood measurements have been the traditional criteria for assessing whether a pole is fit for service or should be condemned. It is noted that condemnation rates have been increasing in Jemena's territory over the last 10 years, and Jemena's incremental forecast reflects this trend.

There are two factors driving Jemena's forecast volumes of wood pole replacements, both of which are driven by the results of asset inspections (but the criteria for condemnation are different):

- poles condemned based on age and condition (sound wood measurements)
- undersized poles that are condemned based on girth measurements or the use of raiser brackets.

The undersized pole replacement program relates to poles with a natural girth less than the minimum for a serviceable pole and LV poles fitted with HV raiser brackets. The ESV argues that these poles should have been attended to in previous price reset periods. However, given that the problem exists, ESV considers that the work needs to be done.

Jemena estimates that there are around 5,000 such poles and plans to replace all of these over a ten year period.

To assess the unit costs that Jemena has used to produce its capex forecast for this item, we have undertaken a comparative analysis exercise using:

- the replacement units costs provided by the DNSPs for the repex modelling exercise
- derived historical actual and forecast unit costs from the relevant pole top activity codes, which were provided by the DNSPs and used in our RQM review.

Based upon this analysis, the HV and LV pole unit costs are high compared to the equivalent unit costs provided by the DNSPs for repex modelling.

However, the forecast average unit cost and historical average (derived from the activity code data) appear reasonable when compared to other DNSPs - only United Energy is lower.

Based upon this, we have accepted Jemena's pole unit costs.

However, we do note that the Jemena's forecast average unit cost is high compared to its historical average. This appears to be due to the assumed ratio of staked poles to replaced poles being much lower in the forecast (63% historical to 49% forecast).

It is not clear whether the ESV has assessed this issue. Therefore, the AER may need to consider whether this assumption should be moved in line with the historical ratio i.e. around 60%. This will result in a reduction in the overall capex allowance for this program.

#### **10.2.8** Overhead Conductor Replacement

Jemena is proposing a proactive replacement program that is designed to secure the performance of the system used and improve network performance overall.

This Jemena program is aimed at reducing the risk of fire initiation, reducing the number of conductor failure related interruptions, reducing the risk of electrocution/injury to the public, reducing the risk of high voltage injection and reducing OH&S issues for electrical workers.

Jemena's unit costs are similar to United Energy, but appear very high compared to Powercor and SP AusNet's unit costs<sup>413</sup>. The unit cost is approximately 85% above Powercor's proposed unit cost and over 100% of our recommended unit cost for Powercor (see section 6.3.3). Jemena has not provided any detailed analysis of past project costs to support its unit cost estimates.

We accept Jemena's unit costs are likely to be higher than Powercor and SP AusNet due to the more urbanised nature of the existing lines. However, we do not consider that this is sufficient to explain the scale of the increase, particularly noting that we would expect the replacement to be largely on rural fringes where the fire hazards are greater.

We also note that the unit cost is more in the range of a complete rebuild or small upgrade. We do not consider this is reasonable, as we would expect in many circumstances restringing or partial rebuild will be possible.

Furthermore, we would also expect an overlap with other replacement needs allowed for in the pole and pole-top allowances. Given the large increases accepted by the ESV in these areas, it seems reasonable to assume that this overlap may be significant.

Based upon the above, and in the absence of more detailed analysis to support the Jemena unit cost, we consider a value of \$55k/km to be reasonable.

This allows for a 66% increase, to cover the higher urban cost, on the efficient unit cost we recommended for Powercor.

#### **10.2.9 HV Installation Replacement**

The High Voltage Installation Replacement Program is targeted primarily at distribution system switchgear. This program includes the replacement of HV overhead switchgear, surge diverters, Auto Circuit Reclosers, HV overhead fuses and mounts and HV indoor type switchgear.

<sup>&</sup>lt;sup>413</sup> It is worth noting that the SP AusNet unit cost should be much lower as it does not capture all the costs allowed for in other DNSP's unit costs.

ESV does not dispute the need for this program, but considers that most of the elements are driven primarily by factors other than safety (e.g. reliability of supply) and should be justified by those other factors.

The exception is the replacement of EDO fuses which would be strongly supported by ESV (forecast volumes for this activity have not been provided). ESV also recognises that the need for the program does contain a safety component, in reducing fire starts, risk of electrocution and OH&S issues for electrical workers.

ESV does not recommend work volumes under this program, but would support the replacement of EDO fuses. Nuttall Consulting has not assessed the unit costs for the program as the ESV does not support the program, with the exception of the EDO fuse replacements.

Based upon a comparison of the Jemena EDO fuse unit cost against the equivalent unit cost of the other DNSPs, Jemena's unit cost is significantly higher than the majority of the other Victorian DNSPs – other than United Energy. We consider that the median unit cost (\$2185) is a suitable benchmark, and such, recommend that the Jemena unit cost is reduced to by approximately **1** to \$2185 per unit. This reflects the **1** cost, which represents the median DNSP.

#### **10.2.10** Distribution Substation & Overhead Switch Maintenance

This Jemena program covers increases to the routine inspection and condition monitoring of overhead HV switchgear and indoor and kiosk type distribution substations, and seeks to move Jemena from a corrective maintenance program to a preventative maintenance program.

ESV does not dispute the need for this program, but considers that most of the elements are driven primarily by factors other than safety (e.g. reliability of supply) and should be justified by those other factors. ESV also recognises that the need for the program does contain a safety component, in reducing fire starts, risk of electrocution and OH&S issues for electrical workers.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

#### **10.2.11** Zone Substation Asset Conditioning Monitoring

This Jemena program provides for increases to the condition monitoring of ageing zone substation primary plant, including transient earth voltage testing, post-type CT and VT testing, transformer dry-outs, and transformer condition testing.

ESV does not dispute the need for this program, but considers that most of the elements are driven primarily by factors other than safety (e.g. reliability of supply) and should be

justified by those other factors. ESV also recognises that the need for the program does contain a safety component, in reducing fire starts and OH&S issues for electrical workers.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

#### **10.2.12** Zone Substation Transformer Replacement

The Jemena Zone Substation Transformer Replacement Program is a major asset replacement program intended to secure the ongoing performance and reliability of the Jemena network.

Jemena has a number of transformers entering the latter years of their life, and are forecast to require replacement. The ageing of this plant is affected by loading, and the increased utilisation.

A life model has been developed to estimate the condition of power transformers across the United Energy network. This model gives an indicator of the estimated life lost per annum, and when the transformer is expected to be at end of life.

ESV considers that the program is driven primarily by factors other than safety (e.g. reliability of supply) and should be justified by those other factors. ESV also recognises that the need for the program does contain a safety component, in reducing fire starts and OH&S issues for electrical workers.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

#### **10.2.13** Zone Substation Circuit Breaker Replacement

Jemena has established an ongoing zone substation circuit breaker replacement program which is aimed at achieving a high level of supply reliability and availability.

The replacement program is based upon a set of established criteria that are used to prioritise the program. Switchgear replacement is based on condition and performance and is aligned with major augmentation work wherever possible.

This Jemena program covers the replacement of ageing and defective zone substation circuit breakers. ESV does not dispute the need for this program, but considers that the program is driven primarily by factors other than safety (e.g. reliability of supply) and should be justified by those other factors. ESV also recognises that the need for the program does contain a safety component.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

#### **10.2.14** Electricity Safety (Electric Line Clearance) Regulations

Jemena is claiming additional expenditure due to changes to the Electricity Safety (Electric Line Clearance) Regulations:

- maintenance of the clearance space
- notification & consultation
- service line clearance
- habitat trees
- hazard trees.

ESV has supported the need for additional work activity in most of these areas.

The Nuttall Consulting assessment of the unit costs associated with the above additional works are provided in the following sections.

#### 10.2.14.1 Maintenance of the Clearance Space – HBRA pre-summer

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. This section deals with the inspection and trimming associated with vegetation management undertaken prior to the bushfire season.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

Jemena is proposing a unit rate of per span for pre-summer vegetation management in HBRA areas.

has used a unit rate between and and a span<sup>414</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** per span

<sup>&</sup>lt;sup>414</sup> The **Example** unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

for both LBRA and HBRA areas<sup>415</sup>. **Constant of a set of** 

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span.

#### **10.2.14.2** Maintenance of the Clearance Space – HBRA cyclic

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. This section deals with the inspection and trimming associated with vegetation management undertaken cyclically.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

Jemena is proposing a unit rate of per span for cyclic vegetation management in HBRA areas.

<sup>&</sup>lt;sup>415</sup> Noting the proposed annual program for HBRA

has used a unit rate between **and and a** span<sup>416</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **and a span**<sup>416</sup> is **a span** for both LBRA and HBRA areas<sup>417</sup>.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Nuttall Consulting notes that the **Constitution** unit rate is the lowest of the group at **Constitution** per span. This unit rate was consistent for **Constitution** across LBRA and HBRA areas. Nuttall Consulting notes that **Constitution** is proposing an annual HBRA vegetation management cycle and considers that this approach would result in the slightly lower average cost per span.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span.

#### **10.2.14.3** Maintenance of the Clearance Space – LBRA

The management of vegetation in Low Bushfire Risk Areas (LBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and

<sup>&</sup>lt;sup>416</sup> The **and the set of the HBRA** rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

<sup>&</sup>lt;sup>417</sup> Noting the proposal annual program for HBRA.

powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

Jemena is proposing a unit rate of per span for LBRA areas.

and and have used a unit rate of a span in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** is **a span** for both LBRA and HBRA areas<sup>418</sup>.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span<sup>419</sup>.

#### **10.2.14.4** Notification & Consultation

The 2010 regulations require consultation only in situations where a tree that is to be cut or removed is within the boundary of a private property. Under the 2010 regulations, responsible persons can notify affected persons of cutting/removal of trees by placing notices in newspapers. ESV found that the changes to the regulations represent a small reduction in burden on the electricity distributors.

Jemena has requested additional work associated with notification and consultation. ESV considers that the requirements in the current regulations are a slight reduction in burden from those contained in the previous regulations, and therefore does not support additional expenditure for notification and consultation.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV.

<sup>418</sup> A side note in the spreadsheet suggests that these figures are not inflated to 2010 dollars.
 <sup>419</sup> Noting the spreadsheet notes of conversion of to 2010 dollars.

#### **10.2.14.5** Reduced clearances for insulated conductor - Services

The unit costs associated with reduced clearances for insulated conductor relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. Jemena has identified service lines as being impacted by this change.

Jemena has estimated the unit rate for the initial establishment of clearance space as with an ongoing rate of per service.

has also estimated the unit rate for the initial establishment of clearance space as with an ongoing rate of per service.

has calculated that the average unit rate per service line would be **average**, in either the annual initial cut or for ongoing recuts<sup>420</sup>. The information provided by **average** did not provide any further breakdown of these costs or time required for the proposed works.

also assessed the unit cost per service for compliance with the Electricity Safety (Electric Line Clearance) Regulations to be for for the considered that there were likely to be

In comparison, the initial cut and to "maintain clearance space" for insulated services. The initial cut cost comprises and the ongoing recuts are costed at the initial cut cost of the initial cut c

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for a four-fold increase in ongoing service recuts in the CitiPower and Powercor areas.

The man-hour assessments provided by appear reasonable, as do the assumptions in relation to approximate times and crew numbers.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

<sup>&</sup>lt;sup>420</sup> This cost includes the cost of the cutting and clean-up of vegetation required as a result of the omission of clauses 9.2.1, 9.2.2 and 9.3 of the 2005 Code from the 2010 Code.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate for clearance of Jemena's insulated services to comply with the Electricity Safety (Electric Line Clearance) Regulations are as follows:

- initial clearance of services: \$83.46
- ongoing clearance of services: \$47.40.

Jemena has also identified that some services may require undergrounding or relocation due to the revised Electricity Safety (Electric Line Clearance) Regulations 2010. The proposed unit costs for these activities are **services** and **services** respectively. The ESV has recommended volumes of 630 and 2,250 for these activities.

Nuttall Consulting has reviewed the proposed replacement cost of **second** per service. The proposed per unit rate of **second** is not consistent with current Jemena prices to provide a new service. The new service and meter price charged by Jemena is currently **second**. This service includes the installation of a service (single phase) and meter and will typically involve greater travel distances between jobs than a programmed replacement schedule.

The service replacement program will not be undertaken in a manner that would support minimising travel time as the services to be relocated may not be located in close proximity to each other. The relocation services may also require consultation with the landowner and adjacent landowners. To make allowances for these additional costs, Nuttall Consulting recommends a unit rate of \$250 per service relocation.

The unit rate of **sector** is greater than would be required to provide a simple underground service in a new residential estate. However, the installation of an underground service to replace an existing overhead service is a complex task. The costs associated with this task can vary dramatically based on factors such as soil type (e.g. rock, clay or sand), other services in the ground (gas, water, electric, sewer, telecoms, etc.), and reinstatement requirements (e.g. pavements, roads, nature strips).

Customer negotiations may also play a significant part in determining the unit cost of this activity. Nuttall Consulting assumes that the **supply** unit rate excludes any works on the customer's premises with the exception of the disconnection and reconnection of the supply to the meter position.

The more densely populated an area, the greater the likelihood of increased costs. The proposed locations for the Jemena undergrounding of services are not known. As such, it is not possible to determine if the proposed unit rate of **services** is efficient as an overall average.

Nuttall Consulting therefore recommends that the proposed unit rate of be accepted.

#### 10.2.14.6 Habitat Trees

Clause 4 of the 2010 regulations requires a DNSP, before undertaking any pruning or removal of vegetation, to identify whether the tree is the habitat for fauna that is:

- listed as threatened in accordance with section 10 of the Flora and Fauna Guarantee Act 1988
- listed in the Threatened Invertebrate Fauna List with a conservation status in Victoria of 'vulnerable', 'endangered' or 'critically endangered' or;
- listed in the Threatened Vertebrate Fauna List with a conservation status in Victoria of 'vulnerable', 'endangered' or 'critically endangered'.

In the event that the tree is the habitat for the fauna listed above, clause 4 of the 2010 regulations requires the cutting or removal of the tree to be undertaken outside of the breeding season wherever practicable.

In the event that it is not practicable to undertake cutting or removal of the tree outside of the breeding season for that species, the 2010 regulations require translocation of the fauna wherever practicable. These requirements did not exist in the 2005 regulations, although the management plan to be developed by the responsible person did require the identification of locations that had 'rare or endangered' species and details of the methods that will be used to avoid and minimise the impact on such vegetation.

Jemena proposes that an additional FTE specialising in the identification and maintenance of species and the maintenance of a register for endangered species and their habitat will be required to work in parallel with the Jemena vegetation management program.

Jemena state that this person would also arrange the training of assessors and other employees to be able to identify threatened species as well as obtain specialist services if required to ensure compliance with the regulations.

The ESV has confirmed that the new clause 4(1) does not require DNSPs to identify the location of 'habitat' trees. The current practice of obtaining information from local councils, government departments and community groups who hold such information will continue. ESV has advised that a DNSP will have met its obligation in regard to identifying the location of 'habitat' trees if it accesses the information held by others. Jemena considers that the need to obtain information from local councils, government departments and community groups, cross reference that information and analyse for threatened species and their breeding patterns will increase the workload above current practice.

As a result of discussions with the ESV Jemena has revised down its resource requirement to one FTE to establish the 'habitat' tree register in the first year (2011), followed by 0.4FTE in subsequent years to monitor and update the register, process questions and information requests, and provide on-going training to employees and vegetation contractors.

The ESV has approved the volume of work proposed by Jemena.

Jemena has used per annum for the salary cost of the Scientific / Environmental Specialist based on existing salary band of Tier 6. Nuttall Consulting considers that the proposed FTE unit rate of per annum is within the reasonable range of expected

costs for this role. This rate is a gross rate and includes overheads and on-going costs associated with employment.

#### 10.2.14.7 Hazard Trees

The Electricity Safety (Electric Line Clearance) Regulations 2005 clause 9(4)(o)(iii) required DNSPs to specify the methods used to monitor the condition of vegetation in the hazard space (defined as vegetation that is beyond the regrowth space and could become a hazard to the safety of the electric line under a range of weather conditions prevalent in the area).

The 2010 regulations (clause 3 of the Code) give DNSPs the authority to minimise hazards by pruning or removing trees that are likely to fall onto or otherwise come into contact with an electric line.

Jemena has included the cutting or removal of hazard trees in its line clearance management plan submitted to the ESV.

Jemena has estimated that the volume of work required for this activity includes 250 tree removals and 500 trees cut. These volumes have been recommended by the ESV.

The Jemena unit costs proposed for these volumes are **for each tree removal and** for each hazard tree trimmed.

Nuttall Consulting has assessed the tree removal costs against those advised by the Australian Institute of Architects (AIA)<sup>421</sup>. This cost guide suggested tree removal costs in Melbourne of between \$300 and \$1,600 per tree. The AIA noted that prices are extremely variable and depend on the following: tree height, trunk circumference, density of branches/foliage, access to site for travel towers, woodchippers & grinders, obstructions, buildings underneath, tree alive or dead. The range could be wider if all the factors counted against easy removal.

Nuttall Consulting considers that the sort of trees likely to be considered a hazard will tend towards larger and older trees that are higher than the overhead lines. On this basis, Nuttall Consulting accepts the proposed tree removal unit rate of the proposed per tree.

The Jemena proposed unit rate of per hazard tree trim exceeds the cyclic span clearing rates of between and and the span typically consists of more than one tree that requires trimming on average. This suggests a per tree trimming cost of less than for the tree trimming required for hazard trees will not have ready street access and will require trimming at a higher level than is typical for cyclic trimming.

On balance, Nuttall Consulting considers that a more cost reflective average cost for hazard tree trimming is therefore per tree.

<sup>&</sup>lt;sup>421</sup> http://www.archicentre.com.au/2008JAN\_Fullcostguide.pdf

### **10.3** Powercor

Powercor is claiming additional expenditure due to changes to the Electricity Safety (Electric Line Clearance) Regulations:

- removal of HBRA exemptions
- reduced clearances for insulated conductors (ABC and services)
- removal of LBRA clearance exemptions
- 100m span clearances
- environmentally or culturally significant (native) trees.

ESV has supported the need for additional work activity in each of these five areas.

The Nuttall Consulting assessment of the unit costs associated with the above additional works are provided in the following sections.

#### **10.3.1** Removal of HBRA exemptions

The ESV has approved additional volumes of vegetation clearance required to comply with the Electricity Safety (Electric Line Clearance) Regulations 2010. Powercor has proposed clearance volumes for trimming undertaken prior to the bushfire season and for cyclic trimming. These two areas are discussed in the following section.

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. This section deals with the inspection and trimming associated with vegetation management undertaken prior to the bushfire season.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

#### **10.3.1.1** Maintenance of the Clearance Space – HBRA pre-summer

Powercor has used a unit rate between **and and a** span<sup>422</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** per span

<sup>&</sup>lt;sup>422</sup> The Powercor unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.
for both LBRA and HBRA areas<sup>423</sup>. **Constant of a set of** 

is proposing a unit rate of per span for pre-summer vegetation management in HBRA areas.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The ESV determination of workload volumes for Powercor identified a change in obligations "resulting in the requirement for additional or more frequent cutting"<sup>424</sup>. Information contained in the Powercor submission indicated that the Powercor unit rates may include an allowance for line inspections. The ESV has advised Nuttall Consulting that the overall inspection rate is the same before and subsequent to the regulation change<sup>425</sup>. Nuttall Consulting considers that the apparent inclusion of inspection costs is therefore not consistent with the ESV recommendations.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is \$150 per span.

#### **10.3.1.2** Maintenance of the Clearance Space – HBRA cyclic

Powercor has used a unit rate between **and and a** span<sup>426</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** per span

<sup>&</sup>lt;sup>423</sup> Noting that the unit rate is based on an annual program in HBRA.

<sup>&</sup>lt;sup>424</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, 21 September 2010, (Ver 2.0), section 2.4.

<sup>&</sup>lt;sup>425</sup> Advised in email from ESV, dated 12 October 2010

<sup>&</sup>lt;sup>426</sup> The Powercor unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

for both LBRA and HBRA areas . **International** is proposing a unit rate of **the per span** for HBRA areas.

HBRA areas.

The Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The ESV determination of workload volumes for Powercor identified a change in obligations "resulting in the requirement for additional or more frequent cutting"<sup>427</sup>. Information contained in the Powercor submission indicated that the Powercor unit rates may include an allowance for line inspections. The ESV has advised Nuttall Consulting that the overall inspection rate is the same before and subsequent to the regulation change<sup>428</sup>. Nuttall Consulting considers that the apparent inclusion of inspection costs is therefore not consistent with the ESV recommendations.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Nuttall Consulting notes that the **example** unit rate is the lowest of the group at **example** per span. This unit rate was consistent for **example** across LBRA and HBRA areas. Nuttall Consulting notes that **example** is proposing an annual HBRA vegetation management cycle and considers that this approach would result in the slightly lower average cost per span.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with the removal of the 2005 Code exemptions is \$230 per span.

<sup>&</sup>lt;sup>427</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, 21 September 2010, (Ver 2.0), section 2.4.

<sup>&</sup>lt;sup>428</sup> Advised in email from ESV, dated 12 October 2010

### 10.3.2 Reduced clearances for insulated conductor - ABC

The unit costs associated with reduced clearances for insulated conductors relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. Powercor has identified two asset types that are impacted by the changed regulations: Aerial Bundled Conductor (ABC) and service lines. Powercor have also identified annual and bi-annual clearing requirements associated with the Electricity Safety (Electric Line Clearance) Regulations.

In support of the additional costs, Powercor has provided a statement by

<sup>429</sup>. Are the current providers of vegetation management services to Powercor and CitiPower. Nuttall Consulting notes that may continue to provide vegetation management services to CitiPower and Powercor. This means that management likely to be contracted to deliver the additional workloads described in the management. As such, Nuttall Consulting have sought where possible to identify third party estimates of the unit cost of meeting these obligations.

have identified a unit rate of

430

In 2009 Powercor incurred costs of **provide the clearing of the clearing of spans**<sup>431</sup>. This equates to a unit cost of **provide the provide the powercor information** is not clear as to whether this included the cost of clearing for services or not. If so, this would reduce the cost per span considerably.

Nuttall Consulting notes the lower customer density of the Powercor franchise area and the reduced traffic management costs that are inherent with this territory. Nuttall Consulting also notes that the **second** unit rates provided are considered conservative.

Unit rate information provided by **Particular** identified costs associated with an elevated work platform and 2 crew to be **Particular** per hour. The cost associated with a wood chipper<sup>432</sup> vehicle and two crew was estimated at **Particular** per hour. These values suggest that Powercor is estimating that the clearing of an ABC span will require in excess of 1 hour per span for both crews. Nuttall Consulting does not consider that the clearance of a single span of conductor would require both crews for more than an hour; particularly the chipper vehicle.

The assessment of the number of LV spans does not appear to differentiate between stand-alone spans of ABC and those spans that are run on the same poles as other conductors. The Powercor network is one of the least densely populated network areas in Australia and consequently has a low proportion of poles with multiple circuits.

- 429
- <sup>430</sup> Bid p22.

<sup>&</sup>lt;sup>431</sup> Powercor and CitiPower response Step change Electricity Safety.pdf. Dated1 September 2010.

<sup>&</sup>lt;sup>432</sup> Vehicle for turning the cut vegetation into woodchips and transport of woodchips.

The reduced costs associated with clearing of ABC that is on the same span as another circuit does not appear to be recognised by the **Exercise**.

Powercor was requested to describe the level of scale efficiencies adopted in forecasting these costs. The Powercor response to this question was: "Refer to sections 82 to 143 of the Witness Statement."<sup>433</sup> This reference is to the whole of the witness statement concerning insulated cables and does not contain any specific reference to scale efficiencies.

Powercor was also requested to "describe and justify the savings that the DNSP anticipates associated with the 2010 Electric Line Clearance regulations". Powercor responded that "There are no savings anticipated due to the omission of reduced clearances for aerial bundled and insulated cables"<sup>434</sup>.

Nuttall Consulting notes that Powercor is proposing to significantly increase the overall amount of expenditure on vegetation management. It is difficult to see how scale efficiencies would not be reasonable and significant based on these increased activity levels.

Powercor was requested to quantify the impact that the step changes proposed would have on fault and emergency opex. In response, Powercor stated that "The 2005 Regulations and HBRA/LBRA Exemption have been successful in establishing an achievable and practicable regulatory regime which does not compromise on safety. Consequently, there would appear to be significant costs and little community benefit, safety or performance justification for the change in the Regulations and the removal of the Exemption."<sup>435</sup>

Nuttall Consulting does not agree with the Powercor position that there will be no impact on reliability outcomes from the substantial increase in expenditure associated with vegetation management. The trimming of vegetation has been proven to reduce vegetation related outages and also reduce damage to the network assets from contact and abrasion. The removal of more vegetation adjacent to powerlines will therefore have a resultant impact on vegetation related outages and network asset integrity. Nuttall Consulting recognises that the incremental removal of vegetation will have a lesser impact than the original trimming requirements.

Noting that Powercor has applied the same unit rate for the clearance of insulated conductors as it has for the removal of the LBRA exemptions, it is reasonable to compare the Powercor unit rates with those of Jemena, United Energy and SP AusNet. The equivalent unit rate proposed by **Exercise** is **per span**. **Exercise** and **Exercise** are proposing a unit rate of **per span** for LBRA areas.

Based on the above considerations, the Powercor proposed unit rate of per span is not considered efficient. Nuttall Consulting recommends a unit rate of \$210 per span as an efficient average unit rate.

435 Ibid

<sup>&</sup>lt;sup>433</sup> Powercor and CitiPower response Step change Electricity Safety.pdf. Dated1 September 2010.

<sup>434</sup> Ibid

### **10.3.3** Reduced clearances for insulated conductor - Services

The unit costs associated with reduced clearances for insulated conductors relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. Powercor has identified two asset types that are impacted by the changed regulations: Aerial Bundled Conductor (ABC) and service lines.

has calculated that the average unit rate per service line would be **111**, in either the initial cut or for ongoing recuts. This cost includes the cost of the cutting and cleanup of vegetation required as a result of the omission of clauses 9.2.1, 9.2.2 and 9.3 of the 2005 Code from the 2010 Code. The information provided by Powercor did not provide any further breakdown of these costs or time required for the proposed works.

Refer to the comparison benchmarking of unit rates in section 10.1.1.3 for details of the unit rates proposed by CitiPower, United Energy, Jemena and SP AusNet.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate for clearance of Powercor insulated services to comply with the Electricity Safety (Electric Line Clearance) Regulations are as follows:

- initial clearance of services: \$84.46
- ongoing clearance of services: \$47.40.

Nuttall Consulting is recommending the lower benchmark initial clearance rate for Powercor based on the **second** observation of increased consultation and complaints in more highly urban areas.

#### **10.3.4** Removal of LBRA clearance exemptions

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

states that maintenance of the increased clearances will involve additional work in the nature of more spans to be cut relative to the cutting undertaken under the 2005 Code and more aggressive cutting of trees in spans.

estimates that there are 15,000 spans in the Powercor network which will need to be cut due to the removal of the allowance under the 2005 Code for reduced clearance spaces for powerlines other than ABC or insulated cables.

Powercor is proposing that compliance with the revised clearance spaces is established in 2 years with 7,500 new clearances established in each year.

For the remaining years of the next regulatory period, estimate that there will be 4,500 spans each year which will require cutting to maintain the required clearance spaces.

has used a unit rate of a span in calculating the cost to comply with clause 11. This rate has also been used by **a span** in determining the equivalent unit rate for CitiPower.

The equivalent unit rate proposed by **example** is **per span for both LBRA and HBRA** areas<sup>436</sup>.

is proposing a unit rate of per span for LBRA areas.

is also proposing a unit rate of per span for LBRA areas.

Nuttall Consulting notes that **accord** has assumed the same unit cost for the exemption removal for CitiPower as for Powercor. **accord** notes elsewhere that urban areas are more likely to incur consultation and complaints than rural areas. It is not clear why

has assumed that the unit costs associated with the exemption removal are the same for both companies. One possible explanation is the longer travel times required to get to worksites in rural and remote areas.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is \$210 per span<sup>437</sup>.

spreadsheet suggests that these figures are not inflated to 2010 dollars.

<sup>&</sup>lt;sup>436</sup> A side note in the

#### **10.3.5 100m span clearances**

ESV has approved additional incremental volumes of 2,500 spans per year for Powercor to comply with the Electricity Safety (Electric Line Clearance) Regulations 2010 in relation to span in excess of 100m.

Table 2 of the 2010 Code sets out the minimum clearance spaces for powerlines in LBRA (other than ABC or insulated cable powerlines). These minimum clearance spaces are contained in Table 10.1 of the 2005 Code.

Table 2 of the 2010 Code requires a larger clearance space for spans exceeding 100 metres in LBRA than Table 10.1 of the 2005 Code. The minimum clearance space for spans exceeding 100 metres has been increased in Table 2 of the 2010 Code by 1 metre for powerlines under 1kV and 0.5 metres for powerlines over 1kV.

citiPower because CitiPower does not have any spans exceeding 100 metres in its network.

states that there are currently 29,793 LBRA spans across Powercor's network which are greater than 100 metres in length and 14,792 of those spans are vegetated. considers that the majority of these vegetated spans are likely to require action as a result of the increase in the minimum and required clearance spaces for spans exceeding 100 metres in LBRA and estimate that 12,500 spans would require additional cutting work over the 5 years from 2011 to 2015.

has used a unit rate of **the** per span representing an estimate of the average cost per span of the incremental work activities required due to the increase in the minimum and required clearance spaces for spans exceeding 100 metres.

notes that this unit rate is higher than other LBRA average unit rates. The higher rate is claimed due to the proximity to irrigated areas and that there will be more vegetation per span. **Security** state that unit rates for cutting in HBRA provide a better guide to the cost per span of the incremental work activities required on Powercor's spans exceeding 100 metres in LBRA.

Nuttall Consulting does not agree with the implied link between irrigated land and increased vegetation that requires trimming. Clearly irrigated land will tend to be more productive and vegetated, but these crops do not require trimming to maintain powerline clearances.

Land external to the irrigated crops may be subject to greater water availability and therefore vegetation growth. However, trees from either intentional planting or natural seeding can cause significant problems for irrigation channels and are typically removed by channel authorities or local farmers. For example<sup>438</sup>:

<sup>&</sup>lt;sup>437</sup> Noting the spreadsheet notes of conversion of to 2010 dollars.

<sup>&</sup>lt;sup>438</sup> Guidelines To Good Practice For The Construction And Refurbishment Of Earthen Irrigation Channel Banks, National Program for Irrigation Research and Development, 2001- Land and Water Resources Research and Development Corporation.

- tree roots may cause damage to the channel banks and batters
- trees can fall over or drop limbs, damaging fences and structures or impeding the flow in the channel
- the roots of some species (e.g. willows) can severely restrict the channel waterway
- access for operation and maintenance can be impeded
- the margin of land for disposal of silt can be reduced
- controlled grazing for weed control may not be possible in the years it takes the trees to become established
- the trees may be in danger from channel weed control operations.

On this basis, Nuttall Consulting considers that irrigated land and land adjacent to irrigation channels are likely to have less vegetation requiring trimming than is the average.

Nuttall Consulting concurs with the position that the average span length for spans in excess of 100m is longer than the average overall span length for LBRA spans. Nuttall Consulting also concurs with the statement that

Based on the above considerations, Nuttall Consulting recommends that the average cost per span of \$230 for cyclic clearing of HBRA vegetation remains appropriate for the clearing of spans in excess of 100m in LBRAs.

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#### **10.3.6** Environmentally or culturally significant (native) trees

Clause 2(3) of the 2010 Code requires that a responsible person must, as far as practicable, restrict the cutting or removal of native trees or trees of cultural or environmental significance to the minimum extent necessary to ensure compliance with the 2010 Code.

The cost impact of clause 2(3) on Powercor arises from the requirement in respect of native trees. There was no provision in the 2005 Code that restricted the cutting or removal of native trees.

has proposed a unit rate of per span in calculating the cost of complying with clause2(3) of the 2010 Code. This represents an average cost per span of the additional work activity required as a result of the restriction on the ability to remove native trees introduced by the 2010 Code.

The unit rate for Powercor of **constant** is lower than that for CitiPower of **constant** based on the lower number of customer complaints and objections that are likely in Powercor's predominantly urban network.

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Jemena, United Energy and SP AusNet have not requested additional expenditure in relation to this obligation. As such, there are no costs to benchmark the CitiPower or Powercor unit rates against.

CitiPower and Powercor have not provided a breakdown of the proposed unit costs, so it is not possible to assess how the final unit rates were arrived at.

Neither the ESV assessment<sup>440</sup> or the CitiPower and Powercor information provide any indication of the sort of work that is anticipated to be undertaken in this cost category.

CitiPower and Powercor were requested to provide a detailed description of the physical change in work practices and other physical requirements relating to each area of change relating to the Electricity Safety (Electric Line Clearance) Regulations. The CitiPower and Powercor response referred to sections 170 to 181 of the **Electricity**. These sections do not provide any quantification of the costs that are used as inputs to the unit rate. Nuttall Consulting does not consider that the CitiPower response is adequate. The CitiPower response does not provide a detailed description of the unit cost.

In the absence of an understanding of the what constitutes the unit rate, it is not possible for Nuttall Consulting to comment on whether this rate is efficient or not.

Nuttall Consulting notes that the **constant** information relating to native trees or trees of cultural or environmental significance does not identify a cost reduction associated with the halt on the removal of this vegetation.

# 10.4 SP AusNet

SP AusNet is proposing a number of enhanced replacement programs in addition to addressing the specific changes in the Electricity Safety (Electric Line Clearance) Regulations 2010.

Nuttall Consulting has assessed the unit rates for the enhanced replacement of crossarms, conductors, insulators, HV fuses, bird and animal proofing, protection and control, and asset inspections in the following sections. Volumes in each of these areas were approved by the ESV.

SP AusNet has also identified additional work volumes associated with the Electricity Safety (Electric Line Clearance) Regulations 2010. The unit rates associated with these ESV approved volumes are assessed in the final SP AusNet section of this report.

#### 10.4.1 Enhanced replacement programs

SP AusNet's revised proposal includes a number of enhanced replacement programs. These are largely in response to the findings of the Bushfire Royal Commission and SP AusNet's analysis of bushfire risks.

The programs cover:

• enhanced cross arm replacement

<sup>&</sup>lt;sup>440</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, ESV, 14 September 2010

- conductor replacements
- HV pin type insulator replacements
- EDO fuse replacements
- enhanced protection and control involving OCR/ACR replacement/upgrades.

The ESV has accepted the volumes proposed by SP AusNet for these programs.

It is also noted that the AER has essentially accepted SP AusNet's unit costs for the insulators and conductors in its draft decision.

For the remaining programs, we have compared SP AusNet's unit costs against other similar unit costs used by the other DNSPs. In all cases, SP AusNet is among the lowest or, at worst, the median DNSPs. Due to the limitation in the available information, it has not been possible to determine actual historical unit rates for comparison purposes. Nonetheless, based upon the findings of our analysis, we have accepted SP AusNet's unit cost.

It is worth noting that in response to an AER request, SP AusNet has provided information on the other benefits that may result from these programs<sup>441</sup>. This includes opex benefits and reliability benefits. The value of these benefits is not great. Nonetheless, the AER may need to assess whether these have been allowed for in SP AusNet's operating forecast, and whether a small reduction should be made in the unit cost to account for the improvement in reliability that may result from these programs – and therefore, would be funded through the reliability incentive scheme.

On the issue of reliability benefits, these do not appear to be that significant (possibly not more than 3-5% of the capex). It is also not clear from SP AusNet's response whether it is anticipating an improvement or worsening in reliability due to SWER protection issues raised through the Royal Bushfire Commission (i.e. the enhanced protection and control program) if its enhanced program occurs.

### **10.4.1.1** Asset inspections by helicopter

In 2009, SP AusNet trialled the use of helicopter mounted, high resolution digital photography with GPS tracking to overhead line assets. With a 7% detection rate, SP AusNet concluded that this inspection process provided an effective means of asset condition inspection and monitoring.

SP AusNet is proposing a 5 year helicopter inspection interval, with a 2.5 year offset to that of the ground based inspection cycle. Intrusive inspection and treatment of timber poles, together with a range of inspection and maintenance activities undertaken through the ground based inspection cycle, will require that the ground based inspection program be maintained.

The incremental work load claimed by SP AusNet is an additional 209,500 spans inspected by helicopter. The ESV has approved this volume.

<sup>&</sup>lt;sup>441</sup> SP AusNet email, dated 3 September 2010

In supplemental information to the AER, SP AusNet provided the following information about the proposed helicopter inspection program<sup>442</sup>.

Enhanced Network Safety & Compliance Programs 2011- 2015 Per Revised Regulatory Proposal July 2010	2006-2010 actual & forecast volumes	Increase to 2006-10 actual & forecast	Total Volume 2011- 2015	2011- 2015 (\$2010M direct, excl escalation)
Asset Inspection – helicopter refer Opex Step Change Paper	15,500	209,500	225,000	\$6.2

The SP AusNet reference to an "Opex Step Change Paper" is not clear as there is no document with this reference that was provided to Nuttall Consulting.

In its revised proposal, SP AusNet identified that it had introduced the use of a mid-cycle helicopter inspection. In 2009, SP AusNet developed and commenced the trial of helicopter mounted, high resolution digital photography with GPS tracking to overhead line assets. SP AusNet reports that this resulted in the inspection of 15,500 poles and the subsequent detection of 1,092 asset maintenance and replacement items in addition to the ground based inspection program. The cost of this program was \$580k in the 2009 calendar year.

SP AusNet propose to inspect 45,000 poles per year at a cost of \$6.2 million over the next regulatory period. This equates to an average unit rate of \$27 per span.

SP AusNet state that the program has a 7% detection rate, and "substantial net benefits".

These net benefits are not explicitly identified. Nuttall Consulting considers that the benefits are likely to relate to reduced operating and maintenance expenditure relating to few asset failures and more timely replacements of assets. SP AusNet has not quantified these benefits.

In addition, some of the detected assets would have been identified by the ground based inspections, so the overall net benefit of the program should be considered in this context.

The new helicopter inspection program is proposed to involve a five year inspection interval, with a 2.5 year offset to that of the ground based five year inspection cycle.

As discussed above, SP AusNet has not provided any information about the unit costs of the helicopter or equipment installed. It is not possible to compare the helicopter costs with other helicopter provider costs due to the specific GPS and photography requirements of this approach.

On this basis, Nuttall Consulting is unable to state that the proposed unit rates for the helicopter inspection program are not efficient. Nuttall Consulting also notes that there are a large number of benefits from the program that are not recognised in the unit rate.

<sup>&</sup>lt;sup>442</sup> EDPR 2011-2015, Additional Safety Expenditure Q&A, 3 Sep 2010, SP AusNet, page 11

### **10.4.2** Electricity Safety (Electric Line Clearance) Regulations

SP AusNet are proposing additional works to meet the requirements of the Electricity Safety (Electric Line Clearance) Regulations 2010. These additional works are classified into 6 areas and the unit costs associated with these works are considered by Nuttall Consulting in the following sections.

### **10.4.2.1** Hazardous trees

The Electricity Safety (Electric Line Clearance) Regulations 2005 clause 9(4)(o)(iii) required DNSPs to specify the methods used to monitor the condition of vegetation in the hazard space (defined as vegetation that is beyond the regrowth space and could become a hazard to the safety of the electric line under a range of weather conditions prevalent in the area).

The 2010 regulations (clause 3 of the Code) give DNSPs the authority to minimise hazards by pruning or removing trees that are likely to fall onto or otherwise come into contact with an electric line.

SP AusNet has included the cutting or removal of hazard trees in its line clearance management plan submitted to the ESV.

SP AusNet has estimated that the volume of work required for this activity includes 25,000 tree removals. These volumes have been recommended by the ESV.

The estimated cost for addressing 5,000 hazard trees per annum is \$3.94 million per annum<sup>443</sup>. This equates to a value of \$788 per tree. Nuttall Consulting notes that the ESV reference to this activity is "No. of hazardous trees removed". Nuttall Consulting has confirmed with ESV that the proposed activity and associated work volumes relate to the trimming of hazardous trees as well as tree removal. Nuttall Consulting has not been provided with a breakdown of the ratio of tree removal and tree trimming.

The unit costs proposed for these volumes are for each hazard tree trimmed and for each tree removed.

The proposed unit rate of per hazard tree trim exceeds the cyclic span clearing rates of between and the cyclic span typically consists of more than one tree that requires trimming on average. This suggests a per tree trimming cost of less than the tree trimming required for hazard trees will not have ready street access and will require trimming at a higher level than is typical for cyclic trimming.

On balance, Nuttall Consulting considers that a more cost reflective average cost for hazard tree trimming is therefore \$250 per tree.

Nuttall Consulting has assessed the tree removal costs against those advised by the Australian Institute of Architects (AIA)<sup>444</sup>. This cost guide suggested tree removal costs in

<sup>&</sup>lt;sup>443</sup> Electricity Distribution Network Incremental Opex impact to 2009 Base Year, Appendix I, SP AusNet, page22.

<sup>&</sup>lt;sup>444</sup> http://www.archicentre.com.au/2008JAN\_Fullcostguide.pdf

Melbourne of between \$300 and \$1,600 per tree. The AIA noted that prices are extremely variable and depend on the following: tree height, trunk circumference, density of branches/foliage, access to site for travel towers, woodchippers & grinders, obstructions, buildings underneath, tree alive or dead. The range could be wider if all the factors counted against easy removal.

Nuttall Consulting considers that the sort of trees likely to be considered a hazard will tend towards larger and older trees that are higher than the overhead lines. On this basis, Nuttall Consulting accepts the proposed tree removal unit rate of \$1,500 per tree.

Based on the recommended tree trimming costs of \$230 per tree and removal costs of \$1,500 per tree, the SP AusNet proposed unit rate of \$788 may well represent a reasonable assessment of average unit cost of these combined activities. Without a more detailed breakdown of the activity types, Nuttall Consulting is unable to determine a more accurate assessment of the relative efficiencies of these activities.

### **10.4.2.2** HBRA clearance exemptions

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. SP AusNet is proposing increasing its cyclic trimming to an annual program. This approach therefore negates the requirement for a pre-summer assessment and trim.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

SP AusNet is proposing a per unit rate of \$195 per span for both LBRA and HBRA areas.

HBRA areas. In the cost to comply with clause 11.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or

<sup>&</sup>lt;sup>445</sup> The **sector** unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Nuttall Consulting notes that the SP AusNet unit rate is the lowest of the group at \$195 per span. This unit rate was consistent for SP AusNet across LBRA and HBRA areas. Nuttall Consulting notes that SP AusNet is proposing an annual HBRA vegetation management cycle and considers that this approach would result in the slightly lower average cost per span.

SP AusNet has noted that the 2010 weighted average unit rate per span has increased to \$205.71/span. This average unit rate per span increase has not been calculated to include the increased volumes associated with the Electricity Safety (Electric Line Clearance) Regulations 2010. On this basis, Nuttall Consulting considers that the previous rates will remain more reflective of the average unit cost for the increased volume of activities.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions for SP AusNet is \$195 per span.

#### **10.4.2.3** LBRA clearance exemptions

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

SP AusNet is proposing a unit rate of \$195 per span for both LBRA and HBRA areas<sup>446</sup>.

has used a unit rate of per span in calculating the cost to comply with clause 11.

is proposing a unit rate of per span for LBRA areas. is also proposing a unit rate of per span for LBRA areas.

<sup>&</sup>lt;sup>446</sup> A side note in the SP AusNet spreadsheet suggests that these figures are not inflated to 2010 dollars.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

SP AusNet has noted that the 2010 weighted average unit rate per span has increased to \$205.71/span. This average unit rate per span increase has not been calculated to include the increased volumes associated with the Electricity Safety (Electric Line Clearance) Regulations 2010. On this basis, Nuttall Consulting considers that the previous rates will remain more reflective of the average unit cost for the increased volume of activities.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with the removal of the 2005 Code exemptions is \$195 per span.

#### **10.4.2.4** Habitat trees

SP AusNet claimed an additional 22 full time equivalent (FTE) employees to meet this obligation. The ESV noted<sup>447</sup> that SP AusNet claimed the 22 FTEs on the assumption that it has the responsibility to make the assessment in regard to endangered fauna. ESV considers that the distributors do not have to make the assessment themselves, but can rely on registers held by others. On this basis, ESV considered that the additional resource required would be 3 FTEs (one for each of SP AusNet's regions).

Nuttall Consulting understands that the role of the 3 FTEs described by ESV will be an administrative one. On that basis, Nuttall Consulting recommends the administrative unit rate adopted by SP AusNet of \$60,000 per annum per FTE<sup>448</sup>.

#### **10.4.2.5** Reduced clearances for insulated conductor – services

The unit costs associated with reduced clearances for insulated conductors relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations.

 <sup>&</sup>lt;sup>447</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, ESV, 14 September 2010, page 24.
 <sup>448</sup> Note \$2009.

SP AusNet has estimated a per service unit cost of \$83.46 for the initial cut and \$47.40 to "maintain clearance space" for insulated services. The initial cut cost comprises "2 men @ \$60/hr for 30 minutes" and the ongoing recuts are costed at "2 men @ \$60/hr for 15 minutes".

In comparison, has calculated that the average unit rate per service line would be **and**, in either the annual initial cut or for ongoing recuts. also assessed the unit cost per service for compliance with the Electricity Safety (Electric Line Clearance) Regulations to be **and** for **and and**.

as with an ongoing rate of per service.

has also estimated the unit rate for the initial establishment of clearance space as with an ongoing rate of the per service.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for a four-fold increase in ongoing service recuts in the CitiPower and Powercor areas.

The man-hour assessments provided by SP AusNet appear reasonable, as do the assumptions in relation to approximate times and crew numbers.

The information provided by SP AusNet, United Energy and Jemena is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate for clearance of SP AusNet insulated services to comply with the Electricity Safety (Electric Line Clearance) Regulations are as follows:

- initial clearance of services: \$83.46
- ongoing clearance of services: \$47.40

#### 10.4.2.6 Overhangs

ESV is recommending a volume of 2,000 spans that require the removal of overhanging vegetation.

In HBRA areas, the standard Clearance Space requirement allows for no vegetation to overhang open wire electric lines. In recognition of constraints in environmentally significant areas, the regulations do allow for exceptions, with conditions that include:

- vegetation is at least 3 metres above the line
- limbs are structurally sound
- an annual inspection is performed by a qualified arborist and any necessary cutting action taken.

These rules also apply to 66kV lines in LBRA areas.

SP AusNet identifies such spans as 56M's, a code which originated in the SECV Line Inspection System (LIS). SP AusNet states that it has actively reduced the number of 56Ms over the past decade, through a combination of targeted tree removal and line augmentation. The remaining 5,000 trees are now contained in 2,000 spans and are classified by SP AusNet as generally very large and/or significant in areas where tree removal would be very costly with significant stakeholder/environmental impact.

SP AusNet is proposing a range of actions to relocate or underground the affected spans. The proposed cost for these works is approximately \$36 million or \$17,966 per span.

The proposed costs are considerably greater than those proposed by

has identified engineering solutions to address overhanging vegetation with unit rates of **and a mean** per span.

SP AusNet has provided a spreadsheet<sup>449</sup> detailing the cost estimate build up for the estimated \$36 million. This spreadsheet provides a number of assumptions and identifies the primary input values for determining the forecast costs.

Nuttall Consulting has reviewed the information contained in this spreadsheet. In general, Nuttall Consulting considers that the approach was generally robust, given the relatively unknown nature of the actual rectification projects. The following items are areas where Nuttall Consulting does not agree with the assumptions or input costs.

- The HV option analysis reviewed only 81 overhang spans. This represents less than 6% of the total overhang HV spans.
- The SP AusNet analysis assumed a large percentage of rectification works would require the undergrounding of the HV line. This percentage was heavily influenced by one project where the recommended action was the underground replacement of 36 spans of overhang. HV undergrounding is the most expensive option of the actions considered by SP AusNet.
- SP AusNet has applied a contingency of 20% to every project. Nuttall Consulting does not consider that a contingency of 20% is valid to be applied equally to every project. Nuttall Consulting considers it likely that some projects will run over the average cost and others will be completed under the average cost. Nuttall Consulting recommends removal of the contingency amount.

<sup>&</sup>lt;sup>449</sup> 56M options Feb 2010 rev 4.xls

- SP AusNet has assumed an average LV span of 70m. In Nuttall Consulting's experience this is longer than the average Victorian LV span.
- The assumption that replacement of 6 spans will be required to address a single span of overhang in 1489 cases (78%) appears conservative and may understate the requirements in some areas.
- The costs for undergrounding and ABC were hard-coded into the model and could not be separated in many instances. This meant that it was not possible to assess the underlying unit rates that had been assumed for these activities.
- The model does not include any recognition of reduced operating and maintenance costs or deferred capex. SP AusNet states that "there is no meaningful difference in outage risk of 56M spans compared to other spans on the network"<sup>450</sup>. Nuttall Consulting does consider that there is a considerable reduction in outage risk for ABC and underground conductors compared to bare overhead conductors.
- Nuttall Consulting considers that the assumption that a HV Switching cabinet will be required for a 6 span HV UG option to allow for supply to a pole substation will not always be necessary (e.g. relocation of the pole top transformer to an adjacent pole).
- The unit rates assumed by SP AusNet did not appear to assume the reuse of existing pole top transformers and assumed that new transformers would be used. Nuttall Consulting considers that this may not always be the case and that this would overstate the required expenditures.

On the basis of the above review, Nuttall Consulting recommends that the proposed unit rates for SP AusNet projects to address overhang (56m) should be reduced by 20%.

# **10.5** United Energy

United Energy is claiming additional expenditures for the next regulatory control period associated with the Electricity Safety (Electric Line Clearance) Regulations 2010. The main areas of additional expenditure are as follows:

- Strategic program expenditures
  - ESMS Process Compliance Costs
  - Replacement of Non-Preferred Services
  - Installation of Neutral Condition Monitors
  - Removal of Public Lighting Switch Wires
  - Ground Fault Neutralisers and Removal of SWER
  - Install ABC in HBRA
  - Pole Top Fire Mitigation

<sup>&</sup>lt;sup>450</sup> AMS – Electricity Distribution Network Vegetation Management (AMS 20-23), SP AusNet, page 11

- Pole Top Replacement (Age & Condition)
- Pole Replacement
- Overhead Conductor Replacement
- Zone Substation Transformer Replacement
- Zone Substation Circuit Breaker Replacement
- Backup earth fault protection systems
- Electricity Safety (Electric Line Clearance) Regulation expenditure
  - Maintenance of the Clearance Space
  - Notification & Consultation
  - Service Line Clearance
  - Habitat Trees
  - Hazard Trees
  - Overhanging trees

Each of these expenditure items are covered in the following sections.

### **10.5.1** Strategic planning expenditures

United Energy has prepared a number of strategic planning papers targeted at specific asset classes. The papers identify additional expenditures associated with changes to the historical approach to managing these assets. The individual review of the ESV approved volumes for these strategies are considered below.

The ESMS compliance assessment has been grouped in this category for the sake of simplicity.

### **10.5.1.1** ESMS Process Compliance Costs

United Energy has identified the need for additional resources to meet its obligations under the new Electricity Safety (Management) Regulations. These regulations require United Energy to submit a risk-based Electricity Safety Management Scheme (ESMS).

United Energy has claimed the need for additional resources to meet its obligations under the new Electricity Safety (Management) Regulations which require United Energy to submit a risk-based Electricity Safety Management Scheme (ESMS). The additional resources claimed are shown in the following table.

#### Table 85 – United Energy compliance costs

ESMS Processing FTE Total for 5 Year Period	2011-15
Scheme description	20
Formal Safety Assessments	200
Establish Technical Policy Committee	50
Incorporation of risk in AMP	20
Monitoring, reviewing, auditing of processes	10
Safety related KPIs	120
Specification of Access Authority System	10
Establishment of formal incident processes & systems	360
Reporting	40
Auditing	Not provided
Emergency Response Plans	50
Total	880

ESV notes that the additional resources claimed by United Energy equate to less than 1 additional FTE over the five year period. ESV does not consider the level of resources to be material.

The United Energy unit rates are based on an internal labour rate of per day. Nuttall Consulting notes that this is a relatively high rate and equates to an annual salary of approximately . This level of remuneration is more consistent with a senior management or executive role, rather than a technical or administrative role.

On this basis, Nuttall Consulting recommends an annual FTE rate of \$150k.

#### **10.5.1.2** Replacement of Non-Preferred Services

Under its ESMS, United Energy is proposing a planned replacement program for nonpreferred services. ESV noted that the need for the program was identified in the risk assessments conducted by United Energy in preparing its ESMS. The replacement of neutral screen services has been identified as a priority by the industry for more than a decade.

ESV note that the need for the program is supported by Jemena's analysis<sup>451</sup> arising from defects detected during its Neutral Service Testing program and through the increasing trend in electric shocks reported by the public.

The majority of issues relate to neutral screened and twisted service cables. Both of these types of service cable are reaching the end of their service life and present levels of risk

<sup>&</sup>lt;sup>451</sup> Asset Strategy, Strategic Planning Paper, UED Neutral Screened Services, United Energy – page 2

that require attention. ESV strongly supports the need for the proposed replacement program, which is expected to take 15 years.

The ESV supports the planned non-preferred service replacement and height replacement of services, but not the fault replacement. The ESV considered that fault replacement represented business as usual practice.

In the original report, Nuttall Consulting determined that United Energy had not demonstrated any change in regulation or business driver that suggests that the neutral screened replacement program should be materially different from currently adopted practices.

United Energy states that the drivers for the change of approach for the neutral screen services replacement program are twofold; ESMS regulations and an improved understanding of associated risk.

Revised Electricity Safety (Management) Regulations were introduced in 2009 and amendments were made to the Electricity Safety Act 2007 which came into effect on 1 January 2010. The new regulations allow a robust risk management process to manage its network safety based on risk. United Energy also states that the ESV has identified a number of principal risks including "unsafe connection to customer premises"<sup>452</sup> although no reference to this was provided.

United Energy states that they commenced a 10 year neutral screen service replacement program in 2008<sup>453</sup> due to an observed increasing trend of failure of this class of service and the resulting public safety hazard.<sup>454</sup> However, they state that "the potential of severe risks such as customer fatality were identified. The only realistic option to address the risk is to eliminate it by replacing this type of overhead service. Risks have been assessed as so severe that the program is to be accelerated so that it is completed by 2015". Nuttall Consulting is concerned that these "severe risks" are not being addressed at present with the 5 year program not commencing until 2011. These statements appear contradictory.

To satisfy the Electricity Safety (Network Assets) Regulations 1999 United Energy determined that all overhead services needed to be measured for neutral to earth resistance by the end of 2009<sup>455</sup>. United Energy has reportedly halted this program for the duration of the AMI roll out.<sup>456</sup> This deferral suggests that United Energy does not consider the risks associated with this asset type to be of the highest priority.

Nuttall Consulting also noted that the electricity industry, and United Energy specifically, have been aware of issues relating to neutral screen services for a long time and have had dedicated testing and replacement programs in place for nearly a decade.

<sup>&</sup>lt;sup>452</sup> UED's Revised Regulatory Proposal 2011-2015, page 143

<sup>&</sup>lt;sup>453</sup> This date has been stated as 2009 in a later paper (Asset Strategy Strategic Planning Paper, UED Neutral Screened Services – undated). Which date is correct is not discussed.

<sup>454</sup> Ibid

<sup>&</sup>lt;sup>455</sup> LV Overhead Services Lifecycle Management Plan, Document No.: UE 4356 – 117, 10/09/2009.

<sup>456</sup> Ibid.

Nuttall Consulting also notes that between 2001 and 2003, United Energy had already identified that 68% of electrical shock reports occurred only in service cables which have a neutral screen<sup>457</sup>. This is a very high proportion of electrical shocks from this population of assets and again highlights that the problems with neutral screen services are not new.

United Energy also states that "(t)he reported level of customer tingles and shocks has not materially changed over the historical period covered by the neutral service testing program."<sup>458</sup> This suggests that the risk of the failure mode that results in shocks or tingles for the neutral screen service population has not changed in recent years.

The United Energy asset strategy for neutral screened services<sup>459</sup> also identifies a "direct benefit" of \$100 savings for each unplanned (faulty) service replacement that is avoided through the replacement program. Although this was a specific issue identified by Nuttall Consulting in the original report, United Energy has not identified this benefit in terms of a reduced operating expenditure requirement.

The United Energy forecast expenditure for the neutral screen service replacement program does not appear to recognise the interaction with the proposed vegetation clearance requirements. The new clearance regulations applying to vegetation in proximity to overhead services will reduce the level of neutral screen service faults due to abrasion by vegetation. The impact of these new regulations do not appear to be considered in the risk assessments undertaken by United Energy.

Nuttall Consulting notes that both the non-preferred service replacement and the height replacement programs are ongoing. It will be necessary to assess the historical volumes of service replacements and deduct these from the proposed replacement programs to determine the incremental volumes for the next regulatory period.

United Energy has proposed a unit rate for service replacement of

Nuttall Consulting has reviewed the proposed replacement cost of per service. The proposed per unit rate of is not consistent with current United Energy prices to provide a new service. The new service and meter price charged by United Energy is currently **1**<sup>460</sup>. This service includes the installation of a service (single phase) and meter and will typically involve greater travel distances between jobs than a programmed replacement schedule.

An efficiently run replacement program would be undertaken to minimise travel time through undertaking all replacements within close proximity to each other where possible. As these services were often installed as suburbs were developed, many will be in adjacent houses.

<sup>&</sup>lt;sup>457</sup> United Energy Electricity Safety Maintenance Plans For Overhead Service Heights Pole Mounted Substation Clearances Neutral Testing Program And The Management of Shallow Underground Cables. Document No. UE 4200-30.

<sup>&</sup>lt;sup>458</sup> Asset Strategy, Strategic Planning Paper, UED Neutral Screened Services (undated).

<sup>459</sup> Ibid, page 11

<sup>&</sup>lt;sup>460</sup> United Energy Distribution Prescribed and Excluded Service Charges - United Energy Distribution, 1 January2010

The current United Energy charges to install a temporary single phase service is and this includes the disconnection and removal of the service at a later date. The cost for a temporary service installation with a coincident disconnection is **detect**. This is essentially the same physical requirements as for a service replacement, with the additional costs of connecting a meter.

Nuttall Consulting notes that a percentage of neutral screen services may be three phase and that the connection time for these services may be a little longer than for a single phase service. The cost of the service materials may also be slightly higher.

To allow for the slightly higher three phase costs, Nuttall Consulting recommends a per unit amount of \$160 for each service replacement.

#### **10.5.2** Removal of Public Lighting Switch Wires

As identified by the ESV, public lighting switch wires have been largely redundant since the mid 1980's as lighting control was transferred to photo electric switching. On the United Energy network, the switch wires were not removed when luminaires were replaced and in many places have still remained in place for over 25 years as an unused asset.

United Energy has opportunistically removed switch wires during other programmed work, but it is estimated that around 7,236 spans remain on the United Energy network (based on experience). The presence of unmaintained switch wires represents a hazard (there have been several fatalities and near misses) and ESV strongly supports United Energy's program to remove the remaining spans of switch wire on a planned basis.

The ESV supports this program.

The United Energy proposed approach to switch wire removal is to:

- continue and reinforce the opportunistic removal of switch wire during major maintenance
- identify the extent and presence of switch wire during the 4 yearly pole and line inspections
- remove the remaining sections of obsolete public lighting switch wire over a three year period to 2015. This is expected to require one line crew with traffic control for approximately 50% of the time over a three year period and would be co-ordinated with major maintenance and renewal activities as far as practicable.

The unit rate for this work implied by the United Energy submission information is per span. This is based on the United Energy proposed expenditure of per annum<sup>461</sup> and the ESV recommended volumes of 2,412 per annum.

Nuttall Consulting has assessed the per unit requirement for switchwire removal on the United Energy and networks and concludes rate of per span is reasonable.

<sup>&</sup>lt;sup>461</sup> Asset Strategy Strategic Planning Paper UED Public Lighting Switch Wire Removal, United Energy, page 11

Switchwires are typically uncovered copper, steel or aluminium conductors. These materials have a positive value when sold as scrap, particularly copper. United Energy has not identified a recovery price for these materials.

The size and the type of the switchwire conductors is not known. It would be necessary to know the lengths, gauge and type of conductors to determine the recovery value of the materials.

United Energy also identifies that there are costs of leaving the unmaintained asset on the network. These include the costs of failure of the asset as well as the time and confusion required to identify and make safe the switchwire every time a crew is working on or near these assets.

Nuttall Consulting considers that the unit rate of per span is a reasonable unit rate for this work. However, the unit rate does not recognise the benefits of removal of this asset as identified by United Energy.

### 10.5.3 Ground Fault Neutralisers and Removal of SWER

United Energy is proposing the removal of the remaining SWER lines in its service territory and the installation of Ground Fault Neutralisers (GFNs) in zone substations.

The ESV supports the volumes proposed for both of these works. These are the replacement of 44km of SWER and the installation of GFNs in three zone substations.

United Energy has provided the following unit rates to support the cost build up for this project.

Area	ltem	Unit	Source	Unit rate
Zone Substation	GFN Unit	Per installation	FSH Actual Project	
Zone Substation	Directional Relays	Per relay	Benchmark Price	
Zone Substation	Unearth Cap Bank	Per cap bank	FSH Actual Project	
Zone Substation	Other Costs	Per installation	FSH Actual Project	
Distribution Network	SWER -Line	Per km	Benchmark Price	
Distribution Network	SWER -Tx	Per km	Benchmark Price	
Distribution Network	SA – Replace	Per 3 phase set	Benchmark Price	
Distribution Network	SA -Retire	Per 3 phase set	FSH Actual Project	
Distribution Network	Other Costs	Per installation	FSH Actual Project	

#### Table 86 – GFN and SWER unit rates

United Energy states that they have also verified the pricing used to establish these unit rates and that actual costs have been back-calculated from an already complete GFN installation.

Nuttall Consulting has assessed the unit rates against the unit rates contained in the DNSP RIN submissions. Although not directly comparable in many cases, Nuttall Consulting considers that the proposed unit rates fall within the reasonable range of expected costs.

Nuttall Consulting recommends the following unit costs:

- \$175,000 per km of SWER replacement
- \$1.7m per zone substation for GFN installation.

Nuttall Consulting notes that the following unit rate does not make allowances for any of the following benefits:

- Bush fire start risk reduction Significant reduction in the size of the phase to ground fault level reduces the risk of arcing for a conductor on the ground and therefore reduces fire start risk. This will result in less fault and emergency work for United Energy and reduced claims.
- Improved safety Significant reduction in the size of the phase to ground fault current reduces step and touch potentials during fault conditions.
- Improved reliability The self-extinguishing capability of the GFN for transient faults will see a reduction in MAIFI. United Energy has valued this at \$10k per annum per zone substation. The reduction in fault current will also have an impact through reduced wear of circuit breaker contact points and less strain on line fittings and fixtures. This value was not quantified by United Energy.
- Surge arrester end of life Surge arrestors need to be replaced at their end of life. Upgrading surge arresters to cater for GFN operation will defer the need for the next replacement. United Energy has valued this at \$75k per annum per zone substation.
- SWER constraints Many SWER systems have significant constraints in terms of voltage and capacity. Retiring the SWER will alleviate these constraints. This value was not quantified by United Energy.
- Standardisation Removal of SWER will mean that spare parts for this type of network will no longer be required. This value was not quantified by United Energy.

#### **10.5.4** Pole Top Fire Mitigation

United Energy is proposing a targeted program for reducing the incidence of pole top fires. The United Energy program of targeted inspection and replacement involves the refurbishment of HV and subtransmission pole top structures, including inspection, cleaning, tightening and replacement of crossarms and insulators where there is evidence of deterioration, charring or burning.

United Energy's 2011-2015 Capital and Operating Works Plan identifies a total of \$7.97m for pole fire mitigation over the period 2011 to 2015. This allows for the targeted replacement of approximately 3,000 pole top structures.

The unit rate for this activity is calculated at per pole top structure. Nuttall Consulting considers that this is a very high rate for the described works. Mitigating this cost is the non-sequential nature of the replacement. United Energy's description of the proposed program is that it will be based on inspections and driven by observed condition triggers. On this basis, pole tops will be replaced in a relatively sporadic fashion with limited ability to aggregate and gain efficiencies through adjacent works.

In these cases, the majority of unit costs may relate to labour and vehicle requirements, rather than the cost of materials.

Based on the above, Nuttall Consulting considers that the proposed unit rates are reasonable as follows:

- per insulator set
- per crossarm.

However, Nuttall Consulting considers that the proposed inspection unit rate of per inspection is not reasonable. United Energy has not provided any information to substantiate an inspection that would justify this equivalent labour amount. Nuttall Consulting considers that a unit cost of \$100 per inspection represents a conservative estimate of the time required to inspect the pole top assets.

Nuttall Consulting notes that these unit rates do not account for the following items:

- the reduction in emergency maintenance
- the historical expenditure of \$200-\$300k p.a in this area<sup>462</sup>
- the reduction in "pole fire events (that) have caused widespread impact on network performance"<sup>463</sup>.

### **10.5.5** Pole Top Replacement (Age & Condition)

United Energy proposes to replace crossarms in targeted areas based on their age and condition, to achieve a reduction in the number of pole fires. This program has been considered in conjunction with the pole top fire mitigation program discussed in the preceding section.

This United Energy program is aimed at reducing the risk of fire initiation, reducing the number of pole fire related interruptions, reducing the risk of electrocution/injury to the public and reducing the risk of high voltage injection.

<sup>&</sup>lt;sup>462</sup> Asset Strategy Strategic Planning Paper, UED Pole Top Fire Mitigation , United Energy, page 8

<sup>&</sup>lt;sup>463</sup> Asset Strategy Strategic Planning Paper, UED Pole Top Fire Mitigation, United Energy, page 2

United Energy is proposing to replace an additional 50,088 cross-arms (and associated assets) in the next regulatory period. These are proposed as additional works to the existing programs of pole top replacement. The ESV supports these work volumes.

To assess the unit costs that United Energy has used to produce its capex forecast for this item, we have undertaken a comparative analysis exercise using:

- the replacement units costs provided by the DNSPs for the repex modelling exercise
- derived historical actual and forecast units costs from the relevant pole top activity codes, which were provided by the DNSPs and used in our RQM review.

Based upon this analysis, the unit costs look low compared to the other DNSPs, both the individual unit costs and the average unit cost. Furthermore, the average forecast unit cost also looks lower than the historical average derived from activity code data.

Based upon this analysis, we have accepted the United Energy unit costs.

### **10.5.6** Install ABC in HBRA

Approximately 40% of the United Energy network area is within the HBRA including around 19,500 poles and 2,300 km of overhead conductor. United Energy proposes to replace specific routes of bare overhead conductor with ABC, selected on the basis of relative fire risk of the line assets and their surrounding environment. Replacing bare conductor with ABC will reduce the risk of fire starts, reduce vegetation management costs and improve reliability of supply.

The incremental work load claimed by United Energy is shown in the following table.

#### Table 87 – United Energy proposed ABC in HBRA

	2011	2012	2013	2014	2015	2011-15
HV ABC Projects in HBRA (m)	4,800	4,800	4,800	4,800	4,800	24,000
LV ABC Projects in HBRA (m)	2,950	2,950	2,950	2,950	2,950	14,750

ESV supports the need for the program and has concluded that the work volumes appear reasonable.

United Energy is proposing unit rates of per metre for HV and per metre for LV.

Nuttall Consulting has reviewed the proposed rates against the per kilometre costs provided by the DNSPs for other capital projects and considers that the proposed amounts are reasonable.

Nuttall Consulting notes that these unit rates do not account for any associated reduction in emergency maintenance.

### **10.5.7** Pole Replacement

This United Energy program is aimed at reducing supply interruptions, improving public perception and safety associated with pole failures, and to ensure the economic optimization of pole life.

To assess the unit costs that United Energy has used to produce its capex forecast for this item, we have undertaken a comparative analysis exercise using:

- the replacement units costs provided by the DNSPs for the repex modelling exercise
- derived historical actual and forecast unit costs from the relevant pole top activity codes, which were provided by the DNSPs and used in our RQM review.

Based upon this analysis, the individual replacement unit costs are low compared to the majority of other DNSPs, using the unit costs provided for repex modelling. Furthermore, the forecast average unit cost appears reasonable compared to the other DNSPs historical and forecast averages derived from the activity code data - United Energy is lowest of the five DNSPs.

Based upon this analysis, we have accepted the individual unit costs.

However, we do note that the United Energy forecast average unit cost is high compared to its historical average. This appears to be due to the assumed ratio of staked poles to replaced poles being much lower in the forecast (58% historical to 43% forecast).

It is not clear whether the ESV has assessed this issue. Therefore, the AER may need to consider whether this assumption should be moved in line with the historical ratio i.e. around 55%. This will result in a reduction in the overall capex allowance for this program.

### **10.5.8** Overhead Conductor Replacement

United Energy is proposing a proactive replacement program that is designed to secure the performance of the system used and improve network performance overall.

This United Energy program is aimed at reducing the risk of fire initiation, reducing the number of conductor failure related interruptions, reducing the risk of electrocution/injury to the public, reducing the risk of high voltage injection and reducing OH&S issues for electrical workers.

United Energy's unit costs are similar to Jemena, but appear very high compared to Powercor and SP AusNet's unit costs<sup>464</sup>. The unit cost is approximately 85% above Powercor's proposed unit cost and over 100% of our recommended unit cost for Powercor (see section 6.3.3). United Energy has not provided any detailed analysis of past project costs to support its unit cost estimates.

We accept United Energy unit costs are likely to be higher than Powercor and SP AusNet due to the more urbanised nature of the existing lines. However, we do not consider that

<sup>&</sup>lt;sup>464</sup> It is worth noting that the SP AusNet unit cost should be much lower as it does not capture all the costs allowed for in other DNSP's unit costs.

this is sufficient to explain the scale of the increase, particularly noting that we would expect the replacement to be largely on rural fringes where the fire hazards are greater.

We also note that the unit cost is more in the range of a complete rebuild or small upgrade. We do not consider this is reasonable, as we would expect in many circumstances restringing or partial rebuild will be possible.

Furthermore, we would also expect an overlap with other replacement needs allowed for in the pole and pole-top allowances. Given the large increases accepted by the ESV in these areas, it seems reasonable to assume that this overlap may be significant.

Based upon the above, and in the absence of more detailed analysis to support the United Energy unit cost, we consider a value of \$55k/km to be reasonable.

This allows for a 66% increase, to cover the higher urban cost, on the efficient unit cost we recommended for Powercor.

#### **10.5.9** Zone Substation Transformer Replacement

The United Energy Zone Substation Transformer Replacement Program is a major asset replacement program intended to secure the ongoing performance and reliability of the United Energy network.

United Energy has a number of transformers entering the latter years of their life, and are forecast to require replacement. The ageing of this plant is affected by loading, and the increased utilisation.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

#### **10.5.10** Zone Substation Circuit Breaker Replacement

United Energy has established an ongoing zone substation circuit breaker replacement program which is aimed at achieving a high level of supply reliability and availability.

The replacement program is based upon a set of established criteria that are used to prioritise the program. Switchgear replacement is based on condition and performance and is aligned with major augmentation work wherever possible.

This United Energy program covers the replacement of ageing and defective zone substation circuit breakers. ESV does not dispute the need for this program, but considers that the program is driven primarily by factors other than safety (e.g. reliability of supply) and should be justified by those other factors. ESV also recognises that the need for the program does contain a safety component.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV. Replacement volumes and unit costs for this asset group have been assessed and provided for in the Nuttall Consulting recommendations on reliability and quality maintained capex.

### **10.5.11** Backup earth fault protection

A number of United Energy's zone substations are reliant on a single protection scheme to detect and isolate earth faults on the HV network. ESV considers this situation to be unacceptable due to the increased risk of electrocutions, fire starts and damage to network assets.

United Energy has 15 of its zone substations without backup earth fault protection. The incremental work load claimed by United Energy is shown in the following table.

Table 88 - United Energy	y backup earth	protection volumes
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	2011	2012	2013	2014	2015	2011- 15
Install backup protection schemes	3	3	3	3	3	15

ESV supports the need for the program and has concluded that the work volumes appear reasonable.

The installation of a backup earth fault protection scheme will ensure network faults are disconnected in the event that the primary (feeder) protection scheme fails to operate. However, the operation of the backup earth fault scheme will result in the loss of at least one zone substation bus, resulting in more customers off supply.

United Energy has estimated the unit rate to install backup earth fault protection at per scheme.

Nuttall Consulting is not able to benchmark this cost against other protection schemes as the retro-fitting of a protection scheme is driven by integration with the existing protection schemes and communication infrastructure.

Nuttall Consulting considers that the proposed unit rate of per scheme does not appear unreasonable, but is not able to confirm these proposed costs against existing benchmarks or similar work types.

#### **10.5.12** Electricity Safety (Electric Line Clearance) Regulations

United Energy is claiming additional expenditure due to changes to the Electricity Safety (Electric Line Clearance) Regulations:

- Maintenance of the Clearance Space
- Notification & Consultation
- Service Line Clearance

- Habitat Trees
- Hazard Trees

ESV has supported the need for additional work activity in most of these areas.

The Nuttall Consulting assessment of the unit costs associated with the above additional works are provided in the following sections.

### 10.5.12.1 Maintenance of the Clearance Space – HBRA pre-summer

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. This section deals with the inspection and trimming associated with vegetation management undertaken prior to the bushfire season.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

United Energy is proposing a unit rate of per span for pre-summer vegetation management in HBRA areas.

has used a unit rate between and and a span<sup>465</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** for both LBRA and HBRA areas<sup>466</sup>. **Constant** is proposing a unit rate of **a span** for HBRA areas.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, United Energy and Jemena is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

<sup>&</sup>lt;sup>465</sup> The **sector** unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

<sup>&</sup>lt;sup>466</sup> Noting the proposed annual program for HBRA

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, Jemena and United Energy is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span.

#### **10.5.12.2** Maintenance of the Clearance Space – HBRA cyclic

The management of vegetation in High Bushfire Risk Areas (HBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010. DNSPs currently inspect and cut vegetation in HBRAs cyclically with a special inspection and trim undertaken prior to the summer bushfire period. This section deals with the inspection and trimming associated with vegetation management undertaken cyclically.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

United Energy is proposing a unit rate of per span for cyclic vegetation management in HBRA areas.

has used a unit rate between and a span<sup>467</sup> in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **a span** for both LBRA and HBRA areas<sup>468</sup>. **Constant** is proposing a unit rate of **a span** for HBRA areas.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, Jemena and United Energy is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. Powercor did not provide a working spreadsheet or detailed information to the level of the other companies. Powercor did identify that the

<sup>&</sup>lt;sup>467</sup> The **sector** unit costs decrease over time because of increased productivity and, in the case of the HBRA rates, also the reduced workload per span after larger clearances are achieved (i.e., compliance is established) during 2011-13.

<sup>&</sup>lt;sup>468</sup> Noting the proposal annual program for HBRA.

unit rates for HBRA, in particular those for the cyclic and pre-summer programs, reflect the increased work activity per span, particularly in the early years of the period 2011-15, required as a result of the removal of the HBRA Exemption.

The Powercor explanation for the increased unit rates does not provide any differentiation from the other DNSPs. On this basis, it remains unclear as to why the Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, Jemena and United Energy is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Nuttall Consulting notes that the **Sector Sector** unit rate is the lowest of the group at **Sector** per span. This unit rate was consistent for **Sector** across LBRA and HBRA areas. Nuttall Consulting notes that **Sector** is proposing an annual HBRA vegetation management cycle and considers that this approach would result in the slightly lower average cost per span.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span.

#### **10.5.12.3** Maintenance of the Clearance Space – LBRA

The management of vegetation in Low Bushfire Risk Areas (LBRA) is required to change due to changes in the Electricity Safety (Electric Line Clearance) Regulations 2010.

Clause 11 of the 2010 Code establishes the required clearance spaces for non-insulated powerlines. These requirements were previously contained in clause 10 of the 2005 code. Clauses 10(b) and (c) and Tables 10.2 and 10.3 of the 2005 Code provided for smaller clearance spaces than would otherwise apply to powerlines of 22,000 volts or less and powerlines of 66,000 volts where the responsible person complied with clause 12 of the 2005 Code. These exceptions have not been included in the 2010 Code, resulting in a requirement for additional cutting.

United Energy is proposing a unit rate of per span for LBRA areas.

have used a unit rate of a span in calculating the cost to comply with clause 11. The equivalent unit rate proposed by **a span** is **b** per span for both LBRA and HBRA areas<sup>469</sup>. **a span** is proposing a unit rate of **b** per span for LBRA areas.

The CitiPower/Powercor unit costs are considerably higher than those of all the other Victorian DNSPs.

The information provided by SP AusNet, Jemena and United Energy is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to

spreadsheet suggests that these figures are not inflated to 2010 dollars.

<sup>&</sup>lt;sup>469</sup> A side note in the

show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for the differences in proposed unit costs.

The information provided by SP AusNet, Jemena and United Energy is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate associated with removal of the 2005 Code exemptions is per span<sup>470</sup>.

#### **10.5.12.4** Additional resources

United Energy has claimed additional labour resources associated with maintenance of the clearance space.

ESV "questions the level of additional resources claimed"<sup>471</sup>. Nuttall Consulting assumes that this statement means that ESV does not approve the volumes proposed and has therefore not assessed the unit rates proposed for this item.

#### 10.5.12.5 Mid-cycle pruning program

United Energy is proposing the addition of a mid-cycle pruning program to augment the vegetation management program. The ESV has approved additional work volumes associated with this activity.

The unit rates proposed by United Energy for this work are provided in the following table.

Mid-cycle Pruning Program	Rate/Span (\$)
Span Cut Rate HBRA Inspection	
Span Cut Rate LBRA Inspection	
Span Cut Rate Service lines Inspection	

 Table 89 – Proposed mid-cycle pruning rates

Nuttall Consulting notes that the unit rates vary considerably between LBRA and HBRA areas. It is not clear why the LBRA inspection costs are greater than the cyclic trimming costs proposed by United Energy of **Costs**.

In the absence of justification from moving from the existing LBRA unit rate of **Markov**, Nuttall Consulting is unable to recommend the proposed unit rate of **Markov**. Nuttall

<sup>&</sup>lt;sup>470</sup> Noting the spreadsheet notes of conversion of to 2010 dollars.

<sup>&</sup>lt;sup>471</sup> Assessment By Energy Safe Victoria Of EDPR Safety-Related Programs, ESV, 14 September 2010, page 19

Consulting notes that the cyclic LBRA cost of compares closely to the unit rate for this work of .

The mid-cycle cut rate of the for services is also higher than other comparable unit rates. and United Energy have estimated the initial establishment of service clearance space at a unit rate of the with an ongoing rate of the service. In comparison, has estimated a per service unit cost of the initial cut and to maintain clearance space for insulated services.

United Energy has not provided evidence to justify the mid-cycle unit rate being greater than the ongoing service clearance rate.

Based on the above, Nuttall Consulting recommends the following unit rates:

Table 90 – Recommended mid-cycle pruning rates

Mid-cycle Pruning Program	Rate/Span (\$)
Span Cut Rate HBRA Inspection	\$188
Span Cut Rate LBRA Inspection	\$210
Span Cut Rate Service lines Inspection	\$47.33

#### **10.5.12.6** Notification & Consultation

The 2010 regulations require consultation only in situations where a tree that is to be cut or removed is within the boundary of a private property. Under the 2010 regulations, responsible persons can notify affected persons of cutting/removal of trees by placing notices in newspapers. ESV found that the changes to the regulations represent a small reduction in burden on the electricity distributors.

United Energy has requested additional work associated with notification and consultation. ESV considers that the requirements in the current regulations are a slight reduction in burden from those contained in the previous regulations, and therefore does not support additional expenditure for notification and consultation.

ESV did not recommend any work volumes under this program.

Nuttall Consulting has not assessed the unit costs for this program as it has not been recommended by the ESV.

#### **10.5.12.7** Reduced clearances for insulated conductor - Services

The unit costs associated with reduced clearances for insulated conductor relate to the omission of exceptions in clauses 9.2.1, 9.2.2 and clause 9.3 in the revised Electricity Safety (Electric Line Clearance) Regulations. United Energy has identified service lines as being impacted by this change.

United Energy has estimated the initial establishment of clearance space unit rate as with an ongoing rate of the per service.

has also estimated the initial establishment of clearance space unit rate as with an ongoing rate of the per service.

has calculated that the average unit rate per service line would be **11**, in either the annual initial cut or for ongoing recuts<sup>472</sup>. The information provided by **11** did not provide any further breakdown of these costs or time required for the proposed works.

The information provided by SP AusNet, Jemena and United Energy is highly consistent and is also the most detailed. Each of these companies provided detailed spreadsheets to show how the costs were built up. CitiPower and Powercor did not provide a working spreadsheet or detailed information to the level of the other companies.

On this basis, it is not possible to determine why the CitiPower and Powercor costs are considerably higher than those of the other Victorian DNSPs. Nuttall Consulting is not aware of any geographic or demographic reasons that would account for a four-fold increase in ongoing service recuts in the CitiPower and Powercor areas.

The man-hour assessments provided by SP AusNet appear reasonable, as do the assumptions in relation to approximate times and crew numbers.

The information provided by SP AusNet, Jemena and United Energy is sufficient for Nuttall Consulting to form the view that these represent efficient unit costs for the proposed works. Nuttall Consulting is unable to conclude that the costs proposed by CitiPower and Powercor are efficient and has therefore rejected these.

Based on the information provided, Nuttall Consulting considers that the efficient unit rate for clearance of United Energy insulated services to comply with the Electricity Safety (Electric Line Clearance) Regulations are as follows:

- initial clearance of services: \$83.46
- ongoing clearance of services: \$47.40.

<sup>&</sup>lt;sup>472</sup> This cost includes the cost of the cutting and clean-up of vegetation required as a result of the omission of clauses 9.2.1, 9.2.2 and 9.3 of the 2005 Code from the 2010 Code.
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United Energy has also identified that some services may require undergrounding or relocation due to the revised Electricity Safety (Electric Line Clearance) Regulations 2010. The proposed unit costs for these activities are **services** and **services** respectively. The ESV has recommended volumes of 16,590 and 4,150 for these activities.

Nuttall Consulting has reviewed the proposed replacement cost of per service. The proposed per unit rate of is not consistent with current United Energy prices to provide a new service. The new service and meter price charged by United Energy is currently **1**<sup>473</sup>. This service includes the installation of a service (single phase) and meter and will typically involve greater travel distances between jobs than a programmed replacement schedule.

The service replacement program will not be undertaken in a manner that would support minimising travel time as the services to be relocated may not be located in close proximity to each other. The relocation services may also require consultation with the landowner and adjacent landowners. To make allowances for these additional costs, Nuttall Consulting recommends a unit rate of \$250 per service relocation.

The unit rate of **sector** is greater than would be required to provide a simple underground service in a new residential estate. However, the installation of an underground service to replace an existing overhead service is a complex task. The costs associated with this task can vary dramatically based on factors such as soil type (e.g. rock, clay or sand), other services in the ground (gas, water, electric, sewer, telecoms, etc.), and reinstatement requirements (e.g. pavements, roads, nature strips).

Customer negotiations may also play a significant part in determining the unit cost of this activity. Nuttall Consulting assumes that the **supply** unit rate excludes any works on the customer's premises with the exception of the disconnection and reconnection of the supply to the meter position.

The more densely populated an area, the greater the likelihood of increased costs. The proposed locations for the United Energy undergrounding of services are not known. As such, it is not possible to determine if the proposed unit rate of **services** is efficient as an overall average.

Nuttall Consulting therefore recommends that the proposed unit rate of **be** accepted.

#### 10.5.12.8 Habitat Trees

Clause 4 of the 2010 regulations requires a DNSP, before undertaking any pruning or removal of vegetation, to identify whether the tree is the habitat for fauna that is:

 listed as threatened in accordance with section 10 of the Flora and Fauna Guarantee Act 1988

<sup>&</sup>lt;sup>473</sup> United Energy Distribution Prescribed and Excluded Service Charges, United Energy Distribution, 1 January 2010, page 10.

## **Nuttall Consulting**

- listed in the Threatened Invertebrate Fauna List with a conservation status in Victoria of 'vulnerable', 'endangered' or 'critically endangered'
- listed in the Threatened Vertebrate Fauna List with a conservation status in Victoria of 'vulnerable', 'endangered' or 'critically endangered'.

In the event that the tree is the habitat for the fauna listed above, clause 4 of the 2010 regulations requires the cutting or removal of the tree to be undertaken outside of the breeding season wherever practicable.

In the event that it is not practicable to undertake cutting or removal of the tree outside of the breeding season for that species, the 2010 regulations require translocation of the fauna wherever practicable. These requirements did not exist in the 2005 regulations, although the management plan to be developed by the responsible person did require the identification of location of areas of vegetation that is the habitat of 'rare or endangered' species and details of the methods that will be used to avoid and minimise the impact on such vegetation.

United Energy proposes that an additional FTE specialising in the identification and maintenance of species and the maintenance of a register for endangered species and their habitat will be required to work in parallel with the United Energy vegetation management program.

United Energy state that this person would also arrange the training of assessors and other employees to be able to identify threatened species as well as obtain specialist services if required to ensure compliance with the regulations.

The ESV has confirmed that the new clause 4(1) does not require DNSPs to identify the location of 'habitat' trees. The current practice of obtaining information from local councils, government departments and community groups who hold such information will continue. ESV has advised that a DNSP will have met its obligation in regard to identifying the location of 'habitat' trees if it accesses the information held by others. United Energy considers that the need to obtain information from local councils, government departments and community groups, cross reference that information and analyse for threatened species and their breeding patterns will increase the workload above current practice.

As a result of discussions with the ESV United Energy has revised down its resource requirement to one FTE to establish the 'habitat' tree register in the first year (2011), followed by 0.4FTE in subsequent years to monitor and update the register, process questions and information requests, and provide on-going training to employees and vegetation contractors.

The ESV has approved the volume of work proposed by United Energy.

United Energy has used per annum for the salary cost of the Scientific / Environmental Specialist based on existing salary band of Tier 6. Nuttall Consulting considers that the proposed FTE unit rate of per annum is within the reasonable range of expected costs for this role. This rate includes is a gross rate and includes overheads and on-costs associated with employment.

#### 10.5.12.9 Hazard Trees

The Electricity Safety (Electric Line Clearance) Regulations 2005 clause 9(4)(o)(iii) required DNSPs to specify the methods used to monitor the condition of vegetation in the hazard space (defined as vegetation that is beyond the regrowth space and could become a hazard to the safety of the electric line under a range of weather conditions prevalent in the area).

The 2010 regulations (clause 3 of the Code) give DNSPs the authority to minimise hazards by pruning or removing trees that are likely to fall onto or otherwise come into contact with an electric line.

United Energy has included the cutting or removal of hazard trees in its line clearance management plan submitted to the ESV.

United Energy has estimated that the volume of work required for this activity includes 500 tree removals and 1,500 trees cut. These volumes have been recommended by the ESV.

The United Energy unit costs proposed for these volumes are for each tree removal and for each hazard tree trimmed.

Nuttall Consulting has assessed the tree removal costs against those advised by the Australian Institute of Architects (AIA)<sup>474</sup>. This cost guide suggested tree removal costs in Melbourne of between \$300 and \$1,600 per tree. The AIA noted that prices are extremely variable and depend on the following: tree height, trunk circumference, density of branches/foliage, access to site for travel towers, woodchippers & grinders, obstructions, buildings underneath, tree alive or dead. The range could be wider if all the factors counted against easy removal.

Nuttall Consulting considers that the sort of trees likely to be considered a hazard will tend towards larger and older trees that are higher than the overhead lines. On this basis, Nuttall Consulting accepts the proposed tree removal unit rate of per tree.

The United Energy proposed unit rate of **per hazard tree trim exceeds the cyclic span** clearing rates of between **second and second**. A span typically consists of more than one tree that requires trimming on average. This suggests a per tree trimming cost of less than **second second** to **second**. Mitigating against this is the likelihood that the tree trimming required for hazard trees will not have ready street access and will require trimming at a higher level than is typical for cyclic trimming.

On balance, Nuttall Consulting considers that a more cost reflective average cost for hazard tree trimming is therefore per tree.

#### **10.5.13** Overhanging trees

The ESV has approved a proposal by United Energy to cut or remove overhanging trees. The ESV report is not clear as to the driver for this work. Nuttall Consulting has assumed that the driver for these works is the Electricity Safety (Electric Line Clearance) Regulations

<sup>&</sup>lt;sup>474</sup> http://www.archicentre.com.au/2008JAN\_Fullcostguide.pdf

## **Nuttall Consulting**

2010. In HBRA areas, the standard Clearance Space requirement allows for no vegetation to overhang open wire electric lines.

The incremental resources claimed by United Energy are shown in the following table:

Table 91 – ESV approved overhanging tree volumes

	2011 - 2015
Opex – Cutting trees	2,400
Capex – Engineering (u/g, line relocation, ABC, etc)	728
Project Management (FTE)	2.5

ESV has concluded that the work volumes appear reasonable, but questions the level of additional FTEs claimed.

United Energy state that 328 spans overhanging the 66kV in LBRA as covered by clause 10(c) and that 2,800 spans are registered as overhanging the clearance space in HBRA. United Energy considers that the removal of vegetation directly above the clearance space as not feasible in approximately 25% of these locations due to a number of reasons which include:

- health and safety risk to personnel attempting to undertake this work
- adverse public reaction.

United Energy have estimated that there are 2,400 spans that are overhung and are capable of tree cutting to meet the Electricity Safety (Electric Line Clearance) Regulations 2010 requirements. The breakdown of these spans and the unit rates associated with the tree cutting are provided in the following table.

 Table 92 – United Energy overhang spans (cutting)

Item	Spans	Unit rate
HBRA bare	2,100	
LBRA 66kV	300	
SUB - TOTAL	2,400	

The unit cost proposed for compete tree removal is

Nuttall Consulting has assessed the tree removal costs against those advised by the Australian Institute of Architects (AIA). This cost guide suggested tree removal costs in Melbourne of between \$300 and \$1,600 per tree. The AIA noted that prices are extremely variable and depend on the following: tree height, trunk circumference, density of branches/foliage, access to site for travel towers, woodchippers & grinders, obstructions, buildings underneath, tree alive or dead. The range could be wider if all the factors counted against easy removal.

## **Nuttall Consulting**

As discussed previously, Nuttall Consulting considers that the sort of trees likely to be considered a hazard will tend towards larger and older trees that are higher than the overhead lines.

United Energy has not identified the volume of trees that would be removed or whether some trees may only require the partial removal of vegetation. These factors may influence the average cost significantly. A greater number of trees to be removed per span would increase the average costs, while a greater number of partial removals would reduce the average costs.

In the absence of this information it is not possible to determine if the United Energy proposed unit rate of **second** is reasonable and reflects an efficient costs.

Noting the above, Nuttall Consulting recommends the unit rate of per span.

In cases where vegetation removal is not feasible, United Energy has determined that a range of engineering solutions will be required. The engineering options proposed by United Energy include re-constructing the lines with insulated cables, offset crossarms, pole relocation, undergrounding or a combination of various option.

The following table provides a summary of the unit rates proposed by United Energy. The volumes have been approved by ESV.

ltem	Spans	Unit rate
HBRA bare	700	
LBRA 66kV	28	
SUB - TOTAL	728	

 Table 93 – United Energy overhang spans (engineering)

is proposing a range of actions to relocate or underground the affected spans. The proposed cost for these works is approximately per span.

The United Energy proposed unit rates compare favourably to those proposed by **Exercise**. However, the **Exercise** analysis provided to Nuttall Consulting was considerably more detailed than the analysis provided for United Energy.

Nuttall Consulting notes that United Energy have been relatively conservative in estimating that all 66kV works will be achieved through the fitting of offset crossarms and pole relocations where possible.

Nuttall Consulting has reviewed the costs of undergrounding and considers that the unit rates proposed by United Energy are low when compared to full undergrounding options. This suggests that United Energy is considering that pole relocations and offset crossarms may be used in a number of cases. The lack of any further breakdown of costs means that Nuttall Consulting is unable to assess the individual costs of the proposed engineering solutions.

Nuttall Consulting considers that the unit rates proposed by United Energy are reasonable.

# Attachment A – Curriculum Vitae of main review team

# Curriculum Vitae – Brian Nuttall

#### Summary

Brian Nuttall is the Director of Nuttall Consulting.

He has worked as a consultant specialising in electricity regulation, strategy and asset management for the past ten years after beginning his career as an engineer within a large consulting engineering firm.

Before relocating to Australia in 2000, Brian was based in Newcastle, UK, where he was primarily focused on the analysis related to electrical distribution and transmission network planning, design and operation. Since 2000, Brian has had a much greater focus on strategic projects, bringing his technical knowledge to bear on many regulatory related issues. He has provided consulting services to many regulatory authorities in Australia and New Zealand on a large number of projects, including: numerous distribution and transmission regulatory resets, incentive scheme design, reliability reporting, valuations, and compliance auditing. He has also provided strategic advice to the network business, undertaking reviews of expenditure proposals, and independent expenditure and performance modelling.

#### Focus

- Strategic electrical network regulatory and technical advice for governments, regulators and companies.
- Expenditure and performance forecasting and reviews for regulators and network businesses.
- Power system study analysis and review for network service providers and market participants.

## **Relevant project experience**

#### Advice to regulatory agencies

- For the ACCC, ESCOSA, OTTER, and ESC, involved in a number of regulatory revenue application processes, primarily focused on reviewing transmission and distribution businesses' expenditure proposals. Revenue applications include: Powerlink, Vencorp / SPI Powernet, Murraylink, TransGrid, ETSA, Aurora, and the five Victorian distribution businesses.
- For the AER, advised on a number of strategic regulatory issues, including:
  - the scoping of a cost reporting and analysis framework for assessing distribution businesses' expenditure requirements;
  - o the analysis of a number of differing capital expenditure incentive schemes; and
  - o the assessment of a market constraint based service incentives scheme.
- For a number of regulators, including the ESC, IPART and the Commerce Commission (NZ), member of audit team performing a range of regulatory technical compliance audits.

#### Advice to network businesses – revenue applications

- For a number of network businesses, advice and assistance in preparing revenue or price reset applications. The primary focus for this assistance is normally expenditure and service standard forecasts.
- For a number of distribution businesses, developed expenditure and reliability forecasting models. The models were used to produce independent forecasts or benchmark the businesses' own forecasts.

#### Other general strategic projects

- For Australian TNSP, performed numerous projects, including a review of the planning process, re-drafted its planning criteria document, assisted in preparing internal board papers and public submission papers.
- For ESIPC, lead development of Adelaide CBD transmission development plan, looking at the long term development options of the transmission system requirements for supplying Adelaide CBD.
- For DITR, examined the proposed SNI scope of works and associated costs as part of a project assessing the technical and economic worth of SNI.
- For a Pacific island electricity authority, lead the preparation of a transmission development plan, looking at the long term development options of the transmission system.
- For ESIPC, produced a discussion paper to provide and elicit information on a transmission development plan.
- For a major international network business, part of team developing a Strategic Asset Management Plan.

#### Power system planning and studies

• For numerous network businesses, generators and developers, performed a wide range of power system studies, analysis and evaluations, to assess: power system performance; network and non-network developments, and network interconnections.

# Qualifications

- Doctor of Philosophy, Modelling and Multivariable Control of Turbogenerators, University of Newcastle, UK, 1999;
- Master of Science, Control and Information Technology, UMIST, 1993;
- Bachelor of Engineering (Honours), Electronic and Mechanical Systems Engineering, University of Salford, 1992.

# Anthony Seipolt (MBA MAICD)

**Director Cadency Consulting** 

#### **Contact details**

Email: anthony@cadency.com Phone: (03) 9421 0939 Mobile: 0418 889 890 Address: PO Box 5043, Burnley VIC 3121, Australia

## Summary

Anthony Seipolt is a senior consultant with extensive experience in the electricity, water and gas utility management and regulation including significant international expertise. Anthony has over 20 years' experience in the utility industry and is the director of Cadency Consulting.

Anthony has extensive experience in advising business, government and regulators in the interaction between technical needs and commercial or regulatory objectives. Anthony consistently provides technical input that enables a more robust and workable outcome; be it regulation, policy or legislation.

He has a Master of Business Administration, is a Member of the Australian Institute of Company Directors (MAICD) and is a former National Manager and Director of Parsons Brinckerhoff Associates. Anthony has managed performance reviews for over 200 electricity and water companies across the world as part of the UMS Group's benchmarking program. Anthony has also held a number of Board positions for community not-for-profit organisations.

## **Focus**

- Utility Regulation
  - Regulation of natural monopoly industries and the interaction with good engineering practice



- Expenditure assessments including the review of forecast capital and operating expenditures
- Asset management planning reviews of electricity and water businesses
- Expert witness for the development of regulation frameworks and policy
- Asset valuation and methodologies
- Cost allocation policies and reviews including customer class, corporate and direct, rural and urban, etc
- Development of forward pricing proposals in partnership with water and electricity companies
- Detailed practical understanding of electricity, water and businesses, regulation, expenditure planning and service standards
- Gas, water and electricity distribution pricing and reliability
- Planning/forecasting studies and regulatory tests.
- Utility Management and processes
  - Development and review of Asset Management Plans
  - Capital governance and management processes
  - Operations efficiency analysis
  - Reliability assessments and trade-offs
  - Development and review of network business cases
  - Asset and condition assessments
  - Capital and operating forecasts
  - Benchmarking and performance
- Project and Business Management
  - Management of critical timelines and complex environments
  - Leadership and integration of diverse teams
  - Co-ordination of complex projects with multiple stakeholders and objectives
  - Process reviews and operational audits of water, gas and electric utilities.

#### **Career Summary**

Anthony commenced his career in 1985 as a District Technical Officer for the State Electricity Commission (SEC) of Victoria. During the period between 1985 and 1996, Anthony undertook project design and management of various electricity extension and development works in rural and urban Victoria. This included positions based in Geelong, Camberwell and the Melbourne head office of the SEC.

In the early 1990's he was involved in the privatisation of the SEC and undertook the role of project manager for the Data Room for the sale of CitiPower.

With the newly formed private company (CitiPower), Anthony was appointed to manage the relationship between the network and retail arms of the business – in particular the emerging regulatory requirements of the new industry structure.

In 1996 Anthony joined the international benchmarking firm UMS Group. He undertook a large number of performance assessments of Australian energy companies. This work later extended to provide benchmarking and performance assessment services to utility companies in New Zealand, Indonesia, Singapore, Hong Kong, the United Kingdom and the United States. Anthony also helped to develop the initial WSAA water benchmarking program.

Anthony moved to New Jersey (USA) in 1999 to manage the development and delivery of the international benchmarking products of the UMS Group.

In 2000, Anthony was appointed national manager for the technical consulting firm of PB Associates. Over the next 5 years Anthony directed a large number of consulting projects for the majority of energy sector businesses and regulators.

Key projects included price and expenditure reviews for Queensland, Victoria, New South Wales, South Australia and Tasmania. In 2005, Anthony was also project director for the expenditure reviews of the Melbourne Metropolitan Water Businesses.

Anthony joined FSC in 2005 as an Associate. Anthony's technical experience provided a highly complementary skillset with that of the FSC group and has increased the overall offering of FSC.

With FSC, Anthony undertook projects including water expenditure guidance, asset management planning reviews, supported regulatory submissions and provided project governance and establishment advice. Recent clients include Australian and New Zealand regulatory bodies, water and energy companies.

In 2009, Anthony established Cadency Consulting and has continued delivering energy regulation services. These have included the development of capital forecasts for the National Grid Company of the Philippines, peer review for regulatory frameworks for the Commerce Commission of New Zealand and expenditure reviews of the Victorian electricity distribution sector for the Australian Energy Regulator.

#### **Relevant experience**

#### **Utility Management & Regulation**

- Undertaken expenditure reviews of the Victorian electricity distribution sector for the Australian Energy Regulator. Specific areas of review included opex step changes and targeted capex expenditure categories. Developed and implemented a comparative analysis and trending assessment of DNSP capex.
- Reported to the Commerce Commission in relation to distribution network asset management in New Zealand including the current condition of those assets, an indication of likely future investment requirements, the impacts that the threshold regime has had on historical investment and how required investment might be addressed by future regulatory arrangements. This work included a high-level determination of asset replacement valuations for each of the 28 Electricity Line Businesses.
- Advised National Grid Company of the Philippines in relation to the setting of capital expenditure requirements for the regulatory reset process.
- Advised the Commerce Commission on the Information Disclosure Requirements. Works involved reviewing and advising on the technical, quality and reliability reporting aspects of the information disclosure requirements.
- Anthony worked with Melbourne Water to develop a pricing proposal for submission to the Victorian water regulator.
- Anthony led the review of the metropolitan Victorian water businesses (Melbourne Water, South East Water, Yarra Valley Water and City West Water) for the Essential Services Commission of Victoria.
- Anthony has led teams to review the FRC forecast expenditures of the major NSW gas distribution businesses including AGL, Origin Energy and Country Energy.
- Since the introduction of incentive based regulation in Australia, Anthony has advised the majority of Australian electricity utilities in

preparing for and/or responding to regulatory price reviews. Utility clients included; AGL, ACTEW/AGL, Alinta, Aurora, CitiPower, Energy, Ergon Energy, Energex, EnergyAustralia, ETSA Utilities, Integral Energy, Powercor, SP AusNet, and Western Power.

- A principal focus of this work was the current capital and operation expenditures of the Australia utility businesses as well as future expenditures. Over the last 5 years, Anthony has been involved in business and project planning exercises totalling over \$1billion in proposed expenditures.
- Acted under expert witness provisions for the Commerce Commission in New Zealand in relation to the development of customised price path regulation.
- Undertaken technical and engineering reviews of Australian TNSPs and DNSPs for the Australian Energy Regulator with a primary focus on capital expenditure and operating expenditure forecasts.
- Undertook review of the Asset Management Plans for each of the ELBs on behalf of the Commerce Commission in 2005.
- Anthony has also directed audit teams for the electricity and water sectors – principally process and service level audits in line with regulatory requirements.
- Detailed reviews of cost allocation methodologies and processes for regulators and businesses including:
  - regulatory and non-regulated activities
  - corporate, indirect and direct cost allocations
  - customer type and location (including assessment of rural and urban allocations and customer class).
- Anthony has extensive experience in the assessment of proposed business expenditures and has developed and implemented expenditure review frameworks to meet business and regulatory requirements; including the application of the regulatory test.
- Responsible for the delivery of regulatory pricing reviews, access arrangement reviews and FRC reviews for the majority of Australian Energy Regulators.
- Led teams to deliver regulatory projects in the water, gas and electricity industry across Australia.
- As Project Director/Project Manager for numerous reviews and related projects, established strong relationships with the following regulatory bodies;

- Commerce Commission of New Zealand,
- Australian Energy Regulator (AER)/Australian Competition and Consumer Commission (ACCC),
- Independent Pricing and Regulatory Tribunal (IPART),
- Essential Services Commission (ESC),
- Independent Competition and Regulatory Commission (ICRC),
- Queensland Competition Authority (QCA),
- Essential Services Commission of South Australia (ESCOSA),
- Office of the Tasmanian Energy Regulator (OTTER), and
- Economic Regulatory Authority of Western Australia (ERA).

#### **Price Review/Access Arrangements:**

- Review of Transend's (Tasmanian Transmission Company) forecast and historical renewal expenditure for the Australian Energy Regulator in 2008.
- Supported Integral Energy in developing the 5-year pricing proposal for the period 2009 to 2014.
- Supported Melbourne Water in developing the 3-year pricing proposal.
- Technical review of the Water Plans of Melbourne Water, City West Water, South East Water and Yarra Valley Water for the Essential Services Commission of Victoria in 2005.
- Established and maintained a sound working relationship with the ACCC in terms of electrical transmission pricing in Australia. Through this relationship Anthony has undertaken price reviews for the ACCC (now AER) covering TransGrid (NSW), EnergyAustralia (NSW), PowerLink (Qld), Transend (Tasmania), VENCorp (Victoria), and SPI PowerNet (Victoria).
- Led the review of the Western Australian Technical Code for the Economic Regulatory Authority of Western Australia.
- Project manager for the Western Power capital and operating expenditure modelling and forecasting project in preparation for the introduction of the new regulatory regime in Western Australian.
- Project director for the South Australia Electricity Distribution Price Review for ESCOSA.

- Project Director for the technical component of the Distribution Price Review of Tasmania in 2001 involving a review of 5-year historical and forecast capital expenditure and operating expenditure. The review also assessed base-case reliability and made recommendations on a number of enhanced reliability outcomes.
- Regulatory price review of the Queensland distribution industry for the Queensland Competition Authority. As part of this review, reported on the capital efficiency and performance of the Queensland distributors as well reviewing asset valuations and forecasting.
- Led reviews of the costs of implementing Full Retail Contestability in NSW, Victoria and the ACT. These projects have assessed more than ½ Billion Australian dollars in claimed costs for the gas and electricity industries.
- Managed reviews for the Essential Services Commission into the costs of electrical connection services in rural Victoria as well as a review of the Melbourne CBD electrical outage.

#### **Project and Business Management**

- Anthony was National Manager for the Australian operations of PB Associates – a technical consulting firm servicing the energy and water industries. In this role, Anthony was responsible for annual budgets in excess of \$2million as well as business development, business strategy and people management.
- Over the last 5 years, Anthony has managed a large number of projects across and broad sphere of activities. Activities included resource scheduling across multiple-competing objectives, managing conflicting stakeholder requirements, and solving complex issues with limited information.
- Anthony has provided project establishment and governance advise for a major energy retailer.
- Anthony has managed large infrastructure projects, complex regulatory projects, national and international studies across;
  - private and public businesses,
  - local, state and federal government,
  - regulatory bodies, and
  - non-profit operations.

# Qualifications

- Master of Business Administration (MBA), Deakin University, Melbourne Australia, 2000
- Advanced Certificate in Business Management, Deakin University, Australia 1992
- Certificate of Technology, Electrical, Northern Metropolitan College, Australia, 1985
- Additional Studies: Project Management Courses 1992,1998 Contract Law – 1990

#### **Conference Papers**

- "Strategic and regulatory issues facing the Australian Utilities market", Intergraph Users Conference 2008.
- "Water Pricing & Regulation", Water Pricing Conference, Melbourne, October 2005.
- Chairperson, "The National Network Service Provider's Asset Management Conference", Brisbane, December 2004.
- "Post Reform Performance An Interim Check-Point", Energy Focus National Conference, Sydney 2003.
- "The Challenge of Universal Service for Efficient Economic Regulation", Urban Water Reform Conference, Westin Hotel, Melbourne. October 2003
- "Water Benchmarking", Global Developments in Water International Performance Benchmarking, Perth, Western Australia, 2003
- "A Brief History of Price Reviews", Australian Water Association Conference, Melbourne, Australia 2003
- "The Cost of Competition" 2nd Annual Energy Regulation Conference, Melbourne, Australia 2002.
- "Utility Structures", Hong Kong Institute of Engineers, Hong Kong Sheraton, Hong Kong, 2001.
- "Risk Management", PACE Annual Practices Conference, San Francisco, California, 2000
- "Asset Management Performance Assessment", UK Asset Management Forum, Sheffield, UK, 2000
- "Performance Assessment", PACE Annual Practices Conference, Denver, Colorado, 2000
- "Benchmarking Water", WSAA Benchmarking Conference, Melbourne, Victoria, 1999

- "Regulation and De-regulation", ANZ CEO Conference UMS Group, Queensland, 1999
- "Asset Management", UMS Group Conference, Marina del Ray, Los Angeles, 1999

# ANDREW WEBSTER – INFORMATION TECHNOLOGY ANALYST

Innovator, Evangelist, Project Manager & Architect for deploying, managing and understanding Large Scale IT environments, with special emphasis on investigation of underlying costs to improve efficiencies and deliver automaton..

Age:	Nationality:	Languages:	Years of Experience:	
41 Years	Australian	English	>20	
	Specialities			
International Experience:	<ul> <li>Lowering th Communica</li> </ul>	e Total Cost of ( tion Technology	Ownership (TCO) of Information & (ICT),	
	• Technology Architect – Storage, Database, <b>CRM</b> and <b>ERP</b> systems.			
Australia, Japan, Singapore	<ul> <li>Process Engineering - maximising efficiency, reducing operating costs and delivery a better (faster) level of service,</li> </ul>			
	<ul> <li>Team Manager – highly motivating and inspiring leader, who maximises people's potential.</li> </ul>			
Employers/Contracts:	Inve Barc Fina now Utili & El	estment Bankin lays Global Inve ancial Services ( Reuters), Sunco ities & Telcos ( lectricity utilities	<b>g (</b> Barclays Capital, Deutsche Bank, stors, ANZ <b>)</b> , Knight Ridder Financial (then Bridge rp Metway Melbourne Water, Telstra, Sensis, Gas throughout NSW and Victoria)	

# **KEY ATTRIBUTES**

- **Practical** and **pragmatic** whilst being **innovative** in the delivery and operation of **strategic** IT infrastructure that delivers **within budget** but flexible to adapt to ever changing **business needs**.
- Proven team management in the operation and implementation of complex IT technology including day to day management of staff, appraisingly individual & teams, platform & process re-engineering and performance improvement, specifically on improving efficiencies whilst driving costs down.
- In-depth technical knowledge and real-world experience with large (>200TB) NAS, SAN and DAS enterprise storage and clustered databases (Microsoft & Oracle) in real-time, near-time and disaster recovery scenarios utilising EMC, CISCO & Network Appliance infrastructures.
- Committed to creating in-depth **documentation** and understands the importance of **Change Control** and **Change Management**.
- Extensive experience in identification and investigation of technology costs and advice for government regulators in Victoria (Essential Services Commission) and New South Wales (IPART).

# EDUCATION

Bachelor of Science (Chemistry), Monash University

Certificate of Computing, Monash University

Microsoft Certified System Engineer (**MSCE**) (#13042) Microsoft Certified Product Specialist *Since 1995 – one of the first* 

Novell Certified NetWare Engineer (**CNE**) (#6220282) Since 1993, until 2003

# ADDITIONAL STUDIES

Speed Reading & Superior Learning Skills (1992) Performance Tuning and Optimisation of SQL Server Windows NT (1994) Measuring and Managing IT (1995 Prince 2 Foundation (2005)

# **PROFESSIONAL ASSOCIATIONS**

Australian Computer Society – Full Member (**MACS**) (#1207975) Network Professionals Association (**NPA**) – Member (#205747) Information Technology Professionals Association (**ITPA**) – Member

# EMPLOYMENT HISTORY

# Practice Lead – Infrastructure Optimisation THE MASTERMIND GROUP

MELBOURNE, AUSTRALIA

#### July'2007 to current (Permanent)

The Mastermind Group (TMG) is boutique consultancy dedicated to ICT infrastructure optimisation and data migration for large enterprises including Telstra, Sensis, Suncorp, Transurban and the Health sector.

During his time at TMG Andrew has been involved the following projects:-

Suncorp, Brisbane (July'2007 until April'2008)

Suncorp embarked on rapid technology and organisation transformation following the acquisition of similar sized former competitor Promina. Andrew provided specialist advice and guidance to the Suncorp as part of this transformation, including developing strategies to meet business requirements for a NetApp Storage deployment for Unix and Windows systems, a solution to resolve Mainframe storage issues and deployment of a virtualisation platform (VMware ESX) within the new environment. Andrew developed a Storage Service Catalogue and Cost Model that continues to be used to this day.

Sensis, Melbourne (April'2008 until December'2008)

Andrew ran the Sensis Design & Build Storage Team, consisting of 7 members responsible for providing storage and backup solutions on both IP and FC Storage from NetApp and EMC. Andrew drove down deployment costs and introduced further automation into the environment. Andrew then recruited an permanent employee to become the new Team Leader.

Andrew is currently involved in a number of reviews and rationalisation projects for TMG including desktop strategies, data centre design & utilisation, database system design and systems architecture.

#### Head of Storage & Backup (APAC) BARCLAYS CAPITAL

SINGAPORE, SINGAPORE

April 2004 to July'2007 (Permanent)

Barclays Capital is the investment banking division of Barclays Bank PLC, headquartered in the United Kingdom. Andrew was responsible for EMC SAN, NetApp NAS and IBM TSM Backup infrastructure for the firm's 14 sites throughout Asia Pacific. During this time:-

- Designed and published a Storage Capacity Planning model and budget for Asia Pacific and then drove the financial justification for deployment of new infrastructure that quadrupled the size of storage connectivity (SAN ports) and storage capacity (Disk Space) to keep up with demands.
- Engineered and deployed a new global real-time Backup infrastructure alerting, system, integrating with the firms Remedy problem management system.
- Designed and deployed new SAN and NAS environments for new data centres in Tokyo and Hong Kong.
- Performed numerous data migrations on NAS and SAN array to better utilise capacity.
- Designed a new 1<sup>st</sup> Line Support model, including negotiation a multi-million dollar contact. Then recruited and trained the team to perform 18 support tasks. On 24 by 7 basis. This lead to 25% reduction in support costs.
- Engineering and deployed a new storage solution for small sites, that used asynchronous replication to Singapore, where it could be centrally backed up, to meet the firm's revised Disaster Recovery requirements.
- Designed eleven process and procedures to meet US Sarbanes Oxley audit requirements. These processes were all implemented globally.

# Senior IT Infrastructure Consultant ECS AUSTRALIA

MELBOURNE, AUSTRALIA

# July 2001 to April 2004 (Permanent)

ECS Australia is a specialist consulting organisation in the review, audit and design of IT infrastructure. During his tenure, at ECS, Andrew has provided senior consulting and management services in the following areas:-

- On behalf of various economic regulators, expert analysis of IT **budgets**, **strategic architecture** and **infrastructure** of energy retailers (AGL, Energy Australia, TXU etc.) And distributors (Integral, TXU, Envestra etc) operating throughout NSW, Victorian and South Australian. Provided detailed assessments of prudency, suitability, efficiency and readiness of metering, **ERP**, **CIS** and **B2B** systems,
- Firewall & Network Architect for an integrated Internet Service Provider (ISP), including the development a firewall solution for a custom application with unique technical requirements,
- Specialist advice and detailed assessment to the Essential Service Commission (Victoria) on **B2B/XML** requirements for the electricity industry,
- **Project Management** in relocations of IT infrastructure for three medium sized organisations (>250 users),
- Review and complete redesign of the IT infrastructure for an AFL football club, including **Microsoft Exchange 2000** and **PXE** infrastructure.
- Storage Architecture for Network Appliance in the design and implementation of Disaster Recovery, Filer migration projects and storage technologies,
- Development of a flexible and extensible Windows XP, Windows 2000 and **Windows 2003** automated build product that can be rapidly customised to each customer's unique needs.

## Storage Architect/Project Management

DEUTSCHE BANK AG

SYDNEY, AUSTRALIA

October 2000 to July 2001 (Contract)

In this position, Andrew designed and implemented a slightly smaller version of the Solaris based backup/archive system that he previously implemented for Deutsche Bank in Tokyo. In addition, the role grew into project management of the relocation of sixty Windows servers, two **Network Appliance** Filers (1.5TB ea) and **EMC** (500GB) connected Notes servers to new central infrastructure and BCP/Disaster Recovery sites.

# Storage & Backup Architect

# DEUTSCHE REAL-ESTATE SERVICES

#### TOKYO, JAPAN

## January 2000 to October 2000 (Contract)

In this position, Andrew designed and implemented the first **Network Attached Storage** (NAS) for Global and Equities markets at Deutsche Bank. This included complete project management of the relocation of over 1500 Windows servers and workstation, from five buildings around Tokyo, to one large building; Andrew designed and implemented a Gigabit based network of **Network Appliance** F760 Filers with 6 Terabytes of disk storage, including near-real-time replication to a series of backup Filers, plus the design and implementation of four **SAN** based **Tivoli Storage Manager** backup servers (3 **Solaris**, 1 **Windows 2000**), connected to a 95TB AIT-2 tape library with 18 tape drives. Andrew custom developed a brand new data retention policy, to solve logistical and operational problems with the previous policy. Andrew also developed a complete backup reporting infrastructure to provide daily reports to system administrators and summary reports to managers.

# Senior Support Engineer (Projects)

# DEUTSCHE BANK SECURITES

## TOKYO, JAPAN

## March 1999 to December 1999 (Permanent)

This position involved Andrew acting as the sole SL3 (Service Level 3) for the entire Deutsche Bank Windows environment in Japan. Andrew liaised with other senior technical staff throughout the region and around the world, including **change and control management** of several world-wide lines of business systems.

Andrew redesigned and re-implemented the Windows infrastructure, including **DNS**, **WINS**, **DHCP** and re-deploying of backup software for 80 Windows NT servers in both English & Japanese, migrate all user data (700GB) from several standalone NT servers to a series of NT 4 Enterprise clusters connected to **EMC** or **Compaq** based **SAN** storage systems, built test environment for evaluation of Windows 2000 for local deployment to solve localisation issues, rolled out of **Microsoft SMS** to 1200 desktops, and implementation of an **Oracle 8i** Windows **SAN** connected cluster for a worldwide line of business system.

Finally, Andrew designed and piloted a Windows NT4 and 2000 **Server SOE** in both Japanese and English. Andrew then implemented the new SOE to over 60 Windows English & Japanese application servers.

# Technical Consulting Manager

#### ECLIPSE COMPUTING

TOKYO, JAPAN

#### August 1998 to February 1999 (Contract)

Eclipse is a financial services organisation delivering multi-language solutions. Andrew was engaged to reinvigorate the Technical Consulting Team. Andrew implemented a new Windows and Exchange 5.5 based infrastructure (migrating from Novell and Groupwise) plus undertaking an extensive technical and personal appraisal of all existing consultants. The customer consulting typically involved Microsoft SQL 7 design, administration, tuning, redundancy options and troubleshooting. Andrew then developed a training program to raise the level of technical skills and recruited one new consultant for a senior role.

# Windows Architect

# BARCLAYS GLOBAL INVESTORS

TOKYO, JAPAN

## March 1998 to August 1998 (Contract)

This was a short-term contract role in implementing a new Windows infrastructure at BGI's new Tokyo office. During this brief time, Andrew designed and implemented a Japanese automated NT 4 **Standard Operating Environment** and rebuilt over 170 workstations with it. In addition, Andrew designed and implemented a new **dual-language print server** environment plus a new desktop management environment via Microsoft's SMS product.

## **SOE Architect**

#### THE OPTIMISE GROUP (HP/TELSTRA)

MELBOURNE, AUSTRALIA

## June 1997 to January 1998 (Contract)

This role involved the design, development and manufacture of an automated build process for installing of Windows NT workstation **SOE** (known as CLS4) for 50,000 computers for Australia largest telecommunications provider Telstra. Andrew liaised with the various technology groups throughout Telstra, design & developed six applications in **C++** and **Transact SQL** for automating a variety of tasks. The project had been successfully piloted, before Andrew joined his family in Tokyo, Japan, after his wife accepted an employment opportunity there.

# Senior Systems Engineer

#### CANDLE AUSTRALIA

MELBOURNE, AUSTRALIA

## October 1995 to September 1997 (Contract)

This role was to provide on going support and project management for the operation of Melbourne Water's extensive **Windows NT 3.51/4.0** network that operates throughout the state of Victoria. Projects included the relocation of **Microsoft SQL & Sybase** databases; implemented a new **WINS** infrastructure to support the environment, commissioning of Internet mail facilities, a Gauntlet based **firewall**, implementation of **SMS** and data-migration projects from **Unix** to Windows NT systems.

# **Team Leader Central Systems**

KNIGHT RIDDER FINANCIAL (formerly EQUINET PTY LTD)

MELBOURNE, AUSTRALIA

## November 1991 to September 1995 (Permanent)

This position involved Andrew managing the backend operation of KRF Knight Ridder Financial (KRF)/Equinet IT infrastructure for the real-time time delivery of equities market data to professional investors and fund managers around the world. The environment included the management of a group of five staff – plus over 30 OS/2 servers, 20 Windows NT 3.51, 2 Microsoft SQL 4.2 Servers, 3 System V Unix systems, 1 Data General mini-computer as wells as CISCO, Wellfleet routers plus several internal Novell Netware file and print servers for both Sydney and Melbourne.

Andrew also acted as the Asian-Pacific Change Control manager.

# Senior Computer Operator

**BUDGET RENT A CAR** 

MELBOURNE, AUSTRALIA January 1990 to October 1991 (Permanent)

# SUMMARY OF SKILLS AND EXPERIENCE

Skill	Experience
Windows NT 3.1/3.51/4/2000/XP/2003/2008 – Design, Implementation, In-depth Troubleshooting	11 Years
IBM Tivoli Storage Management (ADSM / TSM) - Design and Implementation	8 Years
Staff Management & Leadership, including technical & professional appraisals and recruitment	8 Years
TCP/IP Networking - Design, Implementation, In-depth Troubleshooting, Security, Analysis	8 Years
MS SQL v6.0/6.5/7.0/2000 / 2005 /2008, Sybase System 10 and 11 – Design, Implementation & Troubleshooting	7 Years
Oracle 8i / 10 / 11 RAC - Implementation & Troubleshooting	6 Years
Use of Enterprise Storage (DAS, NAS, SAN) systems from EMC, Network Appliance, Hitachi, Hewlett Packard and Compaq	9 Years
Visual C++, Visual Basic, Borland C++ Builder – Analysis and Programming	6 Years
Automated Windows Desktop and Servers in English, Japanese, Chinese (Simplified)	5 Years
Citrix and Microsoft Terminal Servers & Services	5 Years
COM/DCOM/MTS/Component Based/Distributed Computing Architectures and Implementation experience	5 Years
In-depth knowledge of high-availability, fault resilient network designs and implementations	5 Years
Managing Change, Change Control and Reporting	5 Years
Tivoli (IBM) 3.1/3.7/4.1/4.2) ADSM/TSM – Design, Implementation, In-depth Troubleshooting	5 Years
Microsoft AD/NDS Tree/ Enterprise Directories - Design and Implementation	4 Years
Multi Terabyte Backup/Archival and Business Contingency Systems & Planning	4 Years
Novell NetWare 3.X/4.X - Design, Implementation, In-depth Troubleshooting	4 Years
People and Project Management Skills	4 Years
Windows Enterprise Computing including Clustering & Fault Tolerance for >50,000 environments	4 Years
Linux (RedHat & Debian) - Design, Implementation, In-depth Troubleshooting	3 Years
Solaris – Design, Implementation, In-depth Troubleshooting	2 Years

# CONTACT DETAILS

Email webstean@gmail.com

# Postal Address

12 Main Road, Walhalla 3825

<u>Telephone</u> Mobile: +61 4 3001 6095

<u>References</u>

Available Upon Request

Internet Links

http://www.linkedin.com/in/maketechnologywork

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# CRAIG OWENS

Senior Consulting Engineer

m/ 0418 536 610 438 e/ <u>cowens@hmac.com.au</u>

f/ +61 (0)7 3236 4266

Craig joined Hill Michael in March 2007 and has over 25 years experience in the electricity industry.

Craig holds qualifications in Electrical Engineering, Computing and Management. He started his career as cadet engineer with the Sydney County Council, gaining valuable practical experience while completing his degree. Moving to Tasmania in 1989, he joined the Hydro Electric Corporation (HEC) as a Project Engineer.

Five years in the Retail Division was valuable in better understanding customers' needs, and the impact of end-use equipment on the distribution network.

Craig moved back to Network division in 1995. After the HEC was disaggregated in 1998 Craig joined the newly formed Aurora Energy and worked in System Planning, Strategic Improvement, Protection and Control, and System Performance.

# Specialist Areas

- Network Planning
- Reliability
- Power Quality
- Software development
- Artificial Intelligence applications in electrical engineering
- Protection

## Significant Projects

- Development of Protection Analysis DINIS Software
- Leadership of a team that delivered average reliability improvements of 50% on targeted feeders in Aurora's 'Feeder Trunk Strategy'
- Development of Aurora Energy's policy on permissible loading of transformers
- Participation in production of the 'Greater Launceston Area Development Plan'

#### Qualifications, Professional Membership & Industry Involvement

- BE (Electrical)
- Postgraduate Diploma in Computing
- Postgraduate Diploma in Management
- MIEAust
- CPEng



Hill Michael is a specialist electrical networks and strategic engineering firm. Focused on the application of engineering expertise in the context of organisational and project strategy, Hill Michael is a leading advisor to owners of electricity supply networks and those wishing to connect to them. Established 1987.



# **DR JOHN H NIELSEN**

Director Distribution and Subtransmission

m/ 0409 316 890 e/ jnielsen@hmac.com.au p/ +61 (0)7 3236 4244 f/ +61 (0)7 3236 4266

John has 15 years experience in the Queensland electricity supply industry and more than 10 years experience lecturing on a large range of electrical engineering subjects.

He has extensive experience with Ergon Energy as Principal Engineer Subtransmission Planning & Investigation and provides the highest level of professional support to Network Service Providers, energy users and generators in the technical aspects of connecting to the national electricity grid.

John is a Chartered Professional Engineer with a doctorate in electrical engineering and provides invaluable technical capability for network providers and users.

#### Specialist Areas

- Major customer load and generator connections to the shared electricity grid
- Harmonic analysis
- Network modelling and analysis
- Complex technical investigations

#### Significant Projects

- Network connection investigations for:
  - o Townsville Power Station steam turbine generator, 80 MW
  - Pioneer Sugar Mill new steam turbine generators, 68 MW
  - Isis Sugar Mill new steam turbine generator, 25 MW
  - Condamine Power Station, 140 MW
  - Daandine Power Station, gas engine generators, 27 MW
  - Load increases associated with Abbot Point coal port expansion
  - Orica plant expansion at Gladstone
  - Proposed Wiggins Island coal port at Gladstone
  - Multiple major mining loads in the Mt Isa district
- Development of DINIS API (Application Programming Interface) code to automate Distribution Loss Factor calculations, fault level studies and contingency analyses

#### Qualifications, Professional Membership & Industry Involvement

- IEAust Representative, Standards Australia committees EL-048 and EL008 (2009)
- Registered Professional Engineer Queensland (2008)
- Chartered Professional Engineer, Institution of Engineers, Australia (1996)
- Member of IEEE (1981)
- PhD in Electrical Engineering, James Cook University (2003)
- Master of Engineering Science, James Cook University (1982)
- Bachelor of Engineering (Electrical) Class 1 Honours, James Cook University (1980)
  - Graduate Certificate of Education in Tertiary Teaching (1996)



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# DR. CRAIG AUMULLER

Senior Distribution / Sub-Transmission Engineer

m/ 0403 991 828 e/<u>caumuller@hmac.com.au</u> p/ +61 (0)7 32364244 f/ +61 (0)7 3236 4266

Craig has worked in a wide variety of electrical engineering roles in the 13 years since graduating with a Bachelor of Engineering from James Cook University in Townsville, Queensland.

He has had extensive experience with power generation, power transmission and power distribution companies; spent time as a consultant industrial engineer. Craig has completed an industry funded PhD at the University of Queensland and lectured in power engineering at James Cook University.

#### Specialist Areas

- Power systems planning, load flow analysis, dynamic analysis, fault analysis and protection studies
- Power systems education
- Industrial protection and control system design
- Lighting and power reticulation design

## Significant Projects

- Planning of major infrastructure projects for the Energex electricity subtransmission and distribution networks through analysis, computer simulation and consultation with stakeholders.
- Protection coordination study for the Cairns Port Authority
- Design and installation of 132kV, 62.64Mvar capacitor bank at Boyne Smelters
- Design of replacement Kangaroo Valley Switching Station earth grid

#### **Qualifications, Professional Membership & Industry Involvement**

- BEng (Elec), James Cook University (1997)
- PhD in Electrical Engineering, University of Qld (2003)
- Graduate Certificate in Tertiary Education (2005)



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Peoble Profiles

## SORUBY K BHARATHY

Commercial Engineer

e/ sbharathy@hmac.com.au

p/ +61 (0)7 3236 4244 f/ +61 (0)7 3236 4266

Soruby is a qualified electrical / electronics engineer with a Masters in Engineering Management. She has more than 5 years experience in the electricity transmission sector.

Having previously worked in Transend and NEMMCO, Soruby provides valuable expertise in: strategic long term transmission planning, National Electricity Rules compliance, Australia's deregulated electricity industry regulatory framework, feasibility studies for high voltage connection options, power system studies and high voltage connection agreements.

#### **Specialist Areas**

- Stability and load flow using PSSE and other transmission planning software.
- Preparation of long term load flow scenarios for the Grid Vision Project
- Technical compliance of generators to the National Electricity Rules.
- Connection Strategy, Agreements and Regulatory advice / Management

#### Significant Projects

- Preparation of the Statement of Opportunities 2007 for NEMMCO.
- Development of concepts, methodology and implementation of constraint equations for the NEM Entry and Basslink projects.
- Pulp Mill Connection Options for 200MW Cogeneration plant at Bell Bay.
- Power system stabiliser tuning and commissioning for Gordon power station.
- Network Studies on 110kV, 132kV and selected 275kV Feeders, Energex.

#### **Qualifications, Professional Membership & Industry Involvement**

- Chartered Professional Engineer, Australian Institute of Engineers
- Master of Engineering Management (University of Canterbury)
- Bachelor of Electrical and Electronics Engineering (University of Canterbury)



Hill Michael is a specialist electrical networks and strategic engineering firm. Focused on the application of engineering expertise in the context of organisational and project strategy, Hill Michael is a leading advisor to owners of electricity supply networks and those wishing to connect to them. Established 1987.

# Bill Heaps IEng MIET, HNC Electrical Eng (UK)

Bill has 32 years' experience that spans the electricity supply chain. He has worked on the implementation of electricity markets in both the UK and New Zealand and has practical experience of the Australian markets. He has also been involved with energy market developments across the Asia Pacific and India.

Bill has extensive experience in the commercial management of electricity distribution companies. He has been a commercial manager for distribution companies in the UK and New Zealand. During the first wave of retail competition in the New Zealand electricity market Bill established Energy Brokers Ltd, one of the first independent retailers to trade electricity across traditional boundaries. To achieve successful energy trading, it was essential to form an appropriate framework and Bill was directly involved in the establishment of market mechanisms for hedge contract trading, metering and reconciliation.

Whilst much of Bill's experience is in the commercial sector of the industry, he has also held executive roles in generation, distribution and transmission. He managed the largest New Zealand geothermal power stations through the transition from public to private ownership and was responsible for significant reductions in operating costs and increases in performance.

Alongside his commercial responsibilities in transmission, he also chaired industry taskforce groups managing electricity supply security events such as; the 2004 Upper South Island supply security, 1999 Upper North Island summer security and the dry winter management in 2002.

Bill Heaps has held directorships with Orion Group Limited d-cypha, the National Reconciler for the electricity industry and was Chairman of Critchlow Associates a geographic information system solutions company. In 2002/3 Mr. Heaps was involved in the successful establishment of an electricity futures contract platform in Australia with d-cyphaTrade and the Sydney Futures Exchange.

Bill currently chairs the Wholesale Market and Transmission Advisory Groups for the New Zealand Electricity Commission and chairs and facilitates other industry groups and projects for the Commission.

Bill's recent roles in the energy sector are:

- Director Orion Group Limited (2006 2008)
- Chairman Wholesale Market Advisory Group, NZ Electricity Commission (2004 2009)
- Chairman Transmission Advisory Group, NZ Electricity Commission (2004 2009)
- Chairman Technical Support Group, (WGIP), NZ Electricity Commission
- Chairman Retail Market Advisory Group, NZ Electricity Commission 2004 2006
- Chairman Switching and Registry Working Group, Gas Industry Company 2005 -2006
- Chairman Model Retail Contracts Working Group, Gas Industry Company 2005 -2006
- General Manager Commercial Services, Transpower NZ Ltd 1997 2003
- Director d-cypha Ltd. 1999 2003

- General Manager Geothermal, the Electricity Corporation of New Zealand ٠ (ECNZ)/Contact Energy 1995 - 97
- General Manager Energy Brokers NZ Ltd 1993-95
  Commercial Manager of CentralPower Ltd 1990-93
- Member of New Zealand's Metering and Reconciliation Information Agreement MARIA establishment committee 1993
- Chairman, New Zealand Upper North Island Summer Security Working Group 1999 • and 2000
- Chairman, New Zealand Winter 2002 Industry Work Group



# Clive Bull BE (Elec) (Hons)

Clive has 30 years experience across a range of roles in the corporate sector of New Zealand's electricity and gas industries. Following graduation as an electrical engineer from the University of Canterbury in 1980, Clive undertook a range of technical post graduate roles in the then New Zealand Electricity Department, leading to an early specialisation in electricity system operations. With corporatisation and the formation of Transpower, Clive's role became the management of transmission system operations in the pre-electricity market phase.

Clive transferred into a grid planning role in 1989 and took up responsibility for the planning and implementation of capital works projects for the North Island grid. This role provided exposure to all aspects of grid planning and the management of significant capital projects. In 1994 Clive took up an opportunity to participate in a management swap programme with Transpower in cooperation with the Georgia Power Company and relocated to the USA to undertake a one year work experience assignment in the area of bulk power markets. At the completion of this assignment, Clive completed the 13 week residential Program for Management Development at the Harvard Business School in Boston, Massachusetts.

On returning to New Zealand, Clive undertook a number of commercial roles at Transpower, at various stages managing transmission contract and pricing development and the customer relationship management team. Clive left Transpower to move into the distribution sector in 1999 taking on customer and commercial management roles with UnitedNetworks, immediately following the separation of line and retail functions in New Zealand. UnitedNetworks expanded its business into gas distribution and Clive was responsible for developing and negotiating a new suite of use of system agreements with electricity and gas retailers. Following the sale of UnitedNetworks to Vector, Clive continued in the newly merged business in the area of customer and commercial management, including a significant period with responsibility for developing a new business model to streamline aspects of Vector's portfolio of network businesses across electricity and gas and later incorporating the purchase of NGC's gas business.

Throughout this period, Clive has been a member of a number of industry advisory and working groups for various regulatory and industry bodies in a range of areas spanning the electricity and gas sectors, including transmission investment, distribution and retail commercial arrangements and industry-developed consumer and landowner complaints resolution schemes.

Most recently, Clive has had responsibility for developing aspects of Vector's business responses to climate change, in particular establishing a visionary programme of research and development activities in the areas of distributed generation based on emerging clean technologies, electric vehicles, smart metering and smart grids.

Clive left Vector in July 2009 to widen his experiences beyond the corporate sector and is currently active as an independent consultant, including as an Associate Consultant with Strata Energy Consulting on a growing range of energy industry assignments.

Clive Bull's relevant experience includes:

- Customer and commercial management roles at both transmission and distribution levels in the electricity and gas sectors, providing a broad customer-focused experience set and a detailed understanding of network company strategy and business operations.
- Asset management roles with specialisation in transmission system planning and project management for projects requiring significant capital expenditure and implementation complexity.
- Roles providing an in-depth understanding of the role and strategic impact of new technologies on network distribution businesses, in particular the types of technologies that are starting to appear on the near horizon with a particular interest and application for mainstream end-consumers.