Discussion Paper

Essential Energy Pole Treatment Performance – Optimising Business Outcomes

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# INTRODUCTION

In 2013/14 the Mains team investigated the performance of timber poles in particular the effectiveness of treatment types (PEC and CCA) as well as the durability class (D1 and D2). A report was generated that produced a number of statistical parameters with a view to utilising these parameters to fiscally assess the treatment and durability class of poles, thus determining optimum business outcomes.

This paper provides an overview of the statistical analysis discusses the assumptions made in developing the fiscal model, and presents the outcomes of the fiscal analysis.

The primary recommendation is the adoption of D2 CCA poles in all areas where timber poles are installed, without any future purchases of D1 CCA poles. This recommendation is based on performance assessment of D1 and D2 CCA poles and the cost benefit analysis work presented in this paper, if implemented the recommendation will achieve on-going permanents savings with a predicted $826,000 saving in the first 5 years.

# DEFINITIONS

**Durability:** Is a rating given to a timber pole that reflects the timbers natural resistance to decay. It only applies to the heartwood as all sapwood has a poor durability. Note the rating is for untreated, natural resistance to decay. Essential Energy utilises D1 and D2 durability class poles.

**Treatment:**  This is a chemical process that is applied to a pole to retard decay. In general this treatment penetrates the full depth of the sapwood and marginally into the heartwood. There are two currently available treatment types from suppliers, Copper Chrome Arsenic (CCA) or Pigment Emulsified Creosote (PEC). Essential Energy currently uses CCA.

**High Risk Areas:** Defined as areas with high decay rates as determined by prior analysis. Depots of high risk are: Taree, Port Macquarie, Kempsey, Coffs Harbour, Grafton, Ballina, Lismore, Casino, Kyogle, Coolangatta/Tweed Heads, Bathurst, Griffith, Moruya, Dubbo, Grenfell, Cowra, Murwillumbah, Armidale and Inverell

**Probability of Decay:** Is the likelihood of an individual pole of defined characteristics on inspection having external decay based on the prior analysis work

**Decay Inception Age:** This the average are at which external decay is detected in a pole

**Avg Decay Condemnation Age:** The average age at which a pole with external decay is condemned

# POLE PERFORMANCE AND STATISTICAL SUMMARY

From the 2013/14 paper on pole treatment[[1]](#footnote-1) the following statistics are of interest in assessing pole performance considering treatment and durability.

Table Durability Statistical Data

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | **Entire Network** | | | **High Risk Areas** | | |
| **Durability** | **Treatment** | **Prob of decay** | **Decay Inception Age** | **Avg Decay Condemnation Age** | **Prob of decay** | **Decay Inception Age** | **Avg Decay Condemnation Age** |
| **D2** | **PEC** | 0.72% | 28 | 36.5 | 1.42% | 30 | 38 |
| **CCA** | 3.60% | 28 | 36.5 | 5.85% | 30 | 38 |
| **D1** | **PEC** | 0.87% | 26 | 35 | 3.12% | 28 | 37 |
| **CCA** | 1.20% | 26 | 35 | 3.67% | 28 | 37 |

Table Pole Treatment Statistical Data - Entire Network

|  |  |  |  |
| --- | --- | --- | --- |
| **Treatment** | **Prob of Decay** | **Decay Inception Age** | **Avg Decay Condemnation Age** |
| **CCA** | 2.98% | 31 | 38 |
| **PEC** | 0.76% | 24 | 34 |

The probability of a pole with external decay being condemned is 12.64%

## Pole Performance Statistics Discussion

The statistics presented in Table 1 and Table 2 clearly demonstrates that;

* PEC is the superior treatment with regards to external decay
* There is no real significance difference between a PEC treated D1 or D2 pole with regards to external decay.
* There is a marked difference for the performance of CCA D1 poles versus CCA D2 poles in high risk areas and the rest of the network

Given that PEC is a better performer and D1 poles irrespective of treatment type perform better than D2 in high risk areas (and the rest of the network) the following questions need to be evaluated for business benefit.

1. Should all poles be PEC treated?

or

1. Is it better to send all D1 CCA treated poles to high risk areas?

or

1. Should PEC treated poles be sent to high risk areas and CCA elsewhere?

or

1. Should the status quo be maintained (random dispersion of D1 and D2 CCA poles across the footprint with the mix of D1 and D2 as available from the supplier)?

or

1. Should D2 CCA treated poles be used everywhere with no D1 poles used?

## Pole Usage Data

Essential Energy uses approximately 14,000 poles per annum. Most suppliers can provide a mix of durability’s based on the NSW Forestry mix roughly 20% D1 and 80% D2. Essential Energy’s current contract supplier can provide 18% of the poles annually as D1 poles (2520 D1 poles per annum).

# FISCAL INPUTS

From a recent market exercise the cost per pole for the two treatment options and durability classes was obtained. For the purposes of this paper the costs for a 12.5m 6KN pole are presented as this is the most common pole utilised on Essential Energy’s network.

Table Timber Pole Prices @ Nov 2014

|  |  |
| --- | --- |
| **12.5m 6kN Timber Pole Prices** | |
| **PEC Treated Pole** | $802 |
| **D1 CCA Treated Pole** | $616 |
| **D2 CCA Treated Pole** | $549 |

In order to model risk cost the operational costs for pole replacement and inspection have been obtained as follows;

Table Timber Pole Operational Costs

|  |  |
| --- | --- |
| **Timber Pole Operational Costs** | |
| **Average Cost for 12.5m Pole Replacement** | $5,500 |
| **Cost for pole inspection per pole** | $63 |

# PEC TREATMENT

In the aforementioned market exercise only one vendor was able to provide pricing for PEC. The offered PEC technology is the standard PEC treatment which is currently banned due to apparent health and safety concerns. A newer technology termed Creosote 185 addresses the health and safety concerns but is not market ready and indicative pricing is not available.

# MODELLING ASSUMPTIONS

This section will document the assumptions used in developing the NPV fiscal model as well as discussing the validity of the assumptions.

## NPV Modelling Assumptions

* Inflation will be 2.5% (within the Reserve Bank target range of 2 – 3% )
* Depreciation of the capital expenditure for poles will be over the expected life of the pole based on the Avg Decay Condemnation Age (38 yrs).
* The NPV evaluation period will be over 10, 20, and 40 years and will run out to 100 Yrs.
* A company tax rate of 30% of operating profits / debits.
* A nominal discount rate of 8% has been utilised

## Modelling Assumptions

A number of assumptions were made to develop the NPV model, each assumption is listed in the following table with commentary around the virtues of the assumption.

|  |  |  |  |
| --- | --- | --- | --- |
| **Assumption** | **Strength** | **Weakness** | **Influence on Outcome** |
| Cost modelling based on a 12.5m 6kN pole | A 12.5m 6kN pole is the most common pole purchased | The cost may not accurately reflect the purchases over time due to size / strength mixes | Insignificant as a 12.5m 6kN pole is the most common; variations will be dependent on volumes, size and length year to year, which are not easily modelled. |
| The NPV model assumes that the selected option is the current practice | Simple fiscal model | Only affects predicted cost reductions and savings, which can be determined via other means (see section PREDICTED SAVINGS for more details) | No influence |
| Poles will be depreciated according to the expected condemnation age based on external decay | Simple to model | Not reflective of actual depreciation rules for poles | This biases higher capital investment as in later years the capital being depreciated is higher. So for poles being replaced due to decay the capital increases thus benefiting later year’s deprecation credits. |
| Risk costs for pole decay are capitalised | Alignment with nominal business practices | As per the above assumption, the ‘risk cost’ of decay is depreciated as it is treated as capital investment | Bias due to depreciation |
| Pole Replacement cost based on 12.5m poles | Alignment with prior assumptions around the most common pole | Replacement cost for high value poles is not reflected in the analysis | Sensitivity analysis as per section SENSITIVITY ANALYSIS has shown that reasonable changes in replacement cost are not significant influences on the outcomes. |

# ANALYSIS RESULTS

Based on the outcome of the NPV the most cost efficient outcome is for all poles to be D2 CCA treated poles. Results of the NPV are shown in the following table in order of preference.

Table Options Analysis – Results

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Preference** | **Option** | **Capital Cost over 100 yrs** | **10 Yr NPV** | **20 Yr NPV** | **30 Yr NPV** | **40 Yr NPV** | **50 Yr NPV** | **100 Yr NPV** |
| **1** | **All D2 CCA Poles** | **(813,156,692)** | **(57,038,656)** | **(81,463,319)** | **(91,852,466)** | **(96,236,569)** | **(98,068,973)** | **(99,322,694)** |
| **2** | **Status Quo** | **(825,561,191)** | **(57,845,569)** | **(82,613,551)** | **(93,147,623)** | **(97,592,324)** | **(99,449,771)** | **(100,720,162)** |
| **3** | **All D1 CCA poles to high risk areas** | **(824,232,715)** | **(58,023,039)** | **(83,639,223)** | **(95,190,971)** | **(100,479,724)** | **(102,925,661)** | **(105,015,250)** |
| **4** | **All PEC poles to high risk areas** | **(890,010,605)** | **(62,322,951)** | **(89,830,295)** | **(102,232,997)** | **(107,910,963)** | **(110,536,880)** | **(112,780,377)** |
| **5** | **All PEC poles** | **(1,131,275,535)** | **(78,094,481)** | **(112,538,359)** | **(128,062,253)** | **(135,167,803)** | **(138,453,862)** | **(113,726,662)** |

# SENSITIVITY ANALYSIS

To determine if there is any significance variation in the lowest cost option (D2 CCA treated poles) variables contained in the NPV model were changed within reasonable bounds to determine if there was any change to the outcome.

Table Variable Sensitivity Analysis

|  |  |  |
| --- | --- | --- |
| **Variable** | **Variable Limits / boundaries** | **Commentary** |
| **Discount Rate** | 5,**8**,10 | No change in preferred option |
| **Pole Replacement Cost** | $4000, **$5,500**, $8,000 | No change in preferred option |
| **Change in PEC Pole Pricing** | $600, **$802**, $900 | No change in preferred option |

# HURDLE RATES

Fiscal analysis determined the following hurdle rates[[2]](#footnote-2) for the options including PEC.

Table Hurdle Rates PEC Poles

|  |  |
| --- | --- |
| **Option** | **Required Cost for a PEC pole to be attractive** |
| **All Poles Treated with PEC** | $565 per PEC pole |
| **PEC poles to high risk areas** | No rate could be found which placed this option as the preferred option |

For options including CCA D1 poles the following hurdle rate was calculated.

Table Hurdle Rates D1 CCA Poles

|  |  |
| --- | --- |
| **Option** | **Required Cost for a D1 CCA pole to be attractive** |
| **All D1 CCA poles to high risk areas** | $555 per D1 CCA pole [[3]](#footnote-3) |

# PREDICTED SAVINGS

As noted in a prior section the NPV model assumes that the options have been in place for many decades. This means that capital cost savings in the model are offset by risk costs that absorb in part the capital costs every year. However for the preferred option when compared to the status quo there is scaled savings as the preferred option has not been implemented. For example a condemned pole today has a chance of being replaced with a D1 CCA or D2 CCA pole, in the proposed option it would be replaced with a D2 CCA pole. The difference is the rate of decay of the D2 CCA pole compared to the D1 pole in the same location combined with the probability of a D1 pole actually being installed.

To model this behaviour it has been assumed that there will be a linear decay rate for CCA D2 poles over the average condemnation age for external decay of 38 yrs. This has then been used to derive a dollar figure for the increased risk cost over time which will erode upfront capital costs.

Figure Predicted Savings over Time

Nominally Essential Energy stands to save $168,840 per annum by not buying D1 CCA poles and substituting with D2 CCA poles. This is eroded over time as the D2 poles decay faster that D1 poles in some locations as shown in Figure 1. However over a 5 year period Essential Energy is predicted to save $826,517.

# RECOMMENDATION

1. Essential Energy adopts D2 CCA poles as the standard with no future purchases of D1 CCA poles based on the fiscal analysis model. Anticipated savings over 5 years amounts to $826,517.

# NPV MODELLING TOOL

The following file contains the fiscal NVP modelling tool used in this analysis



1. Analysis Paper – Essential Energy Pole Performance – External Decay, Mains Team 2014 [↑](#footnote-ref-1)
2. The hurdle rate is the cost at which an option becomes fiscally attractive (breakeven) compared to the preferred option [↑](#footnote-ref-2)
3. This assumes that the ‘Status Quo” option is ignored. Due to the higher decay rates in high risk areas the Status Quo option is favoured over allocation of D1 CCA poles to high risk areas based purely on cost implications due to depreciation. [↑](#footnote-ref-3)