



T R A N S P O W E R

Studholme–Timaru Split Closure

Net Benefit Test

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1 Net Benefit Test for Change of Grid Configuration

Transpower proposes to close the split between Studholme and Timaru from October to April inclusive by bringing the 110 kV Studholme-Timaru 1 circuit back into service.

Initial net benefit tests around closure were for the period November through to January. Pursuant to a customer request we have revised the length of the proposed closure from October through to April.

2 Need

At present, the Studholme load is supplied from Waitaki on the Oamaru-Studholme-Waitaki 2 circuit. Following an unplanned outage on this circuit, an automatic changeover system at Studholme will transfer supply to Timaru, resulting in a loss of supply for a period of 20 – 30 seconds.

The largest load at Studholme is the New Zealand Dairies Limited (NZDL) factory. The occurrence of a brief outage resulting from the automatic change over on the Oamaru-Studholme-Timaru circuit will disrupt the manufacturing process and necessitate a cleaning procedure that takes 24 hours to complete.

3 Cost of Unplanned Outage

A fault on the Oamaru- Studholme-Waitaki 2 circuit will disrupt the NZDL plant. Data on the circuit indicates there have been 31 events in the past 12 years. Outages which occur within a 24 hour period would only affect the manufacturing process once as the cleaning process would still be underway and on removing these occurrences from the historical data set there are 26 outages in the past 12 years. The probability of a fault varies depending on the time of year and the probability of an outage occurring for each month is shown in the table below.

Cost to the plant varies depending on the production level; a cost estimate for each month based on the NZDL submission is provided below. Alongside is the calculated fixed cost of an outage. These costs include the value of lost product in process, cost of cleaning, value of lost production and cost of dumped milk. Note that this cost differs to that previously reported as Transpower has since been advised there was an error in the calculation.

	NZDL production per submission	Fixed Cost per outage	Probability of Outage	Expected Cost of Lost Load
<i>Month</i>	<i>litre/day</i>	<i>\$/outage</i>	<i>Probability</i>	<i>\$</i>
Jan	700,000	605,110	20%	120,246
Feb	542,500	475,823	20%	94,554
Mar	385,000	346,535	30%	103,294
Apr	227,500	217,248	30%	64,757
May	70,000	87,961	50%	43,699
Jun	-	-	20%	-
Jul	-	-	20%	-
Aug	100,000	112,587	0%	-
Sep	450,000	399,892	20%	79,466
Oct	820,000	703,614	20%	139,821
Nov	780,000	670,779	10%	66,648
Dec	740,000	637,945	20%	126,771

The variable cost relating to the length of the outage has not been included as the split could be temporarily closed during an outage.

If the circuit is closed from October to April the expected reduction in the cost of unplanned outages would be:

\$139,821 +\$66,648 +\$126,771 +\$120,246 +\$94,554 +\$103,294 +\$64,757 =
\$716,091

This gives a 20 year NPV of cost from 2010 to 2029 of \$8.12m (\$2009)

4 Proposal

Closing the split from the beginning of October to the end of April will alleviate the problem during the highest cost-risk period, as there will no longer be a break before supply is transferred to Timaru and the production process at NZDL will not be disrupted.

5 Cost

The cost to close the split during the suggested months is estimated to be:

Cost of losses: \$336,740 per annum

This gives a 20 year NPV for the Cost of losses from 2010 to 2029 of \$3.82m (\$2009)

Capital cost: \$228,000 (protection upgrade)

Capital costs include new protection relays and a protection scheme designed to reinstate the split should there be a risk of excessive circuit loading. This is the lowest cost method of alleviating the outage situation at Studholme while not reducing security to other loads.

6 Conclusion

The net benefit is;

= Unserved energy avoided - capital cost - losses cost

= \$8.12m - \$0.228m - \$3.82m

= +\$4.07m

This work has a positive net benefit.

This analysis is based on the 2010 load forecast and assumes no growth for future years. If the split was to be closed for these months over several years then we recommend the analysis is repeated to reflect any changes in the load and costs.

It is proposed that the split is closed over the period October through April. For each of these months the net benefit of closure is positive. That is the Cost of Lost Load (CoLL) when the split is open is greater than the Line Losses if the split is closed. This is shown in the following graph.

Studholme Timaru Split - Cost of Lost Load versus Line Losses by Month

