Power
Quality
Solutions

CURRENT AND FUTURE ELECTRICITY NEEDS FOR RESIDENTIAL AND BUSINESS CUSTOMERS IN WARANGA WARD SHIRE OF CAMPASPE

Executive Summary

Prepared by:

Mr Ian McMichael FIEAust, CPEng

and

Dr Robert Barr FIEAust, CPEng

30 November 2007
Final

Power Quality Solutions
63 Finch St
EAST MALVERN 3145 Vic
Ph 04 1158 3998

Electric Power Consulting Pty Ltd
203 Penguin Head Rd
CULBURRA BEACH 2540 NSW
Ph (02) 4447 3308

EXECUTIVE SUMMARY

This report has been prepared as a result of the "Current and Future Electricity Needs for Residential and Business Consumers in Waranga Ward, Shire of Campaspe" study commissioned by the National Consumer Electricity Advocacy Panel, the Shire of Campaspe and Powercor Australia Ltd.

The study scope was to:

- Investigate through consultation and analyses, the likely future domestic and business growth for the study region to the year 2020. Including the townships of Rushworth, Colbinabbin, Corop, Girgarre and Stanhope.
- Model the electricity infrastructure required to meet the 2020 year growth forecast.
- Identify the gaps between the current electricity infrastructure and the new electricity infrastructure required to meet the forecast development.
- Analyse the current electricity infrastructure located in the Waranga Ward to determine the impact of the existing supply quality and reliability on domestic and business development in the region.

Figure 1 shows the boundaries of the Waranga Ward.

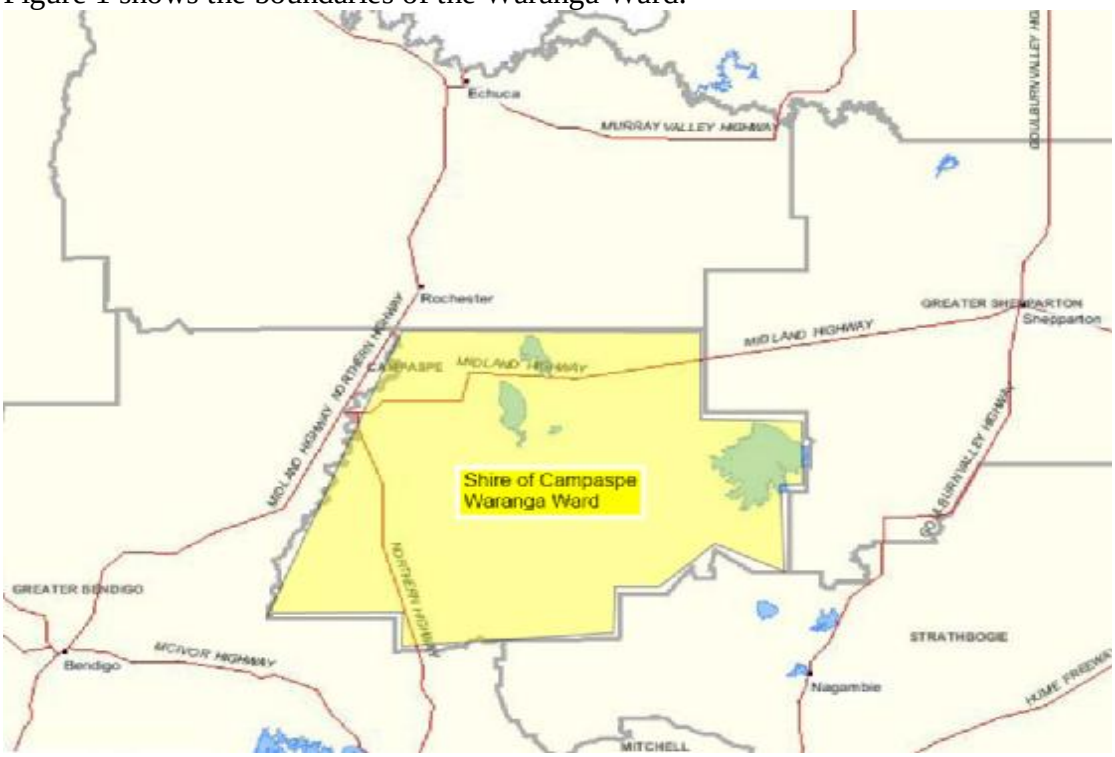

Figure 1 Waranga Ward, Shire of Campaspe

In preparing the report we:

- Visited and surveyed nine electricity customers selected by the Shire in consultation with us from large consumers, small business and residential households across the Ward,

- Reviewed the available information about the existing electricity distribution infrastructure and develop a strategic plan to accommodate forecast load increases,
- Monitored the quality of supply at two sample locations in the Ward and reviewed the available reliability and quality of supply data,
- Attended a public meeting in the Ward and reviewed the contributions from a voluntary Ward resident survey conducted during the data collection period of the study, and
- Held detailed discussions with representatives from Powercor and the Shire of Campaspe.

The report is presented in two parts: Volume 1 containing the main report and Volume 2 containing the quality of supply analysis at the two sample locations. Both Volumes 1 and 2 are confidential to the study sponsors.

Future Domestic and Business Growth for Waranga Ward

The customer interviews summarised in Volume 1 section 5.1 identified a planned increase of 1.5MVA over the next five years in the Colbinabbin Cornella area currently supplied by the 22kV feeder KYM001 from Kyabram.
There were no other significant load increases identified for the other areas of the Ward.
There were no business development plans available or identified that went beyond the next five years. The customers interviewed were strongly focused on surviving the near term.

A large proportion of the businesses in the Ward are agricultural based and heavily dependent on irrigation water. These businesses indicated that if the drought conditions continued and irrigation water allocations remained at the present low levels or reduced further then their output would reduce and electricity consumption decrease. Conversely if irrigation water availability and supply security returned to 'pre-drought levels' there is likely to be a period of strong growth in agricultural based businesses in the Ward. Several participants indicated that when water availability was more plentiful, that in addition to expanding their existing agricultural based business, they were aware of new agricultural businesses being considered for the Colbinabbin Cornella area.

As a result of the present drought conditions combined with the strong dependence of business growth on water availability we have been unable to predict future load growth for the Ward beyond the next few years.

Electricity Infrastructure Requirements

The Waranga Ward is located at the boundaries of three local Zone Substations (ZS), these being Stanhope ZS, Kyabram ZS and Eaglehawk ZS. Past electricity loads have not warranted the establishment of a Zone substation in the Rushworth or Colbinabbin areas. Powercor has been able to make supply available to customers in the Waranga Ward by carefully planning and extending the 22kV system to meet the incrementally increasing load demands.

The identified potential load growth of 1.5MVA in the Colbinabbin Cornella area is the total for several customers and would be implemented in stages over the five year period. The identified load increases over the five year period can be provided by the Powercor network by the normal planning and augmentation works.

The recent construction and commissioning of the Colbinabbin-Bendigo Pipeline Pump Station has provided all customers in the Colbinabbin Cornella area with a significant increase in electricity infrastructure and also provided Powercor with additional network augmentation options to deliver future load growth.

The yearly growth from existing and new residential and small business customers across the Ward can also be readily accommodated in the network by the normal planning and augmentation works.

The economics of electricity supply forces the development of the system in an incremental way as new Zone substations are multi-million dollar capital investments and can only be justified when implemented in conjunction with significant load increases.

As the network is incrementally extended to connect new customers and the load increases, the underlying reliability and power quality can be expected to fall marginally because of increases in the area covered, increases in network exposures and higher levels of voltage regulation. As a consequence, maintaining compliance with the Electricity Distribution Code as the network extends may also require simultaneous incremental capital investment in augmentation works such as reconductoring lines, segmenting lines, installing voltage regulators and installing capacitor banks

To provide for long term load growth eight scenarios have been presented in Volume 1 section 8 as possible network options that could increase capacity and assist in maintaining reliability and power quality in the Ward. Depending on the location and timing of the load increases other network augmentation options may be more appropriate.

Impact of Existing Supply Quality and Reliability on Growth

In the context of this report, reliability of supply refers to interruptions to supply. Power quality or quality of supply refers to the available power having an acceptable set of characteristics to enable the customer's equipment to operate as intended.

None of the participants indicated that any existing reliability or quality of supply problems was at present delaying any expansion plans. However, participants indicated that both improvements in reliability and quality of supply would be raised with Powercor when discussing and planning any expansions.

All of the customers interviewed have embraced the use of electronic and digital equipment over the last 10 years or so and are now very reliant on the reliable operation of electronic controlled appliances, computers, programmable logic controllers (PLC's), variable speed drives (VSD's) and similar electronic devices.

The wide spread customer adoption of electronics based technologies has led to an increasing dependence on the electricity supply including expectations of high reliability and high power quality. In an automated plant a single power quality disturbance can result in thousands of dollars of lost production and product spoilage per event. For residential customers, a similar power quality disturbance may result in spoilage however in many cases the impact is often only a nuisance or inconvenience.

Minimum reliability and power quality performance levels are set by the Victorian Essential Services Commission. These minimum levels are often inadequate for customers with electronics based equipment to avoid business impacts when disturbances occur. There is a mismatch between typical network disturbance performance and electrical/electronic equipment immunity to disturbances that the majority of customers do not understand. Bridging the 'gap' is a case by case economic decision between the costs of business impacts and mitigation measures. Mitigation options can be implemented at the customer equipment level, network level or a combination of both.

Most participants had an understanding of the city/country issues concerning reliability and quality of supply performance. The role of the Essential Services Commission as the regulator and the regulatory structure within which Powercor operates was less well understood.

Customer interviews showed that most participants could benefit from greater understanding and education on the options available to minimise the business impacts of power interruptions and quality of supply events by making targeted improvements to their own installations.

With regard to customer interruption and power quality complaints, indications from participants were that small to medium sized customers have a high "pain" threshold before contacting Powercor.

Opportunities for Electrical Infrastructure Advocacy

Opportunities for advocacy in relation to electrical infrastructure for the Ward should be based around proposed business development and its associated electrical load increase. Additional electrical capacity is available in the vicinity of the Ward as has been recently demonstrated by the Colbinabbin-Bendigo Pipeline Pump Station project.

A significant proportion of the possible load growth for the Ward was related to the availability of irrigation water and its reticulation to customer properties.
Replication of the existing Colbinabbin Cornella Pipeline System concept (pipeline, pump stations, electrical infrastructure) appears to be the type of project that could be supported to aid development within the Ward.
The Shire of Campaspe could act as the facilitator / coordinator of infrastructure projects based on the consolidation of individual business development plans including assistance with the application of Electricity Industry Guideline No. 14 'Provision of Services by Electricity Distributors' to the development proposals.

The involvement of appropriate reliability and power quality expertise in the planning stages of business development projects may be another area of advocacy. This could assist customers in evaluating the options for bridging the gap between typical network disturbance performance and electrical/electronic equipment immunity to disturbances.