Demand Management Investigation Report

North Western Pennant Hills Zone 11kV

Summary

EnergyAustralia carried out an investigation of demand management (DM) options in the North Western Pennant Hills area in 2010. The aim was to determine if there were cost effective demand management measures that could defer the need for $3.75m investment of laying a new 11kV cable from Pennant Hills zone substation to the north of Cherrybrook via Thornleigh and Westleigh, while maintaining network performance at the required level from summer 2011/12 to summer 2012/13. This report concludes that a cost effective demand management option is available.

Screening Test Outcomes

A DM Screening Test completed in February 2010 concluded that to defer the need for the proposed investment until after summer 2012/13 we would need to implement demand reductions totalling 0.55MVA in summer. If 0.82MVA reduction could be achieved, the proposed investment could be deferred until summer 2013/14.

Revised DM Requirement

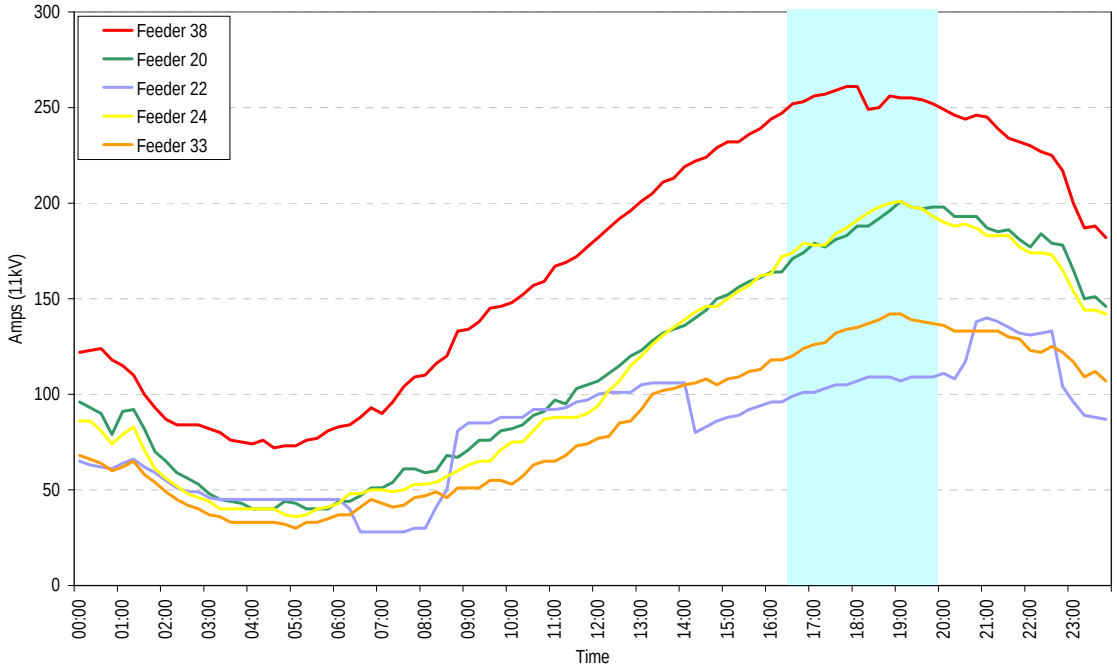
The DM requirement has been revised in March 2010. The updated requirement is listed in the following tables.

EITHER 1) Feeder 38	2011/12	2012/13	2013/14	2014/15	2015/16
11kV Amps	22	27	32	42	71
MVA requirement	0.41	0.51	0.61	0.80	1.35
Deferral value	$729/kVA	$1,131/kVA	$1,370/kVA	$1,346/kVA	$936/kVA
Total deferral value	$299k	$577k	$836k	$1077k	$1301k

OR 2) Feeder 38 & Feeder 20	2011/12	2012/13
11kV Amps	16	21
MVA requirement	0.30	0.39
PLUS Feeder 22		
11kV Amps	6	11
MVA requirement	0.12	0.21
Deferral value	$712/kVA	$962/kVA
Total deferral value	$299k	$577k

Pennant Hills Summer Peak Day Load Profiles

The following charts show the summer peak load profiles of the targeted feeders on January 22, 2010. The load profiles suggest that residential loads dominate the summer peak demand. DM solutions would need to be effective between 4:30pm to 7:30pm in summer. The load profiles of the top 10 days for summer season in targeted areas in Appendix A show that the load profiles are quite consistent.



Demand Management Investigation

The overall investigation approach was to identify potential DM options, assess the likely demand reduction and rank them based on their cost ($/kVA) to EA. The most cost-effective options might result in a feasible project. We reviewed existing investigation reports from the Demand Management and Planning Project (DMPP) in North West Pennant Hills area. We collected and analysed recent energy usage information. For each of the options we assessed the likely demand reduction that would result at the time of network peak at the specific feeders (Feeder 38, Feeder 20, Feeder 22) in the zone substation and calculated the impact on the overload above design limit. We also estimated the cost of implementing DM options to EnergyAustralia. Based on these estimates, we ranked the options and compared them to the potential savings from deferring the proposed supply side investment.

Identified DM Options

- Power factor correction
- Relocatable generators
- Customer standby diesel generators
- Air conditioner and pool pump control

Demand Management Options and Analysis

Power factor correction

Where customer's load exhibit poor power factor, peak demands on the network are higher than they would otherwise be. Based on actual electrical demand data from 2009/10, we identified that Sydney Water pumping station at Thornleigh had poor power factor. The estimated potential demand reduction effective at the specific Feeder 22 only is about 325kVA in summer. From the past quotation, the estimated cost of facilitating the project is about $195,000 (11kV PFC).

Relocatable generators

EnergyAustralia has used relocatable generators to provide reliable temporary load reductions in other areas. A potentially suitable location is needed to install 1MVA generator that can cover first four years on specific Feeder 38 only. The estimated net present cost to EnergyAustralia would be approximately $979,000 for four summer seasons. This estimate is highly sensitive to generator rental costs. If rental costs are 10% higher than assumed, then the estimated NPV would rise to $1,012,000.

Customer standby diesel generators

EnergyAustralia has identified two sites on particular feeders in the target area had diesel standby generators. The capacity of the generators is small. After talking to the customers, we have been informed that the generators can't be used for our demand management options. We did not pursue this option any further.

Air conditioner and poor pump control

In Northwest Pennant Hills zone, the majority of peak load is due to residential air conditioners. One of the solutions is using load control technique. Based on our past consultation, we estimated the cost of the option is over $2,000/kVA, which is very high. We did not pursue this option any further.

Summary of DM Project Cost and Load Reduction

Based on our investigation, we have estimated the DM project cost and potential load reduction. The following table summarises the results. We ranked the options according to the cost to EA ($/kVA)

DM Options for summer	Peak load reduction	Total cost to EA	Cost to EA ($/kVA)	No. of customer involved	Time for implementation
Relocatable generator on Feeder 38	1MVA for 4 summer seasons	$979,000	$979/kVA	1	1 - 4 years
HV PFC on Feeder 22	325kVA	$195,000	$600/kVA	1	1 year

Feasible Options

On the bases of this analysis, we found that relocatable generator option could achieve sufficient demand reduction on specific Feeder 38.

EnergyAustralia has used leased diesel generators in other areas as a successful DM option. Identification of a suitable site where generator can be installed temporarily is a critical element of this option. During our investigation, we identified a likely location for the project, and assessed issues of ease of access, noise, exhaust stack installation, fuel refilling, earthing, generator control communication.

The generator would be remotely controlled and monitored via a reliable communications link to the EA Control Room. The generator would start and run automatically with the ability to be controlled by the System operator (via SCADA). Then they will automatically synchronise and connect to EA network. The control and communications of gensets will be explored and developed further in next stage.

Based on our experience of developing from similar project, we found that this option is technically feasible and commercially viable. Estimated cost, based on our current contracts for generator leasing

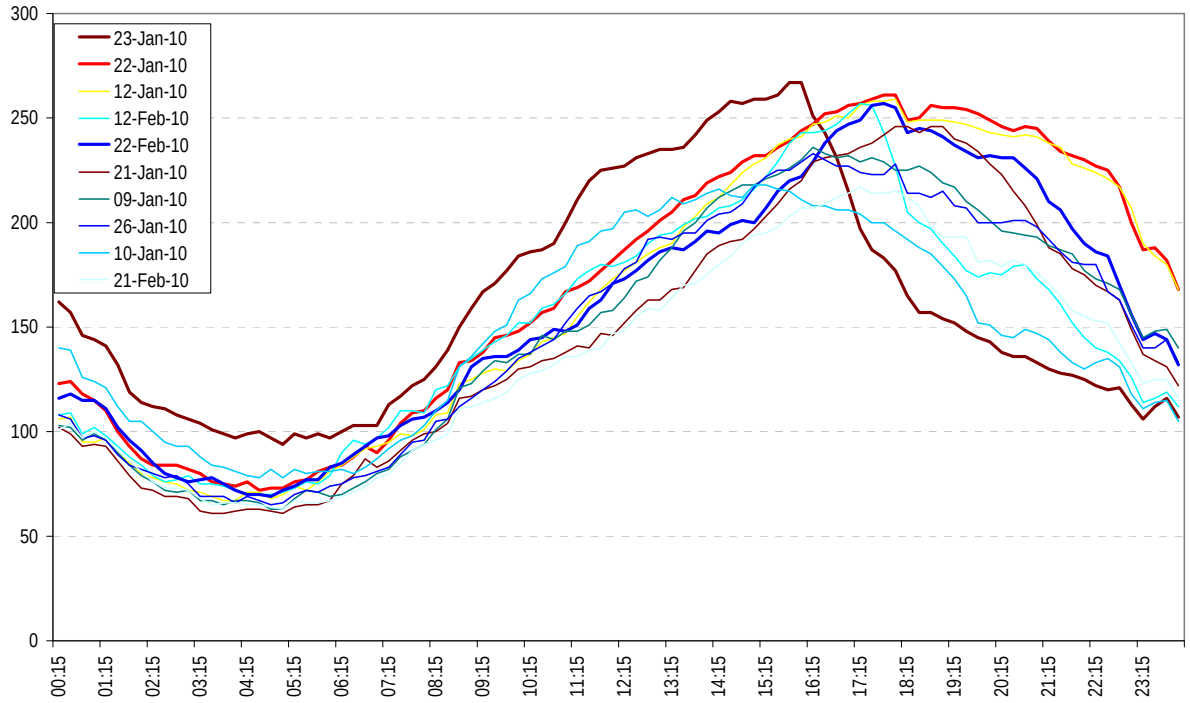
and experience with previous projects is $979,000 for 1MVA installation at one site for four summer seasons starting in summer 2011/12.

Conclusion

We identified feasible DM option of using relocatable generator. The DM option is sufficient large to enable deferral of the proposed investment and provide peak demand relief in West Northern Pennant Hills. The option should be developed further to enable implementation to commence in April 2010.

Appendix A: Additional Data

- Top 10 days summer 2009/10 daily load profiles on Feeder 38



Appendix B: DM Screening Test

DEMAND MANAGEMENT SCREENING TEST

North West Pennant Hills Zone Development

Current Supply Arrangements

The area of interest is feeders 8, 20, 24 and 38 supplied from Pennant Hills zone substation.

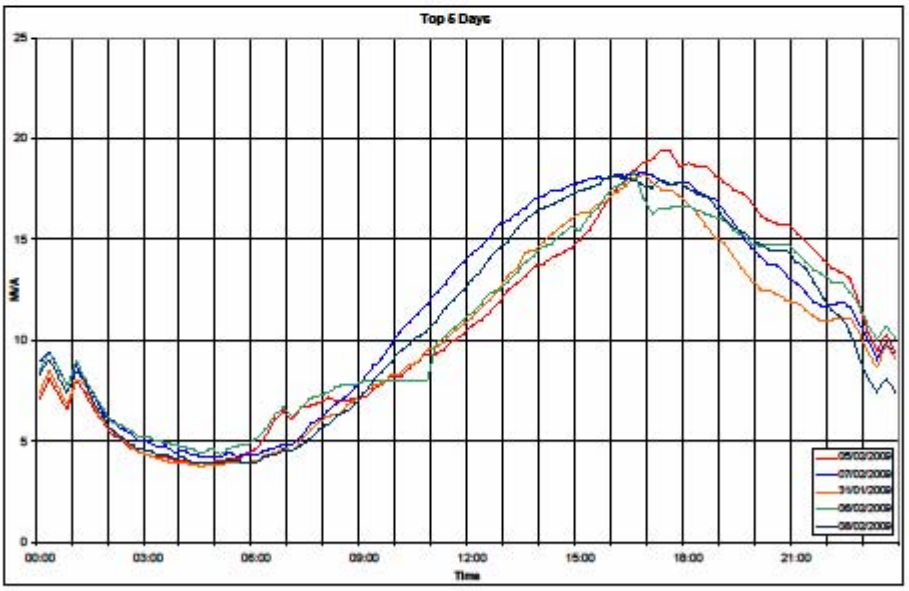
This system is designed so that if any one feeder experiences an outage, the loads on that feeder can be picked up by either of the other two interconnected feeders. This should be achieved with a maximum of 3-5 switching operations, as stipulated in the licence requirement that 11kV customer interruptions in urban areas with a population greater than 5,000 people should be less than 4 hours.

The supply system supplies the suburbs of Dural, Westleigh, Cherrybrook, Pennant Hills, Thornleigh, West Pennant Hills, Beecroft and some parts of Cheltenham.

Supply Capacity and Demand Forecast

The load at Pennant Hills zone is predominately residential and is forecast to grow at 1.5% per annum in summer and 1% in winter.

The graph below shows the top 5 days for summer 2008/09 for the area of interest.



We forecast that demand will have exceeded the relevant capacity limits in summer 2011/12. The worst case loading is described in the table below.

Scenario	Pick up feeder	Rating of critical section (kVA)	Loading (kVA)	DM Requirement (kVA)
Outage of critical section of feeder 20	8	6190	6310	120
Outage of critical section of feeder 38	20	6570	6880	310
Outage of critical section of feeder 24	22	6380	6520	140

For the worst case loadings situation a net load reduction of 410kVA would be required on feeders 20 or 38, and a reduction of 140kVA would be required on feeder 22.

Supply Strategy Option

The preferred supply side option is to lay a new 11kV cable from Pennant Hills zone substation to the north of Cherry Brook via Thornleigh and Westleigh.

The estimated cost of this project is $3.75m. The required date for this project is the 1st of December 2011, the decision date for this project is May 2010.

Required Demand Management Characteristics

If a 550kVA reduction could be achieved, the proposed investment could be deferred until summer 2012/13. 550kVA represents 2.8% of the load on the relevant feeders which is low. The potential savings from a one year deferral would be $240,000 or $437/kVA, which is moderate.

If an 820kVA reduction could be achieved, the proposed investment could be deferred until summer 2013/14. 820kVA represents 4.1% of the load on the relevant feeders which is low. The potential savings from a two year deferral would be $470,000 or $567/kVA, which is high.

If a 1.1MVA reduction could be achieved, the proposed investment could be deferred until summer 2014/15. 1.1MVA represents 5.5% of the load on the relevant feeders which is moderate. The potential savings from a two year deferral would be $680,000 or $608/kVA, which is high.

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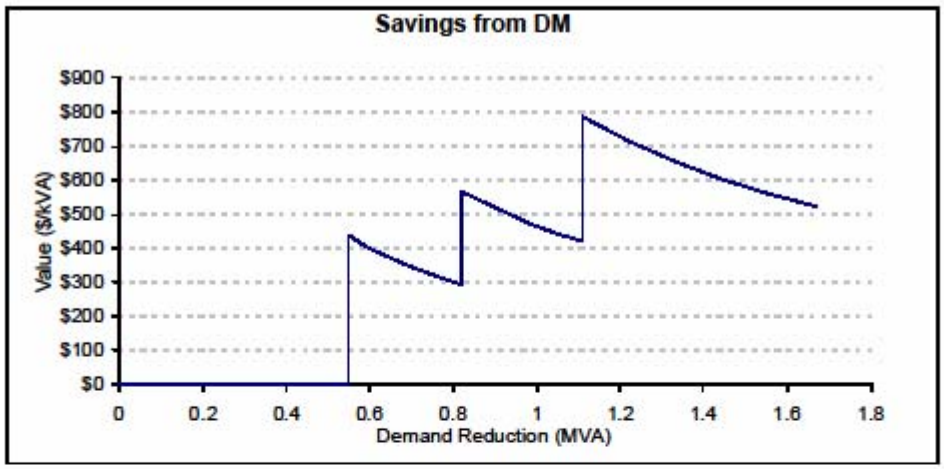

The Demand Management and Planning Project (DMPP) was a project which identified opportunities for demand reductions at large customer sites in the Sydney metropolitan area.

The DMPP has identified 25 opportunities within Pennant Hills Zone load area, on feeders 6, 11, and 26. No opportunities were found in the area of interest.

The load in the area is predominately residential, which increases the difficulty of finding and cost of demand reductions.

For the first year the required demand reduction is small, in both absolute and relative terms and the savings are moderate. For the subsequent years the demand reduction is small in both absolute and relative terms and the savings are moderate in absolute terms and high in terms of $/kVA.

Given the demand reductions are small, especially in relative terms and the savings in terms of $/kVA are moderate to high, it is considered reasonable to expect that an investigation might find cost effective demand management measures.

Recommendation

Based on this analysis it is considered reasonable to expect that it may be cost-effective to postpone the proposed supply-side solution by implementing demand management strategies. A demand management investigation will be undertaken.