

## DEMAND MANAGEMENT SCREENING TEST

### Jewells Zone Substation Upgrade

#### Current Supply Arrangements

The network in the North East Lake Macquarie area consists of eight 33/11kV zone substations. Six are supplied by Merewether sub-transmission substation (STS), including Pelican and Jewells zone substations, and two are supplied by Awaba STS.

Pelican zone substation is equipped with two 19MVA 33/11kV transformers which limit the zone substation licence capacity to 20.6MVA in summer and 22.2MVA in winter. Pelican zone substation supplies the suburbs of Belmont South and Pelican.

Jewells zone substation is equipped with two 12.5MVA 33/11kV transformers which limit the zone substation licence capacity to 20.8MVA in summer and 22.4MVA in winter. Jewells zone substation supplies the suburbs of Belmont, Jewells and Redhead.

Feeder 3635/3431 is part of the 33kV network that supplies Jewells, Pelican and Swansea zone substations as well as a normally open feeder to Croudace Bay. The feeder is limited to 27MVA in summer and 30.3MVA in winter. The load on this feeder is highest when there is an outage of feeder 3095/3422.

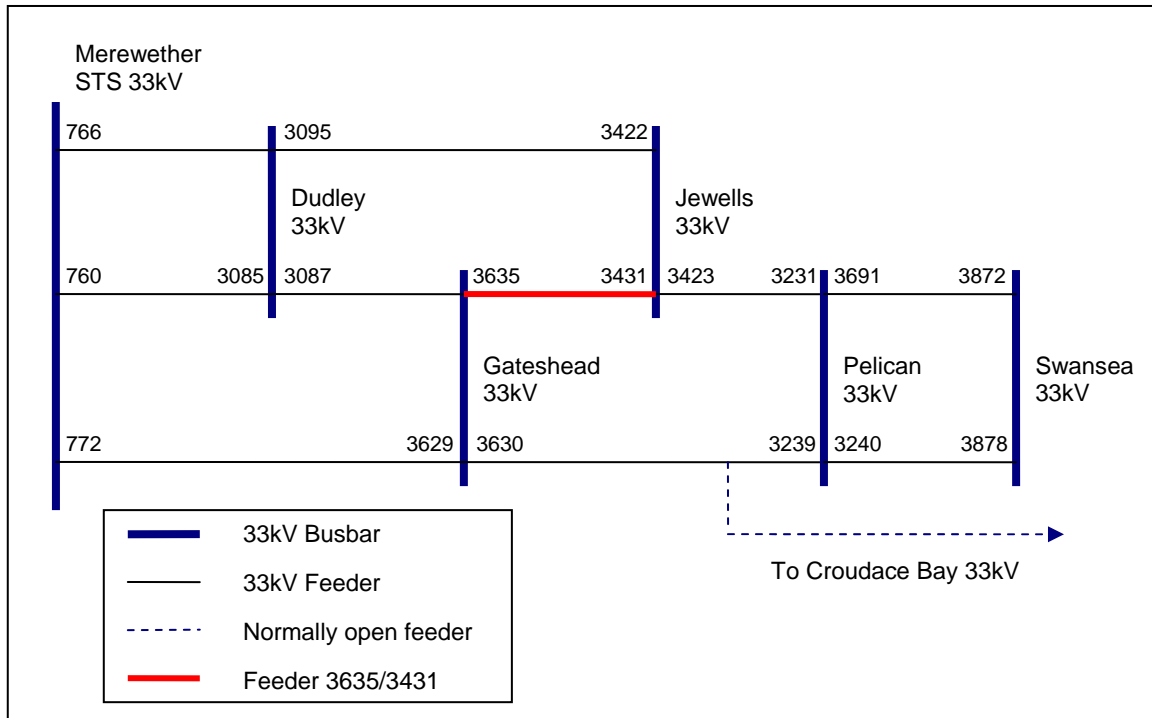


Figure 1. Schematic diagram of part of the North East Lake Macquarie network

## Supply Capacity and Demand Forecast

### Pelican Zone Substation

Based on the load profile, Pelican zone substation appears to be predominantly residential with a large amount of water heating. In the winter, the peaks are in the morning and the evening. In the summer the peak is in the early afternoon. The critical season is summer.

The load on Pelican zone substation is currently 12MVA which is well under the license capacity and is forecast to remain steady.

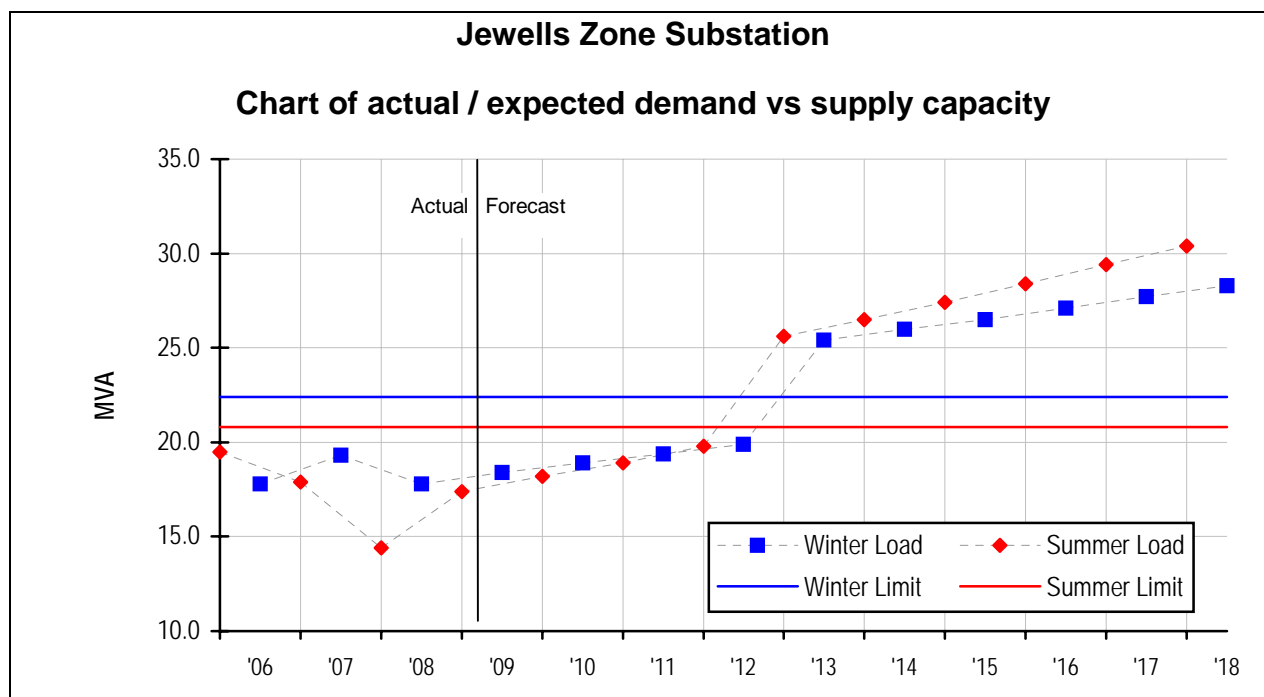
Due to the age and the condition of the assets at Pelican zone substation, the 11kV switchgear is intended to be replaced in 2011 and the substation is expected to be retired by September 2012, with 5MVA of the load transferred to Jewells, and the remainder to Croudace Bay and Swansea.

### Jewells Zone Substation

Based on the load profile, Jewells zone substation also appears to be predominantly residential with a large amount of water heating. In the winter, the peaks are in the morning and the evening. In the summer, the peak is in the early afternoon. The critical season is summer.

The forecast peak demand for Jewells zone substation is shown on the chart below. It includes the proposed 5MVA load transfer from Pelican zone substation by September 2012.

With the load transfer from Pelican zone substation, the peak load would be approximately 4.8MVA above the licence capacity limit in summer 2012/2013.

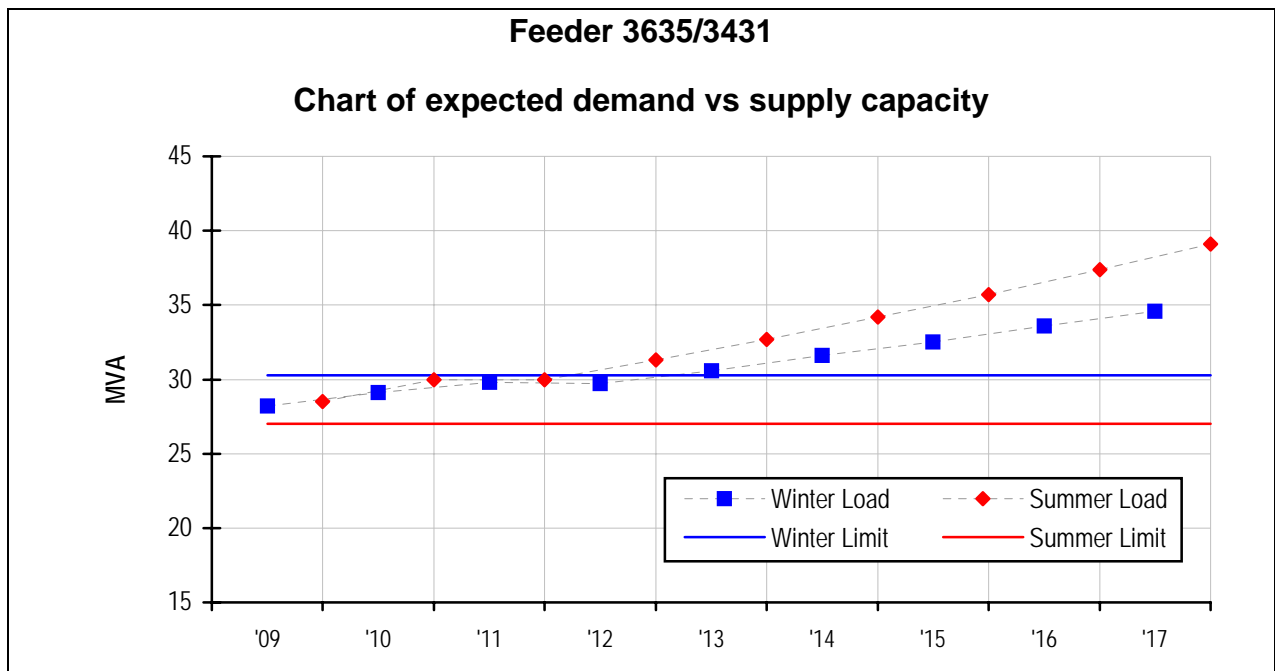


The 33kV circuit breakers at Jewells substation are of the outdoor bulk oil type and need to be replaced by 2017.

Feeder 3635/3431

The forecast load on feeder 3635/3431 is a worst case scenario load based on the failure of feeder 3095/3422 and is affected by load sharing due to the arrangement of the network. During this scenario, the loads on Jewells, Pelican and Swansea zone substations are shared between feeder 3635/3431 and feeder 3630/3239.

The forecast peak demand for feeder 3635/3431 is shown below. In summer 2010/2011, the peak load would be approximately 3MVA above the license capacity limit.



**Supply Strategy Option**

Assuming Pelican zone substation will be retired and 5MVA of its load is transferred to Jewells in September 2012, the preferred supply side option is to replace feeder 3635/3431 and upgrade Jewells zone substation by replacing the existing 12.5MVA transformers with 33MVA transformers.

The replacement of feeder 3635/3431 is expected to be completed in October 2010 to address the demand in summer 2010/11. The upgrading of Jewells zone substation is expected to be completed in October 2011.

The cost of replacing feeder 3635/3431 is \$1.3m. The cost of upgrading Jewells zone substation by replacing the existing transformers is \$3.35m.

## **Required Demand Management Characteristics**

Various combinations of demand reductions at Jewells, Pelican and Swansea zone substations have the potential to reduce loading on feeder 3635/3431. However due to load sharing effects, demand reduction at Jewells zone substation is more effective than at Pelican or Swansea zone substations. In addition, demand reduction at Jewells zone substation would address the concerns at the substation itself as well as the feeder, and therefore be doubly beneficial.

If we could reduce load by 3MVA at Jewells zone substations by summer 2010/11, the need for the upgrade of feeder 3635/3431 would be deferred until summer 2012/13. A load reduction of 3MVA at Jewells zone substation represents 15% of the current load on Jewells zone substation, which is moderate, and would achieve a saving of \$180,000, or \$60/kVA, which is low.

If we could reduce load by an additional 2MVA at Jewells zone substation by summer 2012/13, the need for the upgrade of feeder 3635/3431 and the upgrade of Jewells zone substation would be deferred until summer 2013/14. A load reduction of 5MVA at Jewells zone substations represents 25% of the current load on Jewells zone substation, which is high, and would achieve a saving of \$500,000, or \$100/kVA, which is low.

Given the low savings available and the large demand reductions required, it is unlikely that cost effective demand management strategies could be found.

## **Recommendation**

Based on this analysis it is not considered reasonable to expect that it would be cost-effective to postpone the proposed supply-side solution by implementing demand management strategies.