

# THE UNIVERSITY OF ADELAIDE

## ENERGY INITIATIVES CASE STUDY

# POWER FACTOR CORRECTION

### Straining Infrastructure

South Australian electricity infrastructure struggles to cope during periods of peak demand when hot weather dictates in modern times the maximum operation of air conditioning systems throughout the community.

Domestic customers now pay more for their electrical energy usage during these periods of expected high demand.

Whilst this happens, the Community is also becoming frustrated with the increasing rate of infrastructure failures that affect their homes and working environments.

Whilst the major cause of these issues is undoubtedly increased electrical load, within the load increase is another hidden culprit accounting for at least some of the strain on infrastructure – the phenomenon of power factor.

### Technicalities

Most modern electrical equipment is based on the physics of electro-magnetism. For example, the work-horse of modern industry, the alternating current motor relies on magnetism and until recently, fluorescent lighting systems operating in office buildings used magnetic iron-cored internals within every fitting.

The requirement for magnetism means an 'inductive load', which in summary pushes the current out of synchronism with the voltage. The science of this means that to produce the power that the equipment needs, the current increases by a ratio known as the power factor. A 'poor' power factor requires a larger current, causing increased demand on electrical infrastructure.

The solution is to install additional devices that create better synchronisation between voltage and current. In this manner the poor power factor can be 'corrected'.

### Double Jeopardy

The University operates large amounts of electrical equipment in most buildings and facilities. Much of the equipment causes a poor power factor.

This increases the infrastructure requirement on a building basis, meaning that cables and switchboards need to be larger and more powerful. It can also mean that new or additional equipment can not be supported by the electrical infrastructure.

The double penalty is that ETSA Utilities now have the right to penalise customers, including the University, showing poor power factor at their point of electricity supply.

Conversely, tariff bonuses are offered to customers able to comply with strict power factor criteria.

### University of Adelaide Implements a Solution

The North Terrace Campus has some 13 separate electricity supply connections to the network. Each supply has a specific capacity, which is affected by the power factor of items connected.

The University has begun implementation of a Power Factor Correction project for those supplies that have been found to be operating with a poor power factor. Power Factor correction involves the installation of monitored capacitor banks located at main switchboards or major items of equipment.

It is anticipated that over 10% of the present University supply capacity will be freed up for other requirements of the Campus, or will be returned to the Community to reinforce existing electricity supply infrastructure.

### Project Facts

- First Power Factor Correction units installed – Napier Building 2005, Plaza, 2006.
- Completion date for Power Factor Correction project – North Terrace - February 2007.
- Infrastructure Capacity improvement anticipated – greater than 10%, or around 1.5 MVA. In terms of augmentation, this has a simplified value of almost \$190,000.
- Project Implementation cost at North Terrace - \$150,000, giving a simple payback period of less than 12 months.