
# University improves network performance by 10%*

## Key Challenge

With a community of almost 27,500 students and 1,600 staff members, the University of Southern Queensland (USQ) is committed to sustainability.

With three growing campuses across Toowoomba, Fraser Coast and Springfield, the University recognises that they need to carefully manage their energy use to minimise the adverse impact of its activities on the environment.

## Background

USQ was identified by Ergon Energy as a potential partner in its Power Factor Correction pilot project due to the size of its demand on the network and their desire to reduce their load for the benefit of others.

Ergon Energy and USQ have partnered since the institution's establishment to find mutually beneficial solutions to the site's growing energy demands.

Since the early 1990s, the on-site population at the University's founding campus (Toowoomba) has grown rapidly. 5,000 staff and students currently work or study at the campus, or live on-site at one of the residential colleges. As a large consumer of electricity, their demand on the network often meant that their neighbours occasionally experienced strain on their electricity supply.

Above: James Glasby – Facilities Officer USQ Campus Services inspecting one of the eight capacitor banks installed

## Solution overview

Power factor can be an indicator of how efficient the utilisation of an asset is. A poor power factor impacts on the electricity network and means that the required electricity supplied to a customer is higher than what the customer is actually using.

The maximum demand of USQ's Toowoomba campus was 3500 kVA with a power factor of 0.88. A power factor of 0.88 meant that only 88 percent of the electricity being supplied to the Toowoomba campus was being used effectively.

A Level 2 Energy Audit was undertaken which considered the overall site load requirements and provided recommendations to improve the power factor at USQ's Toowoomba campus. The audit proposed two solutions:

1. Reduce peak demand by at least 10 percent by installing a power factor correction system to achieve a power factor of 0.98 or better. The new peak demand would be reduced to a maximum of 3142 kVA by installing capacitor banks to deliver 1104 kVAR; or

Together with

UNIVERSITY OF SOUTHERN QUEENSLAND

ERGON ENERGY

* savings shown are from an independent auditor's measurement and verification, report conducted in 2013.

2. Reduce peak demand by at least 7 percent by installing a power factor correction system to achieve a power factor of 0.95 or better. The new peak demand would be reduced to 3243 kVA installing capacitor banks to deliver 736 kVAR.

For both solutions it was recommended that capacitor banks be placed at transformers at main switchboards where the correction would be most beneficial. Placing capacitor banks close to the electrical load can help to improve voltage stability and reduce fluctuations from voltage drops and spikes as load dropped off and came back on around the campus and the different supply points from the network.

Furthermore, improved voltage helps to reduce heat in transformers, main switchboards and motors which can lead to longer service life of equipment, fewer thermal overloads and increased capacity.

It was also recommended that power factor correction systems include harmonic reactors designed to protect the capacitors from harmful harmonics.

## Results

Capacitor banks were installed at nine out of 18 transformers across the campus between April and May 2013. An independent measurement and verification report conducted in May 2013 showed that the power factor correction systems maintained a power factor of 0.98.

| Measurement and Verification (M&V) Results* | | | |
|---|---|---|---|
| | Business as usual | Post-PFC installation | Savings |
| Demand (kVA) | 3500 | 3142 | 358 |

Dr Dave Povey, Executive Director Campus Services, quoted:

"By improving the power factor we have helped to build business resilience, by avoiding potential future costs in the event that a kVA billing component is introduced to commercial and industrial customers. We also saw a great deal of value in the process from start to finish. The Energy Audit simplified the tender design and evaluation processes and provided clear line of sight to what we needed to do to achieve a positive result. The success of this project at our Toowoomba campus meant that we are now rolling out the installation of power factor correction units as standard in any new development".

Above: One of the many USQ class rooms reliant on a stable electrical system

Power Factor Correction has now been included in USQ Design Standards:

"Power Factor Correction Equipment shall be provided to maintain a minimum power factor of 0.98 at each main switchboard. As standard practice, the proposed PFC units should include harmonic reactors designed to protect the capacitors from harmful harmonics. Based on history the university recommends PFC units with 3rd harmonic reactors installed on all Campuses."

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