

Case Study

James Cook University Energy Management System





SITE

James Cook University

One of the world's leading institutions focusing on the tropics, Australia's James Cook University is surrounded by the spectacular ecosystems of the rainforests of the Wet tropics, the dry savannahs, and the iconic Great Barrier Reef. JCU's unique location enables students from Australia and overseas to study in a diverse physical environment unparalleled by any university in the world.

Townsville Campus

Around 11,500 students study at JCU Townsville, including over 1,500 international students. The campus is located in the suburb of Douglas, in a 386-hectare natural bush and parkland setting, 13 kilometres (8 miles) from the central business district.

Cairns Campus

Over 4,000 students study at JCU Cairns, including about 380 international students. The campus location is spectacular – surrounded on three sides by rainforest-covered mountains. Located near the northern beaches in the suburb of Smithfield, the campus is 15 kilometres (9 miles) north of the city centre.

PURPOSE

The specific requirements of the Energy Management System are intended to be:

- Measurement data presented in real-time for management consideration and engineering operators;
- Retrieve and display stored historical measurement data;
- Remote monitoring and reporting of both electrical and cooling energy used by each building/department on campus;
- Automatically generated billing report;
- Remote monitoring and reporting of water consumptions;
- Graphical and tabulated representation of data to be displayed for a range of parameters in standard and user defined formats;
- Software and hardware to be scalable to allow expansion and easy modification of system, including power quality analysis;
- Centralised server for software and data storage with remote access via the intranet, internet or VLAN with differing screens and access for users, technicians or administrators.

People

The main users of the Energy Management System include but not limited to:

- Manager Environment
- Finance Department
- Senior Technical Officer
- Manager Student Association
- Many others

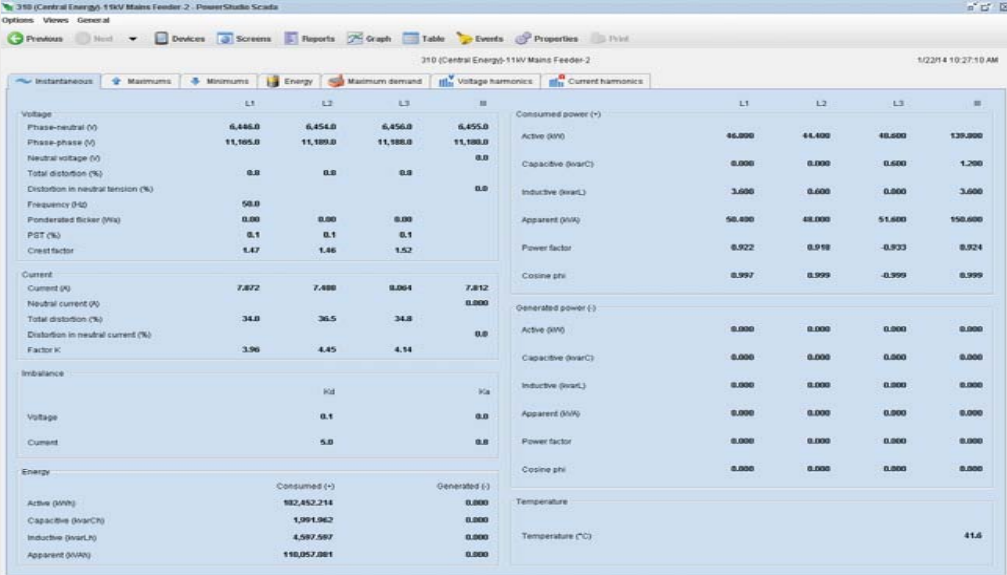


SYSTEM

Power Studio SCADA Deluxe

There are three versions of Power Studio - Power Studio, Power Studio SCADA, and Power Studio SCADA Deluxe. The Deluxe version is the most advanced which including all the features of the other two plus compatibility with third party modbus devices.

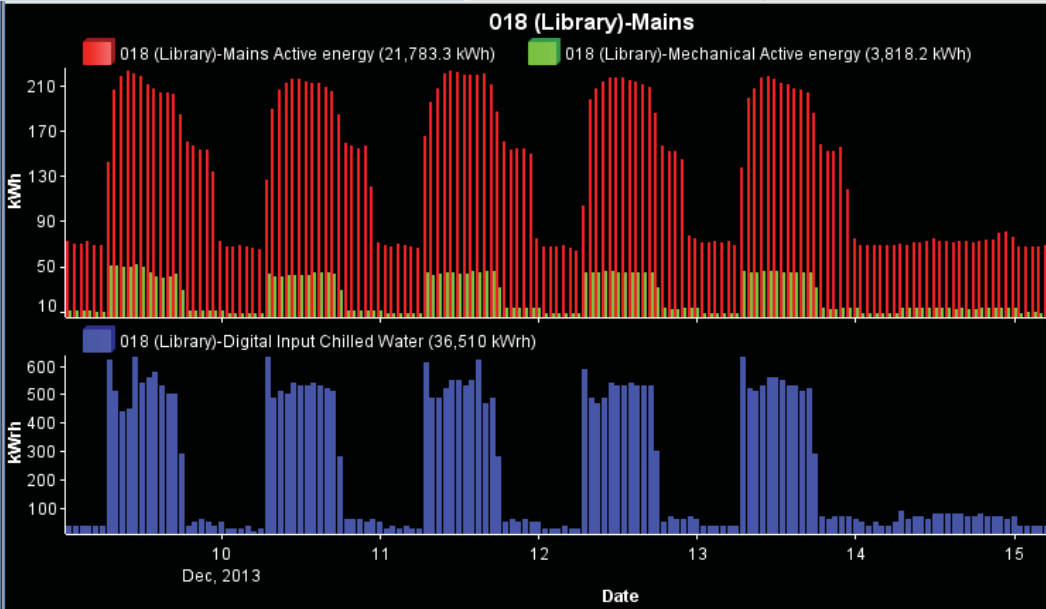
- Real time display of all measured variables of all equipment
- Data display in table format with the option of exporting txt and csv files
- Graphic representation of the historical data recorded by software. Enables configuration of colours and layout individually
- Generate reports
- Create personalised screens
- Control and generate alarms and events
- Integrate any Modbus communications equipment
- OPC Client



Real-time readings

Historical data graphs

158 Electrical Meters
10 Water Meters



System Architecture

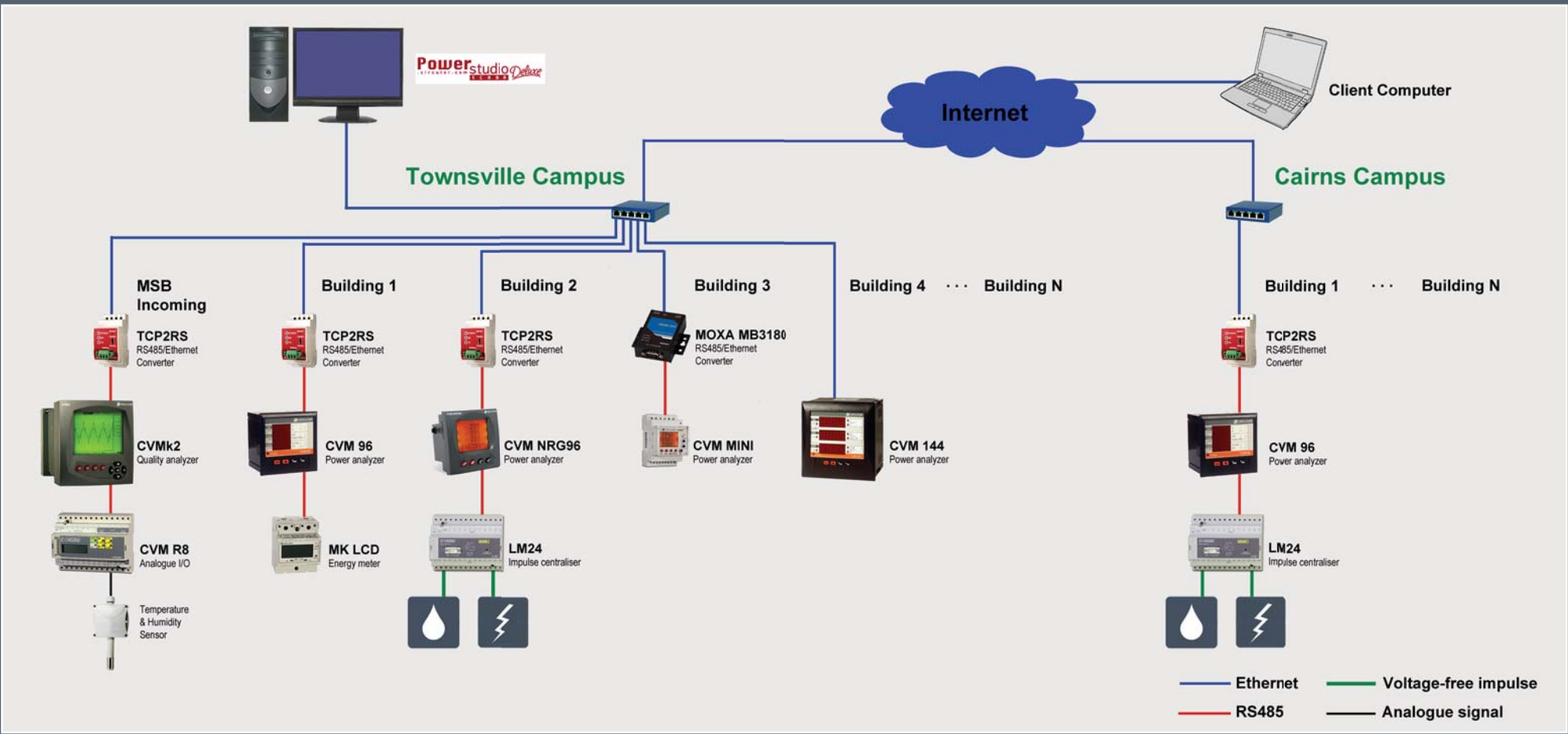
Centralised server

The Energy Management System (EMS) software is installed on a server located in the data centre in Townsville campus.

Meters communicate via direct Ethernet connection or RS485 with daisy-chain connection. A converter is used to convert RS485 to Ethernet for each daisy-chain.

All converters, Ethernet meters, and Power Studio SCADA server is connected together via Ethernet switch(s). The communication between Townsville campus and Cairns campus is linked via VLAN over the internet.

Any user (client end) connected internally on the JCU local area network can securely login with their dedicated username and password to the system using an internet browser or PowerStudio Client. Users can also connect to the system anywhere at anytime via internet through JCU's secured VPN connection.



CVM Series with display

Three-phase power analyzers with LCD display

Power analyzers for high and/or Low Voltage balanced and unbalanced three-phase networks. Measures over 230 electrical parameters and has RS-485 Modbus/RTU and Modbus/TCP communications to establish communications with the master software. Backlit display. Assembly on DIN rail or panel base, depending on the model.

LM Series

Impulse concentrators

Devices with digital/analogue inputs/outputs that centralise the incoming impulses from market meters (energy, water, gas, etc.). They can detect the logical status of inputs, stating the detection of an alarm to the master communications system. They have different communications protocols installed, such as RS-485 (Modbus/RTU) or Ethernet (Modbus/TCP).

PUBLIC DASHBOARD

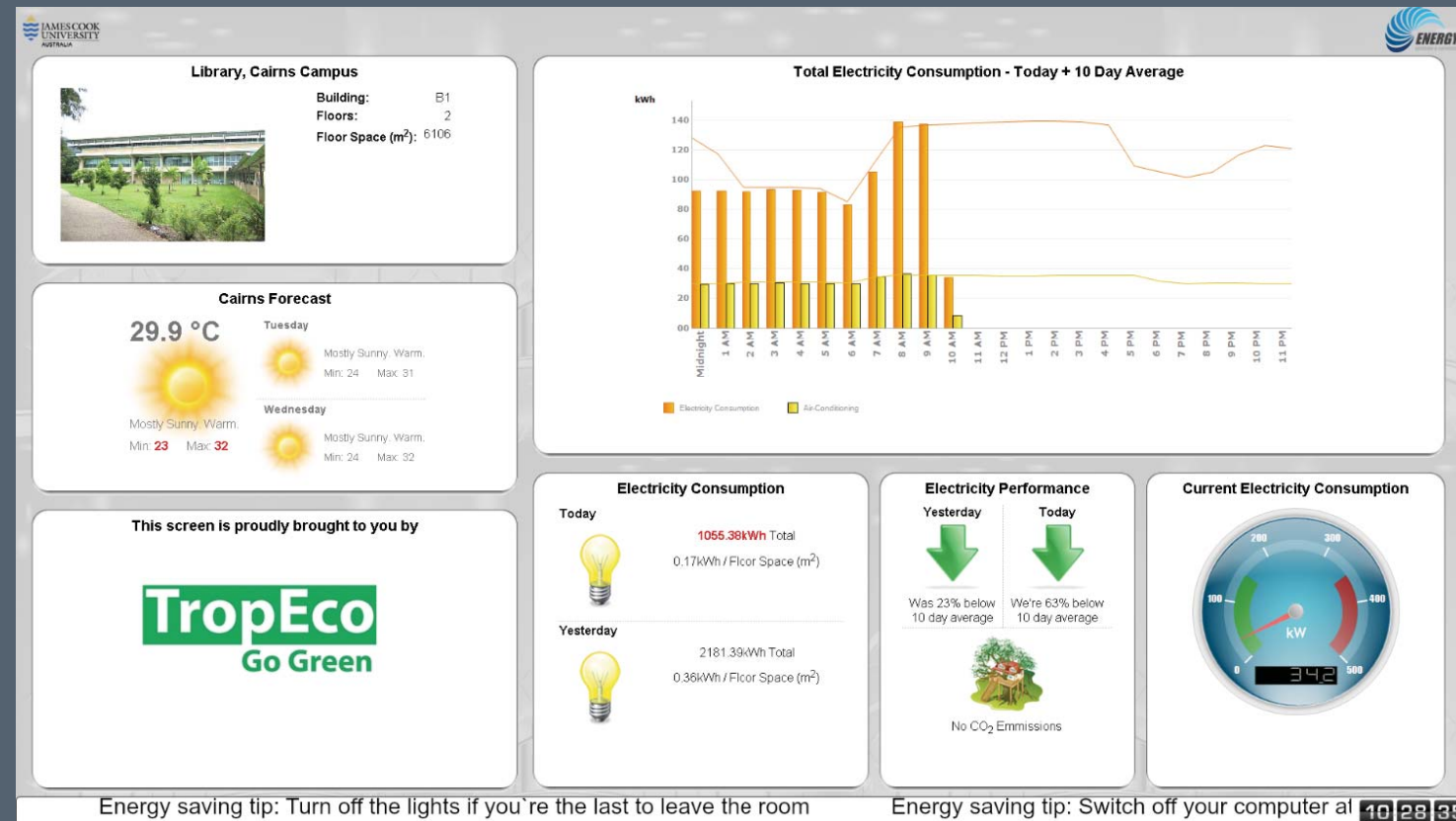
The energy management system installed is a state-of-the-art software for engineers and technical staff. However, to encourage and improve engagement with building occupants and other target groups, a public dashboard has been developed and installed to display data from meters.

Features:

- Live display of utility usage for energy and water
- Simple graphical representation of utility use
- Easy to understand comments associated to the relevant graph type
- Tips on how to conserve energy, water and reduce waste, definitions of sustainability and environmental terminology and facts associated with climate change

Benefits:

- Engages building occupants in environmental aspects of



the building they inhabit, contributing to a positive work environment

- Contributes to reduced utility costs through educating students/staff to be more energy, water and waste efficient
- Occupants and visitors can view the information and understand that you are serious about the environmental impact of your building and climate change
- Internal and external promotions

TropEco Go Green

JCU has a program called TropEco. It aims to actively involve staff and students in sustainability related activities with the objective of changing behaviours and culture within the University and wider community over the coming years.

The program is focused on large scale behavioral change by providing fun and engaging activities and programs for staff and students.

One of the major points of focus for TropEco is:

Energy and water consumption

Next steps

JCU is planning to continuously improve its energy efficiency across all campuses. It will integrate the Energy Management System with the finance program, and continue to roll out meters across campuses including water metering.

Conclusion

Before you can take any action to save your energy and increase your energy efficiency, a better understanding of your energy consumption is essential. Energy Management System can help you do a complete energy study. It will provide you real-time readings, historical data, graph trends and reports.

The key outputs of energy study include:

- Detailed incoming supply and sub-metering readings;
- Consumption comparisons between different periods or circuits.

- Building base-load consumptions data;
- Maximum demands;
- Power Quality information - Power Factor, THDs.
- Leakages;
- And other anomalies;

With the installed Energy Management System, JCU facility management team can easily understand their energy consumptions and monitor the performance of their control systems.

All the data from different campuses can be stored and accessed from a single server. This has given JCU a true global access. They can continuously improve their energy usage and develop energy efficiency strategies to manage rising energy costs based on the information from the system and the energy consumption analysis reports.

The public dashboard screens, as part of the TropEco project, have also been playing a key role of engaging people to save energy and water.

"The highlight for me is the ease of use for billing, especially with the demand based charging and the ability to interrogate the data in fine detail to ensure everything is running efficiently and identify any issues."

Adam Connell | Manager, Environment, Estate Office
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