

Session 2

An Integrated Approach to Energy Management

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James Cook University has embarked on an ambitious energy management program that has realised major cost savings and reduced greenhouse emissions. The coordinated program focuses on demand management, energy efficiency and, through its sustainability program, staff behavioural change to reduce energy wastage, thus ensuring the University can continue to minimise its energy use in coming years at its two major campuses in Townsville and Cairns.

James Cook University's Douglas Campus in Townsville has been through a rapid building expansion in recent years, increasing its air-conditioned building footprint from 70,000 m² of air-conditioned floor space in 2006 to 106,900 m² in 2010 and is predicted to be 133,900 m² by 2015.

In 2007 it was identified that without major changes to its infrastructure and energy management the Douglas Campus would exceed its maximum site demand of 9MW and would be expected to reach 15MW by 2015 with the proposed building expansions. This would necessitate additional substation capacity and expensive high-voltage upgrades to both the Ergon Energy network and university electrical infrastructure. JCU also recognised the increased operating cost implications of a rising electricity market and the capital cost of network upgrades to meet this increased demand.

With air-conditioning accounting for roughly 50-60 per cent of total electricity consumed at the campus, it was identified as a major focus for energy efficiency. This initiated the development of the Douglas Campus Infrastructure Master Plan which included the Central District Cooling (CDC) system and various other linked projects to improve energy efficiency and reduce peak demand. The results were a peak demand reduction of 4.5MW (40%), a 25% reduction in total energy use and major savings in both costs and CO₂ emissions to JCU. As a result of these achievements JCU was awarded the 2010 Australian Business Award for Environmental Sustainability.

JCU's CDC system is the largest Central District Cooling system in the Southern Hemisphere and incorporates high-efficiency chillers, sophisticated controls and large-scale thermal energy water storage for cooling 30 buildings on campus, with the capacity to connect future buildings as they are constructed. The CDC system and other services infrastructure is linked to each building through a central spine of underground service trenches across the campus. This allows streamlining of existing services and expansion with future development.

JCU's Cairns Campus is currently facing similar issues and is expected to almost double its building footprint from 2010 to 2015. The campus has outgrown the capacity of its existing services infrastructure and requires a major upgrade to ensure the campus is energy efficient and costs are minimised. The lessons learnt from the Douglas Campus will soon be implemented in Cairns as part of the Cairns Campus Infrastructure Master Plan to ensure maximum energy efficiency, reduced costs and a flat demand curve for the campus.

JCU's services infrastructure is linked to a Building Management System (BMS), which allows direct control over building services, and a separate Energy Management System (EMS) which is used to interrogate building energy use and collect valuable data that can be used to identify inefficiencies and energy wastage in buildings.

Use of this EMS data in an accessible, user-friendly format is the next step to reducing energy use through running educational programs to encourage staff and student behavioural changes that minimise energy wastage.

TropEco, JCU's sustainability program, is planning to use the EMS data to raise awareness of building energy use within the University community. The data will be analysed and displayed in the form of an interactive dashboard display in building foyers and a desktop program that shows building energy use and encourages staff to reduce usage where possible through office competitions and incentives. This ensures that the University community gains a sense of ownership over their energy use and provides them with relevant, real-time information.

By linking efficiency improvements in University infrastructure, implementation of energy management tools and an education program to promote behavioural change, JCU is providing a powerful multi-pronged approach toward reducing energy consumption on its two major campuses.

Presenters Biography

Adam Connell is the Environment Manager at James Cook University and is responsible for management of the TropEco program, which runs initiatives to encourage staff and students at JCU to take on more environmentally sustainable practices. Adam has been involved in environmental management for over 6 years, previously working in aquaculture and natural resource management in the Burdekin region.

Adams work regularly focuses on stakeholder engagement and behaviour change to bring about

Dennis Frost joined the ANU in Canberra in a technical officer role over 30 years ago. His position at the time was to implement controls, monitoring and energy saving equipment as part of a campus wide roll out of electrical heating and air conditioning upgrade. In 1982, his efforts to save energy earned the University a National Energy Management Award for efficient use of energy. Dennis then left the ANU and established mechanical, electrical and IT business delivery totally integrated solutions to Federal government departments. But after more than 20 years in business, he returned to the University world when he joined JCU in Townsville 5 years ago as the University's Infrastructure Services Manager.

During this time, he has implemented a series of energy saving initiatives which have combined to significantly reduce the amount of energy used by the University. These initiatives include campus-wide power factor correction and implementation of a campus district cooling system at the Townsville campus. This has shifted the load from peak to off-peak. He also implemented an advanced EMS/BMS system providing real-time energy usage monitoring and management by building. This resulted in savings for energy use of over \$2 million in 2010, compared with usual business projections.

JCU now intends to go further, and has incorporated plans for other energy saving initiatives to form an integrated energy management plan for the University. His story provides an account of the huge reductions in energy use that can be achieved by an organisation in a relatively short period of time.