CASE STUDY 04/10

Intensive care

nurses Christchurch Hospital back to energy health

Canterbury District Health Board recognised the Christchurch Hospital energy management team with a Quality and Innovation Award for its strategy that achieved 10% energy savings, worth $180,000 a year.

CHRISTCHURCH HOSPITAL OPERATIONS ENGINEER **BRENDON GROUFSKY** IN THE LINK TUNNEL THAT CONNECTS THE MAIN HOSPITAL BUILDINGS WITH NEARBY LABORATORIES AND STAFF PARKING.

THE TUNNEL'S **$6000 ANNUAL LIGHTING COST** HAS BEEN **CUT BY 70%**.

Energy priorities

- A single energy database for the campus;
- Improved management and maintenance of energy use;
- Greater ability to forecast energy consumption and budget requirements;
- Improved status reporting;
- Improved reliability and disaster recovery options;
- Capacity for growth on existing reticulation systems.

Christchurch Hospital energy fuel consumption

Fuel	Annual consumption	Cost
Electricity	17.12 GWh	$1,103,334
Coal	41.15 GWh	$ 565,177
Oil	0.68 GWh	$ 34,144
Total	**58.95GWh**	**$1.7 million**

The total consumption is enough to run 4900 homes.

1 THE **ELECTRICITY CONSUMPTION GRAPH** SHOWS A DECREASE IN CONSUMPTION FROM THE 2002/03 FINANCIAL YEAR TO THE 2003/04 FINANCIAL YEAR, WITH **SAVINGS EXCEEDING THE TARGET** SET.

Alan Bavis stands at the entrance of the Maintenance and Engineering Department of Christchurch Public Hospital and casts an eye along the corridor. It is as unremarkable as any in the building, less than 20 metres of grey linoleum extending from a main hospital thoroughfare, and yet it has a special place in an award-winning energy efficiency programme.

Just a few months ago the corridor was illuminated by eight luminaires, each containing twin 36W lamps, long considered necessary for a windowless enclave deep beneath the wards. But Bavis, the site's maintenance and engineering manager, has turned the side corridor into a compelling test case for energy efficiency.

On the corridor wall is a series of graphs showing daily consumption of the electricity and steam that power the dense cluster of buildings making up the public hospital campus. "You can see the impact of de-lamping right here," says Brendon Groufsky, the operations engineer who, with Bavis, has headed an efficiency campaign that has quickly saved 10%, worth $180,000 to the Canterbury District Health Board.

The chart shows that under a business-as-usual approach the eight luminaires in the engineering corridor would cost $280 a year to run. But by selectively removing lamps while still conforming to New Zealand lighting standards, that cost was reduced to $120. With a small investment in new technology fittings, the cost was further reduced to just $40.

The installation in the corridor is now running six single 28W luminaires with T5 tubes and high efficiency control gear, with very good levels of illumination.

Similar examples abound. In the link tunnel that connects the main buildings with the nearby laboratories and staff parking, the $6000 annual lighting cost has fallen by 70%.

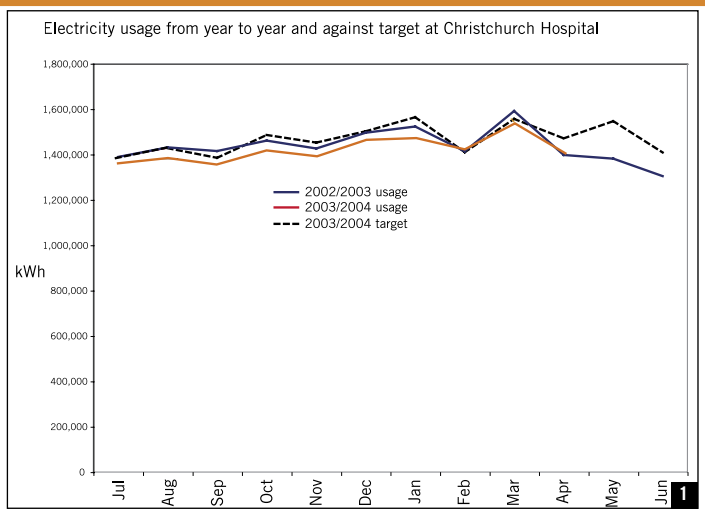
Steam consumption is down too, through improvements in the condensate return and on-site generation capacity that have netted $85,000 for the hospital's bottom line, for very little outlay.

The savings have been recognised in the Canterbury District Health Board's Quality and Innovation Awards, being judged joint winner in the Hospital & Specialist Services category alongside a project to reduce over-sedation of critically ill patients.

2 **CHRISTCHURCH HOSPITAL**, ON THE EDGE OF HAGLEY PARK. THE PHOTO WAS TAKEN IN 2000, BEFORE CONSTRUCTION OF THE **CHRISTCHURCH WOMEN'S HOSPITAL** ON SITE.

Strategy

Christchurch Hospital has a comprehensive energy management strategy. This, together with a detailed monitoring and targeting regime, has ensured the performance indicators for energy continue to improve



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Demand charges

The hospital buys only 10% of its electricity supply on the spot market, which limits its exposure to price spikes during times of supply constraint. But the network company's demand charges during control periods can cause budget over-runs if not managed well.

The network sends a signal to let large users know when the demand charges are going to kick in.

The hospital can then use its diesel-powered standby generators to produce electricity for 21 cents per kWh, compared with around $1.00 for each kWh coming from the grid during the demand control periods.

Tweaking the standby system has increased total output from 1.4MVA to 2.3MVA, producing an estimated saving of around $74,000 a year.

despite severe weather and rapid growth of the site.

The strategy has concentrated on the low-hanging fruit (low-cost or no-cost for implementation) to kick start the project.

The energy savings are being channelled back to fund higher-cost opportunities with longer payback periods.

Technology drives demand

The hospital site is large and its activities are complex. It has more than 100,000 square metres of floor space, equivalent to around 1000 average New Zealand homes.

The hospital has 18 wards, 11 operating theatres and 650 beds, used by 36,350 in-patients a year. Around two-thirds of these people are admitted for acute conditions.

The emergency department is the busiest in Australasia, with 65,000 visitors a year. The throughput for the outpatients' clinic is 210,000 more visits a year.

Hospitals are increasing in their energy intensity. Medical advances introduce more electrically powered devices each year, and patients' expectations have increased the level of services.

Christchurch Hospital uses 17.12 GWh of electricity a year at a cost of $1,103,334. It consumes 41.15 GWh of coal, costing $565,177; and 0.68 GWh of oil, costing $34,144. The total consumption is 58.95 GWh, enough to run 4900 homes, at a cost of just over $1.7 million.

Electricity is used for lighting, medical and office equipment, and the pumps and motors that drive the chillers and other building services. Steam is used for space heating, humidification, domestic hot water, sterilisation and cooking; and for the many heat exchangers throughout the hospital.

Oil is used for the hospital's generators, for peak lopping and standby power.

Energy team

Alan Bavis, a UK-qualified building and services engineer, joined the Canterbury District Health Board (CDHB) in January 2003 and quickly used his experience in energy management to put into place a policy and strategy to meet the needs of patients at the least cost, with the least impact on the environment.

He began by dusting off a 1999 energy audit and assigning responsibility for its implementation to Groufsky, a Municipal Electricity Department-trained electrical engineer with a background in computers, who joined the hospital in April 2003.

Setting priorities

"The previous situation at Christchurch Hospital regarding energy management was best described as informal," says Bavis.

"There was no clear vision for energy management and no policy in place – control systems did exist, but were in varying states of functionality. Energy efficiency standards or procedures were not in place.

"There was also no assigned responsibility for energy consumption or reporting lines for energy measures and no financial criteria for energy management initiatives or formal co-ordinated information capture systems," says Bavis.


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3 **ALAN BAVIS** (LEFT) AND **BRENDON GROUFSKY** RECEIVING $3000 IN PRIZE MONEY IN THE DISTRICT HEALTH BOARD'S **QUALITY AND INNOVATION AWARDS**.

THE **ENGINEERING AND MAINTENANCE TEAM** SHARED THE AWARD WITH A PROJECT TO REDUCE OVER-SEDATION OF CRITICALLY ILL PATIENTS.

"Some staff, especially in clinical roles, really do understand the value of a dollar saved on energy – that it's the same as receiving an extra dollar in operational revenue."
– Brendon Groufsky.

4 ALAN BAVIS AND BRENDON GROUFSKY WITH THE **STANDBY GENERATOR,** WHICH RUNS AT PEAK TIMES TO AVOID NETWORK DEMAND CHARGES.
5 GROUFSKY WITH A **CHILLER**.

"Our first task was to get to grips with what we were using, and where."

Working with the rest of the maintenance and engineering team, Bavis and Groufsky developed a set of priorities to guide the project (see p16).

Both project leaders recognised the importance of getting the project off the ground without additional funding, to prove that savings could accrue and be used to fund large savings.

Based on the principle of "low-hanging fruit," they began by de-lamping (selective removal of excess lamps, usually by replacing the lamps with more energy-efficient types with electronic control gear).

Most of the hospital's 10,000 light fittings were de-lamped to some degree.

In some areas Bavis and Groufsky found illumination at around twice the recommended level. The de-lamping process coincided with the 2003 dry hydro winter, so there was high level of awareness and staff support.

Progress was reported through the CDHB's internal newsletter. Some unexpected champions emerged. Says Groufsky: "People would come to us and say that we could switch off this or that, or use a sensor light in some areas, and we acted on as many of those suggestions as possible. Some staff, especially in clinical roles, really do understand the value of a dollar saved on energy – that it's the same as receiving an extra dollar in operational revenue – but there are others who don't yet make that link. Having said that, there was no lack of support – it's been a great team effort that's involved all of the staff."

After reporting their initial results, the project leaders put up a case for capital expenditure and received approval for $250,000 of funding for projects with a payback of less than two years.

Around $180,000 was spent on lighting with a payback of less than 12 months.

The building management system's (BMS) control system for heating and ventilation also received attention. The team looked at time schedules for the heating load and its connection to the BMS.

Pipework was upgraded and work on the steam traps, which collect hot water condensing in pipes, improved condensate return to the boiler house by 15.4%.

Further savings

The energy saving project is currently into Stage III of the energy audit recommendations. The approach tends towards life cycle analysis and replacement of larger items such as the chiller in the laboratories building.

The new Diabetes Centre building, for example, will have a 50 year design-life and so energy efficiency is being given a high priority.

Although Bavis and Groufsky joined CDHB after the plans for the new women's wing were drawn, they have been able to influence some of the details. For example, the condensate return system has been revised so that it will work without needing to be powered electrically, and there has been further upgrading of the lighting specifications.

Accurate measurement

Both agree that accurate daily measurement has been a key factor in the success of projects. But while there is a clear view of consumption, overall efficiency is an elusive measurement when the load is increasing all the time.

The oncology and paediatrics departments both added a significant amount of new medical equipment during Stage I of the implementation, and the opening of the women's hospital in a big new wing will change the picture entirely.

Says Bavis: "Another department has just added another 53 computer workstations and everyone there felt really chuffed. What people don't realise is that there is a running cost for the computers and a further cost for additional chilling – so our energy targets are always moving."

Further savings will be essential to contain costs and reduce the hospital's environmental footprint.

As this issue of *EnergyWise News* was going to press the engineering team won approval for further capital expenditure, including $125,000 for lighting in the Canterbury Health Laboratories building, $125,000 for reconfiguring plant in the BMS, $10,000 for variable speed drives in the boilerhouse and $10,000 for upgrading BMS controls. All of these changes will be closely monitored by financial managers to ensure a return on investment.

The engineering and maintenance team has received $3000 in prize money with its award, which it plans to spend on staff education and professional development. It is also considering the purchases of some additional light measuring equipment that staff can use themselves, to help maintain long term awareness and interest in energy efficiency. ■

CREDITS

Christchurch Hospital maintenance and engineering manager Alan Bavis

Operations engineer Brendon Groufsky

Case study author Nick Early, Restore NZ Ltd

EECA Emprove account manager Alastair Hines