



Christchurch Men's Prison Laundry using free heat from the sun

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The decision Christchurch Men's Prison made to use solar water heating in its laundry will help save over \$7,000 per year on their hot water bill, with a payback of 7.6 years¹. With 21 solar panels covering 97m² the prison has one of the largest solar water heating systems in New Zealand.

Their new solar water heating system will:

- provide much of the hot water (at up to 80°C), greatly reducing the carbon footprint of the site
- provide the balance of the hot water using LPG, which has a smaller carbon footprint per unit of heating than the diesel which would otherwise be used, and
- eliminate the use of chemicals required to treat the water when it was only 45 degrees.

Leading the way

The Department of Corrections' annual energy bill totals \$9 million dollars (excluding transport fuels); one of the largest of all government Departments. This includes electricity, reticulated gas, LPG, biomass and coal, the latter being steadily phased out as part of the commitment to reducing the department's carbon footprint.

The Department of Corrections have recognised their government responsibility of contributing to sustainability and carbon neutrality. They have an Energy Facilities Standard which requires elements affecting energy consumption and supply to be evaluated for all new buildings and building services upgrades for existing facilities.

About Christchurch Men's Prison laundry

The laundry at Christchurch Men's Prison operates 13 hours per day, five days per week and its washing machines consume about 7,000 litres of hot water per day.

The hot water temperature at the laundry was getting to the point where it could not sustain the minimum acceptable sanitation and washing conditions.

A diesel-fired boiler is typically used for all hot water requirements such as kitchens, personal use and space heating. Because the laundry was at the end of a ring-main system it was only able to provide hot water at around 45°C when 80°C is required for sterilisation purposes².

¹ These figures are based on projected annual savings of 62,400 kilowatt hours (kWh)

² In some situations, cold water washing can be used in commercial laundries, but a study carried out in November 2006 by Enercon Ltd advised that cold water washing was not an option at this location and recommended hot water washing temperatures of 80°C to achieve the required levels of thermal disinfection and cleanliness.

The upgrade required to the hot water supply fell neatly into the category outlined in the Energy Facilities Standard.

The case for installing solar water heating

Taking the lead on energy issues is somewhere Corrections strives to be. With their Energy Facilities Standard in place, it made sense that solar water heating be considered for the Christchurch Men's Prison laundry.

"We were keen and needed to make the business case," said Corrections energy manager Cees Ebskamp. "In fact, in the first instance we needed to obtain funding to carry out the technical feasibility study to give us information to prepare the business case."

Fortunately, the Energy Efficiency and Conservation Authority (EECA) was able to provide financial support to the project.

"When EECA agreed to fund half of the cost of the feasibility study, and then subsidise the installation if it went ahead, it gave us confidence we were on the right track."

The technical feasibility study determined that the most appropriate solution would be to produce hot water at the point of use using a high efficiency LPG boiler. The study further showed that because of the large quantity of hot water required, solar should be considered to create a hybrid system.

The inclusion of solar water heating met Corrections' own investment criteria (a payback of below 3 years and /or a positive Net Present Value (NPV)). By February 2008, nine months after the feasibility study had been completed, LPG prices had increased considerably. As a result the simple payback of the system was reduced to 7.6 years.

The installation

The solar water heating installation at the prison comprises 21 solar panels, made up of 630 tubes, with a sun collection area of 97m². This makes it one of the largest in the country, but the project was still given the green light.

While the slope of the laundry roof faces east-west, the shallow angle of the roof has allowed the panels to be arranged facing north at an angle of inclination equal to the latitude angle of Christchurch (43.5°) for maximum solar gain.

A 3,000 litre insulated solar water pre-heat tank is used to store the water heated by the panels before it is passed through a secondary 3,000 litre tank and heated by the 114kW LPG fired back-up boiler to the 80°C required for laundry sterilisation purposes.

The thermal efficiency of the panels is 52.5% and the solar system is calculated to contribute 39% of the total hot water requirement with the balance from the backup boiler.

The green light

Considerations which helped get the project running were projected increases in the cost of other energy sources - gas, LPG, diesel and electricity – and solar would be offsetting fossil fuel consumption and therefore reducing the Department's carbon footprint.

“To continue to meet, and future proof, the end users’ hot water supply requirement was paramount, but it needed to be achieved with the most effective solutions,” says Craig Humphries, Regional Facilities Manager for the Department of Corrections.

“Given there are large laundries in prisons throughout the country, there was considerable potential to replicate solar installation which met the Department’s investment financial criteria” said Cees Ebskamp.

The prospects of solar look promising

National Manager, Asset Management and Support, Phil Butter said that, last year, Corrections installed a solar system of a similar size at the new Springhill prison in the northern Waikato to provide “domestic” hot water for a 88-bed accommodation block. In 2005/06, Corrections also installed 20 solar water heating systems in self care (pre-release) units at five other prisons.

“Presently the Department has under-way a national solar study to identify the best solar water applications and those sites it will best suit,” he said. “This will assist in the development of a solar energy plan which will be a component of our second (2008-13) five year energy plan.

Planning for the future

“The energy plan is one part of an Environmental & Sustainability Strategy which will integrate energy, water, waste minimisation, transport fuels and other issues such as Heritage moving the Department towards the government goal of sustainability.”

In recent years the Department has won a number of EECA ENERGYWISE™ and Ministry for Environment Govt3 awards for its efforts to reduce energy use and use renewable energy.

Contact EECA

For more information about the solar water heating Grants for Public Buildings scheme, visit www.energywise.govt.nz/solar/consumers/funding-options/government or email solarfinance@eeca.govt.nz.