



Central Library studies the numbers

and discovers new ways to save



Client: Wellington City Council.

EMANZ Member: Sandy Winterton, Wellington City Council.

Challenge: To ensure that the Wellington Central Library building is as energy-efficient as possible; to reduce energy costs and GHG emissions; and to complement the Library's involvement in Wellington's Smart Building Challenge.

Solution: To keep a close watch on energy usage levels. To collect data at frequent time increments, turn it into user-friendly information – regularly monitor it and look out for any increase in energy usage.

In brief: In late 2014, Wellington City Council joined EMANZ and EECA, together with Microsoft and Switch Automation, to launch the Wellington Smart Building Challenge. The Challenge aims to reduce energy levels in participating buildings by 10% and encourages keeping a close eye on energy usage information. After an incident where regular data monitoring detected two problems – which, left unchecked, had the potential to cause around \$24K per annum in unnecessary energy costs – the Council is keen to share its detection methods with other energy managers to avert similar, and possibly expensive, energy waste.

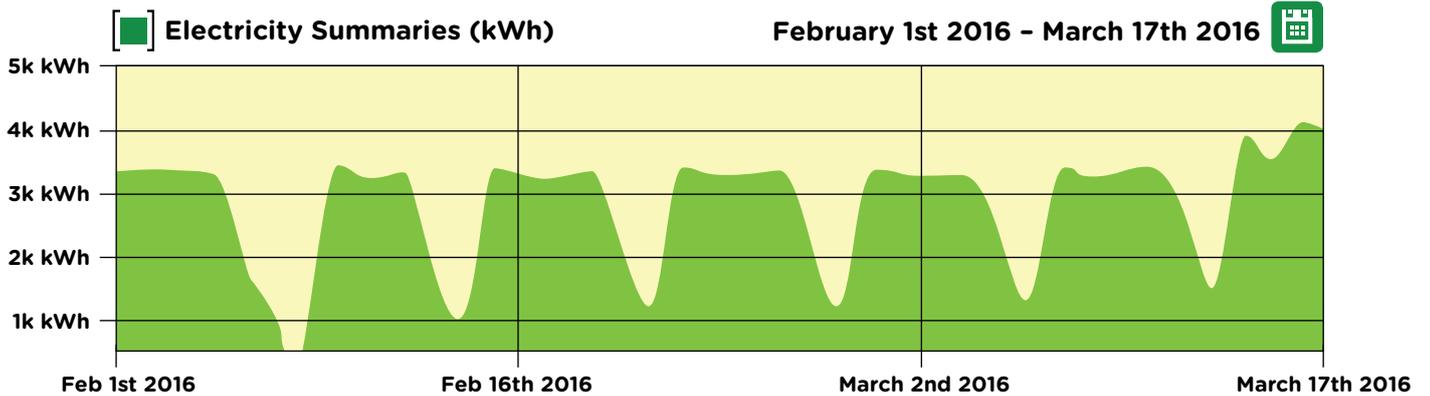
The Project

Built in 1991, the Wellington Central Library was supplied with electricity through four check meters from an ICP serving all the civic centre buildings built at that time. In 2013, the four meter system was updated so the data could be viewed online – enhancing its accessibility as well as the way it was presented.

Since the Smart Building Challenge began, Sandy Winterton, had been logging onto the system once a week for around five minutes to check through the information. Regular patterns were showing normal – with daily energy usage levels consistently at around 750 – 900 kWh.

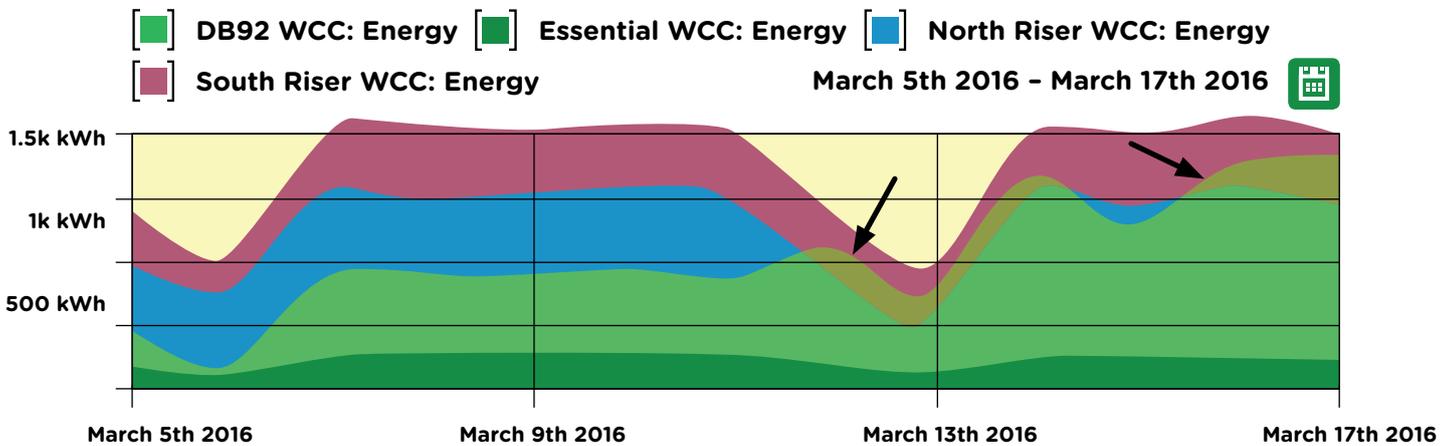
However, on 17th March 2016, Sandy noticed an unusual spike whereby energy usage increased to nearly 1,500 kWh on that day. His approach to finding the problem was to methodically work through a process where he could drill down to the level of detail necessary for a diagnosis.

First, Sandy plotted the overall building consumption to check for any problems. The chart below shows the combined load from the building's four sub meters. The troughs are the weekends.

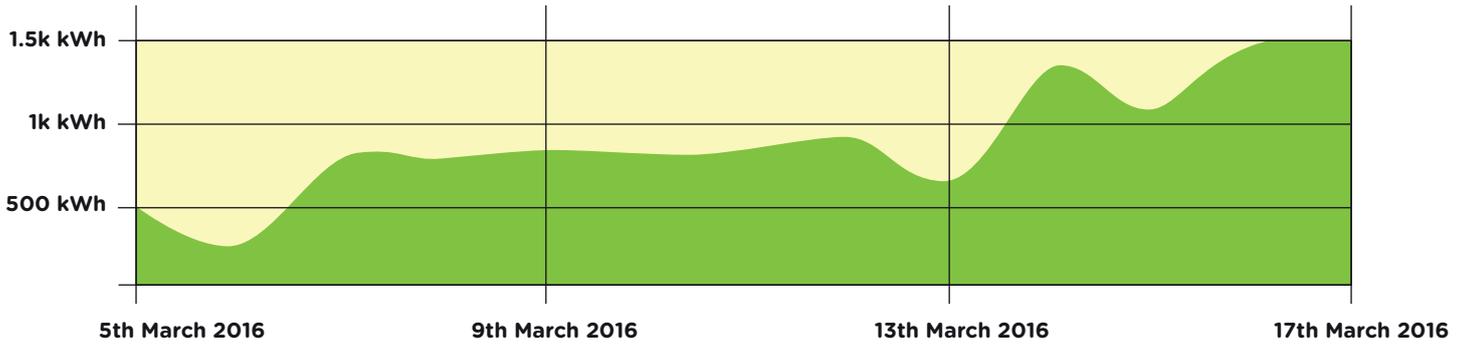


A closer look at the data charts showed that one of the meters was showing significantly higher energy usage.

Next, Sandy zoomed in to the week before and after the problem arose. He plotted the four meters separately to look for information that might point to the cause. The chart shows that meter DB92 is the only meter with a change of pattern. DB92 is the sub meter for the HVAC plant.



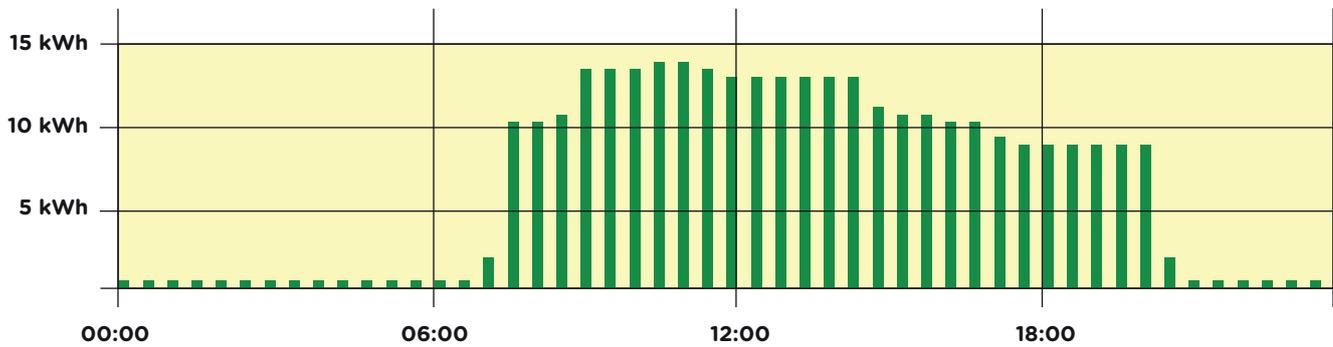
He then removed the other plots to reveal only the meter in question. The chart below shows that something has definitely happened to increase electricity use through the sub meter.



Sandy's next task was to look closer at the maximum granularity, in this case, 15 minute intervals - comparing the Mondays of the problem week and the week previous. The chart below shows that the plant ran longer hours. The schedule was checked, and it had not been changed.

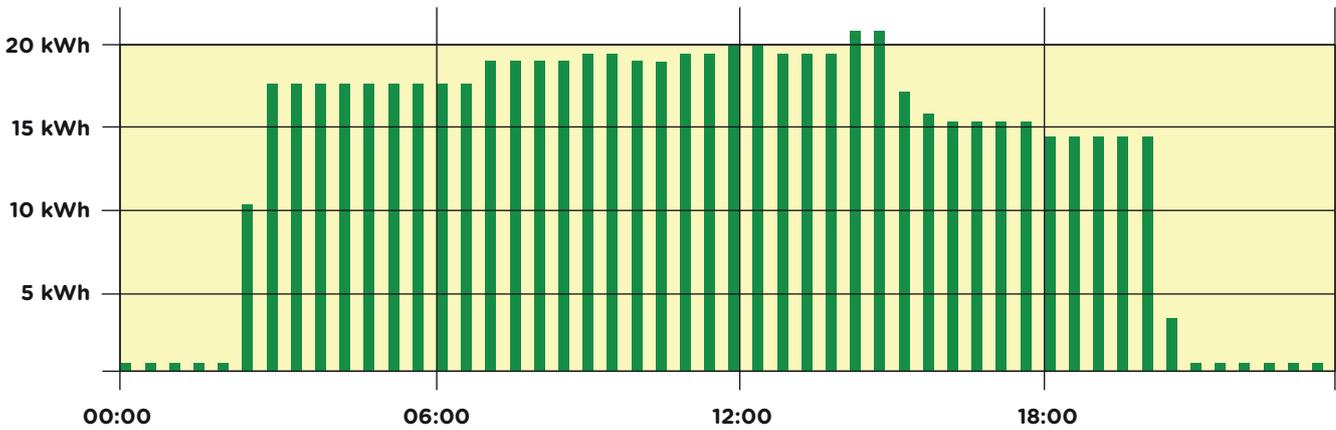
DB92 WCC: Energy

Monday March 7th 2016



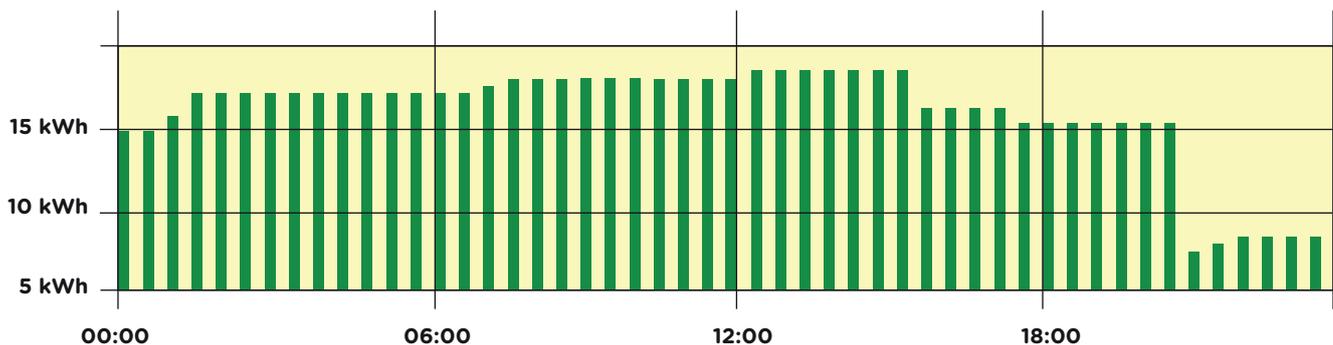
DB92 WCC: Energy

Monday March 14th 2016



By examining the detail of the peak day, Sandy could see that consumption was highest on 17 March. The run hours on this day were even longer.

DB92 WCC: Energy

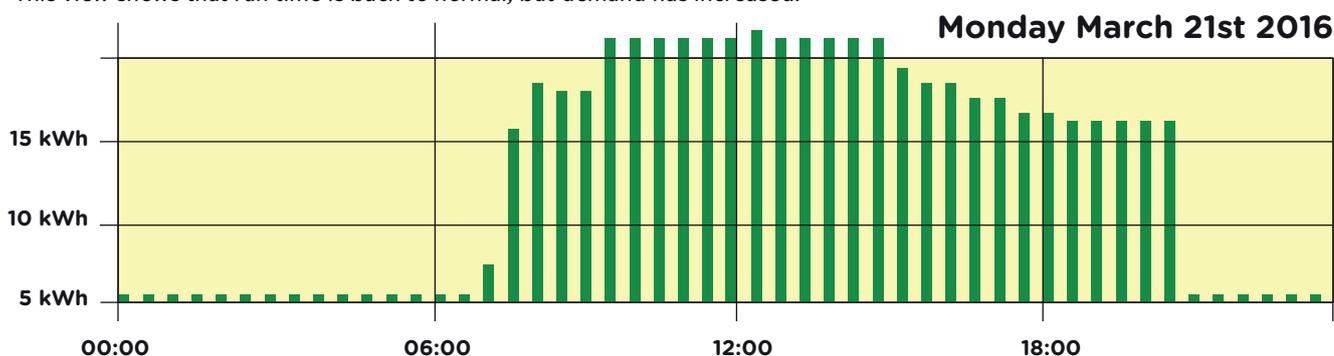


The Solution

Sandy alerted a mechanical technician. The problem was investigated and it was discovered that the BMS controller had failed. This was replaced within two days.

But then... a few days later, when Sandy went to check the data again, he discovered that while the meter's patterns had resumed normality, energy usage was still inflated.

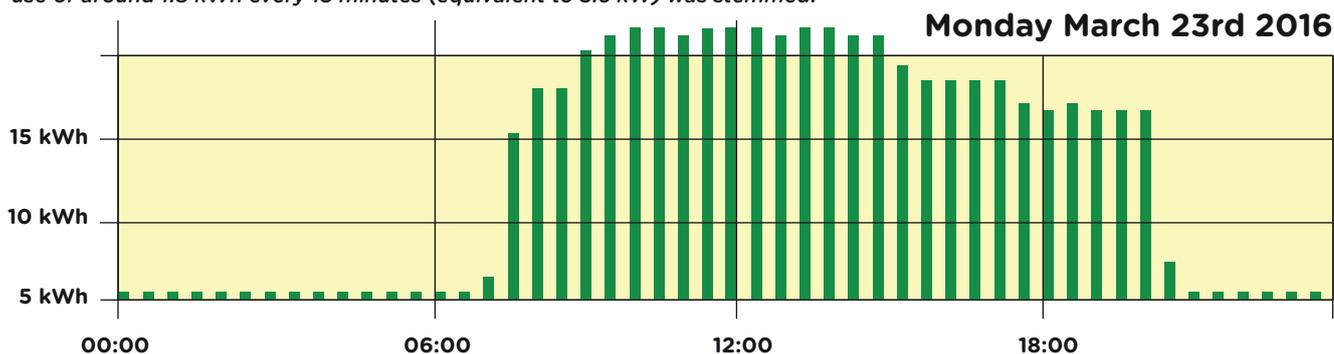
This view shows that run time is back to normal, but demand has increased.



Usage was running at 19.4 kWh per 15 minute interval on 21 March 2016, compared to the usual rate of 17.6 kWh. Not only that, on even closer scrutiny, the data showed that this problem had commenced on 11th March 2016 - before the first problem had been detected.

This time the problem was attributed to a problem with a previous but unrelated piece of work. The issue was fixed and the excess use of around 1.8 kWh every 15 minutes (equivalent to 5.6 kW) was stemmed.

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The Building

The library's 14,760m² floor space houses three floors of public library services and two smaller floors of offices. Operated by the Wellington City Council and funded by rate payers, the Council is acutely aware of its responsibility to run its services as efficiently as possible. Electricity use in the building has almost reached the Smart Building Challenge goal of achieving a 10% reduction in energy use after one year of participation in the scheme. In fact, within the first 5 months, the library had used 8% less than for the same period the previous year.

By comparison, managing gas use at the library has not been as easy. However, the Council is looking to install a gas meter data collection system that will also provide on-line, close-interval information on usage. Currently, only monthly consumption figures are provided. This should allow a similar approach to be taken for both energy sources.

“Improving energy efficiency starts with first understanding how much is being used. In my experience, the best way to approach this is to gather as much data around usage as possible. Installing sub-meters that provide short interval data is highly valuable. Having meaningful data on hand - and making time to monitor it regularly - means that you can apply a disciplined approach (as we did), to finding a problem should it arise.”

Sandy Winterton, Energy Manager, Wellington City Council.

