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Out-of-hours consumption makes all the difference

By admin (http://www.fmmagazine.com.au/author/admin/) on November 4, 2013 in Energy Watch (http://www.fmmagazine.com.au/category/Energy-Watch)

PETE TICKLER, co-founder of Greensense, shares some statistics that point to a compelling

place to start an energy efficiency program.

One of the biggest challenges of any energy efficiency program can be deciding where to start. This can be tough if you have one property, and particularly tricky for managers of large portfolios.

To set off on the right track, data can be your biggest friend. If analysed and presented correctly, it can be hugely powerful, both in terms of identifying where to begin on your energy efficiency quest and also in providing the means to track and quantify performance improvements over time.

We recently did some analysis using data from thousands of buildings. The results were fascinating and pointed to one rather obvious, but compelling, place to start an energy efficiency program.

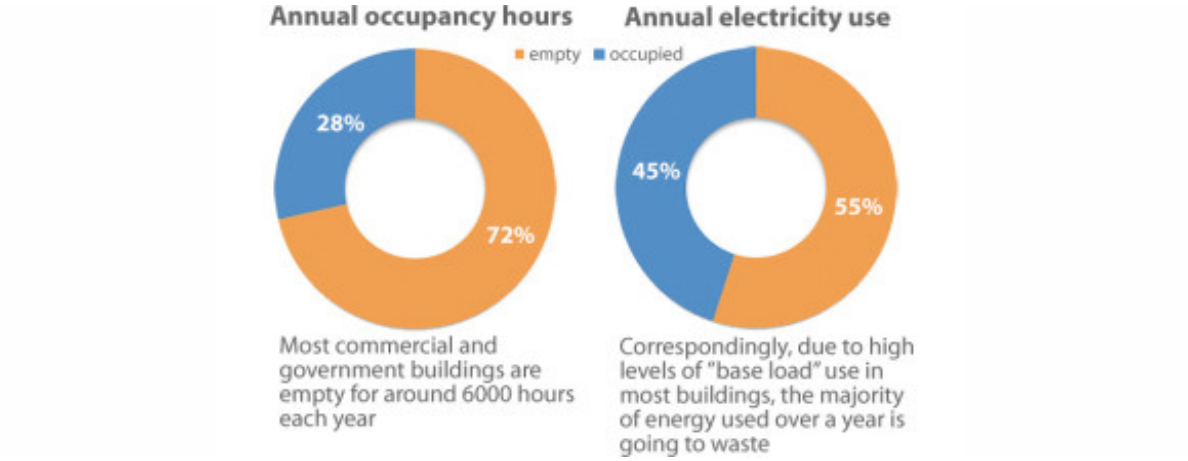
AFTER HOURS ENERGY USE

Based on buildings across a range of sectors and industries – including offices, educational facilities and government buildings – we found that buildings are, on average, empty for around 72 percent of the year[1]. Due to most people clocking off in the evenings, on weekends and on holidays, a building is empty far more often than it is occupied.

From a sustainability perspective, there's nothing wrong with having an empty building, as long as it's not consuming any energy while sitting idle. Unfortunately, that is never the case, far from it in fact.

Our analysis found that typically 55 percent of all electricity use occurs during this time (see Diagram 1). So, more than half of a building's energy consumption is being pumped into an empty building.

Why is this? The numbers showed that most buildings have relatively high levels of 'base load', meaning they continue to consume significant amounts of power even when they're empty. This becomes a very important consideration when you're looking at improving efficiency. To help remedy this, let's look at the costs, culprits and a few solutions.



(http://www.fmmagazine.com.au/wp-content/uploads/2013/11/After-Hours-Occupancy-v-En.jpg)

Typically, 55 percent of all electricity use occurs when a building is unoccupied.

UNDERSTANDING THE COST

As always in discussions around building (in)efficiency, when it comes to costs we need to consider both the environmental and the financial implications.

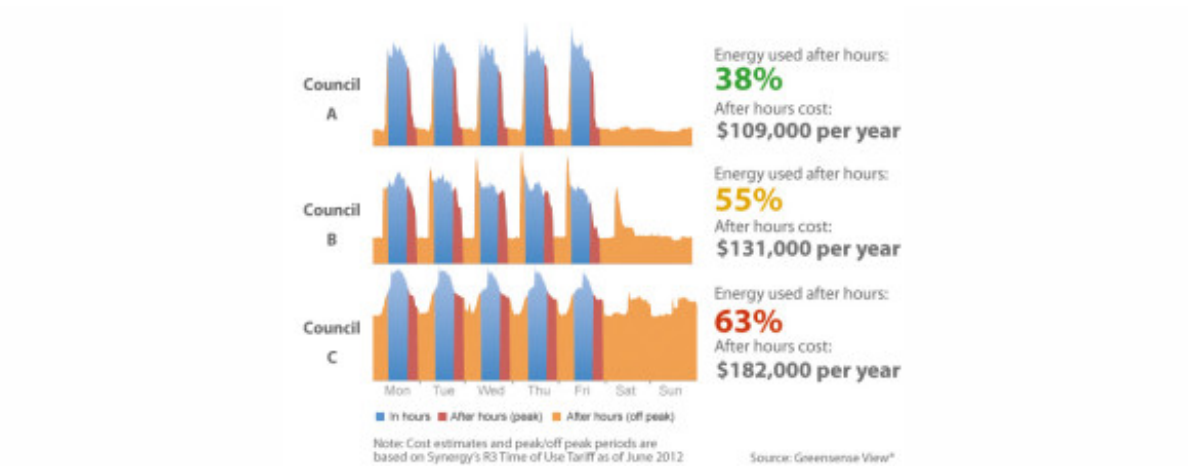
The environmental cost is pretty easy to work out. In Australia, each kilowatt hour of electricity poured into an empty building generates around 0.9 kilograms[2] of greenhouse gas emissions. Of course, you may be subsidising your wasted electricity through some on-site renewables, such as solar, but remember that the majority of this out-of-hours consumption is going to occur at night when your solar panels can't help.

The financial cost is trickier to calculate, as it will depend on the tariff for each building. In order to explore the cost question a little further, and at the same time to illustrate the value in understanding your building's energy profile, Graph 1 illustrates how significant out-of-hours consumption can be to the financial bottom line.

It compares the average weekly energy consumption for three local government administration buildings. The buildings are located within a few kilometres of each other in a major Australian city, are of very similar size, have very similar operating hours and perform the same function. In many ways they are typical examples of office buildings.

Despite the similarities, the amount of energy going into these buildings during out-of-hours periods varies hugely, with correspondingly significant implications in terms of operating costs. Even the 'best' performer here is spending over $100,000 a year powering an empty building.

What the graphic also shows is that, while benchmarking can put the after-hours performance of each building in context, taking a seven-day view of resource consumption is extremely useful in understanding when that energy is being used.



(http://www.fmmagazine.com.au/wp-content/uploads/2013/11/After-Hours-Council-comparison.jpg)
How out-of-hours consumption affects the financial bottom line.

WHERE IS ALL THE ENERGY GOING?

Exactly where all that out-of-hours electricity is going will vary from building to building, but even without sub-metering data, we can make some informed guesses.

In a typical office building there are three main energy users: HVAC (heating, ventilation and air-conditioning) (50 percent), lighting (25 percent) and plug loads (25 percent)[3]. HVAC is often centralised in larger offices, although there may still be a few split-system units around the building, and lighting control is increasingly centralised too. So, while they may be playing a part in the story, it will most likely be plug loads that are the real culprit and must inevitably form the focus of any out-of-hours performance improvements.

AN EASY STARTING POINT

Sometimes it's important to be pragmatic when looking to roll out environmental programs, and energy efficiency is no different. There will likely be a number of (often competing) project options, whether it's covering the building in solar panels or turning up the set point on the air-conditioner. While many of these projects will have merit, a number will present significant obstacles such as upfront cost (solar panels) or push back from building occupants (air-conditioning tweaks).

If you start your energy saving quest by focusing on out-of-hours use, you remove most of these barriers. First and foremost, nobody can deny that pouring energy into an empty building is wasteful. Secondly, the steps taken to reduce this waste are often relatively uncomplicated. Why? Because the building is empty for a start. It's much easier to affect change in an empty building as you don't have to worry about upsetting the occupants. Coupled with that, the savings you'll find are often from simple, operational tweaks such as shutting down printers and computers at night.

For those aspiring to improve the energy efficiency of their buildings, getting to grips with out-of-hours consumption is an obvious, and often rewarding, place to start. By focusing on one particular element of building performance, it helps bring direction and clarity to your efficiency program. All you need to get going is some decent quality interval data and the ability to analyse it in a way that helps you determine how much of your precious and increasingly expensive energy is going into empty buildings. The results will be startling and should provide all the incentive you need to start tracking down those savings.

1. A 365-day year is composed of 8760 hours. Of those 365 days, only around 250, or 2500 hours (assuming a 10-hour operating day), are working days. The rest are weekends and public holidays. This means that the majority of commercial buildings are actually only operating for about 28 percent of the year. For the other 72 percent of the time they're sitting empty.

2. Based on the 2012 NGA factors
http://www.climatechange.gov.au/sites/climatechange/files/documents/03_2013/nga-factors.pdf

3. 2006 review of LEED-NC v2 energy modelling

More Information:

Greensense - greensense.com.au (http://greensense.com.au)

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