LED replacement of fluorescent lights

Another case study is our office lighting. We have approximately 100 fluorescent tubes in our office, in use for about 250 days at 10 hours/day. At 45 watts each (there is a loss in the ballast) they use 11 MWh/year. In Victoria at 1.4 tonne of CO2/MWh, that amounts to 16 tonnes of CO2 per year.

We have replaced these tubes with direct-fit LED arrays. These lights cost a horrifying $90 each or $9000 for the whole office. But they use 15 watts each instead of 45, saving 30 watts. Is this worth it? Using the carbon intensity shortcut, from the CO2 point of view, at 0.5 kg/$, each LED tube represents 45 kgCO2, or to fit the whole office, 4.5 tonnes. The CO2 payback time is 6 months. (The payback time would be longer, 30 months if we used the Chinese figure of 2.4 kg/$- the answer is somewhere in between).

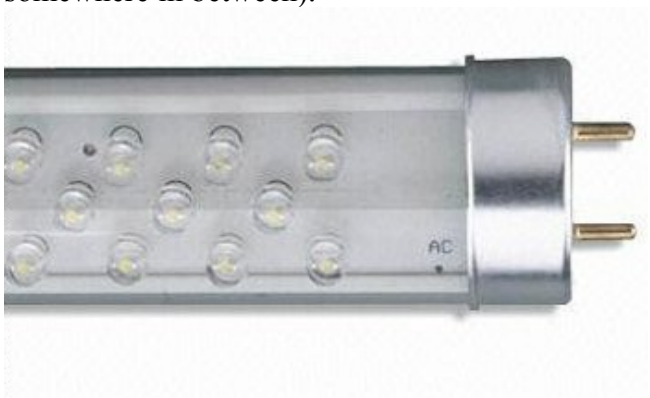

Figure 1 The endcap of an LED replacement for a fluorescent tube. These tubes are a direct plug-in replacement for a standard tube. You only have to take out the starter. They use 15 watts instead of 45 watts. (well actually 17 instead of 43 by my own measurements)

Next, it is interesting to calculate the cost of CO2 abatement through fitting these tube replacements. At the current Victorian electricity price, of $0.15/kWh, the office cost saving is $1130/year for a capital cost of $9000. The simplistic calculation of financial pay back period is 8 years, assuming that electricity prices track interest rates. By that time, some 87 tonnes of CO2 abatement would have cost effectively nothing. Of course, electricity prices are likely to rise faster than interest rates, so that the payback period will be shorter.

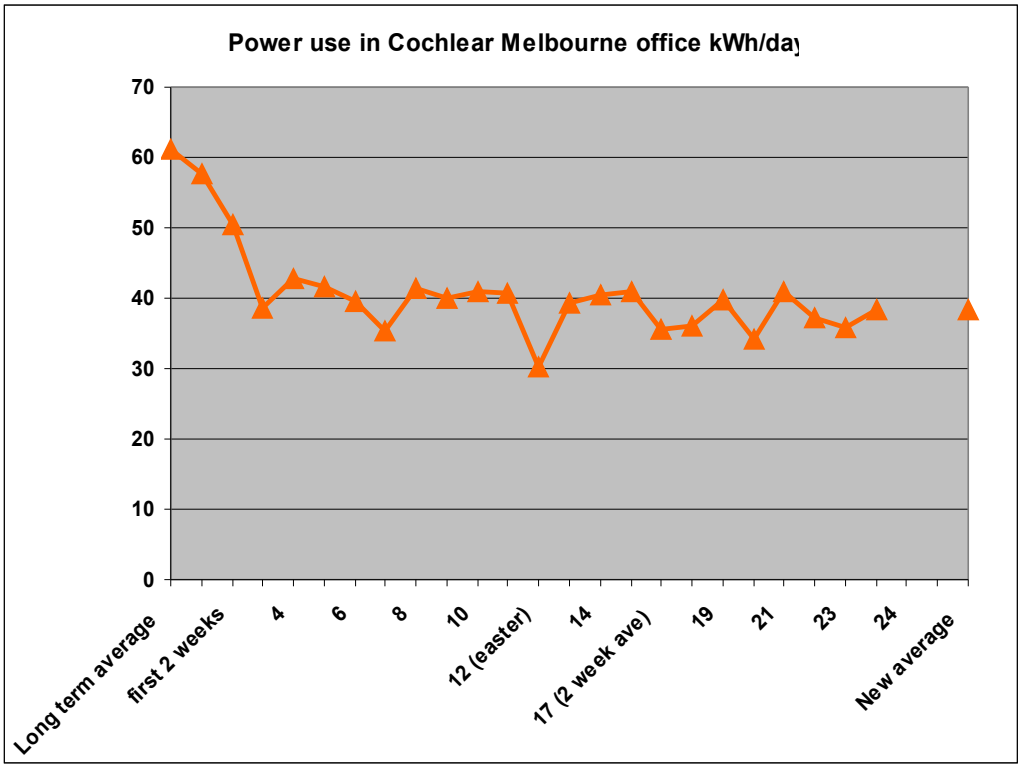

Figure 2 Electricity use after fitting LED and CFL lights in the office.

The total electricity use in the office dropped from 61 to 38 kWh/day. Most of the electricity was used by lighting, and smaller proportion by laptop computers photocopiers and printer etc.

We tried these tubes before we bought them. We had three colour temperatures, 6000-6500k, 5000-5500k and 4000-4500k. Everybody was asked which they preferred. Almost all of us, thought that the 5000-5500k was the best. The cool white seems very harsh, although it is the closest to daylight. We got them from AtoMik Green.

Before I told anybody about the LED replacements, I put a pair into one fitting with a diffuser. The other fittings had normal tubes. I asked my colleagues if they could see any difference between the tubes in the room. Nobody could pick the LED replacements.