Case Study
3br home in QLD

Green Retrofit – show me the money!

Many of us wonder what difference does it **really** make if you spend the time, effort and money making your home more 'green'. As very few take note of the before and after positions (energy and water usage) it's very hard to accurately quantify. However this home owner has done just that. For the record it's a 2 adult and 2 small children household. Read on to find out what happened, abbreviations used are noted at the bottom of the document.

Overview:
The home is a 2 storey, 3 bedroom, brick veneer home in Wellington Point QLD (near Brisbane). The bedrooms and 1 bathroom is upstairs, living, study, kitchen, double lockup garage and patio on the ground level. It has a tiled roof, no insulation in the ceiling, single glazed windows, good eaves, no air-conditioning or heating, no fans and shade cloth over the patio (causing mould and other damp problems). The lighting throughout was inefficient incandescent globes, including 10 globes in a plastic chandelier. There was an electric hot water storage system (220L), electric oven and electric cook top. External spotlights were also incandescent type and there is an outdoor spa. Living and bedrooms are north facing. No rain water collection on the property at all.

- The energy use of the home was 5784 kWh pa, that's 16.5 kWh per day
- Peak energy usage was 3963 kWh pa, off peak usage was 1821 kWh pa.
- Water usage was 131 L per person per day

The Retrofit:
The owners embarked on a 'green conversion' project to make the home more 'eco friendly' and cost efficient. They insulated the ceiling with blow in recycled material with naturally occurring Borax (anti-flamable) to R3.5 level. A little of this insulation was also pumped into the accessible areas of the top floor external wall cavities.

All internal lighting was changed to energy efficient Compact Fluorescent Lighting (CFL), with only 6 halogen lights being fitted into the kitchen area for task lighting. External spotlights were also changed to CFL type. Ceiling fans were installed to all rooms. The external patio area had the shade cloth removed and replaced with an insulated roof with ceiling and ceiling fan.

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A 1 kW solar PV system was installed and grid connected, the internal electric hot water system was replaced with a solar hot water (electric boosted) of the same size and re-located externally. The oven was replaced for a highly efficient pyrolytic electric oven and gas hot plates were installed. The refrigerator was replaced with a 5 star energy rated model. The kitchen was reconfigured with child safety and sustainability in mind reusing existing carcasses and bamboo bench tops installed. A servery window to the patio maximized the usability of the kitchen area and increased natural air ventilation.

Remote 'eco-switches' were installed and connected to all entertainment equipment to cut out all unnecessary stand by power when not in use.

Toilets were all replaced with dual flush models and an 'every drop shower saver' water saving device was installed on the shower. An aerator was also installed on the kitchen tap. One 5000L and two 1600L rain water tanks were installed around the property collecting rain water from the roof. This was plumbed into the ground floor toilet and laundry. The tanks back fill off each other as necessary.

The external spa was treated to a cover to minimize evaporation and filtering requirements and the water is only heated electrically when used and then it's on a timer. The spa is emptied in winter to remove the requirement to maintain the water, and is refilled from the rain water tanks at the start of summer.

The Results:

The home maintains good comfort levels throughout the year and requires no active air conditioning or heating. If the home is closed up on hot summer days, it remains significantly cooler inside for most of the day. The windows are protected from direct sun by the eves and it is well ventilated with good air quality exchange.

The 1 kW solar PV system is feeding in approx 806 kWh to the grid pa (at 50c kWh) so it's earning the house $403 pa.

- The electricity usage now totals1845 kWh pa, that's a mere 5.2 kWh per day
- Peak usage is 1586 kWh and off peak is 259 kWh pa.
- Water usage is 69 litres per person per day.

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Comparison table:

	In 2005	In 2010	Difference
Energy bills usage	**5784 kWh pa** **16.5 kWh daily**	**1846 kWh pa** **5.2 kWh daily**	3938 kWh 11.3 kWh
Green house gas (GHG)	**2132.27 t pa** **6.08 t daily**	**680.16 t pa** **1.92 t daily**	1452.11 t pa 4.16 t daily
Energy bills cost*	**$1099 pa** **or $3.14 daily**	**$ 350 pa** **or $ 0.98 daily**	$ 749 pa or $2.16 daily
Water bill usage	**195 kl pa** **or 530 L daily**	**99 kl pa** **Or 280 L daily**	96 kl Or 250 L daily
Water bill cost	**$302**	**$153**	$149
Other	**None**	**806 kWh energy sent to grid paying $403 pa**	$403 cash back pa

*costs based on current pricing (19c per kWh electricity and $1.55 per kilolitre water) for accurate comparison. It does not take into account the expected annual price rises of approx. 20% pa.

The owners have not only made their home more environmentally friendly and significantly reduced the green house gasses it produces; **the changes have reduced the homes running costs by an impressive two thirds.**

And the solar PV system? That $403 pa they are generating is covering the $350 pa cost of power and more! Effectively living with no electricity bills!

That's a huge cost saving, and one that is likely to be achievable by others with the right advice and access to funding.

Additional note:

Our thanks to the Carter Family for allowing us to do this case study on their home.

Abbreviations used:

CFL = Compact Florescent Lighting
GHG = Green House Gas
pa = per annum
pd = per day
pp = per person
kw = kilowatt
PV = photo voltaic (electricity generation cells)
kWh = kilo Watt hours
L = Litres
t = Metric Tonne