Photovoltaic power economics- South Australia

by Kevin Dobson

I read with interest and a degree of sympathy the article by Jonathon Thwaites in Solar Progress July 2007 relating to his six years experience with an urban photo voltaic system and drawing attention (in his case) to its many deficiencies. I agree that with electricity charges near 20 cents per kWh and water about $1.00 per kilolitre (both in South Australia) it can seem disheartening financially to assist in minimising global warming and water shortage by individual endeavour. However my experience is in absolute contrast to that experienced by Thwaites and may more closely represent the situation in South Australia.

Historically my interest in water catchment and solar power was not put into effect until after my retirement in 1989 because it seemed difficult to justify this on economic grounds and lack of incentives. Never-the-less from 2000-02 we did commence catching rainwater eventually for total household supply and added a solar photovoltaic system grid-connected commencing August 2001.
This 1.5 kW system is made up of 20 BP solar modules each 75W and mounted on a 12 metre long back verandah on the south side of the house using BP aluminium support structure and has two inverters (BP Solar SCI 1200). Initially no new metering device was used so that the meter reversed direction when solar input exceeded electricity use. In September 04 a new metering system was installed (at no personal cost) enabling net electricity used and surplus electricity generated to be separately measured.

Meter readings were taken (by me) from time to time initially and then weekly after installation of the new metering system which allowed monitoring under differing weather conditions and different power usage .Of particular interest was the high consumption in summer to operate reverse cycle air conditioning.

The total cost of the voltaic system at July 01 was $20,757 less a government rebate of $7,500 giving a net outlay of $13,257.The solar panels are discreet, accessible for cleaning if required, are substantially and neatly mounted, are very adequately ventilated, are mounted at the optimal chosen angle and positioned such that shading from trees or from the roof itself (in winter) does not occur (figure 1). Hence there is for me total satisfaction in the construction and efficiency of the system.

The economics of energy generation and usage is complex because living circumstances and habits may change and of course utility charges keep rising. I have data for the years from 1990 to 2007 on water, electricity, and gas used in a double brick house in Adelaide built in 1964 in which gas is used for the stove, hot water supply and house warming; electricity is used for all else including reverse cycle air conditioning.

Annual electricity used in the 11 years from 1990 to 2001 ranged from 3,100 to 4,600 kWh (mean 3860 kWh). Electricity used after grid connection (August

2001) has been less than that generated viz. –342, -602, -594, -508, -303 (mean – 470 kWh) for the five years 02 to 06 respectively with similar trends in 07 (figure 2). This gives a mean difference of 4,330 kWh. If this mean difference can be attributed to solar power generation then the mean daily solar generation would be 11.8 kWh per day in contrast to the 5 kWh suggested by Thwaites in his presentation. Assuming a price of 20 cents/kWh, the cost saving per year would be $866 and the payback period for the $13,257 outlay would be 15.3 years.

As noted by Thwaites, meter measurements are net values ie. the 'power used' reading is that in excess of generated power at the time. Similarly solar 'power generated' readings are the excess not being used for household purposes at a given time. The excess power generated in my case for the years 05 and 06 was 1514 and 1504 kWh respectively. For the above reasons it seems that a 'before' and 'after' comparison is a most helpful way to evaluate financial efficacy of solar power generation.

The only change in the 'before' and 'after' comparisons that might have contributed to the lower power usage was the replacement of a two door upright frig/freezer in September 01 with a small more efficient model rated at 700 kWh/year. The number of people in the house, the living style and the electrical equipment etc. are much the same. Of interest is the fact that energy supplied from gas in this house has similarly decreased. In the 11 years from 1990 to 2001 the mean annual gas used was 24,873 MJ, while the mean annual usage from 01 to 06 was 19200 MJ, representing a reduction of 20%. The point of this comment is that reduced electricity use was not due to the switch from electricity to gas.

The solar power generated in the last six years has supplied all the needs and a surplus sufficient to cover the service costs (currently $135/year) and my last account indicates a credit of $77.80. In summary the system works well, it is well constructed, the economics are good and it is a pleasurable past-time receiving quarterly statements showing a credit balance.

Figure 1: Mounting of solar panels on south side of house.

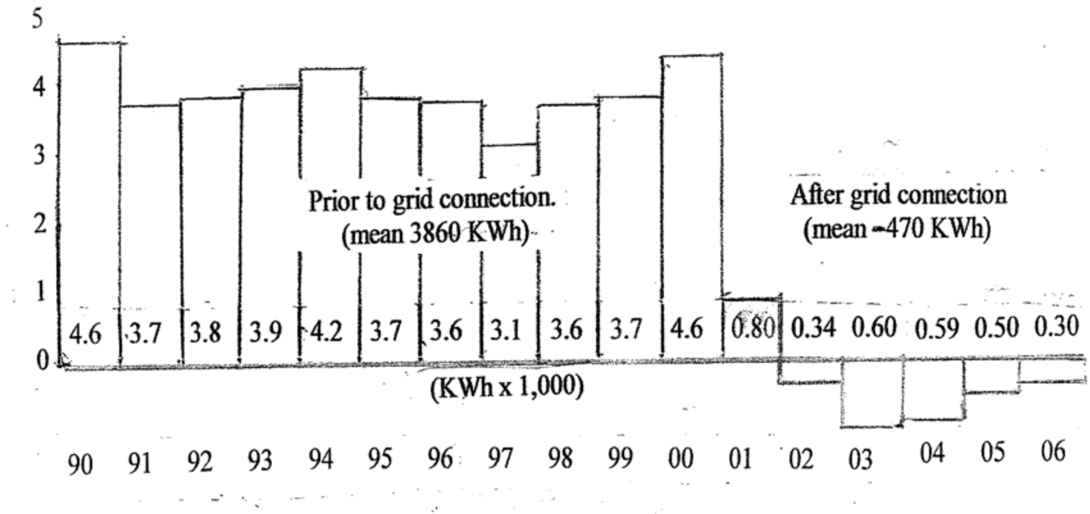

Figure 2. Electricity used before and after installation of a PV system.