Solar Power Generation

The idea of 'green' renewable energy harnessing solar radiation is a wonderfully romantic notion and is based on good intentions, but then supposedly so is the *Road to Hell!* So let's get this question into perspective with a few facts!

The total peak power generated in Australia is approximately 50,000MWs.

The World's largest (currently) operating solar power generation plant is the Olmedilla Photovoltaic Park in Spain, and this needs an area of 250 hectares to generate 60MWs in bright sunlight. So let's put this into perspective.

There are 100 hectares to the square kilometer, and using Olmedilla as a guide, one square kilometer will generate 24MWs.

Theoretically therefore, at maximum generation on a bright sunny day the generation of 50,000MWs to power Australia's needs would require a solar array covering an area of 2,083 square kilometers – a massive area.

However because such a plant would only generate at approximately 20%-30% of its capacity measured over a year, the full size area needed would have to be *five times larger*, i.e. 10,415 square kilometers. This is about 15% of Tasmania or slightly less than half the area of the A.C.T.

Then there is a minor (?) problem: *these plants do not generate at night!*

So, here are some hard facts about solar generation:

1. Supply is more consistent in continually sunny areas e.g. Saudi Arabia, Queensland, North Africa, etc., therefore solar generation would not be very effective in areas such as U.K., Europe, Russia, etc. where it is far more overcast. Solar power requires bright sunlight for maximum performance. The output can vary dependent on how overcast it is.
2. Solar generation is only possible during daylight hours where there is sufficient sunlight, approximately eight to ten hours per day; therefore it does not generate anything for between 14 and 16 hours per day.
3. Output cannot be controlled except for changing angles of those arrays fitted with moving solar panels.
4. The supply is unreliable, although more consistent than wind generation which is notoriously unreliable and thermal, nuclear, or hydro power (if available) is required to carry sufficient reserve in the grid system to compensate for any changes in solar plant output due to any changes in sunlight during the day.
5. It is very expensive per kilowatt to install, and expensive per kilowatt to operate and maintain. The solar panel receivers have to be continuously kept clean of bird droppings, dust, and rubbish; and they can be damaged in severe weather (for example in the recent severe hailstorm in Melbourne).

Solar Power Generation

As a power 'add on', solar 'farms' are useful but could never play anything more than a small part of the grid system because of their inflexible and unreliable nature. The same applies even more so to wind generators.

A note about solar power generation for your home:

The solar program subsidised by the federal government has an output of 1 to 1.5 kilowatts. *provided the sun shines brightly and there is no cloud cover.*

The power usage of the average Australian family (i.e. 2 adults + 2 children) is approximately 3 to 4 kilowatts during the day and the additional power required would be drawn from the grid system

Even at night while you are asleep some 0.8 to 1.5 kilowatts is still required to keep things going, such as a refrigerator *at the very time that the Sun does not shine on the panels.* If you start to run things such as air-conditioning then inevitably your power demand must increase and all power is drawn from the power grid.

The cost of a 1.7kW system is somewhere between $7,000 & $8,000 after allowing for the present Australian Government subsidy. The cost before the subsidy is somewhere between $13,000 & $14,000.

The good news is that a far more efficient solar photovoltaic panels has been invented in Israel, and this is reported to be 400% more efficient than present panels. However these are still being tested and developed and not yet ready for general use.

I hope this puts things in a better perspective,

T. L. Cardwell <terrycar@iinet.net.au>

Terry Cardwell worked 25 years for the *Electricity Commission of NSW* working, commissioning and operating the various power units. His last commission was at the *Munmorah Power Station* near Newcastle, with four (very large!) 350 MW power generating units.