Research Outcome

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“Solar Energy as a Viable Energy Source”

In today’s society, new forms of energy are everywhere as our current non-renewable coal is rapidly running out. Solar energy has emerged as one of the most popular but many people still have their doubts. Which is why the question emerges, is solar energy a viable energy source for our future?
To answer this question, it is important to explore the issues surrounding the cost of solar panels, the angle and direction of roofs and solar hot water and the phase out of electric stored systems, and from within that, what the challenges are that consumers within the McLaren Vale region face when it comes to solar energy.

Installation Cost:

Without a doubt, one of the key reasons as to why many people don’t have solar panels is the cost of installing them. This proved to be the case in my survey results with ‘50% of people saying that cost was a major factor, with no other option getting more than 15%’ (Richardson, Survey Data Analysis, 2012). Furthermore, the data showed that about ‘53% of those I surveyed were over the age of 60’, and the cost of installing solar panels on their roof would be difficult for them.

The panels that our family currently has on our roof generates about half the amount of energy that we need in order to be self-sufficient. During my interview with my expert from Sola Edwards, I discovered that ‘if we had the same number of panels on our roof as we do now but the panels were the newest technology, then we would be generating well over what we would need’ (Dohnt, 2012). This is evidence of the development of panel technology in just the few years since our panels were installed.

Energy Payback Time:

A concern that arose from comments made in my survey for some people was the energy payback time, i.e. ‘the time it takes for the module to generate the same amount of energy required for its manufacture’ (REC Group, 2012). According to REC Group, ‘the Energy Payback Time, as of 2011 is around one year’ (REC Group, 2012).

Installation Costs vs. Money Saved:

In conjunction with this was also the concern of the cost of installation versus the money saved. The results from my survey showed that ‘almost a third of those who have solar panels installed had a quarterly bill of $0 or negative’ (Richardson, Survey Data Analysis, 2012). According to Sola Edwards Adelaide, ‘3kW systems are the most common system that they install which costs around $7000’ (Dohnt, 2012). From my survey results, on average people save about $250-300 on their quarterly bills.

Given that, and the price of installing the average sized systems, then on average the time taken to resolve the installation cost with the money saved on electricity bills would be about 6-7 years, based on current electricity charges.

Feed-in Tariffs:

Originally, a major incentive for people to invest in solar panels was the feed-in tariffs that were being offered by the government and solar companies. Basically how it works is that for every kWh of energy that you produce through your panels and don't use is sent back into the grid and you get a certain amount of money for that. 'The SA Government would give you 44c/kWh for it' (SA Government, 2011), with the solar company that you're with also adding a certain amount, which varied between companies but was generally 'between 4 and 8 cents' (Dohnt, 2012).
Recently, the government have been changing the rules regarding these tariffs, which is decreasing the incentive for people to get solar panels. The table below illustrates the change in the feed-in tariff scheme for South Australia:

		2011-12	2012-13	2013-14
Solar PV Cell Installation / Approval Date	**Class 1** Before 1 October 2011	7.1 + 44 = **51.1c/kWh**	9.8 + 44 = **53.8c/kWh**	11.2 + 44 = **55.2c/kWh**
	Class 2 1 October 2011 - 30 September 2013	7.1 + 16 = **23.1c/kWh**	9.8 + 16 = **25.8c/kWh**	11.2 + 16 = **27.2c/kWh**
	Class 3 From 1 October 2013	N/A	N/A	**11.2c/kWh**

(Essential Services Commission of South Australia, 2012)

Also, if someone has panels installed during class 1 but then decides to add on more panels during class 2, then their feed-in tariff will drop to the class 2 rate. Many people when getting panels installed choose to buy a certain amount of panels at a time, to pay in smaller instalments and then upgrade later on, but it may actually be more beneficial to do the one big installation in order to keep the higher feed-in tariff. Something else that many people don't realise is that you don't have to pay upfront; you can pay a deposit and then pay weekly or monthly instalments.

Solar Credits:

Another incentive that is now provided for solar customers is the solar credits system. 'Solar Credits apply to the first 1.5 kW of solar systems that are connected to an electricity grid' (Australian Government - Department of Climate Change and Energy Efficiency, 2011). 'Solar Credits work by multiplying the number of certificates, called small-scale technology certificates'. These small-scale technology certificates (STC's) are electronic certificates that are 'equal to one megawatt hour (MWh)' (Australian Government - Clean Energy Regulator, 2012) of generated electricity from your system.
These STC's are then multiplied by a certain number, which are gradually changing much like the feed-in tariffs (see table below), and that equals your number of solar credits.

Schedule of Solar Credits multipliers

Date installed	9 June 2009 – 30 June 2011	1 July 2011 - 30 June 2012	1 July 2012 - 30 June 2013	From 1 July 2013 onwards
Multiplier	5	3	2	No multiplier (1)

(Australian Government - Department of Climate Change and Energy Efficiency, 2011)

From this, your solar credits are then sold to energy companies who use them to decrease the emissions of large companies. This program can help solar customers to make money as well as decrease the emissions of large polluting companies (Energy Matters, 2011).

Roof Direction/Angle:

Another one of my key findings was that people thought that in order to have any chance of generating enough energy to be self-sufficient, then they had to have a roof which was primarily north facing. In Adelaide, north facing roofs are most preferable because of the angle that the sun goes over our sky, it will receive more daylight hours and therefore generate more energy. But the difference between having a north facing roof and an east/west facing may not be as big as many people believe, as is illustrated in the table below:

Plane Azimuth (degrees)	Plane Inclination (degrees)									
	0	10	20	30	40	50	60	70	80	90
0	87%	94%	98%	100%	99%	96%	91%	83%	74%	63%
10	87%	94%	98%	100%	99%	96%	90%	83%	74%	63%
20	87%	94%	97%	99%	98%	94%	89%	82%	73%	63%
30	87%	93%	96%	97%	96%	93%	87%	80%	72%	62%
40	87%	92%	95%	95%	94%	91%	85%	78%	71%	61%
50	87%	91%	93%	93%	91%	88%	83%	76%	69%	60%
60	87%	91%	92%	91%	89%	85%	79%	74%	66%	58%
70	87%	89%	90%	88%	85%	81%	76%	70%	63%	56%
80	87%	88%	87%	85%	82%	77%	73%	67%	60%	53%
90	87%	87%	85%	82%	78%	74%	69%	63%	57%	50%
100	87%	86%	83%	79%	75%	70%	64%	59%	53%	47%
110	87%	85%	81%	76%	71%	65%	60%	54%	49%	44%
120	87%	84%	79%	74%	67%	61%	55%	50%	45%	40%
130	87%	83%	77%	71%	64%	57%	51%	46%	41%	36%
140	87%	82%	76%	68%	60%	53%	47%	41%	37%	33%
150	87%	82%	75%	67%	58%	50%	43%	37%	33%	30%
160	87%	81%	74%	65%	56%	48%	40%	34%	30%	27%
170	87%	81%	74%	64%	55%	47%	39%	32%	28%	26%
180	87%	81%	74%	64%	55%	47%	39%	32%	27%	25%
190	87%	81%	74%	65%	55%	47%	39%	33%	28%	26%
200	87%	82%	75%	66%	57%	49%	41%	35%	31%	28%
210	87%	82%	75%	68%	59%	51%	44%	39%	34%	31%
220	87%	83%	77%	70%	62%	55%	49%	43%	38%	34%
230	87%	84%	78%	73%	66%	59%	53%	48%	42%	38%
240	87%	85%	80%	75%	70%	64%	58%	52%	47%	42%
250	87%	86%	83%	78%	74%	68%	63%	57%	51%	46%
260	87%	87%	85%	81%	77%	73%	67%	61%	55%	49%
270	87%	88%	87%	84%	81%	76%	72%	66%	59%	53%
280	87%	89%	89%	87%	85%	80%	75%	70%	63%	56%
290	87%	90%	91%	90%	88%	84%	79%	73%	66%	59%
300	87%	91%	93%	93%	91%	87%	82%	76%	69%	61%
310	87%	92%	95%	95%	94%	90%	85%	79%	71%	62%
320	87%	93%	96%	97%	96%	93%	88%	81%	73%	64%
330	87%	93%	97%	98%	98%	94%	89%	82%	74%	64%
340	87%	94%	98%	100%	99%	96%	90%	83%	74%	64%
350	87%	94%	98%	100%	99%	96%	91%	83%	74%	64%

(Clean Energy Council, 2011) (Dohnt, 2012)

This table represents the different energy generation potential as a percentage based on the direction that the roof faces and the angle that the plane is inclined at. The Plane Azimuth is the direction that the roof faces in degrees, with north being 0/360, east being 90, south is 180 and west is 270; the Plane Inclination is the angle in degrees of the roof, with 0 being a horizontal roof and 90 a directly vertical roof. The squares highlighted in red represent the optimal azimuth and inclination, with the one in green representing the worst.

As the table shows, roofs angling at 30° and facing directly or close to directly north are optimal. This table also makes evident of the fact that the difference between north facing roofs and west facing roofs is far less than what is commonly misconceived. Furthermore, 'the difference between a flat roof (0° inclination) and a 30° roof can be made up by adding one or two extra panels' (Dohnt, 2012).

As you would also notice the lowest percentage is the 180° facing roof which is inclined at 90°. But when you think about it, that would be a directly south facing roof that is directly vertical and no house in the world would use that, particularly when if you have a south facing roof then it's more than likely that you would also have a north facing roof as well, which when using common sense, you would utilise.

Solar Hot Water:

The viability of solar energy goes beyond just the solar panels for electricity. There is also solar hot water, which according to my data collection of the McLaren Vale area, is present in 'about 20% of homes' (Richardson, Street Details Data Collection, 2012). The results from my survey further showed the success and popularity of solar hot water, with '46% having solar hot water' (Richardson, Survey Data Analysis, 2012).
The next most common hot water system from my survey results was the electric stored system, with 'about 32%'. This is important to note given the new government rules for the phase-out of these inefficient systems.
These electric stored 'hot water heaters are used by about half of Australia's eight million households. They produce up to three times the greenhouse gas emissions of low emission technologies such as gas, solar and heat pump systems' (Australian Government - Department of Climate Change and Energy Efficiency, 2012). Basically what this phase-out means is that once your electric stored system no longer works, then you must replace it with a low emission system i.e. solar. The parts for these systems are no longer made so you cannot install a new electric stored system. 'This phase-out will result in the reduction of greenhouse gases by about 51.1 million tonnes over ten years – the equivalent of taking 1.4 million cars off the road for the same period' (Australian Government - Department of Climate Change and Energy Efficiency, 2012).

Examples:

Something that perhaps provides great proof of solar energy's viability as an energy source is the large scale examples throughout the world. In order for solar energy to be a viable energy source, the panels on the roof need to be able to provide enough energy to power the building underneath it.

‘Singapore’s Changi Airport is one of the world’s largest and busiest airports’ (Airports Council International, 2011). In 2010, solar panels were installed on a part of the airport’s roof which is designed to power the entire Budget Terminal, which has ‘as many as seven million people’ pass through its doors every year. According to the REC Group, the entire system ‘is 250 kWp, covering about 2,500 m^2 and is expected to generate over 300,000 kWh per year. The reduction in carbon emissions is about 150,000 kg of CO_2 per year.’

This is the one of many commercial examples of solar energy being successful, with 21 other examples on the REC Group website alone including the Veterans Hospital in the USA and the IKEA Installations in Germany (REC Group, 2012). Looking at the more domestic side of things, McLaren Vale alone has at least 23 examples of success with solar energy (Richardson, Survey Data, 2012).

Conclusion:

Throughout this report, I’ve looked at the reasons why people are hesitant about having solar energy installed into their home and what helps to make solar energy a viable energy source for our future. It is well established that solar energy is a clean and green energy, which does add to its credentials as a viable source of energy, but at the end of the day, if you cannot generate enough energy from your panels to be able to be self-sufficient, then it cannot be a viable source of energy.

The prices of solar panels continue to decrease as their quality and efficiency increases. Almost a third of the people I surveyed said that their quarterly bill was now $0 or negative, and so they are able to be completely self-sufficient. The reduction in the feed-in tariffs is an issue, but the money that can be potentially saved through your electricity bills is paramount to that.

The fact that the difference between a north facing roof compared to a west facing roof is not as large as many people thought is also a major bonus, with the difference between the two can be offset by one or two extra panels.

Also increasing solar energy’s viability is the increasing usage of solar panels for hot water. As the phase-out of electric stored hot water systems continues, solar hot water is becoming the most common source for hot water.

When you consider all of this information, solar energy can be a viable energy source as it is a renewable source of energy, it saves hundreds of dollars on electricity bills, the solar hot water systems are a very successful source for hot water and with the newest technology, solar energy is more than capable of enabling us to become self-sufficient.

Word Count: Approximately 1500 words

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