

Will we let the sun shine in?

Trends in the Australian Solar Industry

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Summary

The solar industry in Australia is growing rapidly, creating jobs and, as a result of the time of day that solar energy is most abundant, pushing down peak and average wholesale electricity prices. While supporters of coal and gas fired electricity often point to the 'cost' of renewable energy there is a growing consensus that renewable energy is putting downward pressure on electricity prices. Indeed, even the modelling commissioned by the Abbott Government's inquiry into the Renewable Energy Target chaired by Dick Warburton found precisely that.

The solar PV industry now employs more than 13,000 people, significantly more than the number of people employed by coal fired power stations in Australia.

There are now more than 1.2 million solar PV panels installed in Australia which means that around 3.1 million people live in houses or work in organisations with solar panels on their roofs. The rapid growth of the solar PV industry has led to significant innovation in the installation of solar panels and, according to international research, the productivity of Australian solar panel installers is now significantly greater than that of workers in the US. As the number of panels installed around the world continues to grow there are likely to be significant opportunities for Australian solar PV installation firms to export their know-how and work practices.

In addition to innovation in the installation of solar panels another major change driving the industry is innovation in the way that solar panels are financed. As solar panels have significant up-front costs but deliver a steady stream of future financial benefits a major factor influencing the uptake of solar PV is the availability of financial products which allow consumers to access both low or zero up-front costs as well as a fair share of the long term benefits that flow from solar PV in terms of reduced demand from other sources of electricity and the capacity to export excess energy to other users. Australian firms have the capacity to generate significant export earnings if they succeed in developing and promoting attractive financial products which facilitate the uptake of solar PV.

The success of solar PV in creating jobs, energy and lower prices is causing significant concern for the existing energy industry. Just as the taxi industry is seeking to protect its profits and market share by demanding regulations which stifle the growth of new online car booking services the existing energy industry is seeking protection from renewable energy through regulatory means.

While falling costs and growing consumer support for solar PV will inevitably drive significant increases in market share a potential barrier to the short term growth of the solar PV industry in Australia is the ability of the existing energy industry to secure regulatory protections which impede, or increase the cost of, solar PV installation. If Australia is to benefit from the employment, price, export and environmental benefits of solar PV it will be necessary to avoid the creation of such 'black tape'.

Introduction

Despite the efforts of the Abbott Government and the fossil fuel industry the Australian energy market is undergoing rapid structural change driven primarily by technological change, changing consumer preferences and rapid shifts in the relative price of energy from different sources. Ten years ago gas fired electricity was seen as a likely 'transition fuel' which would smooth the shift from coal fired power to renewables. In recent years, however, the rapid decline in the cost of renewable energy combined with the expectation that the wholesale price of gas will double or treble when gas export facilities are completed has fundamentally changed the underlying economics of the Australian energy system.

While renewables are getting cheaper and gas is getting dearer Australians are consuming far less electricity per person and per dollar of GDP than they were ten years ago. The combination of an increase in the supply of electricity, as a result of growing renewable energy capacity, and declining demand, is putting strong downward pressure on wholesale electricity prices. Furthermore, the very low marginal cost of renewable energy combined with the fact that solar typically produces more energy during the day time means that the large peaks in daytime electricity prices that were once a dominant feature of the Australian electricity market are becoming less pronounced. High peak prices once delivered large windfall profits to coal and gas fired electricity generators.

In addition to the impact of reductions in the relative cost of renewable energy significant innovation in the financing of renewable energy capacity is also driving new investment. Renewable energy providers and finance providers are developing increasingly attractive funding models for both household and commercial scale solar panels which allow zero up front installation costs combined with reductions in electricity bills over the life of the panels. As the cost of storage capacity for renewable energy continues to fall the possibility of households and businesses opting to go off 'the grid' altogether is forcing 'base load' energy providers to fundamentally rethink their business models.

This paper focuses on the solar industry in Australia. It provides a brief overview of the size, growth and prospects for the Australian solar industry and argues that as the number of solar panels installed continues to rise, the cost of installation and maintenance will continue to fall. The paper argues that the productivity of the Australian solar installation market is among the highest in the world and that Australian firms have the potential to profit from exporting their business and financial structures. The paper concludes that one of the biggest threats to the solar industry, and to the renewable energy industry more generally, is the ability of the large companies that currently dominate the generation, distribution and retail of electricity industry in Australia to distort the regulations of the markets in ways that maintain their market share and profitability

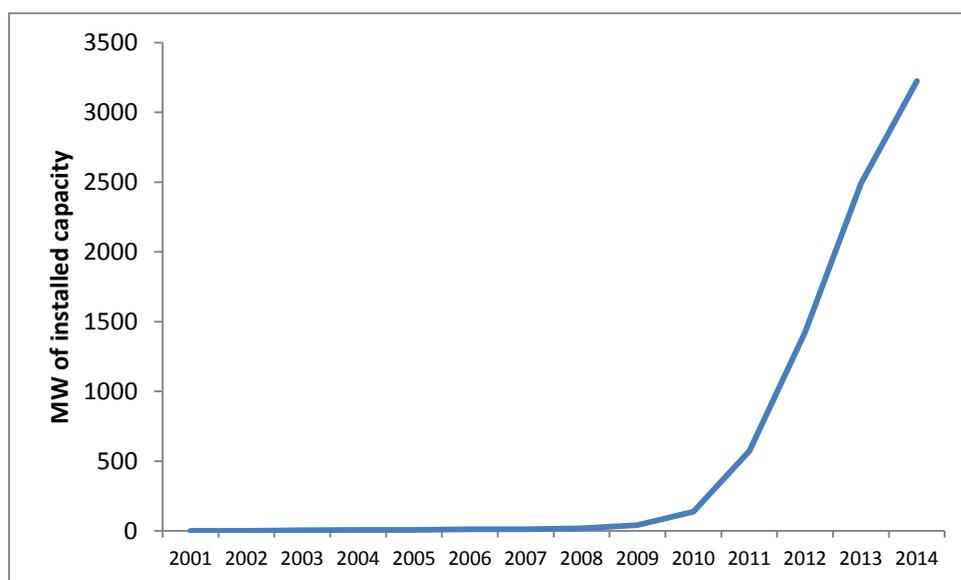
Solar is growing

The solar industry has expanded rapidly in recent years. Large falls in the price of solar panels combined with assistance from Australian governments has allowed the industry to grow from just 8,000 PV systems in 2007 to over one million in 2013.¹ 2.6 million people, or 11 per cent of the Australian population, now get some of their electricity from solar power. Installed capacity has grown from just half a megawatt (MW) in 2001 to over 3,200 MW in 2014.² This expansion is shown in Figure 1. Government assistance has now been greatly reduced and while the growth in solar PV has slowed slightly, the industry has continued to expand rapidly.

¹ Climate Commission (2014) *Australia's future – Solar energy*

² Australian PV Institute (2014) *Australian PV market since April 2001*

Figure 1: Installed solar PV capacity in Australia



Source: Australian PV Institute (2014) *Australian PV market since April 2001*

Power companies are now buying household's excess supply of solar electricity at incredibly low prices. While households buy electricity from retailers at around 30 to 35 cents kw/h, power companies buy any excess solar electricity generated on a home for between 0 and 8 cents a kw/h.³ Despite this inequity the number of solar installations continues to grow and, as the market power of the retailers is eroded over time and households are paid a fairer price for their exported energy the attractiveness of installing solar power on domestic and commercial rooftops will increase further.

Solar power is predicted to become an increasingly important source of energy in Australia. By 2050 it is predicted that solar PV will make up almost 30 per cent of Australia's electricity needs.⁴ This rapid change in Australia's energy mix has been, and will continue to be, very disruptive to the existing power generators. In the same way as digital cameras shook up the photographic processing industry, solar power has damaged the interests of the existing fossil fuel powered electricity industry.

Australia's coal fired power stations and its extensive network of 'poles and wires' was built by government and, in many instances, is still owned by governments. Whether these assets are in public or private hands they generate high rates of return for their owners and, in turn, they have a strong interest in maintaining the status quo and delaying structural change. Just as the taxi industry is seeking regulatory protection from innovative new online car booking services the big electricity generators and distributors are seeking regulatory protections from new energy technologies. For example, they are arguing that because owners of rooftop PV are buying less electricity from the network, they are not paying their "fair share" of network costs, and should therefore have to pay a high, fixed "access charge". By contrast, the electricity industry has long been willing to allow households with large air conditioners and pool pumps to use far more than their "fair share" of network capacity, especially at peak summer demand times, without having to pay a higher price for this privilege.

If the government gives into the existing energy industry's demands to protect them from changes caused by renewable energy, this will simply delay the inevitable and will eventually

³ Johnson (2014). *Solar pays its own way on networks. It's no free rider*

⁴ Climate Commission (2014)

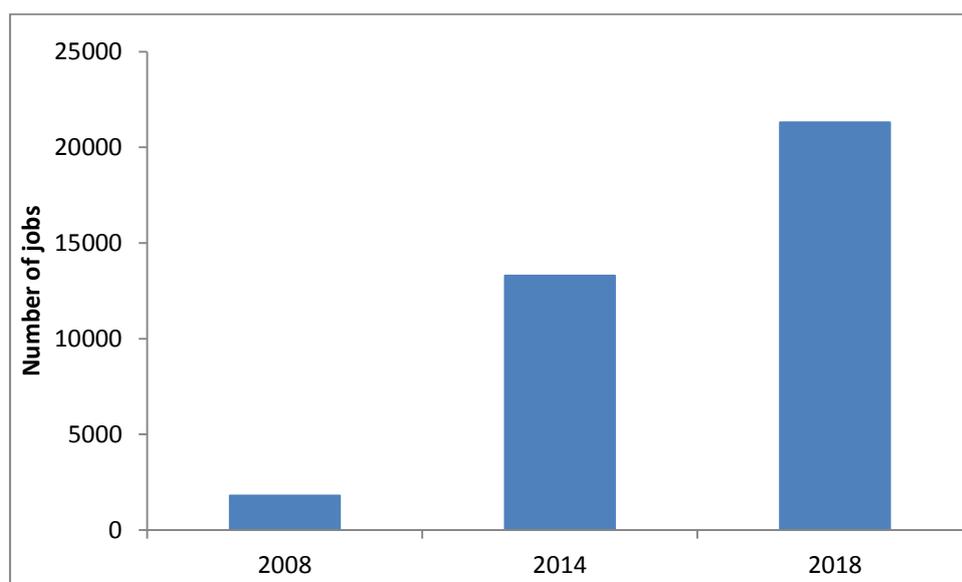
mean a more rapid and painful adjustment. It will also deprive Australians of the environmental benefits of renewable energy as well as deprive electricity users of lower prices.

Solar employment

The solar PV industry has seen rapid expansion in recent years, as shown in Figure 2. This expansion has seen new businesses enter the market and employment has grown. In 2014 there were 4,300 solar PV businesses that employed 13,300 people⁵. This includes those working on solar hot water systems. The expansion of employment in the industry has been rapid since 2008 when the industry only employed 1,800 people.

The industry is also set to continue to expand. It is estimated that an additional 8,000 jobs are expected to be created in the four years from 2014 to 2018. The solar industry is likely to become an even bigger employer in the near future as the price of both solar panels and battery storage come down. Australian governments have a unique opportunity to help the solar industry by lowering the regulatory burdens faced by the industry and shaping our electricity grid to allow solar to compete on a more level playing field. As discussed above, the sooner such an accommodation is made the smoother the transition will be and, in turn, the lower the cost to industry and households.

Figure 2: Solar employment



Source: RAA (2014) *Impact of abolishing the Renewable Energy Target on jobs in the Australian solar industry*

While the solar industry does not employ a large percentage of the Australian labour force it is important to place employment in the Australian solar industry into the context of the electricity generation industry. The 13,300 jobs estimated by the Clean Energy Council and SKM to exist in the solar PV industry are far larger than total employment in Australia's coal fired power stations. Indeed, according to the ABS there were only 9,487 people working in the entire electricity generation sector in Australia in 2007, a figure which also includes employment in gas, hydro and renewable energy generation. Since 2007 no new coal fired power stations have been built but a number have been mothballed including Tarong in Queensland and Munmorah in NSW.

⁵ RAA (2014) *Impact of abolishing the Renewable Energy Target on jobs in the Australian solar industry*

It is also important to highlight that the biggest coal fired power generators in Australia such as Macquarie Generation and Stanwell employ only 642 and 800 FTE workers respectively.

Solar is pushing electricity prices down

Solar power produces most of its energy on hot summer days which are often the days with the greatest peak in demand for electricity. This means that solar puts downward pressure on peak power prices and, in turn, lowers average wholesale electricity prices.

The Renewable Energy Target (RET) has been shown to be putting downward pressure on wholesale electricity prices and this will lead to lower retail electricity prices (the prices that are paid by households and most businesses).⁶ Some studies have also shown that a higher RET target, which would require more renewable energy including solar, will lead to even lower electricity prices.⁷

This phenomenon of increasing solar capacity pushing electricity prices down is not just occurring in Australia, it is happening in places all around the world where there is higher penetration of renewable energy. For example, in Germany between 2008 and 2012 25 GW of solar PV was installed and this had a dramatic effect on peak power prices and, in turn, on average wholesale power prices. This effect is shown in Figure 3 and 4 which show how electricity prices vary over the course of a day. After the installation of large amounts of solar capacity it can be seen that, by 2012, the price of electricity now slumps in the middle of the day due to the large increase in supply of electricity from solar at those times.

Figure 3 – German electricity demand 2008



⁶ Modelling on this has been done by ROAM, SKM MMA, Intelligent Energy Systems, Bloomberg New Energy Finance and Schneider Electric

⁷ Vithayasrichareon et al. (2014)

Figure 4 – German electricity demand 2012



Modelling by Intelligent Energy System has shown that over the next 10 years Australian electricity consumers will be \$500 million better off because of the RET and the additional renewable electricity, including solar, that will be supplied to the grid.⁸ Similarly, University of New South Wales modelling showed that increased provision of renewable energy over and above the mandatory 20 per cent Renewable Energy Target would lower electricity prices even further.⁹ The UNSW modelling showed renewable energy rates of 75 per cent by 2030 produced the lowest electricity costs.

Solar and innovative financing

While the rapid expansion of the Australian solar industry was initially fuelled by generous government subsidies the rate of public assistance to household solar has subsequently been reduced significantly.¹⁰ While the cost of building and installing solar panels has fallen rapidly, and is likely to continue to fall, a major driver of future growth in solar panel installation is likely to be through financial innovation.

One of the major economic advantages of renewable energy is also a major barrier to its uptake by households. For a technology like solar the operating costs (marginal costs) are near zero once the upfront cost of the installation has been met (the fixed costs) as unlike

⁸ Intelligent Energy Systems (2014) *Who Wins and Who Loses from Changing the LRET?*

⁹ Vithayasrichareon et al. (2014) *Using Renewables to Hedge against Future Electricity Industry Uncertainties – An Australian Case Study*

¹⁰ It is important to note that coal fired power stations in Australia were built by governments, not the private companies and that their construction was based on economic development goals rather than short term profit maximisation goals. Further, the mining and transport of the fossil fuels used in coal fired power stations is heavily subsidised.

coal fired power stations, the ‘fuel’ used by solar panels is free. While solar panels may pay for themselves via lower electricity bills over their lifetime there is an extensive body of economic and psychology evidence which suggests that individuals are often unwilling to make short term sacrifices that have long run pay offs. Indeed, the entire superannuation industry in Australia is built on forcing people to spend almost ten per cent of their income on retirement income products as, without compulsion, policy makers assume individuals would not make ‘rational’ choices.

One solution to the unwillingness of individuals to make large up front investments in solar energy is to design financial products which allow households and businesses to install solar panels which deliver reduced electricity bills over the life of the panels with no up-front charge for purchasing and installing the panels. The up-front costs are borne by a financial services provider with ‘repayments’ being made via the sales of exported electricity and/or from the electricity bill.

One Californian electricity company describes their ‘zero down’ solar panel lease as follows:

Get Solar Installed With No Up-Front Costs, And Then Just Pay For The Solar Power By The Month, Just Like Your Utility Bill, Only Cheaper!¹¹

Sungevity, a US company now operating in Australia, states on its website:

Go solar for \$0 down and lock in low energy rates¹²

At a larger scale the Government backed Clean Energy Finance Corporation (CEFC) has recently announced it plans to invest \$186 million into innovative financial products designed to increase the uptake of rooftop solar, including by tenants in rental properties.¹³

High productivity of Australian solar installers – export opportunities

Public debate in Australia is often focussed on the perceived ‘low levels of productivity’ in the Australian labour force. Such debates often compare Australia unfavourably to countries like the US which have lower levels of wages and conditions and often result in calls for reductions in labour market ‘regulation’ in Australia.

Leaving aside the lack of evidence used to support the general concerns with the level of labour productivity in Australia a recent examination of the productivity of solar panel installation found that Australian workers were able to install solar panels in significantly less time than their American counterparts. According to the Rocky Mountain Institute:

According to our on-site analysis, Australian installers are averaging 6.1 labor-hours per kW solar installed, while the U.S. is more than 50 percent higher at 9.4 labor-hours per kW installed.¹⁴

The installation of solar panels represents a significant portion of the upfront cost of rooftop solar. As a developed country with a large and highly productive solar panel installation industry Australia has a significant opportunity to play a role in the rapid uptake of solar panels around the world.

¹¹ Zerodownsolar

¹² Sungevity Australia

¹³ Parkinson (2014) *CEFC to provide \$120m to unlock Australia rooftop solar finance*

¹⁴ McIntosh et al. (2014) *Lessons from Australia: New RMI/GTRI analysis shows how to reduce U.S. solar PV costs through installation labor efficiency*

Solar popularity

Australians appear to love renewable energy. A recent survey by the Australia Institute¹⁵ showed that 86 per cent of people want more renewable energy. While electricity generated from hydro and wind were very popular with 72 per cent wanting more electricity generated from hydro and 80 per cent wanting more from wind, the most popular renewable energy source was solar. An overwhelming 90 per cent of people wanted more solar power in the Australian electricity mix.

Renewable generation was very popular while coal fired electricity was not. Only 8 per cent of people wanted to see more electricity generated from coal. The shift to renewable energy away from coal not only makes economic sense it is also very popular.

Solar households are not being subsidized by other households

There have been claims that households with solar PV systems are being subsidized by households without solar systems. The argument being made by supporters of the coal fired generators is that solar households use less electricity from the grid than non-solar households and so they pay less for the grid's upkeep. This issue has captured increased interest in recent years because of the rapid electricity price rises over the last six years which have been driven mainly by increases in the cost of the 'poles and wires' that constitute the electricity grid.

The claims that non-solar households are subsidizing solar households are incorrect. They are based on the false assumption that solar households use all or most of the electricity they produce. This assumption means that solar households are using very little grid electricity and so are paying very little to the upkeep of the grid.

A study by Sunwiz¹⁶ has shown that solar households only use around 40 per cent of the electricity they generate. The rest is exported onto the grid. As explained earlier the electricity exported onto the grid is typically being sold by household at very low rates of between 0 and 8 cents per kw/h. Since this electricity is likely to be used in the local area it does not require long distance transmission like power from a large coal fired power station. This means it puts far less strain on the network and does not have the same high distribution costs associated with coal fired electricity that often needs to travel hundreds of kilometres from the point of generation to the point of consumption. The electricity exported onto the grid by solar households is therefore likely to be very profitable for power companies.

The combination of solar households only consuming 40 per cent of the electricity they produce and the power company making a good profit on the other 60 per cent means that it is unlikely that solar households are being subsidized by non-solar households. Furthermore, the electricity industry has been silent for decades about the 'cross subsidy' that has existed between its best customers and its worst customers. That is, heavy users of electricity, such as those with large air conditioners and pool pumps receive a significant cross subsidy from their neighbours who do not have such large appliances. While the grid has been built to accommodate the needs of 'heavy users' the pricing system has not reflected this resulting in the fact that low income earners with no pool and no air conditioning have been subsidising the cost of the 'poles and wires' used by heavy users.

¹⁵ TAI (2014) *Australia Institute Survey – March*

¹⁶ Johnson (2014)

Conclusion

The solar industry in Australia is growing rapidly and changes in technology, cost and consumer preference are likely to continue to drive this trend in the coming decades. The continued growth in solar energy will drive employment up and electricity prices down. There is significant potential for Australia to export its solar know how, including highly productive installation practices and financial innovations, even if it is unable to export solar hardware.

While the rate of growth of the solar industry can be curtailed in the short term by poorly designed public policy, in the long run it is highly likely that solar energy will expand at the expense of coal and gas fired electricity. The spike in gas prices associated with the development of east coast gas export terminals virtually ensures this will be the case.

Short run efforts to maintain the status quo by coal fired generators and the owners of the 'poles and wires' can potentially boost the profitability of those firms for the next election cycle or two but such efforts are likely to delay the switch towards cheaper and less environmentally harmful forms of new electricity generation investment. In the long run this will likely mean a higher value of electricity assets will be 'stranded' by technological change, costs to consumers and business will be higher and the opportunities to build new service export markets will be reduced.

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