



Briefing paper – Solar Gardens

Overview

In Australia many energy customers through no fault of their own are unable to put solar on their own roof. This may be because they rent, live in apartments, have shaded roofs etc. One of the most exciting ways to address this equality issue is through the establishment of central solar facilities known as solar gardens, where households and businesses own shares or a number of panels and the energy generated is credited on those customers' energy bills.

This briefing paper outlines the exciting role that solar gardens could play in the Australian energy system, particularly with respect to increasing clean energy accessibility and affordability.

To make solar gardens viable in Australia requires changes to the economics of local generation, which could happen in one of two ways:

1. Through the Local Generation Network Credit Rule Change - State governments and other stakeholders should support this rule change through making submissions to AEMC and participating in consultation.
2. State governments developing a Solar Gardens incentive program for households who cannot put solar on their own roof. This could be in the form of either an electricity bill credit or an upfront rebate.

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Description of Solar Gardens

For energy customers that own a sunny roof, solar PV works by installing solar, using the energy at the time its produced and reducing the amount of electricity imported from the grid. This in turn reduces the amount the customer pays for electricity, with excess generation exported back to the grid. It's called a behind-the-meter model, because the Solar PV is installed on the customer side of an electricity meter (rather than the grid side).

This behind the meter solar model makes economic sense for millions of Australian energy consumers. It's a win-win because it helps a customer reduce and manage power bills while also helping to address climate change. The economics stack up because the cost of grid (or retail) electricity is for most customers greater than the cost of electricity from solar. With the savings on electricity bills solar customers should pay-back the cost of the system in 4-6 years, depending on how much of the electricity a customer uses, the retail price they pay and how good the solar resource is.

However, not everyone is in a position to put solar on their roof – this is a problem. This is where solar gardens come in. 'Solar gardens' work by installing a central solar array, generally in close proximity to a population centre – think a field at the edge of town, perhaps next to the town landfill or a big warehouse roof. The typical grid-integrated solar model is where a private company sells the electricity from a renewable energy generator (wind, solar PV, bioenergy) to a retailer through a power purchase agreement (PPA). In a solar garden:



1. The customer owns (or leases) a share or a number of panels in the central solar array and
2. The electricity generated by their share/panels is credited on the customer's electricity bill (see Figure 1 below)

In the solar garden model any energy customer can participate in and benefit from solar energy. It should be noted that this model could be used for other renewable electricity generating technologies, not just solar.

Figure 1: Solar Garden model



Solar Gardens Internationally

Solar gardens have become the most prevalent community solar program in the US in the last four years. According to the Solar Electric Power Association (SEPA, 2014) they represented 96% of all active and planned community solar capacity with a cumulative capacity of 40 MW. As of August 2014, SEPA listed 57 community solar programmes spanning 22 states (other sources provide even higher numbers). While this is still relatively small sector, solar gardens in the US are predicted to increase in capacity seven-fold by 2020 (Honeyman, 2015).

Why Australia needs Solar Gardens

There are three compelling reasons that Australian governments and regulators need to enable solar gardens:

1. Clean energy accessibility and equality
2. Avoiding the Death Spiral
3. Increased economic and technical efficiency and associated business model benefits

Clean Energy Accessibility



Solar Gardens enable a significant number of customer segments who face market barriers, to participate in and benefit from clean energy technologies.

- Renters – solar gardens bypass the landlord-tenant split incentive issue by enabling renters to buy in to a solar garden and get a credit on their electricity bill. For tenants, this is a much more viable alternative than putting solar on the roof of a rental property.
- Apartment dwellers – solar gardens bypass the issues around space, roof access and the split incentive between strata bodies and apartment owners by giving apartment dwellers an alternative way of participating in solar ownership.
- Low income households – in the US, policy that supports solar gardens requires that Solar Garden providers offer a certain proportion of the solar gardens capacity for free or at a discount to low income customers. Solar gardens are also a less capital intensive and simpler approach for some customers than rooftop solar, which can appeal to low-income households.
- Households without solar access – there are a range of households that cannot put solar on their roof due to roof orientation, shading, heritage listing, space or structural issues. Solar gardens enable these households to participate and benefit from clean energy.

Essentially solar gardens represent an elegant and simple solution to key market failures particularly split incentives, solar access and complexity.

Avoiding the Death Spiral

Australia is going through a period of unprecedented change in our energy system, with a combination of factors leading to potentially unbeneficial outcomes for most actors within the Australian energy system – customers, distribution companies, retailers and generators.

Key factors include:

- High electricity prices and specifically high network costs, resulting from \$47billion being invested in network infrastructure, at least a third of which was to meet peak demand growth that has not eventuated.
- The cost decline of distributed energy technologies – solar PV, energy efficiency and soon batteries, which has and will continue to reduce the usage of grid electricity.

The combination of these two factors lead to what is called the Death Spiral.

Solar gardens hold the potential to become a key strategy in the fight to prevent the Death Spiral. They create a win-win situation by enabling customers to benefit from distributed energy technologies, while maintaining some degree of grid utilisation. This in-turn could reduce grid defection by energy customers, thus maintaining network revenue and avoiding a situation where charges have to be increased so that sunk infrastructure costs can be recouped from the small group of customers who remain connected, including the most vulnerable.

Economic and technical efficiencies

Solar gardens and the policies that underpin them (Local Network Credits and Local Energy Trading – explained below) have significant technical and economic benefits over alternative clean energy business models. Specifically:



- Enabling electricity prosumers to use the grid at reduced cost through a Solar Garden and Local Network Credit will reduce the likely duplication of infrastructure – innovators will no longer look to install private wires (an alternative business model).
- The size of a solar array is no longer dependent on a host-site's energy use, as is the case with the behind-the-meter models of community solar being implemented in Australia – thus unlocking additional roof space for solar.
- The increased size of the solar array in a solar garden compared to both commercial and residential behind the meter business models allows for greater cost reduction through capturing the benefits of economies of scale.
- For community investors in solar gardens the fact that the return on investment is returned as a credit against an electricity bill potentially means that participants are not taxed, just like people who put solar on their own roof, but unlike other models of community renewable energy.

Examples

Moira and Swan Hill, Victoria

As part of the ARENA funded project into Local Energy Trading, a virtual trial of a many-to-one local trading project or solar garden is being undertaken in collaboration with Moira and Swan Hill councils. This trial will look at the viability of solar gardens in the current market context and if the Local Generation Network Credit Rule Change was implemented.

More information: www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/energy-and-climate-2.

Mid-Valley Metro Solar Array, Colorado

The Mid-Valley Metro Solar Array was a pioneer solar garden project in the US. It was constructed prior to the introduction of Colorado's Virtual Net Metering legislation. Holy Cross – the local utility, voluntarily, supported the development of a 78kW ground mounted solar farm in its area by Clean Energy Collective. Clean Energy Collective (CEC) then supported community members (Holy Cross customers) to purchase an ownership stake in the project. The participating customers then receive a monthly bill credit using CEC's smart metering and bill calculation software and hardware system, which integrates directly with the utility's systems.

More information: <http://www.nrel.gov/docs/fy12osti/54570.pdf>, p22-24

Barriers to Solar Gardens in Australia

Solar gardens, while operating across Europe and the US, currently don't work in Australia. The main reason – the economics of the business model – it doesn't stack up.

The economics of Solar Gardens

In Australia, solar gardens currently don't stack up economically. This is because currently the amount that would be credited on a participating customers bill is the wholesale price of electricity - just the "generation" part of the bill, which is typically 4-6c/kWh. If you put solar on your own roof you get to offset the full retail price of electricity – which for residential customers is approximately 18-30c/kWh and for business customers is typically 11-20c/kWh.



The reason for such a significant difference in price is that the cost of transporting electricity – the distribution and transmission infrastructure (aka poles and wires) accounts for approximately half of the retail price of electricity. Further, if you want to generate electricity at one site and use it at another site, as is implicit in the solar gardens model even if the sites are next door or close to each other, the electricity user in this equation has to pay for the full cost of the network infrastructure, even though only a tiny proportion is actually being used.

Unfortunately, the cost of developing, installing, operating and administering a Solar Garden is greater than the revenue stream of 4-6c/kWh of electricity generated even when the additional revenue stream of Renewable Energy Certificates (large or small) are also factored in. As such, in Australia, solar garden projects would always run at a loss, so no one is doing them.

Policy Solutions

To address this challenge requires new incentives or rules that recognise the value of solar gardens – these can be done in a few ways and there are a few dimensions that need to be considered.

Getting Solar Gardens to stack up

The solar gardens model is underpinned by the credit on participating customers' bills, this is essentially a new electricity tariff or pass-through. The questions that then need to be addressed are:

- Who develops this credit – how do they get established?
- In setting the credit amount what needs to be considered?

In establishing the credit there are two possible and complimentary approaches:

1. A rule change through the Australian Energy Market Commission (AEMC). There is currently a rule change process underway on this topic entitled Local Generation Network Credit¹. The rule change is proposed by Total Environment Centre, City of Sydney and the NSW Property Council and AEMC consultation commenced in late 2015 and will continue through at least the first half of 2016.
2. State legislation. State governments can legislate a new Solar Gardens incentive program, based on social and environmental grounds in a process not dissimilar (though on a smaller scale) to the Queensland Community Service Obligation (CSO).

In designing the credit the following details must be considered:

- Amount/value – what is the value of the credit?
- Distance constraints – do the Solar Garden members need to be in the same network distribution area e.g. zone substation area to be able to get the credit?
- Timing – does the energy generated in the solar garden have to be used by the customer at the same time?
- Who can participate – are all customers eligible to participate/benefit from the credit arrangement or just certain customer classes?

Currently, a consortium of different stakeholders including the Institute for Sustainable Futures and a number of Councils, Networks and retailers are funded by the Australian Renewable Energy Agency (ARENA) to investigate the opportunities of peer-to-peer electricity trading.

¹ www.aemc.gov.au/Rule-Changes/Local-Generation-Network-Credits



They are conducting five virtual trials to inform the development of alternative charging methods for local energy projects and potential changes to electricity market rules. Additionally, the Local Generation Network Credit Rule Change process should help clarify the value of local energy generation and thus what the credit on a consumer's bill should be if such a business model were to be enabled.

Specific policy asks

- **Proactively support the Local Generation Network Credit Rule Change**
- **Implement state-based legislation that supports renters, low income households and households without solar access** by one or more of the following methods:
 - Providing grants or rebates to low-income households, apartment dwellers and renters to be able to participate in a Solar Garden.
 - State governments can also put in place legislation to require networks or retailers to credit certain eligible customers who participate in a solar gardens scheme at a certain rate. One option would be that customers who cannot put solar on their own roof could be eligible for full or near-full retail electricity rate, while those customers who can put solar on their roof, would be credited at a lower rate (standard solar feed-in rate), thereby increasing equity of access. The cost of this could be smeared over the bills of all customers or paid for from a capped amount within the state government's budget.
- **Fund at least five trials** to help prove the model and bring down the costs.
- Follow the outcomes of the ARENA/Institute for Sustainable Futures Local Network Credit and Local Energy Trading project - www.uts.edu.au/research-and-teaching/our-research/institute-sustainable-futures/our-research/energy-and-climate-2.

CONTACT DETAILS AND FURTHER INFORMATION

Nicky Ison, Founding Director, Community Power Agency
M: 0402 0345 80, E: nicky@cpagency.org.au