community power agency

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Low-income Community Solar – Options Assessment South Coast Solar Saver Project

PREPARED FOR:

Eurobodalla Shire Council &

The South Coast Health and Sustainability Alliance (SHASA)

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ABOUT THE AUTHORS

The Community Power Agency (CPA) is a leading Australian not-for-profit working in the field of community energy. CPA was established in 2011 to support the growth of community owned renewable energy projects in Australia. We support community groups on the ground, as well as working collaboratively with other organisations to address systemic barriers facing the sector as a whole. CPA has supported over 30 local community energy projects and has been instrumental in bringing together a coalition of over 60 organisations to form the Coalition for Community Energy.

For further information visit: **www.cpagency.org.au**

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DISCLAIMER

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1. Introduction

Across the world energy markets are in transition. With the introduction of low-cost solar PV, energy efficiency measures and other clean energy technologies energy consumers have an opportunity to participate in and benefit from our energy system in unprecidented ways. However, without direct intervention by community groups, governments and social enterprises low-income households will miss out.

The South Coast Health and Sustainability Alliance (SHASA) has secured funding from the NSW Office of Environment and Heritage through their Growing Community Enegy Program to develop and impliment pilot of a new model of community energy that directly benefits low-income households. This project is known as the South Coast Solar Saver Project.

Specifically, the South Coast Solar Saver Project aims to:

- Contribute to the reduction cost of living pressures (from lower energy bills) in low income households.
- Address financial barriers for low-income households to installing solar power.
- Protect those who are most vulnerable to the effects of extreme weather conditions.
- Improve the health and well-being of those unable to meet the costs of heating and cooling.
- Educate homeowners on effective ways to save energy use and associated costs

Community Power Agency (CPA) and Future Energy Consulting's Chris Cooper have been comissioned by SHASA to assist in the development of the South Coast Solar Saver Project in the following ways:

- **Stage One: Options assessment** which includes broad review of different delivery models available to the client.
- **Stage Two: Stakeholder workshop** which will build SHASA's understanding of the potential project models, including opportunities, risks and constraints, and make a collective and informed decision on a 'best-fit' delivery model(s).
- **Stage Three: Full Feasibility Analysis and Action Plan** including an thorough economic feasibility analysis of the selected delivery model and the development of a step-by-step Implementation Plan to guide the stakeholders through the delivery of the program.

1.1 About this report

This report details the research undertaken in Stage One of this project. It provides a full options assessment of the different possible delivery models. The report is structured into the following sections:

Section 1: Introduction – outlines the aims and context for the project.
Section 2: Low-income households – defines the key target audience and outlines the barriers that face low-income households installing solar PV.
Section 3: Program features – identifies the key features that will make up a low-income community solar program.
Section 4: Program options – outlines the key program/model options possible.
Section 5: Quantitative Assessment of Options – provides the results of a preliminary quantitative analysis of the program options.
Section 6: **Next steps** – outlines process options and steps going forward for SHASA.

2. Low-income households – definition and barriers

2.1 Definition of a low-income household

For the purposes of this program, the client has defined a low-income household as one in which the head person(s) or main occupant(s) is/are in possession of a concession or health-care card.

2.2 Barriers to accessing solar for low income households

Low income households experience are typically not able to access solar power due to the . In order to design a successful low-income household solar program, we need to understand the current barriers which prevent solar uptake amongst low-income households. Specifically:

- Capital barriers
- Split incentives – the landlord-tenant problem
- Cultural barriers
- Common property barriers
- Information barriers

These barriers are discussed in detail.

Capital Barriers

Low income households typically do not have disposal income available to fund a capital intensive solar power system, nor are they able to access debt finance due to their income level and, if renting, lack collateral in the form of property. The long term nature of a solar loan[1] means that the lender takes on additional risk relative to a short term unsecured loan. Even if the lender was willing to lend to such a low-income household, the interest rate would reflect the increased risk and therefore render the solar investment uneconomic.

This is evident when one attempts to access a quote for a solar financing package through a major solar retailer, or an unsecured loan from an institutional lender. To access such financing a household is required to submit statements of income and a credit check, which low-income household are unlikely to pass.

Split incentives – the landlord-tenant problem

'Split incentives' refers to situations where a course of action with an economically efficient outcome is obstructed because it is not in the interests of a particular party.

The classic example of split incentives is the landlord-tenant problem. In this case the landlord is reluctant to invest in solar, because the benefit would accrue to the tenants over time through lower energy bills. Meanwhile the tenant is reluctant to pay for investment in solar if they may not remain a tenant long enough to reap the benefits.

Cultural barriers – 'the "second" landlord-tenant problem'

Landlord and tenants do not typically have established processes for considering and deciding issues like investment in solar or energy efficiency. As a general rule, the tenant must typically accept the structural nature of the dwelling as is (i.e. hot water system, insulation, solar energy), having agency to adjust minor aspects of the dwelling (i.e. light bulb type, weatherstripping). These rules are enforced through tenancy contracts and social norms. Adding to this, tenants often do not interact directly with the landlord, but rather through an agent. These factors combine to create an initial barrier to any discussion about the possibility of installing solar, from the perspective of both the landlord and the tenant.

Common property barriers

[1] Defined as a loan taken out to finance solar technology – in this case rooftop solar PV.

This barrier is mostly relevant to households living in a communal or strata dwelling. The shared property rights on the roof (location of solar) and walls (location of inverters and cabling) means that individual households do not try to install solar because:

- the confusion regarding who pays for it and benefits from it (split incentive, information)
- the high administration cost of collective decision making via a strata committee, or
- the belief that such installations are generally not undertaken on strata dwellings (see cultural barriers).

Information barriers

Imperfect information is a common market barrier to the efficient deployment of resources, particularly in emerging markets. According to Garnout (2008) it refers to people not being able to access appropriate or accurate information about:

- the options available
- the approximate costs and benefits of the different options
- how to deploy the options
- the cost of investigating the options.

Information barriers are not confined to low-income households; however, lower average education levels associated with lower income could, in theory, exacerbate confusion surrounding challenging consumer decisions such as a solar power investment. There are so many factors to consider when buying a solar power system that it is arguably one of the most complicated investment decisions a householder could make. To add to the confusion, the salesperson or installer may employ competitive sales tactics and/or often do not undertake thorough economic analysis of each households' benefits (either intentionally or unintentionally), thereby reducing trust in the forecasts of benefits over time.

In addition to the complex investment decision, other factors add to the uncertainty:

- to the average consumer, solar energy components appear to be homogenous in their performance and appearance. Brand recognition in solar is relatively low compared to other consumer products;
- the level of bankability in product warranties is low due to long time period associated with the investment and uncertainty in both the profitability and longevity of companies in the solar supply chain.

To successfully create a low-income solar program the relevant barriers outlined need to be identified and structures and processes put in place to overcome them. The next section outlines the types of program features required to successfully overcome many of these barriers.

3. Program Features

When designing a new energy project/program for low-income households, it is important to first identify the target audience. Then a number of program elements needs to be brought together to form a solution which helps the target audience overcomes the barriers identified in Section 2.2. The right matching elements will depend on the project aims, the capabilities and role of community group, the target audience and the desires of the key stakeholders. Some features of a program include:

- **Who is the target audience?** For example, Low-income owner-occupiers, low-income tenants, strata tenants?
- **Is it a donation based or an investment (repayment) based program?**
- **How are repayments collected to overcome barriers**? Rent, rates or electricity bills?
- **Who pays upfront for the solar power systems**? Is it paid for by the owner-occupier or landlord, or financed by an institutional lender, the community, a charity organisation or a solar company?

3.1 Target audience

Within the broad category of low-income households are a number of sub-categories which have implications for program design.

The authors have identified four broad types of low income household as categorised by their tenure and dwelling status. SHASA have determined whether or not each target audience is under consideration as part of this project. A summary is contained in Table 1 below.

Table 1 Target audience, SHASA decision on consideration as part of this project

Target Audience	SHASA decision on status
Low-income owner occupier	Under consideration
Low-income tenant – housing provider as landlord	Under consideration
Low-income tenant – private landlord	Not under consideration
Low-income household – strata title (tenant or owner-occupier)	Not under consideration

In 2011, in the Eurobodalla:

- 416 households were living in a State housing authority dwelling (55% of which were free-standing dwellings)
- 122 households living in a low-income housing provider property (83% of which were free-standing dwellings).
- No data was available about low-income owner-occupiers.

Source: Australian Bureau of Statistics Community Prolife for Eurobodalla Local Government Area, 2011

Owner-occupier targeted programs

If we look at the barriers listed in Section 2.2, owner-occupiers don't face nearly as many barriers to installing solar as a tenant. However, their low income status might prevent them from being able to pay for a solar power system from their savings, or through accessing finance. Like other consumers, they may be overwhelmed with confusion, or not be able to access trustworthy advice on the best option for their needs.

If owner-occupiers are the target audience, a bulk buy and information provisioning program could be sufficient to drive some uptake, however prevailing capital barriers would prevent substantial uptake. Solutions to capital barriers are discussed in Section Financing3.3.

Tenant targeted programs

Low-income tenants face many of the barriers to installing solar power which were identified in Section 2.2, including capital, split-incentive, cultural and information barriers. Overcoming such a complex set of barriers requires a more engaged, nuanced program which at a minimum include the landlord and tenant as key stakeholders.

Low-income housing providers who rent out large numbers of residential properties present an easy opportunity for engagement as they already have methods of efficiently collecting and pooling repayments from tenants (i.e. rent). They are also very well placed to engage with and understand the needs of the tenants.

Tenants who live in properties owned by a ***private landlord*** (i.e. not a housing provider) present a more difficult engagement target relative to landlords who are low-income housing providers, for the following reasons:

- Many more landlord stakeholders would need to be engaged to reach equivalent scale. This leads to very high program recruitment costs and transaction costs when financing and collecting repayments.
- It is harder to find low-income tenants who live in dwellings owned by private landlord as those tenants may not identify as 'low-income'.
- There is often a real-estate agent who brokers the relationship between landlord and tenant
- Private landlords may not necessarily be sympathetic to the needs of a low-income household, unlike low-income housing providers who see value in assisting their tenants.

As such, SHASA have indicated that tenants with a private landlord will not be a target of this research.

Other target audiences

Low-income tenants in strata title dwellings arguably face more barriers to solar uptake than any other household type. In addition to the barriers faced by regular tenants, 'Common property barriers' and 'Cultural barriers' also come into play. Given the need to limit scope early on, SHASA have indicated that such a program will not be considered as part of this project. However, if successful in its implementation, future project could build off the learnings of this project to better target low-income strata tenants.

Implications of 'Family Energy Rebate' (FER) and 'Low-income Household Rebate' (LIHR) on program design. Many low-income households are eligible for both of these electricity rebate programs. The FER is worth between $150 and $165 annum and the LIHR is worth between $235 and $258.50 per annum (NSW Government, 2015). The rebates are paid via a credit on one electricity bill per annum. As these payments are not tied to electricity consumption, installing solar power will not reduce the rebate benefit received by a low-income household, and therefore these rebates have no implication for program design.

3.2 Information

Providing independent, trusted information will be a common feature of any solar program in order to overcome barriers of imperfect information identified in Section 2.2. The degree of program assistance can vary from a basic level – such as providing general information and advice - through to pre-screening technology and installers, as well as the household for suitability. The financial vulnerability of low income households' requires extra diligence in the provision of information and in particular, suitability screening, relative to a mainstream household program.

Information programs are often accompanied by a bulk procurement process which may lead to capital cost savings. Numerous bulk buy programs have been conducting in Australia, providing useful learnings for the development of program information and engagement tools. Some recent examples include the Mount Alexander Solar Homes project (www.mash.org.au) and Positive Charge bulk buy (www.positivecharge.com.au/projects/solar-bulk-buy).

3.3 Financing

Low-income households all face a capital barrier when wishing to install solar power as they are, by definition, cash-poor. To overcome this barrier, it is important to spread the capital cost of the solar power system over a sufficiently long time period to ensure that the ongoing benefits through electricity bill savings exceed the repayment costs.

Donation or repayment programs

Early on in program planning it is important to decide whether the capital will be raised via:

a. Donation, where there is no need to collect repayments as the solar power system installed at no charge to the household; or,
b. Investment, whereby the financier expects to be paid back principal and interest[2]. We refer to this type of program as a 'repayment-based program'.

The relative merits of these two approaches are outlined in Table 2.

Table 2 Donation versus repayment financing mechanism

	Donation program	Repayment-based program
Advantages	• No repayments required. • Participating households get maximum benefit	• Doesn't rely on charity and can therefore be scaled up and replicated • Easier and quicker to raise capital
Disadvantages	• Difficult and slow to raise money • Limited in its scale and therefore potentially exclusionary and dissatisfying for non-participants	• More complicated to set up. • Need to carefully screen tenants as benefits more sensitive to household electricity use
Funding sources	• Community, charities and housing providers.	• Various (see 'Who finances the project, and how?')

Broadly speaking, the benefits of a donation-based program tend to be offset by the challenge of raising capital and the subsequent limited scope of such projects. For example, Repower Shoalhaven's first project, a donation-based solar power system raised approximately $10,000 in donated funds at a rate of $1500 per week, compared to the organisation's first two investment funded projects which have raised approximately $180,000 at an average rate of $15,000 per week (Repower Shoalhaven, Pers. Comm. 2015).

Given the additional impact, but also complexity associated with repayment-based programs, most of the discussion in this report focuses on variations of such projects. There are three broad financing components as part of a repayment-based low-income household program:

A. Who is collecting repayments?
B. What financing instrument is used?
C. Who finances the project?

It is important to note however, that each component cannot be isolated – adjusting one could impact the other two. Also, the decisions made about each component have critical implications for which stakeholders are engaged in the project, and which barriers are overcome. The following sections look at each of these components in detail.

3.4 Repayment programs - The repayment collector

Low income households cannot typically access direct finance through institutional lenders or solar retailers because the lender sees the household as too risky and more likely to default (counterparty risk). This can be verified by applying for any personal loan or solar leasing program where income checks and/or credit checks are always requested. As a result, program developers need to find a way to de-risk the investment from the perspective of the financier, thereby incentivising their participation. One way to do this is to engage a third party 'repayment collector' who efficiently and effectively collects repayments from the household by 'piggy-backing' the repayments onto an existing bill for an essential service. This third party could include, for example:

- A landlord (via rent),

[2] This includes zero interest loans from charity organisations.

- An electricity or water utility (via utility bills) or
- A local government (via rates).

The theory is that a household will be less likely to default on payments for essential services due to the fear of eviction or utility disconnection. The repayment collector acts as a 'risk buffer' between the low-income household and financier. This ensures the project is sufficiently safe for the financier to participate. Importantly, the repayment collector must be sufficiently incentivised to participate in the program as they are the central stakeholder and carry any residual counterparty risk.

Figure 1 Flow of repayments utilising repayment collector as central stakeholder in program

A description of each possible Repayment Collector, and the corresponding repayment collection mechanism, is discussed below.

Repayment collection mechanism: Landlord - rent-based collection
Description: The landlord collects the repayments from the tenant via a rent increase, before channelled repayments back to the financier.
Advantages: • Rent carries a low risk of default • No adjustments to legal documentation, and therefore no complications when the tenant moves out. • Less stakeholders engaged than with other collection mechanisms. This creates a simpler program which more benefit for key stakeholders. • Helps to overcome the landlord tenant problem to an extent as the cost pass-through can be agreed upon mutually by landlord and tenant.
Disadvantages: • Not suitable for owner-occupier programs, as no rent is paid. • There may be some legal restrictions on rental increases in some cases. • The finance on the solar power systems are tied to the property owner, not the property meaning that the debt cannot easily be transferred.
Status/constraints: Some low-income housing providers may not be able to pass on rent increases. This may be due to government funding conditions or rent increase restrictions. In such cases, a separate 'utility charge' similar to a water charge should be recovered by the landlord. Such a charge is expected to be permitted under funding and regulatory rules; however, it is less preferred (relative to rent) as it is an additional bill and therefore higher administrative costs and higher default rates are expected.

Repayment collection mechanism: Local Government – rates-based collection
Description: The local government collects repayments via rates increases which a property owner opts-into. The repayments are thus are tied to the property. This is a similar approach to that applied in the commercial sector through Environmental Upgrade Agreements (EUAs).

Example: The Darebin Solar Savers Program in Victoria is a successful rates-based financing program. The program installed solar PV on 300 low-income owner-occupier households in the City of Darabin. The cost of the program was paid upfront by Darebin City Council and will be repaid (at 0% interest) by the participating households, through a special rate (also known as a special charge) levied quarterly over a ten year period (MEFL, 2014).

Advantages:

- This method is suitable for owner-occupiers as the method is tied to the property, meaning the contract can be novated to the new property owner upon sale.
- The local government's role as a repayment collector substantially de-risks the investment from the perspective of the financier.
- Local government are in a good position to engage with and provide information to owner-occupier householders.
- The program can be extended to renters, however additional legislative change would be required.

Disadvantages:

- Residential rates-based financing is currently not legally possible within NSW.
- Rate-based collection does not directly overcome the landlord-tenant problem as the landlord (and not the tenant) is responsible for paying rates. The landlord must pass the cost of the repayments onto the tenants via rent increases, creating a two-step collection process.
- Local government are often cumbersome and slow in their decision making, which reduces the chance of 'quick-win' program success.
- Most local government do not view such a program as a core activity of their portfolio.

Status/constraints: Currently, residential rates-based financing is not legally possible within NSW, however the NSW Office of Environment and Heritage is in the process of reviewing options for enabling this mechanism. This review does not mean that the necessary legislative change will proceed and if it does proceed (which is certainly possible) will likely take at least 2-years to implement.

Repayment collection mechanism: Monopoly utilities: 'on-bill financing'

Description: This is where a monopolistic utility collects repayments via special charges on a water or energy bill. This utility could be an electricity distribution network service provider (DNSP) such as Essential Energy, or the local water utility, operated by Eurobodalla Shire Council.

Example: No Australian examples are known by the authors. Internationally, 'on-bill financing' programs have utilised electricity bills to collect repayments for energy efficiency and renewable energy investments, particularly in the United States, and more recently, the unfortunately unsuccessful Green Deal program in the United Kingdom.

Advantages:

- Monopolistic utilities do not face the same competition requirements which potentially prevent an electricity retailer from conducting on-bill financing
- The repayment is tied to the water or electricity meter identification number, and therefore the finance could be easily passed on to the following household if the occupants move out.
- This could help overcome the landlord-tenant problem as the payments are made by the occupier but tied to the property.
- On-bill finance programs in the US have recorded low default rates of 1-2% (ACEEE, 2011)

Disadvantages:

- High establishment costs exist with both of these mechanisms as they would involve the creation of a new tariff category, which in turn would require approval from the Independent Pricing and Regulatory Tribunal (IPART) in NSW.
- In the absence of regulation or sufficient incentives, DNSP's would likely be unwilling to participate.

Status/constraints: Eurobodalla Shire Council, who manages the local water utility, has already expressed their unwillingness to cooperate with such a proposal due to the complexity and effort in establishing the new tariff class.

Repayment collection mechanism: Electricity retailer - 'on-bill financing'

Description: An electricity retailer collects the repayment by a special charge on the household's electricity bill, before being channelled back to the financier, less billing fees.

Example: No known programs in Australia. See 'Monopoly Utilities On-bill financing for international' examples[3]

Advantages:

- Repayments are tied to an existing bill for an essential service, therefore lowering possibility of default
- The costs and savings from solar power are both are realised on the same bill

Disadvantages:

- Unclear on whether it is permitted under the National Energy Retail Law due to the potential anti-competitive implications. Further legal research required.[4]
- Not tied to property, but rather the dwelling occupant. As a result this does not overcome the landlord-tenant problem. If the occupant were to move address, transfering the finance to the next account holder would be difficult
- Retailer would need strong incentives to consider participating due to residual counterparty risk and administrative cost of establishing the repayment framework.

Status/constraints: Whilst a number of Australian electricity retailers, such as Origin Energy and AGL, do offer solar financing packages, they do not currently offer the repayments on electricity bills. This may be because solar power installation and financing deals are covered by the Australian Consumer Law, but the sale of electricity is governed by the National Energy Retail Law. The National Energy Retail Law contains strong provisions to ensure that consumers can access the price benefits of competition by switching retailer. It remains unclear whether it is allowed for an electricity retailer to sign a customer to an electricity supply contract by promising them a solar power system, financed on their bills. Even if this was possible the retailer would need to unbundle the solar power bill and the electricity bill should the customer wish to switch supplier, which may create more administrative cost than the benefit provided by on-bill financing.

Repayment collection mechanism: Solar retailer (direct lease with household)

[3] International examples often have a vertically integrated utility and therefore the retailer is also the monopoly

[4] In most US jurisdictions where on-bill financing has been successfully deployed, electricity is sold by a vertically-integrated monopoly utility (i.e. there is no competition concerns because there is only one retailer). Australia's National Electricity Market has a deregulated retail energy market, separate from the regulated network monopolies.

Description: A solar retailer collects the repayment via a direct solar lease with the household (see Section 3.3 for a description of solar leasing). An underwriter is responsible for making any shortfall payments, thereby de-risking the project from the perspective of the solar retailer.
Example: There are no known examples in Australia specific for low-income households with a financial underwriter. However, the Australian market has a number of solar leasing retailers which could be engaged to deliver such a program
Advantages: • Solar retailers which offer leasing packages usually have efficient billing mechanisms. • Streamlines stakeholders as solar retailer is also repayment collector
Disadvantages: • As the payment is not tied to an existing bill there is higher risk of default. • Exacerbating this default risk, the tenant may have a perverse incentive to intentially default if the underwriter makes up any shortfall payment. The underwriter would need to have procedures in place to mitigate against this. • The solar lease would need to be signed by the tenants. This would likely require a rewording of the lease contract and present challenges when the moving out as the new tenant would need to take over the lease. • Complicated verification process for underwriter to confirm the payment shortfall as they must ask the solar retailer for information on which tenant is not paying. • The above factors all mean that the underwriter will be forced to have an active role in enforcing/supporting the tenant to pay the solar lease bills, and to novate the contracts at the end of the term.
• Status/constraints: Solar retail finance packages are readily available within the NSW market.

Repayment collector - Recommendations

If creating a low-income program for tenants, the authors believe that the landlord approach is the most suitable, in light of challenges with other mechanisms. Using the landlord as a central stakeholder minimises the number of stakeholders relative to rate-based mechanisms or on-bill financing, resulting in a more efficient, straightforward and affordable mechanism. There are no additional contracts required, and as a result no complications arise when a tenant moves out. Costs can be passed through in a way which ensures that all parties share in the benefit, overcoming the 'landlord tenant-problem'. Rent increases, assuming they are well contained and justified, are the preferred option due to the low default risk. A separate utility payment would be the next best available opportunity. However, further investigation is required into the legality of rental increases.

The solar retailer as repayment collector, whilst appearing simple on paper would still require strong involvement from the underwriter. The housing provider landlord is perhaps best placed to fulfil the role of underwriter; as a result, the authors argue that many of the complexities of this model would be overcome by the landlord collecting the repayments directly and taking out a solar lease themselves as landlord.

A number of unresolved challenges remain for rate-based and on-bill collection mechanisms in NSW. Were it available as an option, monopoly utility 'on-bill financing' presents an attractive alternative for overcoming the landlord-tenant problem as the landlord is not heavily involved as an ongoing stakeholder. However, further regulatory reform is required before such options can be considered for NSW.

3.5 Repayment programs - Selecting a financing instrument

The repayment collector - being the central stakeholder – is responsible to signing up to financing deal and honouring its terms and conditions. This is not a decision of the community group, but rather the repayment collector based on their own preferences and values. There are three main finance instrument options:

- Self-financed by the repayment collector
- Debt finance
- Solar lease or PPA

Self-financed

The repayment collector may have sufficient cash reserves to fund the solar power systems from their savings. The repayment collector, for example a landlord, could self-finance the solar power capital and installation cost and reclaim the principal plus interest over time from the low-income household. Based on economic theory, the repayment collector would only be interested in doing this if they had a strong cash-reserves and investing in solar was the best return on investment from all investment opportunities. Therefore, the repayment collector will collect repayments at an interest rate which exceeds or equals the next best investment opportunity (investment risk being equal), unless the repayment collector subsidises or waivers the interest.

Debt-financed

Debt financing is when the repayment collector takes out a loan to pay for the system. The nature of the investment means that it is likely the repayment collector will want a fixed interest rate over the project life for cost certainty and accounting simplicity. The potential lending sources are discussed in Section 3.6.

Solar Leasing financed

A solar lease is a financing mechanism whereby a third party owns and operates the solar power system and collects a fixed, pre-determined lease payment from the customer. A solar lease should be structured so that the savings on electricity bills comfortably exceed the costs. If the system doesn't work, the owner is responsible for fixing it, thereby shifting the technology risk entirely to the third-party owner. The owner is also responsible for monitoring the system performance to ensure you are receiving the stated benefits of the system. A solar lease typically lasts for between 7 and 15 years but can be extended to as long as 20 years to receive a lower lease rate. Depending on the lease conditions, at the end of the contract term the customer will either inherit ownership of the system at no charge (i.e. a 'lease-to-own' contract), or have the option of purchasing the system a residual value or extending the lease. A lease could be accessed directly via a solar retailer, or via a community organisation who develops community renewable energy projects.

A power purchase agreement (PPA) is very similar to a lease, with the only difference being that the customer is charge for using energy generated from the system (in c/kWh) as opposed to a fixed lease payment. We do not recommend a PPA as suitable for this program as a fixed ongoing lease or loan repayment would provide simplicity and cost certainty.

Selection of financing instrument – Recommendations

The relative merits of each of the finance instruments outlined are detailed in Table 3. The authors do not recommend any specific financing instrument. The decision is entirely that of the repayment collector as they sign any financing deal to pay for the solar power systems. Their decision will depend on how they value the benefits each option, subject to the associated costs.

If this repayment collector is a low-income housing provider, a lease may offer simplicity and payment certainty without adding any addition resource burden on the housing provider; however, these benefits should be viewed in light of additional costs.

Table 3 Advantages and Disadvantages of the three financing instruments

	Advantages	Disadvantages
Self-	• Maximises the cash earned from the solar power system (assumes no	• Opportunity cost of using own capital (i.e. it could possibly be better spent elsewhere)

financed	operation and maintenance issues).	• Owner bears the risk and subsequent cost of operation and maintenance, including monitoring, repair, warranty claims, inspections • Owner often undervalues costs associated with Operation and Maintenance
Debt-financed	• Repayment terms can be adjusted to suit needs i.e. term length, rate, fixed or variable rate. • Can use established finance partners or existing debt facility (i.e. mortgage redraw) • In many circumstance it will yield higher cash returns than a solar lease	• Opportunity cost of using debt capital (i.e. it could possibly be better spent elsewhere) • Owner bears the risk and subsequent cost of operation and maintenance, including monitoring, repair, warranty claims, inspections • Owner often undervalues costs associated with Operation and Maintenance
Solar Leasing financed	• Lowest risk option as solar retailer must cover all technology risks • Procurement is fully outsourced, saving internal resources and providing certainty in terms of ongoing cost, technology risk and effort. • A solar lease does not feature on an organisation's account as a gross liability/debt, which may appeal to some customers • lease payments are fully tax deductable as they are an operational expenditure (to profit making organisations) • The customer can typically end the contract early by 'buying-out' the system at an agreed upon value	• Customers typically end up paying more over the length of the contract relative to self-financed and a loan as the risk and maintenance is fully outsourced.

3.6 Repayment programs – Who finances the project

Provided the repayment collector absorbs most of the counterparty risk[5], the finance can come from a variety of sources, specifically:

- A traditional finance institution e.g. a bank
- A charity
- The community
- A solar retailer

Institutional financier

In this case it would be the repayment collector who would takes out a loan from the traditional financial institution such as a bank or credit union. A number of loan options are available, such as:

- redrawing on an existing mortgage
- a capital works or business loan specifically for the solar power systems (if the borrower is a housing provider landlord)
- a personal loan (if the borrower is private landlord)

Charity financier

[5] Counterparty risk is the risk of the household defaulting on repayments

Depending on availability, a charity organisation may see sufficient social value to invest the project by offering a low interest or no-interest loan.

The community

The community could raise the capital via a crowd-funding approach. This could be coordinated by SHASA themselves if they have sufficient local capacity and personnel, or another community group could be engaged to establish the project on SHASA behalf (for example, Repower Shoalhaven or Clear Sky Solar Investments). The form of finance could be either a loan, or solar lease[6].

Solar retailer

A solar retailer could finance the project via the solar retailers financing packages. The form of finance could be either a loan (directly with the solar retailers preferred financier) or a solar lease. A solar lease minimises the number of program stakeholders, as the installer and financier are essentially the same entity.

Selection of financier - recommendations

The authors do not recommend any specific financier. The decision is entirely that of the repayment collector as they sign any financing deal to pay for the solar power systems. Their decision will depend on how they value the benefits each option, subject to the associated costs.

4. Program Options

To create a suitable program the program elements (discussed in Section 3) need to be matched in a way which will ensure that the selected target audience (Section 3.1) are able to overcome the barriers currently preventing their uptake of solar power (identified in Section 2.2)

We have proposed six potential program to consider in more detail:

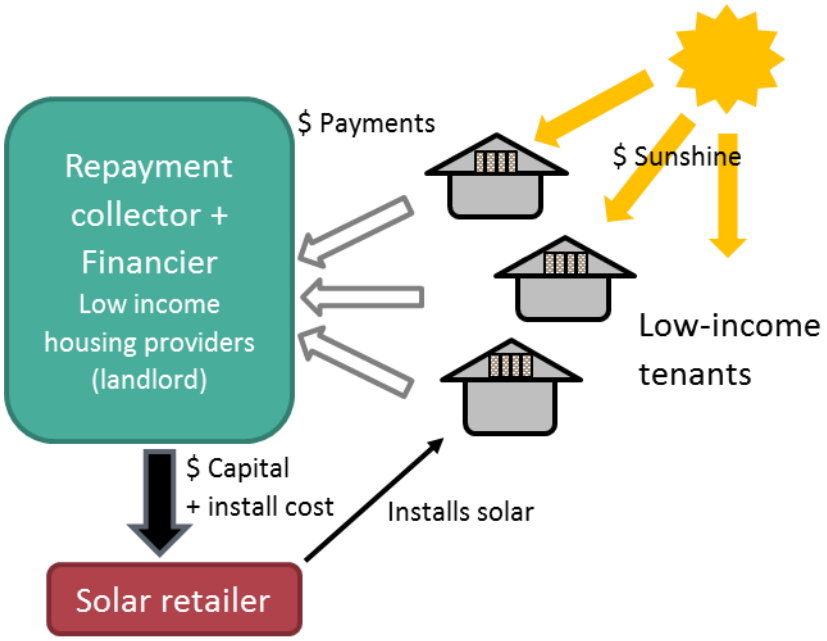
- Option 1: Landlord financed / landlord repayment collector
- Option 2: Loan finance / landlord repayment collector
- Option 3: Community crowdfunded (lease) / landlord repayment collector
- Option 4: Solar retailer financed (lease) / landlord repayment collector
- Option 5: Solar Retailer as repayment collector
- Option 6: Donation-based

Options 1-4 have the landlord (low-income housing provider) as the central stakeholder with repayments collected via a rent increase or separate bill. Option 5 is a direct solar leasing program whereby an underwriter is responsible for correcting a shortfall in repayments. Option 6 is a donation program.

4.1 Option 1: Landlord financed/ landlord repayment collector

This option is where the landlord funds the upfront capital, installation and program costs from their own savings, collecting the repayments from the tenants. The landlord is in complete control with this option as they can set the level of interest on repayment, as well as any administrative charge for managing the repayments.

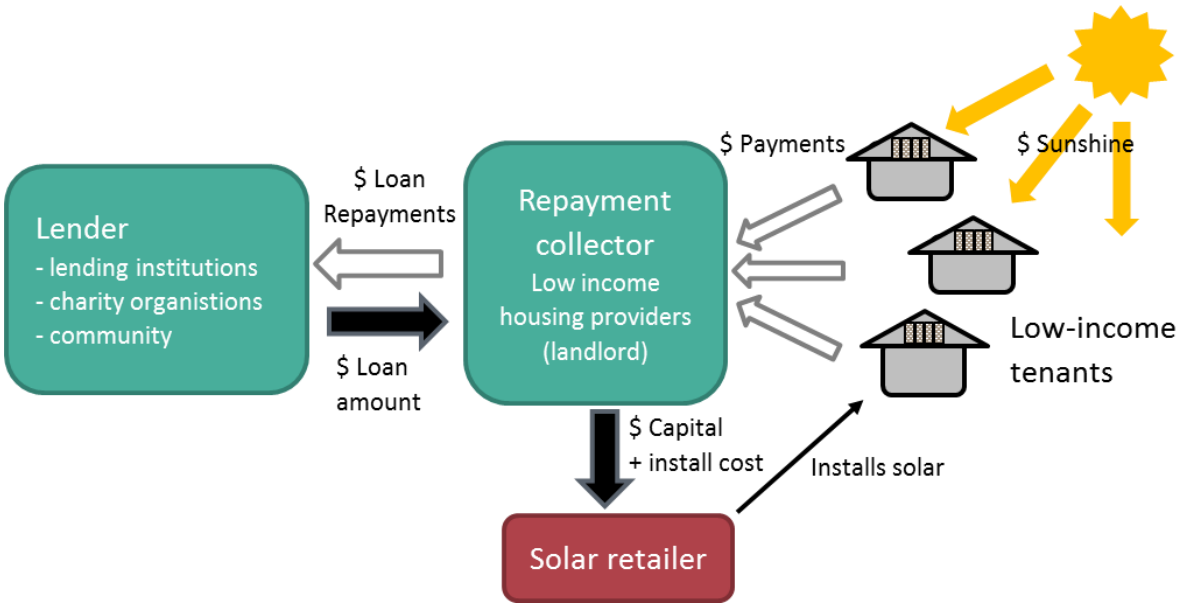
[6] A solar lease is where a third party owner (i.e. community or a solar company) owns and operates the systems, being responsible for monitoring and maintaining the systems.



Repayment collector	Finance instrument	Financier
Rent	Self-financing	Landlord

4.2 Option 2: Loan finance/ landlord repayment collector

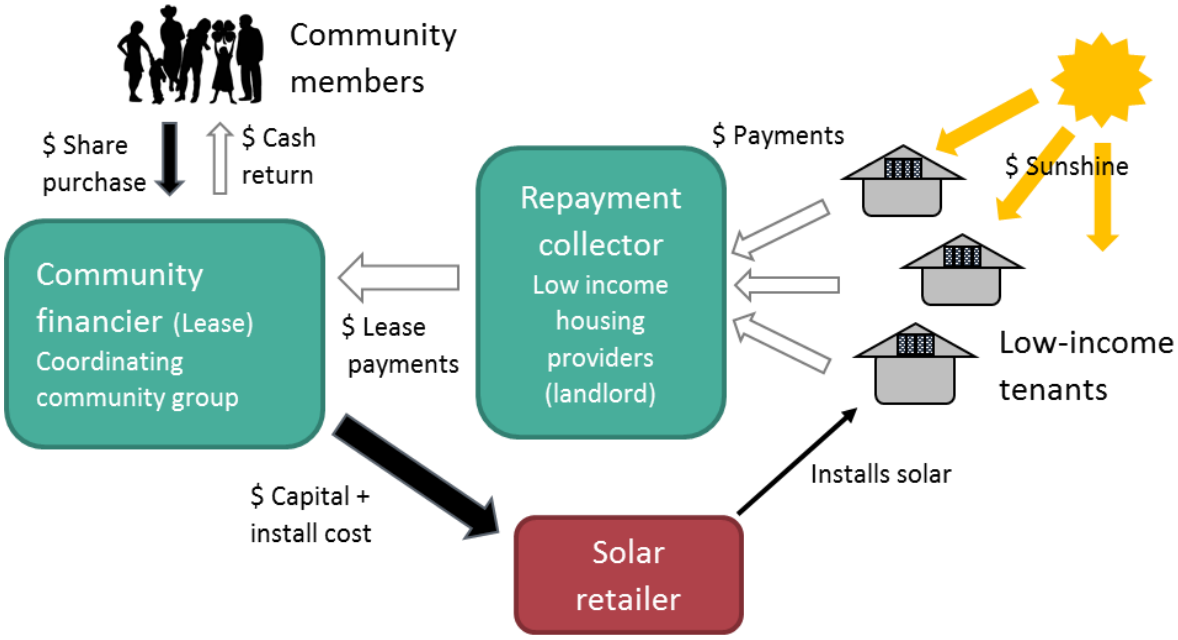
In this option the landlord utilises a third party financier to fund the upfront capital, installation and program costs through the provision of a loan. The landlord is responsible for repaying the capital at a fixed or variable rate of interest. The interest rate offered will vary with each financier and their assessment of risk associated with the project.



Repayment collector	Finance instrument	Financier
Rent	Debt-financed	Traditional financier, charity or community

4.3 Option 3: Community crowdfunded/landlord repayment collector

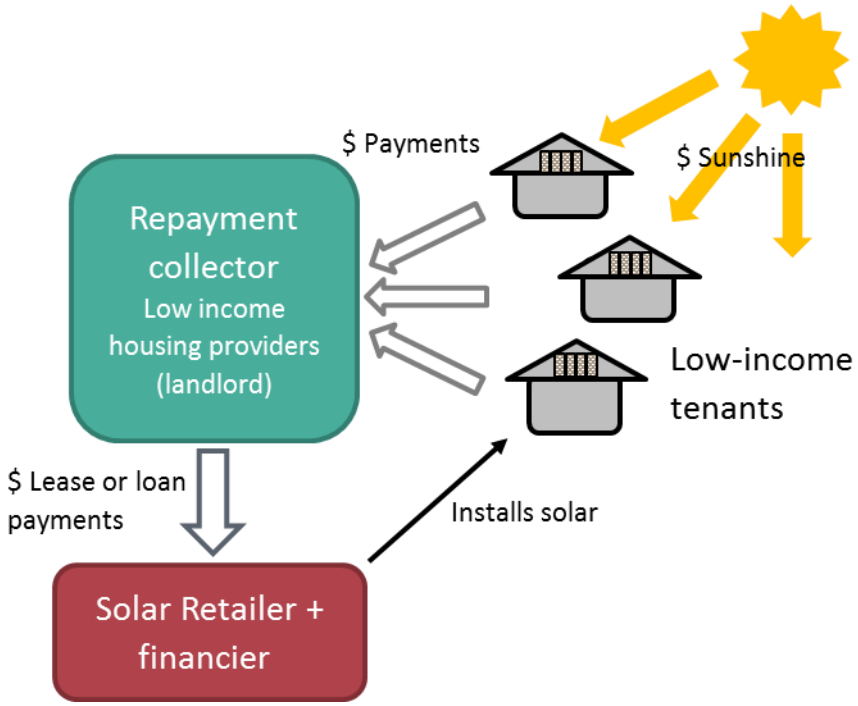
In this option the landlord takes out a solar lease with a community energy organisation. The community energy organisation installs and manages the solar assets on the low-income households' roofs. The landlord is responsible for paying the lease until the end of the contract period. The community group will raise the funds for capital, installation program costs via an investment crowdfunding approach and manage the returns to investors over the contract period.



Repayment collector	Finance instrument	Financier
Rent	Lease/PPA	Community

4.4 Option 4: Solar retailer financed/landlord repayment collector

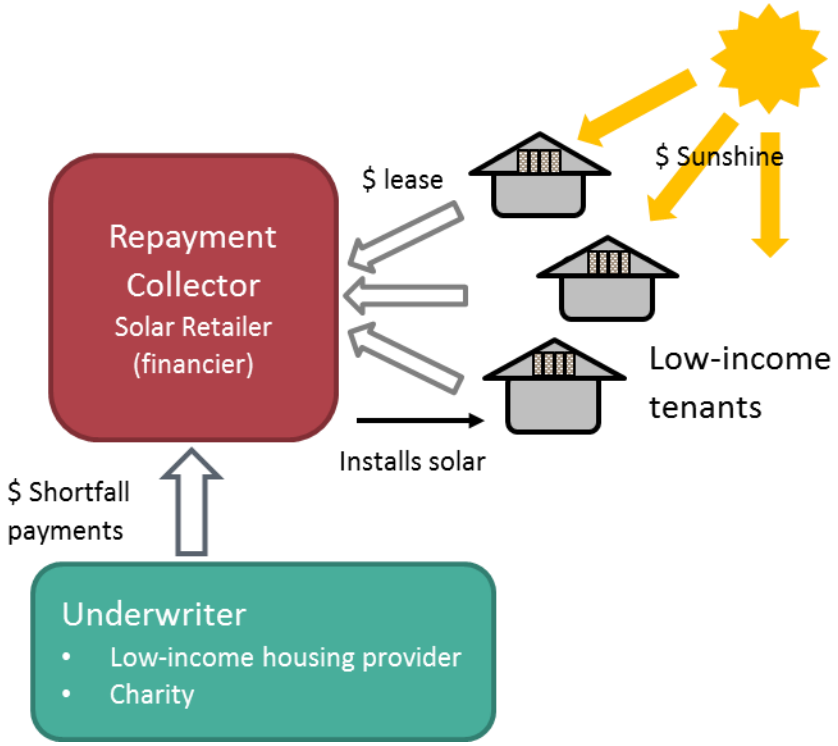
In this option the landlord takes out a solar lease with a solar retailer. The solar retailer installs and manages the solar assets on the low-income households' roofs. The landlord is responsible for paying the lease until the end of the contract period.



Repayment collector	Finance instrument	Financier
Rent	Lease/PPA	Solar Retailer

4.5 Option 5 – Solar Retailer repayment collector

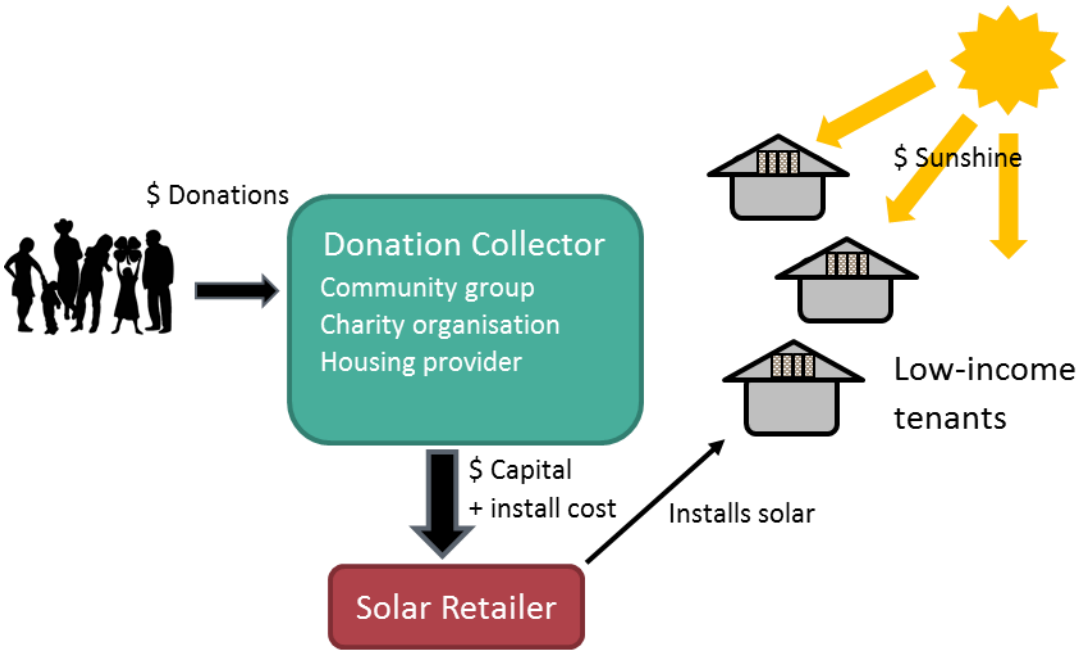
In this option the solar retailer becomes a central project stakeholder as they finance the initial capital and installation costs and are then responsible for collecting repayments directly from the tenant via a solar lease. An underwriter is required to cover the shortfall caused by tenant default. The pros and cons of this option are discussed in Section 3.4 in the table discussing the Solar Retailer option.



Repayment collector	Finance instrument	Financier
Rent	Lease/PPA	Solar Retailer + Underwriter

4.6 Option 6: Donation-based

In this option the 'donation collector' raises donation funds to pay for the capital, installation and program costs. No repayments are required. The pros and cons of this option are discussed in Section 3.3.



Repayment collector	Finance instrument	Financier
N/A	N/A	Community (donations)

5. Quantitative analysis of options

High level modelling of the benefits and costs of each option has been undertaken from the perspective of the tenant. The outputs have been calculated from the perspective of the household. As solar is a long-term investment, benefits to the household have been calculated for both during the program period, and afterwards when the repayments cease. The outputs should be viewed in light of the inputs and assumptions, which are clearly stated below. The authors have selected conservative inputs into the modelling.

After the selection of the preferred program option(s) in Stage 2, full feasibility analysis of the preferred option(s) will be conducted in Stage 3. The full feasibility analysis will include fully referenced costings and sensitivity analysis, as well as the estimation of additional benefits as part of a benefit-cost analysis.

5.1 Inputs and assumptions

The costs in this preliminary analysis are based on the assumption of 100 participating households in the program. It is assumed that the same system size will be installed on each household to allow

streamlined upfront cost and simple repayment collection. Key additional assumptions are outlined in Table 4.

Table 4 Program, technology assumptions, common for all program types

System size per household	2 kW
Capital, install, network cost per household	$3600 (inc. GST)[a]
Generation per year	1450kWh/kW[b]
Module degradation	-0.5% per annum
Repayment-based program duration	12 years[c]
Electricity price (Year 1)	28.5c/kWh[d]
Feed-in-tariff	6c/kWh[e]
Real electricity price growth (per annum)	1%

[a] The capital, installation and network connection cost is inclusive of GST, being based on the average 2kW price experienced in two recent bulk buy projects in Victoria (MASH.org.au, 2015; Positive Charge, 2014).

[b] Module generation assumes an optimal north facing shade-free array; as such, some households will experience less generation.

[c] The repayment term of 12 years was chosen for Stage One modelling as the authors believe this length offers a balance between low per week costs during the contract period and overall economic benefit over the lifetime of the technology.

[d] Electricity prices are based on the average flat rate standing offer on the Australian Energy Regulator's 'Energy Made Easy' website for Moruya in August (AER, 2015). Some customers may access cheaper electricity rates, other customers may pay more.

[e] Feed-in-tariff offers are also based on the average voluntary tariffs offered by the major retailers; however it should be noted that not all retailers offer a feed-in-tariff.

Upfront program costs are estimates based on the actual administrative costs experienced in the Darebin Shire program conducted by Moreland Energy Foundation (Bruce Thompson, Pers. comms, 2015). The estimates assume three information session workshops are conducted. Each tenant will be selected at an estimated cost of $200 per participating household which covers telephone pre-screening, site visit (including labour and transport costs) and technical and economic modelling. Project coordination costs include all other expenses associated with coordinating the site visits, screening and selection of households. Program costs will be covered in detail as part of the Stage 3 Feasibility Analysis and Implementation Plan. The modelled numbers as part of this program assume the costs identified in Table 5 are recovered via through the program and not funded from grant, donation or pro-bono assistance.

Table 5 Program administrative costs – common with all program types (estimated) (Source: Bruce Thompson, Pers. comm., MEFL, 2015)

# Participating Households		100
Project Coordination	$	12,000
Tenant engagement workshops	$	4,000
Tenant site visit, screening and assessment	$	20,000
Screening and information materials development	$	5,000
Upfront administrative cost – total	$	41,000
Upfront administrative cost - per household	$	410

Community energy project costs are based on Repower Shoalhaven's community energy project model, which would be a suitable for a 100 household project. These administration costs are recovered through project repayments. The costs are presented in Appendix Table 1. Also in this table are costs provided by the Sydney

Renewable Power Company for their Public Company investment structure, which would be suitable for a project of 300 + households. Although we are not assessing a 300+ household scale of project for the SHASA project, should a broader collaborative project emerge with other community energy group partners the project feasibility analysis can be reconsidered using these cost inputs.

Finally, Table 6 outlines the assumed interest rate for the range of options modelled. The subsequent fundraising cost for each option is also shown.

Table 6 Financing rates for each modelled program[7]

Option #	Financier	Finance type	Rate (% p.a.)	Lease ($/pa)	Fixed establishment cost	Total fundraising cost
Option 1. Landlord	Landlord	Savings funded, Interest-free repayments	0%	n/a	$0	$401,000
Option 2. Debt financed	Institution lender	a) Mortgage redraw	5%	n/a	$0	$401,000
		b) Regular loan	7%	n/a	$500	$401,500
	Charity lender	a) No interest	0%	n/a	$0	$401,000
		b) Low interest	3%	n/a	$0	$401,000
Option 3. Community financed	Community crowd-funded	Loan or lease	5.9%	$492/hh/yr	$13,750	$414,750
Option 4. Solar lease (landlord)	Solar retailer	Loan or lease	7%	$504 /hh/yr	$0	$401,000
Option 5. Solar lease (direct)	Solar retailer with underwriter. See Option 4 for an estimate					
Option 6. Donation	Multiple	Donation	n/a	n/a	$0	$401,000

5.2 Results

The preliminary modelling results of the six different program options are summarised in Table 7. Note these results assume all program establishment costs are recovered in the household repayments. For a detailed glossary of definitions of the different output metrics, please refer to Appendix B. The costs and benefits are presented for a household which uses 60% of their solar generation. All programs appear to be viable at this level of household self-consumption. The program with the most benefit are those with a level of charity: including donation programs, landlord funded, interest free or low interest loans.

Depending on the program, a participating household with 60% self-consumption will benefit between $60 and $231 in each program year (excluding donation-based programs). Over the lifetime of the technology, participating households will be $8,744 to $10,792 better off relative to the same household who did not install solar. The total savings are forecast to be at least three-times as much as the cost of participating.

[7] Assumes all program administration costs are recovered via repayments

Table 7 Estimated cost and benefit of different program types (2kW, 60% self-consumption) with all program costs recovered in repayments[8]

		Household weekly cost	Breakeven self-consumption rate	Annual benefit (1st program year)	Annual benefit (Post program)	Accumulated benefit (program years)	Accumulated benefit (lifetime)	Benefit-cost ratio (program years)	Benefit-cost ratio (lifetime)	Community investor cash return
Option 1. Landlord	Self-financed (0%)	**$ 6.43**	**25%**	$ 231	$ 592	$ 2,918	$ 10,792	1.73	3.7	n/a
Option 2a. Institutional lender	Mortgage redraw	**$ 8.71**	**43%**	$ 113	$ 592	$ 1,492	$ 9,366	1.37	3.3	n/a
	Regular loan	**$ 9.72**	**51%**	$ 60	$ 592	$ 862	$ 8,736	1.21	3.2	n/a
Option 2b. Charity lender	No interest loan	**$ 6.43**	**25%**	$ 231	$ 592	$ 2,918	$ 10,792	1.73	3.7	n/a
	Low interest loan	**$ 7.75**	**35%**	$ 163	$ 592	$ 2,094	$ 9,968	1.52	3.5	n/a
Option 3. Community	Lease/loan	**$ 9.46**	**49%**	$ 74	$ 592	$ 1,024	$ 8,898	1.25	3.1	**5.01%**
Option 4. Solar retailer	Lease/loan	**$ 9.71**	**51%**	$ 61	$ 592	$ 870	$ 8,744	1.22	3.2	n/a
Option 6. Donation	Donation	n/a	n/a	$ 566	$ 566	n/a	$ 14,802	n/a	4.7	n/a

Table 8 Estimated cost and benefit of different program types (2kW, 60% self-consumption) with all program costs paid for by grant, donation or pro-bono sources

		Household weekly cost	Breakeven self-consumption rate	Annual benefit (1st program year)	Annual benefit (Post program)	Accumulated benefit (program years)	Accumulated benefit (lifetime)	Benefit-cost ratio (program years)	Benefit-cost ratio (lifetime)	Community investor cash return
Option 1. Landlord	Self-financed (0%)	**$ 5.77**	**19%**	$ 266	$ 592	$ 3,328	$ 11,202	1.92	4.1	n/a
Option 2a. Institutional lender	Mortgage redraw	**$ 7.82**	**36%**	$ 159	$ 592	$ 2,047	$ 9,921	1.57	3.8	n/a
	Regular loan	**$ 8.73**	**43%**	$ 112	$ 592	$ 1,482	$ 9,356	1.41	3.6	n/a
Option 2b. Charity lender	No interest loan	**$ 5.77**	**19%**	$ 266	$ 592	$ 3,328	$ 11,202	1.92	4.1	n/a
	Low interest loan	**$ 6.96**	**29%**	$ 204	$ 592	$ 2,588	$ 10,462	1.72	3.9	n/a
Option 3. Community	Lease/loan	**$ 8.53**	**41%**	$ 122	$ 592	$ 1,608	$ 9,482	1.43	3.5	**4.98%**
Option 4. Solar retailer	Lease/loan	**$ 8.72**	**43%**	$ 112	$ 592	$ 1,489	$ 9,363	1.41	3.6	n/a
Option 6. Donation	Donation	n/a	n/a	$ 566	$ 566	n/a	$ 14,802	n/a	4.7	n/a

[8] For Option 5 – see Option 4 for an approximation

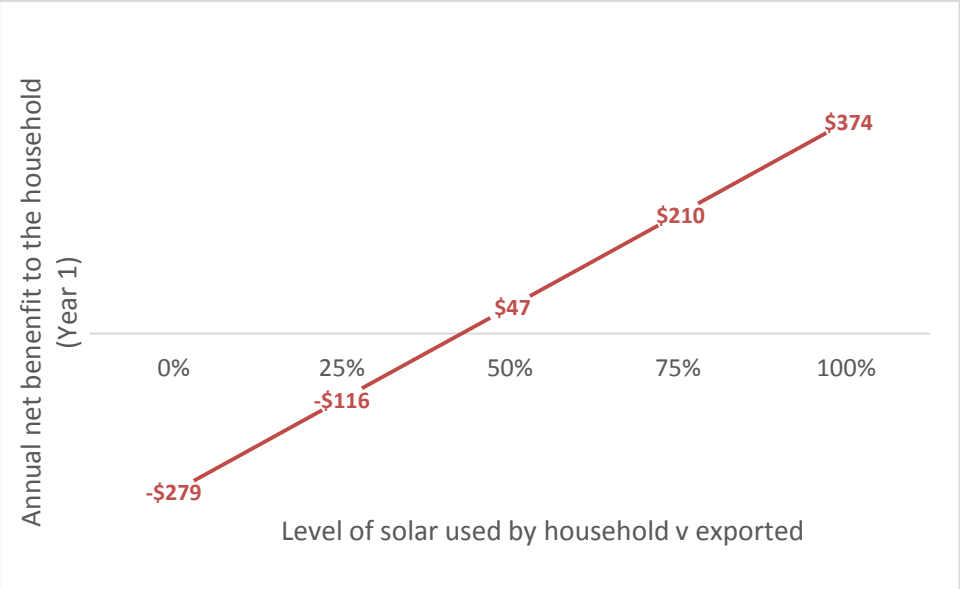
In

Table 8, the outputs are presented again, but this time the program costs identified in Table 5 are not recovered through the program repayments, but rather paid for via a grant, donation, pro-bono or other means. As can be seen, the repayment drops by approximately $1 per household per week which in turn has a significant impact on the 'Break-even self-consumption rate' and subsequent household benefit.

In Figure 2 below, we have selected a single program – Option 2a Institutional Lender (Mortgage Redraw)- to demonstrate the sensitivity of household benefits to the level of self-consumption. In this example, when the level of self-consumption drops to 43%, the household is cash-flow negative. This has implications for program design and shows the importance of lowering program cost and, in particular, effective and accurate screening of households to determine self-consumption rates.

When considering household cash-flow, project proponents should also consider the seasonal variation in solar benefit. In a hypothetical example, a participating household may save only $6 per week off their power bill during winter, but $13 in summer. If their weekly cost is fixed at $8 all year, then they actually pay more during winter despite making stronger savings in summer. One solution is to seasonally weight the weekly cost; however, this would be more compatible with certain repayment collection mechanisms (such as on-bill financing or landlord utility charge) over others (such as rent repayment which usually have no seasonal variation).

Figure 2 Household sensitivity to level of self-consumption – Option 2a – Institutional lender (mortgage redraw)[9]



6. Next steps

The next stage of this process is a workshop with SHASA to determine which program option will undergo further feasibility analysis. During this workshop, the team will be invited to confirm:

1. The target audience for the program
2. Whether they wish to run a donation or a repayment based program
   - If donation based program is chosen no repayment is needed. The steps involved in implementation will include:
     - securing a partnership with a housing provider
     - Fundraising.

[9] Assumes a mortgage redraw rate of 5%.

    - Getting quotes and installing the systems.
- If an investment based program is chosen the community's role will depend on what the central stakeholder(s) is interested in having them do.
    - Option 1: present this report/workshops to central stakeholders and put them in touch with other key stakeholders i.e. solar installers, financiers and independent consultants. SHASA may have a role in terms of providing volunteers to screen households for solar suitability.
    - Option 2: Opton 1 + present community crowdfunding as an option. If central stakeholder wants community crowdfunding, SHASA will have a key role in engaging with the community to raise the capital.

As such, the exact role of SHASA in the implementation of a repayment based program is in part dependent on the central stakeholder (likely a housing provider) and part dependent on the capabilities, interest and ambition of the group. For example, SHASA could outsource some of the elements of undertaking a community investment process and/or securing solar installers to another community organisation.

Whatever program is chosen, it is critically important to de-risk each participating households and to ensure beyond reasonable doubt that they will experience positive cash flows during the program term. The key household input related to this is the level of solar self-consumption. For example, a household who uses a very low amount of the solar energy (i.e. 30%) will be in a negative financial position during the program term of most modelled programs, however one who uses 50% will be cash flow positive in most programs. Such a high level of participant sensitivity, highlights the need for appropriate and accurate screening of tenants; further information for which will be provided in the Stage 3 Implementation Plan.

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Appendix A: Community financing administration costs

Appendix Table 1 – Community financing administration costs – upfront and ongoing

	Private company (Repower Shoalhaven model)	Public company (Sydney Renewable Power Company model)
Data Source	Chris Cooper (pers. comm., 2015)	Andy Cavanagh Downs (Pers. Comm., 2015) *estimation
Upfront administration costs		
Company establishment/ registration costs	$1,250	$13,220
Accounting/legals	$1800	$5,000*
Personal Property Security Register costs	$200	$200
Contingency	$500	$2,000
Project development fees	$10,000	$25,000*
Total establishment cost	$13,750	$44,420
Ongoing annual administration costs		
Billing and administration - third party	$1,200	$2,000
ASIC compliance fee	0	$1,161
Banking fees	100	$300
Accountancy fees	700	$10,000
Office rental	165	$165
Wind down costs (one off cost in final year)	500	$3000
Total annual costs	$ 2,207	$13,876

Appendix B: Definition of results metrics

Appendix Table 2 - Definition of outputs

Household weekly cost	This is the household weekly cost, assuming 100% of costs are passed on to the tenant and there are no ongoing program administration fees.
Breakeven self-consumption rate	This is the level of solar generation which must be self-consumed (as opposed to exported) by the household in order for them to break even in the first year of the program.
Annual benefit (1st program year)	**This is the forecast net annual benefit in year 1 of the program i.e. Savings less costs**
Annual benefit (Post program)	This is the forecast net annual benefit in the first year after the program's repayment period ends.
Accumulated benefit (program years)	This is the accumulated benefit to the household at the end of the program's repayment period
Accumulated benefit (lifetime)	This is the accumulated benefit to the household at the end of solar power systems useful life (25 years)
Benefit-cost ratio (program years)	This is the ratio of accumulated benefits to accumulated costs at the end of the program's repayment period.
Benefit-cost ratio (lifetime)	This is the ratio of accumulated benefits to accumulated costs at the end of the program's repayment period.
Community investor cash return	This is the forecast internal rate of cash return per annum for the community investor. This cash return includes capital repayments, dividends and franking credits.