



# Solar on Strata

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## WATTBLOCK

**Michael Crouch Innovation Centre  
Gate 2, High St, University of NSW 2052**

**Phone: +61 (2) 9977 1801**

**Email: [brent.clark@wattblock.com.au](mailto:brent.clark@wattblock.com.au)**

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## Overview

Australia currently has the highest rooftop solar per capita with 23% penetration. There are now over 2 million houses in Australia with solar panels. However, apartment blocks or strata schemes have not yet embraced the solar revolution. It is estimated that less than 0.5% of residential strata schemes have solar panels, nationwide.

Over the past 4 years, Wattblock has provided over 250 solar feasibility studies to residential strata buildings across Australia. We have also assisted 20 residential apartment blocks to select vendors for solar installation, check the performance of their existing solar systems, or increase the size of their existing solar system.

***There are 1.4m apartments in Australia housing 10% of Australians. A third of new dwellings which are constructed are apartments. 62% of Australian apartments are in buildings which are under 4 storeys.<sup>1</sup>***

To date, the uptake of solar on apartment buildings has been slow, but we expect it to accelerate. The introduction of battery subsidies which residential strata schemes are eligible for will be a stimulus for solar & batteries on strata.<sup>2</sup> Also, the introduction of NABERS for Apartment Buildings six star energy ratings should increase the uptake of solar on apartment buildings.

The benefits of solar for apartment buildings are far-reaching. For individual apartment residents there are lower electricity bills, a clean source of energy and reduced reliance on the electricity grid. For Australia's electricity networks the benefits are reduced network demand. Solar is the lowest cost electricity generation model which can be considered by a strata scheme and provides reduce CO2 emissions meeting local, state and federal emissions reduction targets.

This paper covers the major considerations which a strata scheme needs to take into account, in order to successfully implement a solar system in the most equitable manner. It attempts to do this without excessive technical jargon or background knowledge of solar, such that it can be read by an enthusiastic strata committee member, who doesn't necessarily have a science or engineering background.

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<sup>1</sup> Solar Apartments – Workshop 3<sup>rd</sup> December 2018 CEEM / SPREE, UNSW Sydney. Mike Roberts, Dr Anna Bruce, Associate Professor Iain MacGill

<sup>2</sup> <https://www.qld.gov.au/community/cost-of-living-support/concessions/energy-concessions/solar-battery-rebate/about-the-program>

## Governance Model

When considering a solar system for a residential apartment block, the main governance models which need to be considered are:

1. All Owners participate
2. Some Owners participate on an “opt-in” basis
3. Energy retailer governs the system
4. External entity governs the system, e.g. trust or special purpose vehicle

Let’s examine scenario 1 to start with. If all Owners participate, this will result in improved use of capital from the capital works fund (sinking fund) and it will preserve equity between generations of owners. Owner Occupiers will benefit through lower electricity bills and lower strata levies as well as receiving a capital gain. Owners typically live in an apartment for up to 9 years, so will receive plenty of benefits.

Owner Investors will receive a capital gain benefit on their investment and should be able to negotiate increased rent, based upon the lower utility costs in the apartment. Owner Investors will enjoy lower strata levies.

Tenants will benefit from lower increased electricity costs, but may be giving up some of these benefits to their landlord.

Now consider scenario 2. This is typically a governance arrangement where there are some “hold outs” within the community of Owners who do not want to participate in the solar project. However, there is a “driving force” of Owners who do want to participate and they decide to proceed on an “Opt-in” basis. Only those who pay for a solar system get connected and get benefits of cheaper electricity. Those who don’t initially participate can connect to the solar system, after paying a connection fee later on. By-laws are required to get this type of system up and running. There are also possibly reduced benefits for the common area meter as the Owners fronting the bill may want to keep all the solar benefits to themselves.

In the third scenario, the Energy Retailer owns and maintains solar equipment under an energy regulation governance model. They provide cheaper electricity to the residents and/or common areas than can be provided by the grid, but not as cheap electricity under 1) or 2) as the energy retailer needs to recoup their capital costs of the system.





Figure 1 - Veriu Suites in Camperdown NSW has a 5kW solar system under a 15 year Power Purchase Agreement (PPA).

A fourth scenario, which has been used in other “community” solar projects but hasn’t been implemented in strata yet is that a Trust or Special Purpose Vehicle Owns and Maintains Solar Equipment. This is an alternative to either strata governance models (1 or 2) or the energy retailer governance model (3). Investors in the trust or special purpose vehicle may be anyone, including interested owners, residents or external financiers who are not related to the building. Under this model electricity costs will be cheaper than grid but not as cheap as strata governance model where all owners participate.

## Optimal System Size

A key question which a strata community has to address is: *How big should the solar system be?* There are a lot of factors to take into account here. These include energy billing rates, what electricity loads are to be included and whether the typical strategy of “minimizing” feed-in to the grid is to be followed. (When excess solar is produced, which cannot be consumed by the loads inside the building this is exported back into the energy grid and is called “feed-in”.)

Let’s start with energy billing rates. These may be different for the common area meter (may include things like capacity charges) when compared with the bills for individual apartment meters. If buildings do have capacity charges, then solar can have a positive impact on capacity charges (provided you request a capacity reset) as solar generation often matches peak consumption spikes brought on by air conditioning.

The energy billing rates inside the apartments are often on a different class of tariff, known as a residential tariff. These rates are usually less attractive than the rates for the common area but keep in mind the peak, off peak and shoulder periods may not be the same. Commercial tariffs are often highest during the day, where people expect residential tariffs to be highest after work, when everyone gets home. Solar generated during the day can have a bigger saving on the commercial tariffs on the common area meter than people would often expect.

The next challenge for an apartment block is to work out what energy loads the solar power is going to be applied against. This is called load profiling. The first question regarding common area loads starts with “is there enough load” to make it worthwhile applying solar energy to. If there are 8 common area lights in a townhouse, the answer will be no. The second question is should solar be applied to the load in the apartments as almost every apartment has a fridge running 24 x 7. A rule of thumb is 1 kW of solar per apartment and more if there is electric hot water heating during the day or a split system air conditioning system, which is often used during the middle of the day. What is the occupancy rate of the apartment block in terms of persons per apartment and also occupied apartments (e.g. are there any apartments which are permanently empty as people have gone overseas? Short term letting? Major renovations?)

If the load from the apartments (or some apartments) is to be included, what is the “solar sharing” governance/technology model. Are you going to install solar sharing gateways? This is only feasible if all the apartment meters are in the one location (i.e. not in meterboards scattered up the different levels of the building).

- What are some common pricing models around solar sharing gateways, on top of the usual solar system components? (e.g. \$3,000 for each solar sharing box.)
- Is there a maximum number of apartments which can connect to a solar sharing box? (e.g. 30)
- Will there be a one-time connection fee for each apartment who connects up to the solar sharing box? (e.g. \$160 + electrician call out fee).
- Will each apartment which connects up have to pay a monthly fee for a separate bill for the solar energy which they consume? (e.g. \$4.99 per month per participating apartment)

- Is your strata scheme viable for an embedded electrical network? As a rule of thumb, you would need over 60 apartments to make a retrofit viable. You would also need a high proportion of owner occupiers or a high proportion of owner investors. If you have a small number of apartments, you might be able to collect everyone's energy bills for analysis. Otherwise, an estimate of the consumption of the apartments will need to be made to estimate the load profile of the apartments in aggregate.



Figure 2 - The Orchards Norwest in Kellyville will eventually have 24 tennis courts worth of solar panels generating 1GWh of free electricity for 1300 apartments via embedded network.

- What type of embedded electrical network will you implement? One where the Owners Corporation owns all the meters, takes the liability for unpaid electricity bills of residents and gets the lowest electricity rates for everyone? Or one where the embedded network is outsourced to a licensed energy retailer who then owns and maintains the meters.
- Will you need to appoint an embedded network manager? Embedded networks, like solar sharing gateways, are mechanisms to be able to apply solar power into the apartments.

Now that we have decided which loads within the apartment block to apply solar to, we need to decide whether the size of the solar system will be optimized to minimize "feed-in." Remember, solar generation is less in winter than it is in summer. The solar system which is the right size in winter is oversized when it comes to summer. A common strategy is to try and size the solar system to an in-between size, where it will feed-in 10% in summer. Note that grid consumption costs per kWh are always much higher than feed-in tariffs (e.g. an apartment might spend 35c per kWh on electricity. Solar feed-in for selling solar power to the grid might be 5c-12c, depending on your common area meter tariff). You most likely will have to change your tariff to one which has a feed-in rate, after you install solar. If your solar system is over 40kW in size you may not be allowed to get feed-in rates at all, depending on your grid provider (e.g. Ausgrid, Energex).



To determine the best solar sizing, you should try and request 2 years of common area meter data from your energy retailer. This is sometimes called interval data and will be given to you in 15 minute intervals or 30 minute intervals. If you have an older analogue style common area meter, you will not be able to request this. Your load profile will have to be estimated using software.

Another item to take into account in the optimal solar sizing is “What is the Physical Structure of the Solar Panel Installation going to be?”

A strata scheme can put a single solar system on its roof and connect this to the participating meters. It can also install individual solar systems for individual apartments and connect this to the private apartment meter(s).

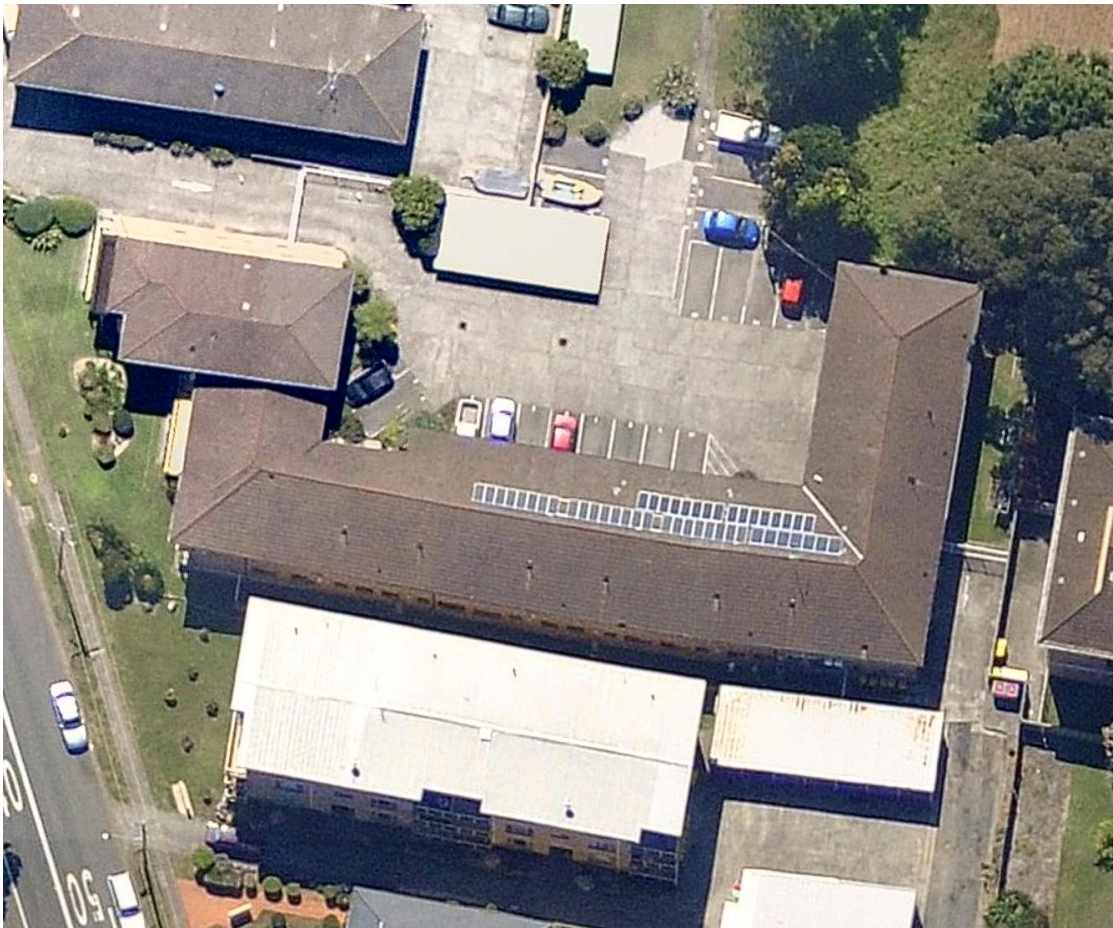


Figure 3 - Wallis View at Forster in NSW has 5 x 1.5kW solar systems connected to individual apartment meters and a 2.5kW solar system connected to the common area meter. (Source: Greenstrata)

Having multiple solar systems for individual apartments reduces economies of scale in installation. It also reduces the “smoothing” effect of a single solar system which works best when load profiles from individual apartments change over time. Finally, a single solar system is best for futureproofing the apartment block for batteries.



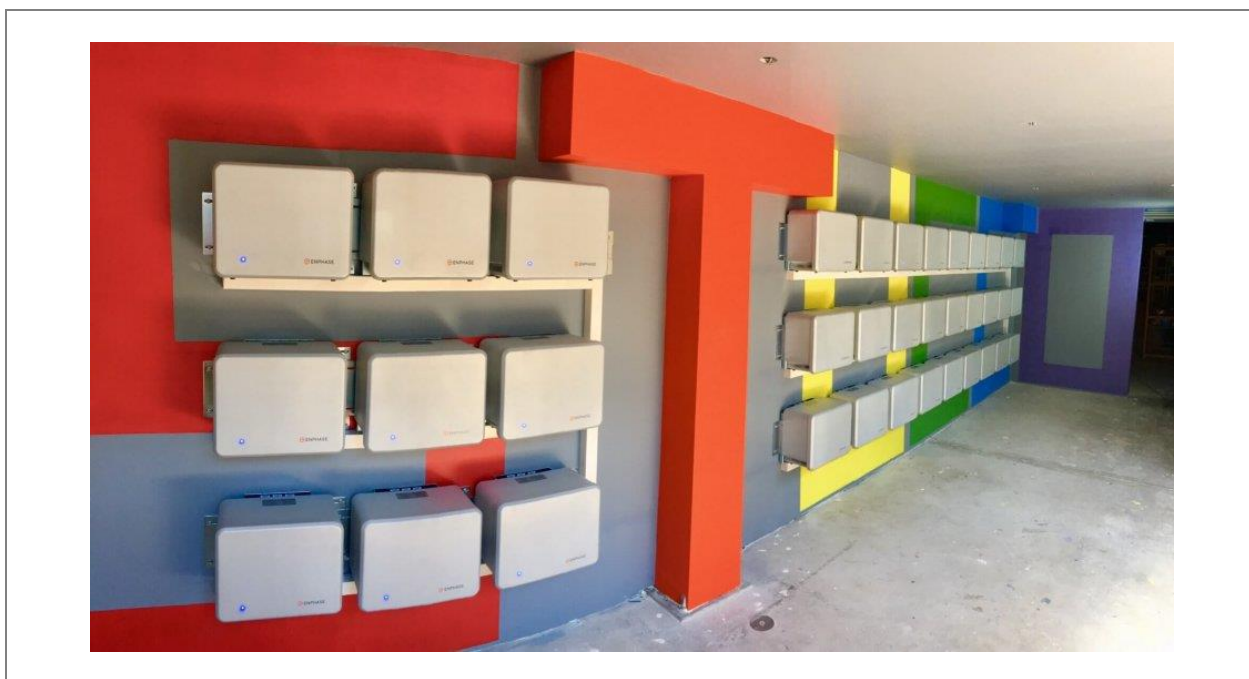


Figure 4 - 43.2 kWh of batteries installed at Sydney University Housing ("Stucco")

Another item to take into consideration when load profiling is any future energy efficiency upgrade to common areas. For example, if you are going to do a common area LED lighting project, you should reduce the size of your solar system and not size it on today's load profile. You should size it for the load profile after an LED lighting upgrade.

What are magic numbers for solar systems? These change over time in accordance with the change in government policy around rebates. However, a couple of magic numbers can be the largest solar system size which can be installed without having to install grid protection equipment (e.g. 39kW via a 30kW inverter). Another magic number is 100kW as that is the largest you can install under the Small Technology Certificates regime and qualify for an upfront rebate. There is a possibility that the small technology certificates will end before 2020. The next magic number is 200kW. This is about the size solar system where the next government rebate scheme called Large-scale Generation Certificates (LGC's) comes into play and is effective. However, the rebates on LGC's are not paid upfront. They are paid out over time.

Not all solar panels are the same size or the same efficiency. Once you have optimised the size of the solar system, the next thing is to take into account the panel wattage price for performance trade-off. Are you satisfied with more cost-effective 280W panels or are you interested in more expensive 360W panels. If you are short on roofspace and want to squeeze as much generation onto the roof, you should go for a higher wattage to ensure maximum kW per square metre. Maybe you want to pay more for "edge protection" and have panels right down to the edge of the roof.

One final thing to take into consideration on the optimal system size is "are there any heritage listed constraints?" Is it the case that solar panels cannot be seen on sections of a heritage roof which are visible from the street but could be installed on sections of the roof which are not visible from the street?

## Choosing a vendor

Strata committees are used to getting attention from a number of service providers (e.g. strata lawyers, cleaning companies, etc). However, strata schemes should not assume that solar installers actually want their business. Solar installers are run off their feet with fast decision cycles in residential homes, where there are fewer installation challenges. Larger solar companies are dedicated to commercial solar installations. Strata schemes fall in the “dead zone” of the solar market. Most solar installers have been burnt by strata schemes which request quotes, request re-quotes and can never make a decision. For this reason, they are not attractive leads for solar installers. However, there is nothing stopping a strata scheme from requesting 3 quotes from an online solar website. The key problem is that the quotes will likely come in with different sizes of solar system and make an “apples for apples” comparison difficult.

## Private request for proposal

Some solar companies do not like strata schemes releasing “request for tenders” as the size of the job is so small for them and the strata committee may not have decided to go ahead with the project. For this reason some solar companies prefer strata schemes to issue “Expressions of Interest” or “Request for Quote” or “Request for Proposal” instead.

The challenge for the strata committee is to understand the value of each response across cost, quality and warranties on the individual system components.

## Installation

If the strata scheme has a pitched tiled roof with wooden support beams, you will want to engage a structural engineer to ensure that the roof can support the weight of the solar system.

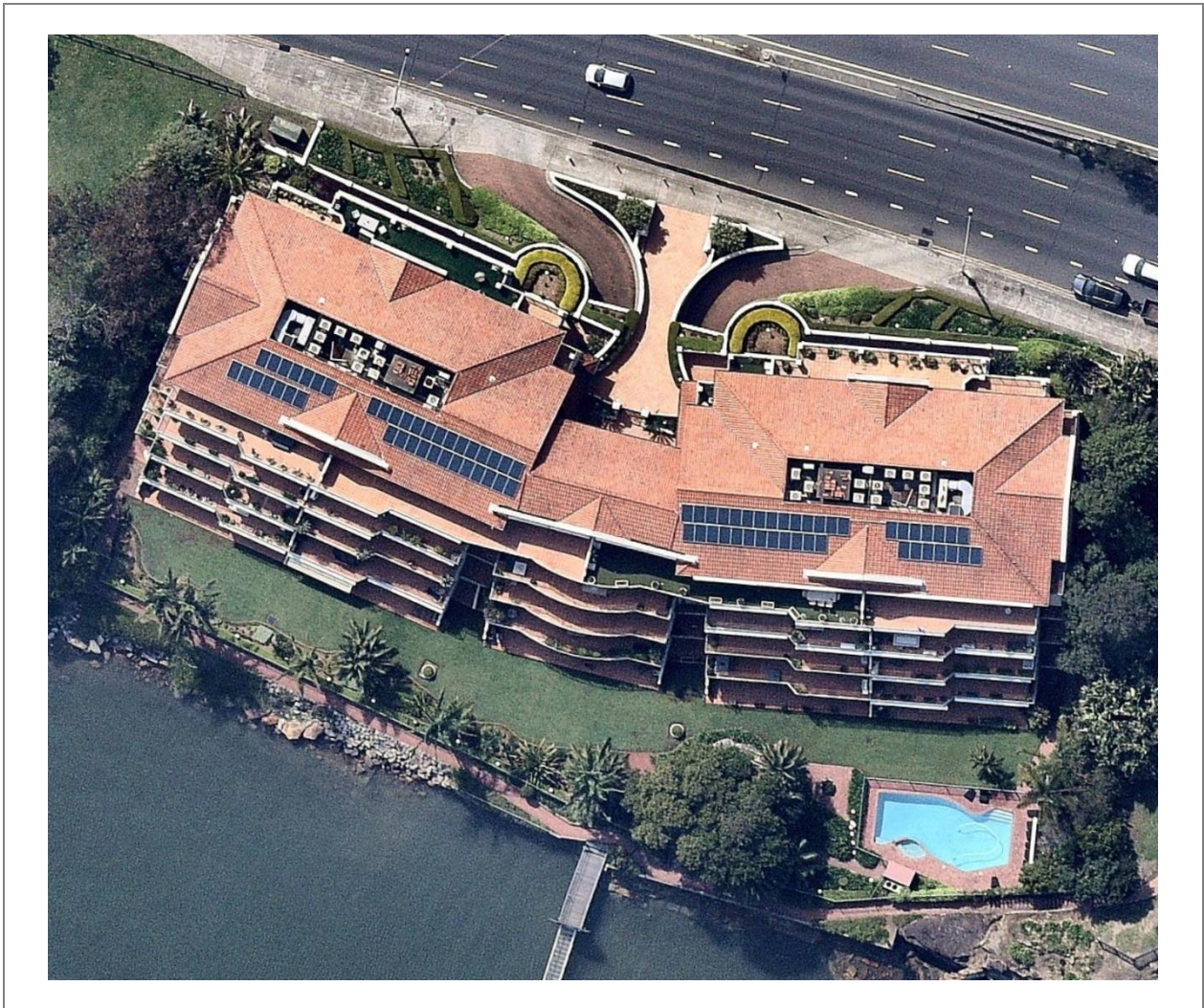


Figure 5 - Seabreeze Apartments in Blakehurst installed solar on a tiled roof.

If the building is medium-rise to high rise, then you will need a structural engineering sign-off for wind speeds in that vicinity (unless this is provided by the solar company itself). If it is not a well-known energy company, before a solar installer commences work, a strata scheme should ask for a copy of any installer's certificate of insurance relating to the installation that may be required by legislation. Also, a copy of the installer's Certificate of Currency of Contractor's All Risks insurance cover should be checked for a minimum of \$10,000,000. The key things the strata scheme needs to protect are the structural integrity of the building, the integrity of waterproofing for the roof and common property walls and integrity of fire safety separations.



## Preparing for a solar installation

Some checklist items which you can go through prior to installation of a solar system are to make sure:

- That you are only using licensed installers
- You meet council requirements
- The building has structural integrity to support the weight of solar panels
- There is a structural engineering sign-off on method of attaching solar panels at height of roof, taking into account wind speeds
- You don't compromise waterproofing
- The goods delivered meet the specification
- Clean up occurs after install

## Getting materials to roof for installation

The key questions which need to be answered at this stage are “do you require a structural engineering sign off on wind speeds in the local area”? This is to ensure that the future solar system does not get captured by a wind gust and fly off the roof. Are panels able to be installed via a ladder or is a scissor lift/elevated work platform or crane required? If a crane is required, do you need to apply to the local council for the right to close the street? Do you need to engage traffic controllers? Do you need to have tiger tails put on electricity wires, prior to craning?

Some strata schemes have a fire escape from the top floor serviced by the lift, which allows people to walk out onto the roof. Keep in mind, solar installers do not want to hoist panels up a ladder at the top of your firestairs and through a skylight as there is too much risk of damaging the solar panels. In some cases, access to the rooftop can be negotiated from a private resident's balcony, however the solar installers do not desire this approach.

## Racking and mounting systems

The racking or mounting system is the metal frame which the solar panels are attached to, which is then fixed to the roof of your strata scheme. There are two main ways for attaching the racking system to a concrete roof. This is using anchor points which are drilled into the roof (and then waterproofed around) and the other is using ballast. It is far easier to get a structural engineering sign-off for a racking/mounting system which is connected by anchor points. There seems to be unwillingness of structural engineers to sign off on the amount of ballast required. (The exception to this is if you use a large energy company which might have the ability to do a structural engineering sign-off internally, but be prepared to pay a premium for this engineering).



Figure 6 - Aria Building at 5 Potter St Waterloo, Sydney with ballast weighted solar system.

## Estimating and Measuring the Return on Investment

This is the most difficult part of the process for the Owner/strata committee member challenged with estimating it. There are a number of factors which affect return on investment when installing solar on apartment buildings. It is a much more complicated estimate than solar on residential houses.

The obvious things which need to be included are the installation and setup costs. After this you have maintenance costs which may include cleaning costs and replacement of the inverter somewhere between 7 and 12 years into the 25 year lifespan of the solar system. The hardest input into the ROI calculation is future electricity prices over 25 years. This includes two components, being the grid import electricity rate prediction and the solar feed-in rate prediction. Grid electricity prices will probably be higher in 25 years time as more people go off grid and fewer people are left footing the bill for the grid infrastructure. Feed-in rates may reduce over time as more rooftops in neighbourhoods get solar systems. However, if energy trading of solar feed-in takes off, then this may see higher feed-in rates over time.

The next challenge for strata is the “Benefits Distribution Model” for solar. There is a pool of benefits which, based upon governance model decisions, can be distributed differently across the Owners Corporation, Owners, Tenants and external entities who may have funded the upfront capital costs of the solar system. Is the Owners Corporation leasing roofspace to an external entity? Is the Owners Corporation on-selling electricity to residents at a higher rate so that it can cover maintenance costs of the system. Thankfully, there is already a private tax ruling which says that solar feed-in “revenue” does not have to be declared on a lot-entitlement basis on individual owners’ private tax returns. Are there “foreign” entities involved in the governance model such as a licensed energy retailer providing a Power Purchase Agreement (PPA) or a Trust/Special Purpose Vehicle which actually owns the solar system?

## Non-financial benefits

Most Owners in strata schemes will focus on the financial benefits and ROI. However, there are some non-financial benefits to a solar system which may resonate with some Owners. These include reducing environmental footprint of the building, improving the NABERS for Apartment Buildings rating, reducing air conditioning costs for individual apartments on the top floor under the solar system and preparing the building for electric vehicle charging.

## Metering

A key question which needs to be asked is whether meter upgrades and meter board upgrades are part of the solar project or not. Properly managed strata schemes should have upgrade of meters and metering boards to be AS3000 compliant in their capital works/sinking fund plans. The benefits of upgrading old meterboards are reduced risk of electrocution, reduced fire risk and preparing the building for electric vehicle charging. For this reason, the argument should be that meter and meterboard upgrades are not included in the ROI for the solar system. They are actually items which should be scheduled as part of the maintenance of the building. Keep in mind, you may already have digital meters installed, rather than the old analogue (spinning disc) meters but these may not be ready for solar. Also, is there space on the existing meterboards for smart meters? The footprint of the smart meter is often larger than the old analogue meters. The other key consideration for a strata scheme is the location of the individual apartment meters. These can all be in switchrooms or are sometimes distributed in metering cabinets on each floor, or every second floor of the apartment block. If the meters are located in cabinets on different floors of the building, then the apartment block probably cannot use solar sharing gateway technology. This is usually only viable if all the meters are located in switchrooms.

Note: The solar smart meter (also called Net Meter) allows the energy retailer to calculate how much solar energy is fed back to the grid. The new solar smart meter which started rolling out after Dec 2017 allows a single phase inverter to be connected to three phase supply while all three phases are able to “access” solar energy.



## Cabling

Cabling connecting panels to the inverter and the inverter to the meter will generally run through a conduit on a building's external façade and/or through an internal service shaft. The type of conduit, route taken, method of affixing it, and the size of any holes in common property floors and walls and their impact on waterproofing need to be considered. The holes can also impact the integrity of fire safety separations between owners' lots and the common property.

## Applying for Building approvals

A rooftop system under 10kW can usually be installed without any approvals from the local council. Systems between 10 and 100kW may need a Complying Development certificate. Systems over 100kW will need a Development Application. (Note: under energy regulation, systems over 100kW will also need to be regulated as “powerplants” so any solar system over 100kW is not for the faint-hearted strata scheme).



Figure 7 - 99.94kW solar system (350 panels) on Quay Grand at Circular Quay

## Roofspace

The direction of roofspace on a strata scheme is important. North facing roof areas are the best. Solar panels can also be installed on east and west facing roof areas but the energy production is not as good. West facing roofs match solar production with consumption, if solar is being channelled into individual apartments but are not as good if solar is only being channelled into the common area meter.

## Roof Surface

We have encountered strata roof areas which are flat concrete (sometimes with pebbles on them for insulation), Colorbond or tiled. It is possible to install on all of these roof types.

A real challenge is that according to research from the UNSW's City Futures Research Centre, 85 per cent of respondents in buildings built from 2000 reported defects in the construction of their building. Among the building defect problems in a number of cases is water penetration and waterproofing of concrete roof areas, which should be part of the capital works plan for the building. A common question we get when people have recently waterproofed their strata roof is "do we need to penetrate the membrane?" Ballast weighted solar installs on strata schemes are possible, except they are more expensive than anchor point mounted solar systems. This is because it is difficult to get a structural engineering sign-off on the weight loading required from tier 2 or tier 3 solar suppliers. Ideally, anchor points should be inserted into the slab before waterproofing, but then the challenge is that you must have selected your solar installer and racking system in advance of waterproofing the roof.

Other roof-related considerations include historic or future development approvals for a greenroof or BBQ area. If these are to be installed, then it will be necessary to fence off the solar system on a flat 'active' rooftop. The other consideration is plant and equipment shading from air conditioners, ventilation fans, hot water boilers, water tanks or lift overruns. Trees can also be a source of shading as well as other buildings or future buildings. Can trees be cut down or trimmed to improve solar generation? It may warrant investing in more expensive inverter technology (DC Optimisers, microinverters) if shading of part of the system is present. This allows individual solar panels in an array to keep generating solar when other solar panels in the array are subject to shading.

## Estimating the optimal size solar system

The two key questions to ask here are:

- Is there enough load in the building, that solar can cover all available roof area where it can be installed?
- Is there not enough roof area to cover the load of the building during peak solar generation?

Most of the time it is the latter, with the exception of some sprawling townhouse developments. The other factor which needs to be taken into account is whether the solar power is being channelled into the common areas only, or into the common areas & apartment loads combined. It is quite difficult to estimate the load of all the apartments in a strata scheme as it requires knowledge of occupancy rates. These can vary depending on the type of strata scheme development, the age of the residents, presence of split air conditioning systems on the individual apartment meters (but not necessarily all) and type of hot water heating if there is no common hot water system. (The electric hot water systems in individual apartments are occasionally on controlled load.)

## Maintenance

Studies have shown that more than one third of all solar systems are underperforming in Australia. A number of the 2 million solar systems which have been installed on rooftops in Australia are not operational. This can be due to failed inverters, DC isolator switches being turned off, the open circuit voltage being too low for the inverter or no DC voltage at the inverter coming from the array.

Many solar panels will last 25 years if regularly maintained. Some come with a performance warranty of 80% of generation in year 25. That is, the panel will still generate 80% of the electricity that it did when it was first installed. (In other terms, there is performance degradation of 20% over 25 years).

Other maintenance considerations are birds nesting under the solar arrays increasing the bird poo on the solar panels and decreasing performance.

A number of solar systems are installed with the AC isolator switches not being easily accessible from the inverter to enable safe shutdown of the system.

In some poor installations, the solar net-meter is not installed to allow capture of feed-in generation.

Due to the need to prevent water penetration, there are cases where the solar installer has resealed entry points to the isolator and/or inverter making maintenance more difficult.

For these reasons, it is highly recommended that a strata scheme gets a solar monitoring system installed. The benefit of a solar monitoring system is that it will show you via a web browser or mobile phone app what the production is. This can be used to identify faults early and/or schedule cleaning as needed. Scheduling cleaning may not be necessary on a tilted roof (>15 degrees) as the rain will provide “self cleaning events”. It is also recommended that the monitoring system uses 3G/4G rather than Wi-Fi. This avoids the problem of Wi-Fi range and having the owners corporation setup a dedicated Wi-Fi account.



Occasionally, an individual owner will install solar panels on a common area roof (with permission) for benefit of their own individual apartment only. In this case, the Owner is responsible for maintaining the system and any common property at a point of contact between the system's components and the common property. This would include to the Owner repairing any damage caused by the system to common property or the property of other residents. A by-law should be put in place to manage the relevant responsibilities in these cases.

## Grid approval

An approval is required from the grid provider (e.g. Ausgrid, Energex, Citipower) if connecting a solar system to the grid for feed-in. Typically, feed-in will not be allowed if the system is over 30kW, although this may depend on the number of nearby solar systems and the individual grid provider. Grid protection devices are required for systems over 30kW.

## Billing Model for Solar Power Generated

There are two different models which could be considered for solar on strata. These are individual user pays billing for solar power consumed and "solar power as a free utility" for residents on a first come, first serve basis. All the examples we have come across to date are "user pays" but there could be a case for the Owners Corporation providing "free solar power" in some instances. This would change behaviours of residents to set washing machines to run in solar generation windows and replace existing private gas hot water with electric heat pumps if they are on the ground floor.

Most strata schemes will need to have a "user pays" model for the amount of solar consumed by each apartment. This can be operationalized through a two bill system or a one bill system. Under a two bill system, each resident will receive one grid electricity bill as normal and a separate bill for solar power consumed. Under a single bill system, each resident will receive one electricity bill with grid import and solar consumption itemised separately. In some cases, such as an embedded electrical network (smart meter network), each resident will receive a single bill with a "blended rate" across grid import and solar electricity consumed.

## Batteries

Batteries are not currently financially viable for most strata schemes. However, many strata schemes are likely to install them in the future for return on investment and energy security purposes.

If your strata scheme is likely to install batteries within 2 years time, it should consider installing a larger solar system now (if you have the roof space) and create more solar feed-in for 2 years, until your battery is installed and then capture that feed-in in the battery instead of feeding it into the grid. If it is going to be 5 years until you install batteries, don't install a bigger solar system now. Look at a second solar project in 5 years time to install more panels at the same time as installing your batteries.

The energy security benefit of a battery is higher in buildings where the strata scheme has a lift. This will potentially give mobility impaired residents the ability to leave the building via lifts during a power outage.

Batteries can also be charged up on off-peak grid power and discharged during peak periods in a process called time-shifting. The payback on time-shifting does not currently make standalone batteries viable from an ROI perspective. However, adding time-shifting and capture of excess solar, increases the return on investment but potentially reduces the lifespan of the battery. Further financial benefits will accrue to batteries once they can be enrolled in Demand Response programs with local grid providers. By giving grid providers the ability to remotely discharge your battery at their discretion, strata schemes will get compensated at rates much higher than current feed-in rates from solar.

## How to Fund a solar system

Keep in mind that typically strata schemes are getting a return of 0%-2.5% on the funds in the capital works/sinking fund. If the size of the capital works/sinking fund is greater than the cost of a solar system, capital will be better deployed in the solar system which will generate 4 to 8 times the return on investment, compared to the interest rate on the capital works/sinking fund.

Special levies are generally unpopular but in affluent areas, strata scheme owners may choose to pay a special levy rather than take out a finance arrangement. The downside is that all owners need to participate in a special levy.

Strata loans can be taken out to finance solar. These are generally financially viable as the energy savings outstrip the interest rate on the strata loan.

In situations where not all owners want to participate and receive the benefits of solar (e.g. 6 owners in a scheme of 8 townhouses), then a strata lawyer can setup a trust or special purpose vehicle to own the solar system, outside of the strata governance model. Under this model, not all owners need to participate.

Another model is for an energy company to finance the solar system via a Power Purchase Agreement (PPA). Under this model, there is \$0 upfront capital cost to the strata scheme and the residents just pay for solar power on a cents per kilowatt hour basis over the lifespan of the power purchase agreement which could be 10 years.

Another model is where the energy retailer leases the roof space from the strata scheme for 10 years. There is no upfront cost for the solar system but after 10 years the Owners Corporation can buy the solar system for \$1.

## By-laws

A solar system is a change to the physical structure of the building and therefore requires a passing of a special resolution. A special resolution needs not more than 25% of those owners who are in good standing and present to be against the motion. Similarly, a motion will need to be passed to take out a strata loan, if this is the preferred method of funding the solar. This can be done at the annual general meeting or at a “paper” extraordinary general meeting.

If there is a situation where one owner or a couple of owners want to install solar for their own benefit, connected to their own private meter, then a special privilege by-law needs to be passed at a general meeting, allowing them to use the common property roof area. To lodge such a by-law it needs to be submitted with a form 15CB at Land & Property Management Authority (LPMA) with the original common property certificate of title or a statutory declaration from the Owners Corporation secretary saying that the original common property certificate of title is not available. The owner needs to indemnify the owners corporation and the Owners Corporation needs to manage any breaches of the by-law by the Owner. For example, the Owners Corp needs to retain the rights to perform emergency repairs or necessary maintenance on the underlying common property, even if that necessitates decommissioning or de-installing the solar system.



## Government incentives

### **Federal Government - Small Technology Certificates (STC's)**

These are the upfront federal rebates available for systems up to 100kW in size. The STC program typically reduces the upfront system cost by as much as 40% or \$70,000 for a 100kW system. Due to the STC program, solar energy systems up to 100kW typically offer the fastest financial payback. However, the STC program is gradually being phased out between 2017 and 2030 with reduced rebates each year. Furthermore, in July 2018, Australia's competition regulator ACCC proposed to abolish the subsidy on the basis that solar panels are already cheap enough to buy without any subsidy. It is therefore recommended that your strata scheme should install solar early to maximise the available solar rebate.

### **Federal Government – Large-scale Generation Certificates (LGC's)**

Very few strata schemes will be able to install over 100kW of solar. However, if they do they are eligible for large scale government certificates. These are not paid upfront as a rebate like the STC's so are not as attractive. They are paid out over time over 10 years. However, this creates a dead spot for solar systems between 100kW and 200kW which tend to miss out on optimising their return from government rebates.

### **South Australia State Government – Home Battery Scheme**

This scheme provides a subsidy of up to \$6,000 and is calculated based on storage capacity – \$600.00 subsidy per kilowatt hour for energy concession holders and \$500.00 per kilowatt hour for all other households. While the subsidy applies only to batteries, low interest finance is available that can also be used to purchase a solar + energy storage system or for additional solar panels to accompany a battery installation.

### **Queensland State Government - Battery Scheme**

The Queensland government has announced a grant of up to \$3,000 for installation of batteries. A body corporate may also apply for a grant only in relation to common property under a community titles scheme (CTS).

## Futureproofing

Is your strata scheme likely to install any of the following in the next 10 years:

### Electric Vehicle Charging stations

Adding each electric vehicle charging at the same time is the equivalent of adding an additional apartment electricity load into the apartment block. How many electric vehicles are going to be charging in your apartment building in each year over the next 10 years? Will you need to upgrade the main switchboard and electricity meters to take into account additional load of electric vehicle charging. (Contact Wattblock now to run an electric vehicle survey now to capture the intentions of residents.)



Figure 8 - Livingstonia (Sanctuary Cove) has a solar system which is used to charge up 92 electric golf buggies.

### Smart meter networks (embedded electrical network)

Based on the economic argument, 30% of strata schemes might implement an embedded electrical network over the next 10 years. There are more than 20 companies in Australia which specialise in installing smart meter networks. These “microgrids” are potentially the future of the distributed energy grid.



Figure 9 - Genesis Development in Meadowbank has 30kW of solar & embedded network

### Heat pumps for heating hot water to reduce gas consumption

Do you have a common gas hot water plant today? It is possible to decommission gas for heating hot water entirely and replace it with heat pumps. Heat pumps (same technology as reverse cycle air conditioning) use air temperature to do 80% of the heating of the water, with the remaining energy for heating the water coming from electricity. Heat pump cycles can be lined up with solar generation windows to provide a low cost method of heating common hot water.

### Photovoltaic Glass

“The General” in Northcote in Melbourne is the first apartment block in Australia to use Onyx Solar Photovoltaic Glass. Bi-facial solar is also coming, which means waterproofing membranes and painting of roof surfaces should be “white” to maximise reflectivity.



Figure 10 - The General in Northcote in Melbourne uses Onyx Photovoltaic Glass and achieved a 7.5 star NatHERS energy rating.

### **Photovoltaic Tiles**

Tesla have started installing photovoltaic roof tiles. Check out Bristile for a local Australian company.

### **Peer to Peer Energy Trading**

Suppliers such as LO3, Powerledger, Wepower or Enosi are trialling blockchain technology, which will allow strata schemes or individual owners with solar & batteries to trade energy with other market participants.



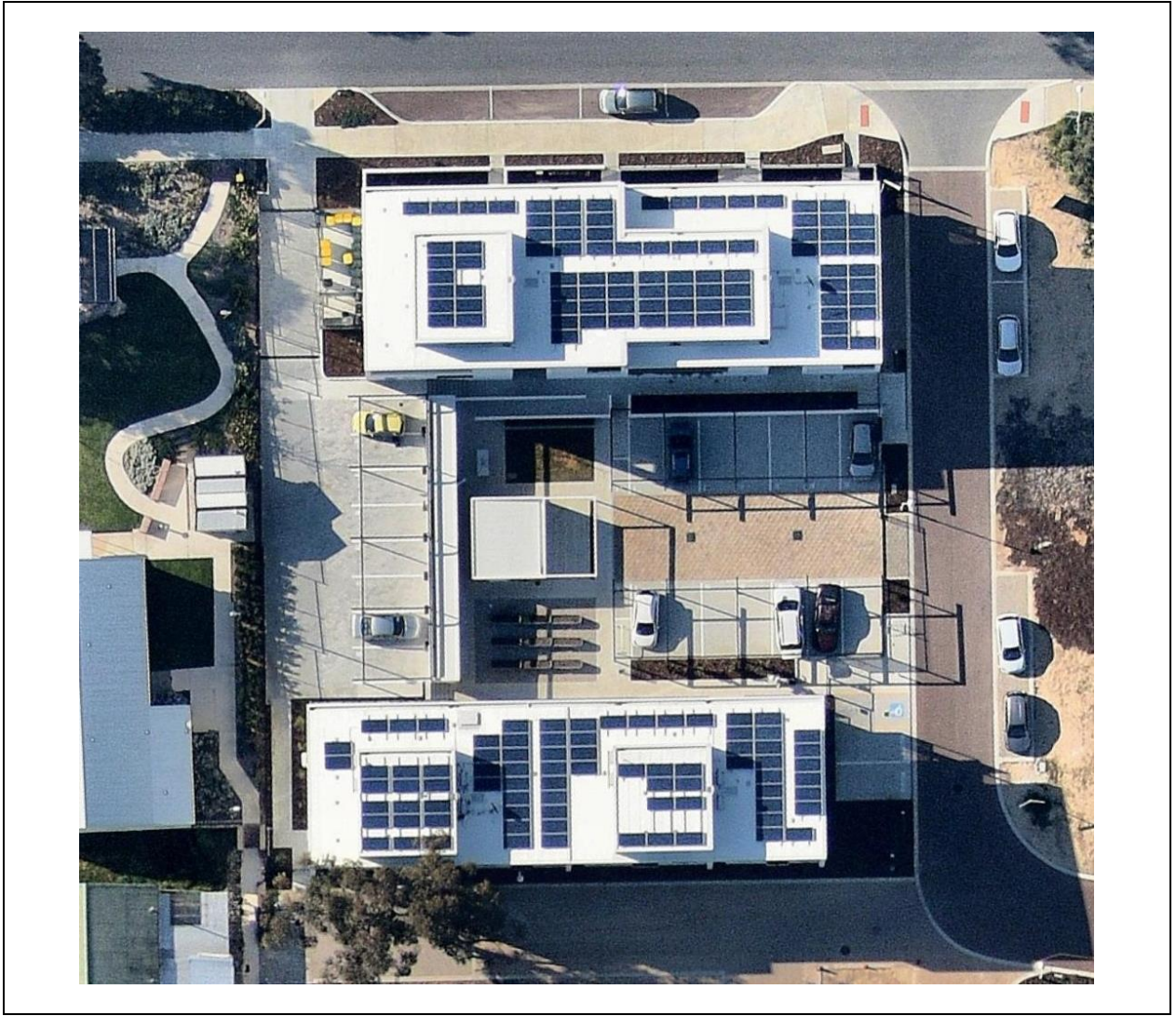


Figure 11 - Evermore at Whitegum Valley in Western Australia is a trial site for peer 2 peer energy trading.

### **Who is Wattblock?**

Wattblock was co-founded by Brent Clark, Ross McIntyre and Charlotte Yarkoni (muru-D Pty Ltd) in 2014. They are joined by Jacky Zhong and Wilson Huang solar engineers, Paul Conyngham machine learning engineer and a team of interns from UNSW.

### **What is Wattblock's mission?**

The energy wasted in Australia's strata buildings has a bigger impact on carbon emissions than the cars driving on the roads. Wattblock aims to **crowdsource** the achievement of Australia's national carbon emission reduction target.

### **How many strata buildings has Wattblock assisted?**

Wattblock has assisted approximately 1,000 strata buildings across Australia with energy reports. Wattblock has also directly project managed the upgrade of 81 buildings with LED lighting, solar, ventilation and hot water. To date it has identified over \$25m of annual energy waste across townhouses to high-rise residential skyscrapers. Over 130 strata buildings have participated in electric vehicle recharging studies.

### **Who is partnering with Wattblock?**

Jobs for NSW, Advance Queensland, North Sydney Council, Microsoft CityNext, Telstra's muru-D, UNSW Entrepreneurship, Griffith University, University of Queensland and Queensland University of Technology.

### **Who is covering Wattblock in the media?**

SBS, North Shore Times, Foxtel, BRW, The Australian, Business Insider, Computerworld, StartupSmart, StartupDaily, LookupStrata, Technode, Fifth Estate, One Step Off the Grid, Renew Economy, Inside Strata, Beyond Zero Emissions, Your Strata Property Online, Impakter and Telstra's Behind the Mic.

### **Wattblock Awards**

Innovation of the Year - Strata Community Australia (NSW), Best Social Change Entrepreneur 2015 (Start-up Smart) Energy Winner at 1776 Challenge Cup Sydney, CeBIT Community Support Finalist (2015).

### **Who is backing Wattblock?**

Wattblock has received investment from muru-D as part of Telstra's startup accelerator program, Eastern Hill Investments, an Asian-based environmental engineer, a UK-based energy company consultant, a U.S.-based hi-tech investor, a NZ sustainability funds manager, a Sydney-based environmental impact investor, a Sydney-based clean tech consultant, a Sydney-based clean technology finance consultant and an innovation laboratory research director.

### **Where is Wattblock located?**

Wattblock is based at Michael Crouch Innovation Centre at UNSW in Sydney.

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