Curtin University

White Gum Valley Project market acceptance report

Prepared by the Curtin University Sustainability Policy Institute

December 2018

Curtin University Sustainability Policy Institute presents this report on market acceptance of the technology and systems applied in the White Gum Valley Project

This ARENA-funded research project is installing and analysing models for shared ownership of solar electricty generation and battery storage in medium and high-density developments.

Located near Perth in Western Australia, the White Gum Valley Precinct is currently serving as a demonstration site for the effectiveness of the governance model. This enables larger scale solar PV and storage to be adopted across apartment housing in Western Australia and across other parts of Australia.

This project received funding from ARENA as part of ARENA's Research and Development Program.

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Executive summary

Curtin University Sustainability Policy Institute (CUSP) is pleased to present this report on market acceptance of the solar photovoltaic (PV) generation and battery storage systems applied in the

***White Gum Valley: increasing the uptake of solar PV, using energy storage, monitoring and grid-connected micro-grids within strata project* (WGV Project).**

This report provides an overview of *"Social acceptance – Market acceptance of the benef ts of the systems by dwelling buyers, occupiers and strata"*.

This report is informed by a series of interviews with White Gum Valley residents and other key stakeholders, and presents an overview of the general levels of awareness and acceptance of the project concept, energy systems and technology platforms used in the WGV Project. It also provides insight into stakeholder's perceptions of the benefits of the solar PV and battery systems and associated governance model and trading systems.

This report also provides key recommendations to increase market awareness and acceptance over the remainder of this project.

At time of writing, the energy systems, trading platform and governance model had been in place and fully operational for less than two months. This report therefore represents stakeholder's early perceptions only. Interviews have been conducted with the following parties:

- Residents of the Gen Y development
- Access Housing (strata manager for the SHAC development)
- Yolk (strata manager for the Evermore development)
- LandCorp
- City of Fremantle
- Solar Balance (technology provider)
- Powerledger (peer to peer trading system provider)

Note the SHAC and Evermore development have only recently commenced occupancy, therefore the experiences of these residents have not yet been captured. Interviews are being conducted with SHAC and Evermore residents and will be factored into future analysis.

A key recommendation from this report is that detailed social and market acceptance reports should be produced every 12 months over the four-year life of the WGV Project as part of the 'living lab', to test how acceptance levels have changed as users become familiar with the systems.

Summary of findings

Key findings relating to market acceptance of the WGV Project are:

- The overall living experience among residents appears positive and the concept of solar-battery infrastructure is understood at a high level
- Sustainability is important to residents and therefore the shared solar-battery system is an attractive point of difference when purchasing a property
- The potential for reduction in electricity bills is a major incentive for residents, however, it is too early in the project for residents to ascertain the commercial advantages to them
- There is limited understanding of how the energy system works in practice. More significantly, at this stage residents were unaware of the governance structure (the financial settlement model) and the potential for energy trading
- All three developments indicated significant savings on electricity bills and from a purely financial perspective have been a good use of capital
- While the Gen Y project was net present value (NPV) positive, the Evermore and SHAC projects returned a negative NPV and would not be commercially viable without ARENA funding at this time
- Stakeholders generally accept that this sort of system is viable and could be scaled up, however, further information on market acceptance and a workable business model is required
- The technical requirements and Australian Standards for grid-connection of battery systems are extremely prescriptive, and the process for certifying battery systems that are not already covered by Australian Standards requires considerable time and effort

Summary of lessons learnt

Key lessons learnt from the project are:

- While the concept of capturing and storing solar energy is well established and therefore reasonably well understood, allocating and trading electricity is a newer concept, therefore understanding of how this works and how it can be utilised is less mature
- More detailed training and education on the workings of the financial settlement system is required for the parties who will be administering the energy trading/billing systems (strata managers)
- Strategic communications and a targeted education program are required to raise awareness among residents of the benefits and application of the solar-battery systems and associated trading platforms
- While sustainability is a driver, the commerciality of the systems is of greater interest to most stakeholders. More should be done to demonstrate the economics of solar-battery solutions and enable all parties to better understand how the systems can be commercially viable in the future
- Technical specifications and compliance with Australian Standards (specifically AS 4777) are significant hurdles that must be factored into future solar-battery developments
- Market acceptance is generally good, however, more detailed longer-term studies are required in order to generate more meaningful and practicable learnings for future projects

Conclusions and recommendations

Overall, findings at this early stage of the WGV Project are positive. Stakeholders generally accept the premise behind the solar PV and battery storage systems, and appreciate the environmental benefits and scalability of the project. Due to the project only having been fully online for less than two months, market acceptance of the trading platforms and associated energy costs is largely untested. However, stakeholders are generally in favour of the system where it can help reduce costs and environmental impact. CUSP therefore recommends that ongoing, periodic market acceptance analysis be undertaken to gauge the impact of similar projects to the WGV Project in relation to costs, and how attractive shared solar-battery systems are in the property market.

Greater communication and education should be provided to strata managers, tenants and homeowners upon taking up residency of properties with solar PV and battery storage systems. If stakeholders are provided more thorough education and frequent updates on the characteristics of their energy systems, the governance framework, and ways they can maximise the benefit from these systems, their experience and acceptance is more likely to be positive.

CUSP recommends future energy system projects be supported by a structured and comprehensive engagement and education program, which should include frequent touch points for the duration of the project. Communication and training sessions should be tailored for each party (homeowners, tenants strata managers, developers), as each set of stakeholders has subtly different information requirements. Regular education and reinforcement, via both passive and active media, will enable all parties to fully understand and utilise such systems. This in turn will allow the full benefits of projects such as the WGV Project to be realised.

Broader market acceptance of the WGV Project is dependent on the commerciality of the systems and the shared solar-battery concept. Current studies indicate that the Evermore and SHAC developments would not have been NPV positive without the ARENA funding. The ability for the solar-battery systems to be commercially viable without additional funding is critical if developers, planning authorities and customers are to accept them as mainstream.

The commercial viability of these systems should improve as the costs of the solar PV systems and batteries falls, however, it would be worth analysing what other factors might make projects such as the WGV Project economic.

For example, it would be worth engaging with property developers to understand the drivers for installing new technology in strata developments and what their investment triggers are. While cost is always a factor, it is feasible that compliance (e.g. energy ratings), market differentiation, design specifications and planning approvals are major factors in any decision by developers to install the types of systems applied in WGV. CUSP recommends this would be beneficial to test this with the property development sector.

Key recommendations for future shared solar-battery projects

1. **Ongoing, periodic market acceptance analysis is required to gauge the full impact of the project and levels of understading/ maturity among residents and other key stakeholders.**

2. **Future shared solar-battery projects be supported by a structured and comprehensive engagement and education program for strata managers, tenants and homeowners, which should include frequent touch points for the duration of the project.**

3. **Detailed training and ongoing supervision should be conducted during the commissioning and handover phase of the project to ensure the parties administering electrcity trading/billing are comfortable with how it should work. Supervision should continue for at least one billing cycle.**

4. **Close engagement with apartment developers and the property sector more broadly is required to understand what their investment triggers are and how shared solar-battery systems could be an attractive and commercial proposition for them.**

5. **Where possible, all hardware (PV systems, inverters and batteries) should be sourced from an equipment list pre-certified by Australian Standard, the network operator, and the relevant regulatory bodies. Where non-certified hardware is required, additional time should be factored into the program to accommodate the certification process.**

1. About the WGV Project

The WGV project is WA's first One Planet Community. Located in Fremantle, WGV is intended to demonstrate modern, sustainable design and create a community where it is easy and affordable for people to live in a way that makes smart use of renewable energy. WGV is one of LandCorp's 'Innovation through Demonstration' projects and is the home of a four-year 'living laboratory' research program with the Cooperative Research Centre for Low Carbon Living.

WGV includes the following developments:

- Gen Y
- SHAC (Sustainable Housing for Artists and Creatives)
- Evermore

Fremantle is a vibrant community and its residents share a passion for sustainability. The WGV precinct at White Gum Valley has been designed to capture, retain and encourage this culture, while setting a new standard for sustainable living in Western Australia.

Three developments across this two hectare site are serving as testing bed for the innovative Strata Utility Governance Model. At the time of writing all three developments are now complete and fully occupied, CUSP is now collecting data on how the governance model is performing with respect to performance estimations.

Gen Y development

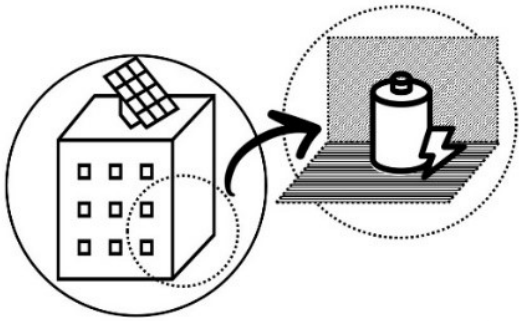
SHAC development

Evermore development

1.1 How WGV works

Each development includes a solar PV and battery system, data collection systems, a dashboard and a peer-to-peer (P2P) trading system for trading of on-site strata energy. For each development, solar energy is captured and converted to electricity by communal solar PV systems. That locally-generated electricity is then consumed by the residents of each development or collected in battery storage systems for use outside of daylight hours. The aim of this system is to allow the majority of residents' electricity needs to be supplied by solar energy and reduce dependence on the Western Power electricity network.

The solar PV and battery storage systems are owned by the strata company , therefore the electricity generated (and stored) at each development is owned and administered by the strata company, which acts as the electricity retailer. Each dwelling in the development is allocated a proportion of the electricity generated, with a proportion also set aside for powering the common areas of the building (lobbies, lifts, car parks, etc.).



The strata company sells the electricity to residents at a lower rate from the strata company than from Synergy via the main grid (operated by Western Power), making it more economical. Payment for energy is made to the strata management, which can be used to offset the strata levies.

Each building in the WGV precinct remains connected to Western Power's network, which acts as a secondary supply of electricity when PV systems are non-operational and battery storage levels are depleted. The WGV Project also includes a P2P trading system, which allows individual residents to trade their allocated proportion of electricity with each other.

1.2 Characteristics of each development

The three developments apply the same concept, but each have subtly different technical systems and target a different demographic. The differences between the three developments is summarised in the following table.

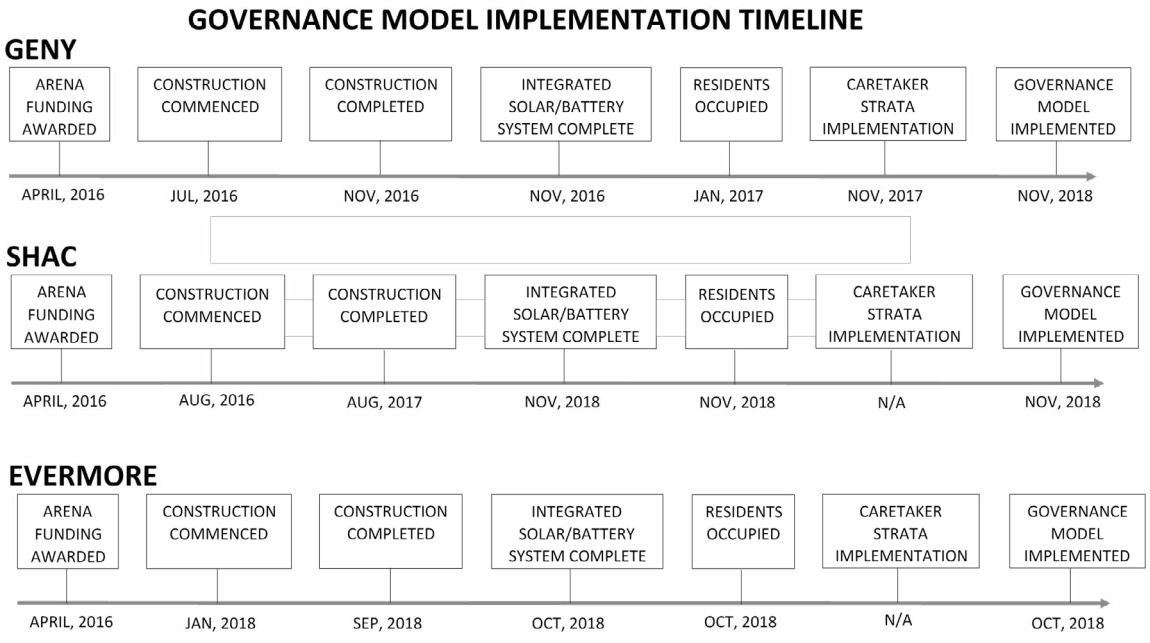
Table 1: Key characteristics of each project

Development	No. of dwellings	Occupancy status (Nov 2018)	Target demographic	Solar PV system	Battery size
Gen Y	3	All dwellings owner-occupied	Young professionals aged 25-40	9 kW	8 kWh
SHAC	15	All dwellings occupied by tenants	Professional artists working in the Fremantle area who have been priced out of the local housing market	20 kW	40 kWh
Evermore	24	All dwellings occupied. Mostly owner-occupied	Affluent couples seeking to downsize ('empty nesters')	53.6 kW	150 kWh

The Gen Y project was the first to come online and is therefore the most mature in terms of its market acceptance, with residents taking occupancy in January 2017. Residents did not move into the SHAC and Evermore developments until November 2018 and October 2018 respectively.

CUSP is continuing to interview SHAC and Evermore residents as part of its ongoing studies until July 2019, and will continue to analyse market acceptance and lessons learnt for the four-year life of the project. The following diagram shows the implementation time line for all three projects.

Figure 1: Implementation time lines for the Gen Y, SHAC and Evermore developments



2. Findings

This section provides information on some of the high level findings from the WGV Project so far. The market acceptance findings are drawn from a series of structured interviews conducted in April 2018, as well as anecdotal evidence from stakeholders and project participants.

2.1 Market acceptance

Key findings:

- The overall living experience among residents appears positive and the concept of solar-battery infrastructure is well understood at a high level
- Sustainability is important to residents and therefore the solar-battery system is an attractive point of difference when purchasing a property
- The potential for reduction in electricity bills is a major incentive for residents, however, it is too early in the project for residents to ascertain the commercial advantages to them
- There is limited understanding of how the energy system works. More significantly, at this stage, residents were unaware of the governance structure (the financial settlement model) and the potential for energy trading
- Stakeholders generally accept that this sort of system is viable and could be scaled up, however, further information on market acceptance and a workable business model is required

Based on interviews with residents within the WGV Project, it seems that the overall living experience is positive. While the solar PV and battery storage systems were not necessarily the primary driver for residents taking occupancy at White Gum Valley, residents considered the sustainability feature to be a plus and that the solar-battery system was a factor in their decision to purchase.

One interviewee from the Gen Y developments stated that they were:

> *"Attracted to the holistically sustainable and well thought-through design of the building."*

The sense of buying more than just an apartment and having sustainability features such as the solar and rainwater tank included, drew this owner-occupier to Gen Y. Several interviewees stated that sustainability was important to them and that if they hadn't moved into the WGV developments they would have looked into getting similar sustainable features installed at their previous home.

The concept of solar PV generation and battery storage was well perceived by residents. Most were able to describe at a high level how the system worked and understood the concept that the battery storage system works in tandem with the PV system to supply electricity outside of daylight hours. It was generally accepted that the application of the solar-battery system "seemed like a sensible idea".

However, the communal ownership of the systems, the governance model and the financial settlement systems in place in the WGV Project developments were less well understood. For many residents the interview with the CUSP researcher was the first time they became aware of the governance model and that electricity is allocated to each apartment. There was no awareness of the ability to P2P trade and limited understanding on how the P2P trading system works.

While the residents' limited understanding of the technology and trading system does not impact how the solar-battery system functions, it does inhibit residents' ability to maximise their energy usage and cost efficiency. Simple principles of the system should be better communicated to make full use of the energy saving potential of the building and of each household (such as using washing machines or other programmable electronic devices during the day when the solar PV system is working).

With regard to the potential for lower electricity bills, residents all considered that this was desirable and likely to be the most attractive aspect of the system. However, given only a small number of residents have been in occupancy for a complete billing cycle, it is too early to assess the impact on residents' bills more broadly. As more people start using the system (with SHAC and Evermore coming online), more interviews with residents will be conducted.

Other interviewees included:

- Access Housing (strata manager for SHAC
- Yolk (strata manager for Evermore)
- Solar Balance (technology provider)
- Powerledger (P2P trading system provider)
- LandCorp
- City of Fremantle

Strata managers Access Housing and Yolk each expressed the view that the WGV Project was scalable and despite initial teething problems with technology and compliance issues, they believe the solar-battery systems could be mainstream within 5-10 years. Access Housing and Yolk got involved with the WGV Project in order to understand whether a shared solar-battery system is commercially viable and can deliver real cost savings for residents. While the SHAC and Evermore developments remain in their early stages, both strata managers have a positive outlook for the project.

Both Access Housing and Yolk expressed frustration at the slow approval process for the solar PV and battery systems, as well as the need for improved communication to raise awareness of how the benefits of the systems can be maximised. Despite this, both companies are broadly supportive of the technologies and accept the trading system as a concept to be further explored in future projects.

These views were echoed by LandCorp and the City of Fremantle, who see the project as a success, but identify the need for continued analysis and knowledge sharing throughout the life of the project. While findings to date have been useful, there is considerably more analysis to be done, which will prove invaluable to future developments.

LandCorp in particular expressed surprise at the uptake of residence at the WGV developments, particularly given the depressed property market in the region. It is assumed that the sustainability features of the buildings made the properties particularly attractive in what is currently a slow market. LandCorp was also particularly accepting of the P2P trading system and is optimistic that it will be utilised more frequently as awareness of how trading works and how residents stand to benefit increases. LandCorp, along with Powerledger, considers there is value in scaling up the P2P system and allow trading across Western Power's electricity network.

Solar Balance, one of the technology providers for the WGV Project, shared the view that the project could be scaled up. However, it highlighted the regulatory barriers to implementation and advised that further study on the systems is necessary to understand how and when shared solar-battery systems can be integrated into microgrids and embedded networks.

Overall, stakeholders were accepting of the technology, and of the commercial concept. However, all advised that continued analysis and research must be undertaken in order to capture and realise the full benefits of systems such as those installed in the WGV Project.

2.2 Commerciality

A high level commercial assessment of the WGV Project indicates that from a purely financial perspective, the project has been a good use of capital.

All three developments have indicated they will deliver significant savings on electricity bills and fixed daily supply charges (see Table 2).

Key findings:

- All three developments indicated significant savings on electricity bills and from a purely financial perspective have been a good use of capital
- While the Gen Y project was net present value (NPV) positive, the Evermore and SHAC projects returned a negative NPV and would not be commercially viable without ARENA funding at this time

Table 2: Summary of financial analysis/estimates

Development	NPV (all inlcusive)	NPV (less ARENA funding)	Internal rate of return	Estimated savings on elextricty bills	Estimated savings on fixed daily supply charges
Gen Y	$13,965.94	n/a	10.04%	$216,374.61	$65,730.50
SHAC	-$97,796.04	$52,203.96	3.64%	$522,047.39	$262,922.02
Evermore	-$28,669.59	$211,330.41	8.25%	$1,597,774.02	$525,844.04

Further, the project sets an important financial baseline for comparison with future projects. While the NPV analysis shows that only one of the three developments returns a positive NPV, this is based on high level analysis and does not take into consideration avoided costs. It is also worth noting that the WGV Project has been undertaken in an environment where the costs of the systems are relatively high, and where the cost of grid-connected electricity is at the beginning of an upward trajectory. Over the next 5-10 years CUSP expects the costs of shared solar-battery systems to decline, while grid-connected electricity costs increase as a result of changing energy policy settings. This suggests the current NPV analysis is conservative, and developments such as SHAC and Evermore would return a positive NPV if undertaken in the future.

As part of a sensitivity analysis, the NPV has also been modelled with the impact of the ARENA funding removed. This returns a positive NPV for SHAC and Evermore.

In terms of the internal rate of return, each development delivered a positive return on investment. While the size of the return varies by development, it is notable that even SHAC, which is targeted at a low socio-economic demographic, generates a reasonable return on investment – even with conservative modelling.

While the rate of return on investment is not the only criterion a property developer may consider when forming its investment decisions, CUSP's high level financial analysis indicates the systems in place in the WGV Project may be acceptable to

the property development sector and there is some potential for take-up in certain circumstances.

The most important indicator of the commerciality of the WGV Project, however, is yet to be measured. One of the most attractive aspects of the project (from a knowledge sharing perspective) is the concept of shared ownership of the energy systems and the potential for trading. As at December 2018, the financial settlement model had been in place across all three projects for less than two months.

The settlement process and trading system are methods by which residents (and developers) stand to maximise financial benefits and realise the commerciality of the system. It is therefore currently too early to fully assess the commerciality of the shared solar-battery model.

CUSP will continue to monitor the WGV Project over its lifetime and will capture further information on the benefits of the financial settlement model as its use by residents becomes more mature. While early indications suggest that projects such as the WGV Project are commercially viable and capable of market acceptance, ongoing data capture will help inform what a workable business model for these systems looks like.

2.3 Regulatory / technical acceptance

Key finding:

- The technical requirements and Australian Standards for grid-connection of battery systems are extremely prescriptive, and the process for certifying battery systems that are not already covered by Australian Standards requires considerable time and effort

One of the most important findings (and ultimately one of the most important lesson learnt) from the WGV Project relates to the technical solution. The three WGV developments (Gen Y, SHAC and Evermore) essentially utilised the same technology concept (solar PV system, inverter, battery storage, data collection and dashboard), however, unforeseen problems emerged when scaling up the systems.

The Gen Y installation was installation was relatively straightforward. A 9 kW battery system was sourced from a list of equipment that had been previously approved by the Clean Energy Council (CEC) as being compliant with the relevant Australian Standard (AS 4777) and therefore the installation and commissioning went smoothly.

Issues with compliance became apparent as the SHAC and Evermore projects required larger battery systems and inverters, which were not on the CEC's approved list. As a result, there were significant delays, as the Western Power was not able to allow connection of the SHAC and Evermore batteries and inverters to the network until the equipment was deemed compliant with AS 4777.

The process of testing and accrediting the SHAC and Evermore systems was considerably more onerous than expected. Securing AS 4777 certification proved problematic as the proposed inverters were too large for any laboratory in Australia to run the necessary tests. Testing therefore had to be conducted in Europe.

Even when tests in Europe proved positive, the CEC still required further review from an Australian laboratory before it would add the battery systems to its approved list. This process caused considerable delays, particularly for the SHAC development which did not have an operational solar-battery system until more than a year after the apartments were constructed.

The CEC and Western Power were correct to require the new systems to be tested and accredited, and ultimately it has resulted in two industrial-scale battery systems being approved for future use in Australia. Therefore, there should be no similar delays if these same systems are installed elsewhere. However, the accreditation and compliance issues for SHAC and Evermore were not foreseen in the project initiation and design phase of the WGV Project.

On a positive note, the WGV Project compliance issues have set some important precedents in Western Australia, and have paved the way for application of 50-100 kWh systems in other markets such as shopping centres and residential microgrids. It has also proven that there is (ultimately) market acceptance from a regulatory and compliance perspective for the types of system applied in White Gum Valley.

The important lesson for future projects is to ensure the proposed systems are already AS 4777 certified, or factor in at least 6-12 months for the certification process if non-approved systems are required.

3. Lessons learnt

Key lessons learnt from the project are:

- **The concept of capturing and storing solar energy is well established and therefore reasonably well understood among residents and strata managers. However, allocating and trading electricity is a newer concept, therefore understanding of how this works and how it can be utilised is less mature**
- **More detailed training and education on the workings of the financial settlement system is required for the parties who will be administering the energy trading/billing systems (strata managers)**
- **Strategic communications and a targeted education program are required to raise awareness among residents of the benefits and application of the solar-battery systems and associated trading platforms**
- **While sustainability is a driver, the commerciality of the systems is of greater interest to most stakeholders. More should be done to demonstrate the economics of solar-battery solutions and enable all parties to better understand how the systems can be commercially viable in the future**
- **Technical specifications and compliance with Australian Standards (specifically AS 4777) are significant hurdles that must be factored into future solar-battery developments**
- **Market acceptance is generally good, however, more detailed longer-term studies are required in order to generate more meaningful and practicable learnings for future projects**

While the WGV Project has been (and continues to be) a success, there are several important lessons that should be learnt. The overarching theme of the lessons learnt in this project is the need for more effective communication and engagement with residents and strata managers.

As discussed, it was apparent from interviews with residents that there was a general lack of awareness of how the shared solar-battery system worked and in particular a lack of awareness that the financial settlement model and P2P trading system even existed. While much of this can be attributed to the fact that the systems have not been fully operational for very long, it is concerning that the parties who stand to benefit most from the systems do not seem to have been equipped to maximise their benefits.

Information about the sustainability features and the energy systems was made available to residents via the internet and printed literature, however, an important lesson is that residents will not necessarily seek out this information for themselves. It is therefore important for the remainder of the WGV Project and for similar future projects, that a detailed program of engagement and education be provided for residents.

This could take the form of written information, workshops, regular communications from the strata company, and periodic information sessions that provide hands-on guides to how the financial settlement and trading systems work. Most importantly, this information should be disseminated in such a manner that real-life benefits – in quantitative and qualitative terms – be shown to residents as an example of what they can achieve. Potentially the most powerful messaging could involve demonstrating what cost savings have been made and foregone by residents in their apartment building during a billing period, along with practical advice on simple behavioural changes that will help residents save money.

However, the need for engagement and education is not limited to residents. During the WGV Project there has been instances where the strata manager has found the financial settlement and energy allocation process too complex, or has not fully understood the methodology that should be applied. This meant that the financial settlement system was not used to allocate energy across apartments. While this issue has not caused any significant detriment to the project, it has demonstrated the need for absolute clarity on how the allocation and trading process works.

CUSP therefore recommends that the commissioning phase of any future projects involves hands-on training with strata managers (or whichever party will be administering electricity billing/trading) for at least one complete billing cycle. There is also a requirement for prescriptive and easy-to-follow instructions on how to administer the systems over the longer term.

CUSP recommends a detailed timeline of education and engagement activities, with key milestones, be developed for residents, strata managers and any other interested parties involved in similar shared solar-battery projects. This should be and executed in parallel with the project commissioning, handover and the first 12 months of operations. It would also be beneficial to include a two-way feedback loop to enable residents and administrators to share learnings and take greater ownership of the financial settlement models and trading systems.

From a commerciality perspective, a key lesson is that the economics of shared solar-battery systems is not well understood and at a high level may appear unattractive to some parties. As discussed previously, the high level financial assessment of SHAC and Evermore suggested these developments are NPV negative at this point in time and not commercially viable without third-party funding.

However, CUSP recommends that further research be conducted to understand how shared solar-battery systems can be positioned as being more commercially attractive. Aside from residents,

some of the most influential stakeholders in terms of shared solar-battery systems in strata becoming mainstream are the property developers themselves. If more of this type of development is to occur, it is vital that developers understand how installing these systems might offer them a commercial or market advantage. If we look solely at the NPV, then it seems these sort of projects are uneconomic. However, it is important to test what other factors are at play when developers are making investment decisions on whether to install solar-battery technologies.

For example, one of the biggest obstacles facing developers is securing planning approval. The design and planning approval process can be extremely onerous and is often subjective. Developers regularly have to adapt to ever-changing design specifications, energy ratings and homeowners' expectations around sustainability. It would be worth testing with the property development sector how they see solar-battery systems as a potential solution to planning approval challenges and whether there is scope for these systems enabling them to overcome compliance barriers. In particular, it would be interesting to test what the tipping point in terms of cost, apartment yield and return on investment would be.

It may also be worthwhile testing developer's interest in P2P trading across the Western Power network, and what incentives could be provided to promote uptake of sustainable energy solutions.

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