



# **HERE COMES THE SUN**

**addressing barriers to the installation of solar energy  
systems in strata and community titled properties**

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**UNSW Sydney, Master of Urban Policy Research**  
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## **Disclaimer**

This report has been prepared by the authors as students of UNSW. This report does not represent the views of the authors' employers, the project client, or UNSW.

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# 1 Executive summary

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This research identifies the opportunities to enable a greater take up of solar photovoltaics (solar pv) technology in apartment buildings. In particular, it focuses on the potential for future action by the City of Sydney - either by direct action or through advocacy - to remove barriers and empower owners and the community to pursue retrofit of their buildings to install solar pv.

The research was commissioned by the City of Sydney to explore the barriers to the installation of solar pv to power common areas in existing residential and mixed-use apartment buildings (from walk ups to high-rise) with a focus on strata and community schemes in the City of Sydney. The research methods included a mix of qualitative and quantitative approaches including an international literature review, policies review, data and technology review, and targeted interviews with seven participants.

The authors acknowledge the significant leadership demonstrated by the City of Sydney in this area of sustainability. We also acknowledge that the issues explored, and their solutions, are not unique to the City but sit at the nexus of policies and regulations that are ultimately governed at federal and state levels. In order to address the challenges of retro-fitting solar panels to existing apartment buildings, there is a need for commitment to reform by federal and state governments in the areas of energy market regulation, planning and strata management law. More fundamentally, if the City is to achieve its Net Zero targets, a cultural and behavioural shift is required that reflects a commitment from the community to actively engage and to take on responsibility for environmental stewardship.

We propose ten key recommendations for the City of Sydney. These recommendations address opportunities in the existing actions outlined in the City's Residential Apartments Sustainability Plan and are supported by actions and priorities, which are outlined in this report:

## **Build Capacity**

1. Provide easy to access, tailored and expert support for environmental performance projects involving solar PVs
2. Give owners access to accurate information that will assist them to approve and install solar PVs on common property
3. Encourage strata managers to support and inform owners wishing to install solar PVs

## **Activate upgrades and engage communities**

4. Encourage owners to actively upgrade environmental performance
5. Make building performance data readily available and relevant to the value of the property
6. Increase community awareness of how to contribute to Net Zero targets
7. Demonstrate leading practice in pilot schemes

## **Empower owners**

8. Advocate for changes to the Strata Schemes Management Act and Regulations

## **Plan to support change**

9. Ensure that local planning controls enable the shift to renewable energy
10. Collect data to support future decision making on environmental strategies

## 2 Introduction

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The City of Sydney's Sustainable Sydney 2030 plan aims to make the City as "green, global and connected as possible by 2030". The City is committed to net zero emissions by 2050 and sourcing half of all energy from renewable sources by 2030. This aligns with the City's involvement in the 100 resilient cities initiatives and UN sustainable development goals.

The City has recognised the enormous potential for maximising the use of onsite renewable energy systems in multi-owned properties. The installation of solar pv systems in new and existing apartment buildings particularly is seen as a way to realise significant reductions in the city's carbon emissions. Approximately 80 per cent of City of Sydney residents reside in over 2,000 apartment buildings across the city (containing over 90,000 apartments) (City of Sydney, 2019) and many more apartments are in the pipeline. The City has also suggested that ensuring apartment residents have access to renewable energy will assist in addressing social and resilience objectives and will help to realise economic benefits.

In 2015, Council endorsed the Residential Apartments Sustainability Plan (RASP), a strategic framework for achieving optimum environmental performance and efficiency and working towards the goals of Sustainable Sydney 2030. The RASP includes initiatives aimed at both new and existing apartment buildings. In parallel, the City's Smart Green Apartments Program (which works with existing buildings to reduce carbon emissions and water consumption and improve operational efficiency) has provided data on the potential for on-site renewable options.

Despite the obvious benefits of the retrofit of solar pv systems in apartment and mixed-use buildings, the implementation of the RASP and Smart Green Apartments program have exposed some challenges that are limiting the ability of strata title owners to take this initiative. These policy and technical 'gaps' have also been recognised by academics and strata title professionals. There are also physical and technical challenges to installation – such as poor roof access or a lack of available roof space; heritage considerations; potential overshadowing; lack of knowledge about solar pv systems, costs and maintenance requirements, changes in technology, and funding and financing constraints.

These issues are compounded by a complex governance framework surrounding sustainability upgrades in this sector. As argued by Green and Newman (2018, p202) the requirements for decision making in strata and community schemes in particular have been identified as limiting the potential for uptake of solar photovoltaics in multi-owned buildings.

Public commitment by the NSW Premier in 2019 to lowering the voting threshold for special resolutions by a strata scheme from 75 to 50 per cent (Liberal NSW, 2019) has highlighted the need for reform of strata and community scheme management legislation to create an enabling environment for decisions to install solar pv.

The City has identified opportunities to build capacity for, and accelerate uptake of, renewable energy within the residential apartment sector. In addition to continuing the Smart Green Apartment Program, the City will launch a dedicated renewable engagement program in late 2019, the Net Zero campaign. This will include a 'Solar Concierge', a dedicated resource to provide information and advice to residents considering installing solar pv. This concierge service will require access to accurate and current information about the legislative and policy framework surrounding solar pv installation.

## **Research aim and project objectives**

The aim of the research is to identify opportunities to facilitate the installation of solar pv in apartment buildings in the City of Sydney LGA.

In achieving this aim, the project's objective is to assist the City of Sydney to build capacity for, and accelerate uptake of, renewable energy creation in multi-owned buildings and promote local resilience within the residential apartment sector. Information and resources compiled as part of this research project can be used to strengthen the City's advocacy for the installation of solar pv and also to support the City's efforts to provide information and advice to residents as part of the future solar concierge service.

The research has been guided by four key research questions:

- Q1. What is the legislative and policy framework governing the installation of solar photovoltaics in multi-owned properties in NSW?
- Q2. What do key stakeholders perceive are the main constraints to achieving the installation of solar photovoltaics in multi-owned properties in Sydney?
- Q3. What mechanisms have other jurisdictions implemented to facilitate the installation of solar photovoltaics (or other renewable energy sources) in multi-owned properties? Are these considered to be successful by key stakeholders and what lessons can be learnt from these experiences for the Sydney case?
- Q4. What opportunities exist to facilitate the installation of solar photovoltaics in multi-owned properties through either:
  - regulatory and or policy reform (directly or by advocacy)
  - cultural change / behavioural incentives
  - new products and services
  - other mechanisms

## **Audience**

The report has been drafted anticipating its primary audience to be staff within the City of Sydney working in relevant areas (for example, sustainability, social engagement, development approval and building compliance). We expect the report will also be of interest to:

- State and federal government representatives (including Ministerial advisers and senior policy officers)
- City of Sydney residents
- Strata and building managers
- Strata property owners
- Researchers

## **Project methodology**

The research methodology for the project included:

- Systematic desktop literature review (limited to papers published since 2010, with a focus the Australian context as well as some international references)
- policy and legislative review
- development of case studies and identification of existing strategies, incentives and barriers

- Desktop review of the technical requirements for installation and maintenance of solar photovoltaics and emerging new technologies in solar collection, energy storage and energy network options
- Stakeholder interviews with representatives from the planning assessment team at City of Sydney, academic experts, representatives from the Strata Community Association (NSW) and the Owners Corporation Network Australia, residents of strata schemes, and members of the City of Sydney Sustainability Engagement team.

Refer Appendices A and B for an overview of the research methodology and interviews conducted.

## 3 Background and context

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### 3.1 The strategic context: a foundation for action

The City of Sydney has made a commitment to work towards a more sustainable future. Since 2007 a range of strategic policy documents have defined the community's vision and outlined key actions to deliver against specific targets for improved energy efficiency, reduced waste and a more resilient and diverse community.

#### **Sustainable Sydney 2030 and the Community Strategic Plan**

In 2007-08 the City of Sydney engaged with the community to determine their aspirations for the city, in the local, Australian and global context. *Sustainable Sydney 2030* became the overarching foundational document that outlined that vision, including how to make the city more 'green, global and connected.' The strategy has been a critical component in informing sustainability policy development over the last decade, aligning with Australia's commitments consistent with the United Nations *Sustainable Development Goals*, and key to establishing the city's place within the global community.

In 2017 the *Sustainable Sydney 2030* strategy was augmented by the *Community Strategic Plan (2017-2021)* which provided an updated vision to meet the challenges of ensuring an inclusive, safe, resilient and sustainable city. Ten targets detail key steps to achieving the City's vision, and include a commitment to a 70 per cent reduction in greenhouse gas emissions (based on 2006 levels) by 2030 and to achieving a net zero emissions city by 2050, with 50 percent of electricity demand met by renewable sources by 2030. (City of Sydney, 2017, p23)

The Community Strategic Plan recognises the critical role that residents, businesses, and building owners can play in improving the environmental performance of a city and undertakes to ensure that the community not only understand the impacts of their actions but is also able to collaborate to develop and implement initiatives to 'significantly improve their environmental performance and that of the city as a whole'. ((City of Sydney, 2017, p45). These initiatives are to be supported by 'robust federal, state and local planning policy and standards' to deliver new and existing buildings that achieve high environmental performance.

#### **Environmental Action 2016-2021 strategy and action plan**

To guide the implementation of *Sustainable Sydney 2030*, the City has developed environmental master plans and parallel strategies / actions. The *Environmental Strategy and Action Plan* outlines the City's continued approach to achieving its sustainability targets including its focus on boosting the use of renewable energy to become a low-carbon city (City of Sydney, March 2017, p3). This plan contains the most current set of environmental targets and actions and evaluates the City's progress against the various environmental strategies implemented between 2008 and 2015, including *Sustainable Sydney 2030*.

The document includes an overview of the benchmarks and design features for new buildings to achieve best practice in environmental performance, including onsite renewable energy generation (especially solar photovoltaics) and creates a framework for future reporting on the City's environmental targets.

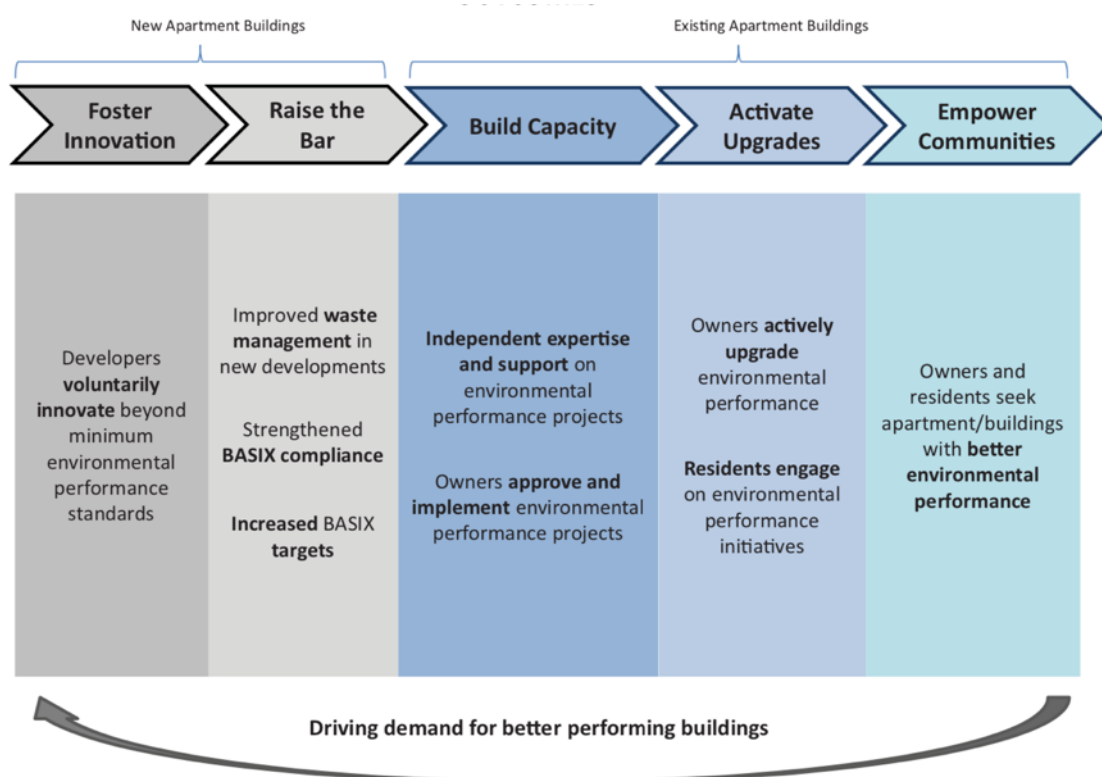
A key outcome identified in the strategy is for more efficient operational performance of existing buildings by developing and delivering an energy focused retrofit program for apartments, and helping to address key barriers to action in improving environmental performance through the City's environmental performance grants programs. Through this action the City has recognised an area



where it would need to rely on advocacy and partnerships to assist in achieving an effective outcome in the private sector. The strategy also identifies advocating for change to introduce mandatory ratings disclosure for residential apartment building energy performance as a mechanism to enable State and federal policy and regulation to support energy efficiency and local renewable and low-carbon energy generation. (City of Sydney, March 2017, p28)

### Residential Apartments Sustainability Plan (August 2015)

The RASP supports the targets in the Environmental Strategy and Action Plan related to improving the environmental performance of new and existing apartment buildings, and contains a range of 'customer focused' targets, outcomes and actions to deliver on the City's commitments related to energy efficiency, renewable energy, water and waste. The outcomes are presented as a spectrum that fosters innovation and proactive design coupled with building capacity within the sector through to empowering the community to achieve retrofits in existing buildings (City of Sydney, 2015, p8). The associated actions are prioritised according to the likely timing of their delivery (now, next, later).



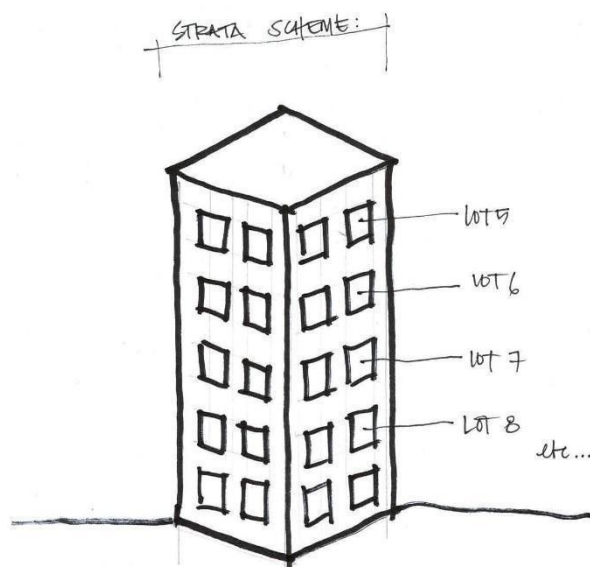
Source: RASP Figure 4 – Environmental outcomes in new and existing residential apartment buildings

The outcomes contained within the RASP spectrum reinforce the City's strategy in promoting greener buildings and more efficient energy generation. However, key actions designed to engage and empower the community to seek apartment buildings with better environmental performance do not address some of the barriers specific to the installation of solar pv. The RASP platform does however provide an opportunity to explore new strategies to enable apartment owners to advocate for and install solar photovoltaics on their buildings.

The RASP strategy has significant relevance in the context of the City's sustainability agenda given the number of people living in apartments and the anticipated growth in the apartment sector. In 2015, the City of Sydney had the largest number of lots (73,486 lots) in the Greater Sydney Area, with the highest percentage of larger strata schemes (25.8 per cent of schemes with over 50 lots) (City Futures Research Centre, 2016, p2). According to the RASP, around 75 per cent of the City's residents live in apartment buildings, with that number forecast to increase to 80% by 2030 (City of Sydney, 2015, p2). Importantly, the RASP highlights that apartment buildings are responsible for around 10 per cent of the City's greenhouse gas (GHG) emissions. The City predicts that the implementation of the RASP strategic actions could reduce GHG emissions caused by the apartment sector by 40 per cent – a significant reduction.

### 3.2 Making solar decisions in a vertical community

Multi-unit residential buildings in Australia are typically strata titled. Each property (such as an apartment, townhouse or villa) is identified within a strata plan as a 'lot' and has its own title (*Strata Schemes Development Act 2015*, section 9). The group of titles within the complex (which can be made up of a single building or collection of buildings) is called a 'strata scheme'. All owners of the lots within a scheme automatically belong to the owners corporation which makes decisions about issues that impact on the scheme as a whole.



Strata title holders own everything inside their lot but share ownership of and responsibility for 'common property' (everything that is not included in the strata lot, for example external walls, foyers and corridors, driveways, shared gardens / landscaping and roofspace)<sup>1</sup> with the other title holders. Balconies and courtyards may or may not be part of the lot, depending on the detail of the strata plan. The owners corporation or an owner of a lot is able to 'add to, alter or erect a new structure on common property for the purpose of improving or enhancing the common property' as long as the change has been authorised by the owners corporation by special resolution<sup>2</sup> (*Strata Schemes Management Act 2015*, Section 108(1) and (2)). The installation of solar pv on the roof of an apartment building is considered a change to common property and as such, requires authorisation by special resolution.

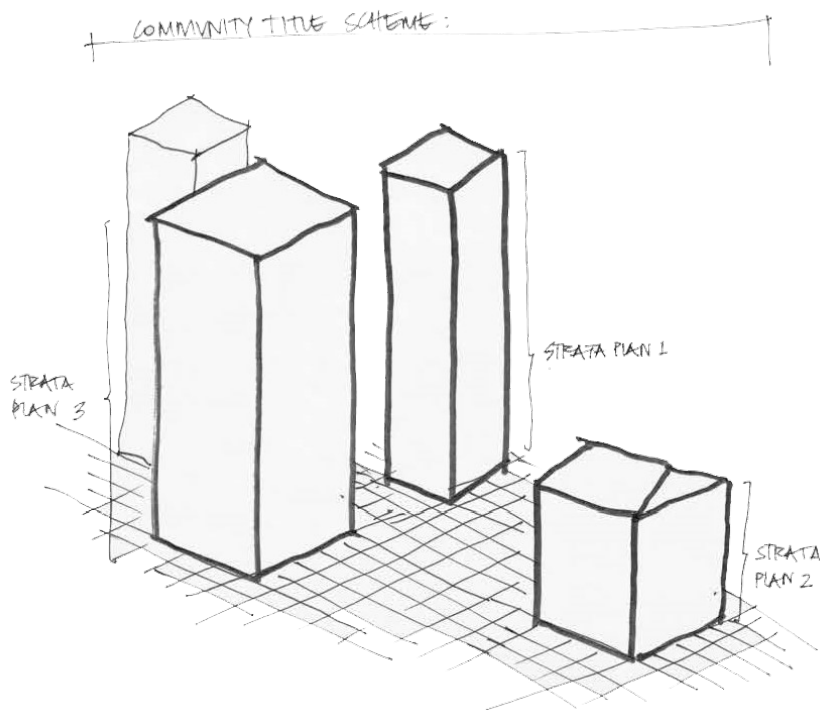
If the special resolution identifies that an action involves a change to common property with ongoing maintenance to be the responsibility of an owner of a lot (e.g. if an owner wants to install solar pv on common property that will produce energy for use within their own lot), then a corresponding by-law (a rule pertaining to the use and running of the strata) will also be required (*Strata Schemes Management Act 2015*, s108(5) and (6)). Tenants and owners within the strata scheme are required to comply with the by-laws for the scheme (*Strata Schemes Management Act 2015*, s135). Such by-laws are not required if the solar pv will be installed on common property and produce electricity only for use on the common property (e.g. for elevators, corridor lighting, heating swimming pools) and the special resolution identifies the owners corporation as having ongoing responsibility for maintenance (or is silent on who has responsibility).

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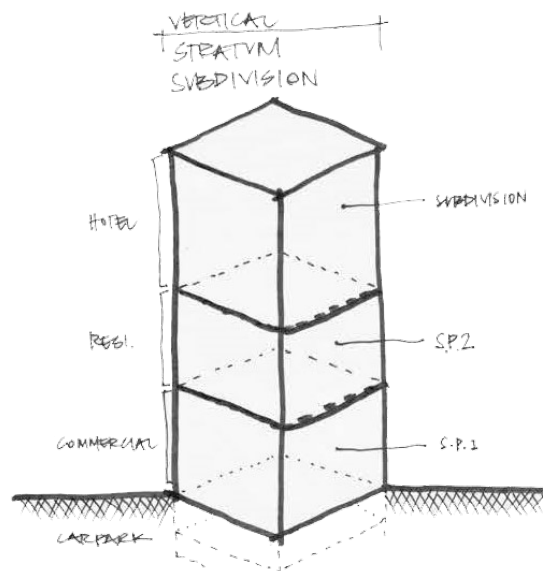
<sup>1</sup> The common property boundaries of each lot are typically formed by:

- The upper surface of the floor (but not including the carpet)
- The under surface of the ceiling
- All external or boundary walls (including doors and windows)

<sup>2</sup> a vote by unit entitlement, passed at a properly convened general meeting, with no more than 25% of the votes cast against it.



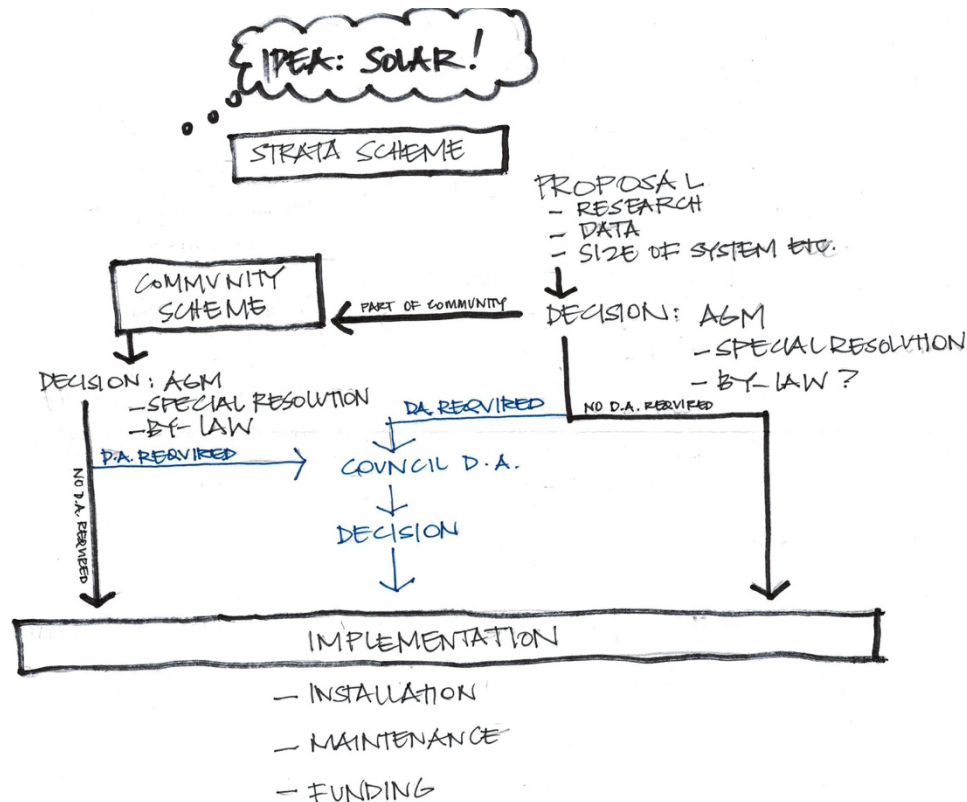
Strata schemes can also sit within a broader community scheme, or within a 'vertical' stratum subdivision in a single building with multiple uses (such as parking, retail, commercial and residential). There are currently five residential community schemes in Sydney that contain an estimated 47 strata schemes.<sup>3</sup>



Where a strata scheme sits within a community scheme, the decision of an owners corporation of a strata scheme relating to common property may be overturned by the community association in accordance with the community 'management statement'. The management statement is binding on the community association and also on any subsidiary body within the scheme (*Community Land Management Act 1989*, section 13(1)). This means that the management statement also takes

<sup>3</sup> Based on review of six maps strata data overlay

precedence over a strata scheme's by-laws. A similar situation exists within buildings that include a part strata development (*Strata Schemes Development Act 2015*, s9(1)(b)) within stratum subdivisions (which are governed by Building Management Statements for the whole building) (*Conveyancing Act 1919*, Part 23, Div 3B).



In a situation where an owners corporation of a strata scheme has decided to allow installation of solar photovoltaics the interpretation of the management statement by the community association becomes important. If the interpretation is that the management statement does not allow installation (for example due to aesthetic reasons) then the community association may make a decision to not allow the solar pv (effectively overruling the decision of the owners corporation). Similarly, where the management statement is interpreted as not allowing the installation but the community scheme accepts the proposal, the management statement will need to be amended.

These governance requirements, central to the smooth running of shared property within community and stratum schemes, can pose a barrier (and cause significant frustration) when lot owners are trying to install solar pv to power common areas – particularly when they will likely have expended significant time and money in commissioning building inspection reports (to test roof structure integrity) and supplier quotes from solar pv installers to sufficiently develop the business case for the proposal with enough detail to then have it voted on at the Annual General Meeting.<sup>4</sup>

The installation of solar photovoltaics may also require development approval by the City – creating an additional layer of complexity and cost for applicants. While the *State Environmental Planning Policy (Infrastructure) 2007* (Section 39(3)) outlines circumstances where proposed solar energy systems are considered exempt development, the placement of these exemptions, separate from the list of exemptions contained within Part 3.1 of the *Sydney Local Environmental Plan 2012*, may lead to them being overlooked by 'lay' applicants unaware of the applicable planning legislation.

<sup>4</sup> Under NSW Fair Trading rules, owners corporations must have at least one annual general meeting (AGM) each year.

### 3.3 Talking about tech

While solar panel technology has been around in some form since the mid-20th century - it is only in the last ten years or so that solar pv has become readily accessible as a renewable energy source. The steady improvement in both the cost and efficiency of solar pv has been the driving factor in the technology's rapid growth. As Boxwell (2019) argues, 'the rapid improvement in the technology and the freefall in costs since 2009 have transformed the industry'.

This sentiment is echoed by Green and Newman (2018) who claim that over the past decade in Australia, solar pv have proven to be a viable, cost effective and low-carbon solution to rising electricity costs for many households.

#### **System requirements**

In Australia, domestic solar pv systems are governed by Australian Standard AS4777, which sets out standards for installation, inverters and grid protection for systems up to 10kVa (single phase) or 30kVa (three phase) capacity (Roberts et al, 2019). These size systems are typical for small to larger multi-owned properties that want to use renewable energy to power common area infrastructure (such as for lighting, lifts, pool pumps, HVAC, etc.)

#### **An evolving technology**

According to David Zabell, Senior Planner from the City of Sydney, when objections are raised by the community about proposals for solar pv they usually relate to concerns about the reflectivity of the panels into nearby properties. While the number of formal objections to development applications for retrofits to install solar has generally been quite small, neighbours' perceptions of the impact of solar pv on their amenity can be a real barrier to greater uptake of solar pv in existing apartment buildings.

With the recent advances in technology and materials for solar pv, these objections can often be overcome by purchasing solar panels that offer reduced glare and reflectivity levels (panels may also be tilted slightly to minimize glare). Similarly, recent advances in design have seen new products such as 'canopy' systems appear in the market.<sup>5</sup>

These changes in technology create opportunities for the increased installation of solar pv in spaces that otherwise may not have been able to support the infrastructure, and can also positively impact the 'aesthetic' appeal of the systems (for example through the use of solar roof tiles). However, without easy access to information about new developments in technology there may still be concern amongst residents as to the 'look and feel' of the final product, with the potential to lead to blockages within strata and community schemes resulting from assumptions about how the panels will impact on the appearance of buildings.

Based on the interviews conducted for this paper, it is evident that where solar pv have successfully been installed in a multi-owned building (either in a strata scheme; or in a strata scheme within a community scheme) it has predominantly required the efforts of a dedicated few (often an owner-occupier) to bring forward the information needed (ie. the business case) to gain traction with the owner's corporation and to obtain the approval needed to proceed with solar photovoltaics installation.

In recent years there has been an increased level of coordination between stakeholders (local government, industry and advocacy bodies) to promote renewable energy initiatives such as solar

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<sup>5</sup> Canopy systems are tilted panels mounted 2.4 metres in the air, with the height separation allowing for maintenance and emergency access.



photovoltaics within multi-owned properties. For example, the City of Melbourne has partnered with a range of stakeholders<sup>6</sup> to produce *'How to make positive change around your apartment building'* – a easy to understand guide that helps apartment owners navigate the process for installing solar photovoltaics on multi-owned properties. This guide is one example of what can be achieved when stakeholders unite to address a common problem or goal impacting shared property within multi-owned properties.

While the information is high level and would benefit from providing case studies that consider a range of scenarios e.g. 2-4 storey buildings, 5-10 storey and 10+ storeys – it is a useful starting point for helping multi-owned properties navigate the pathway to approval for solar photovoltaics.

*"Having applicants and councils clearly understand the benefits (....the measurable benefits) of installing solar pv cells would be really helpful."*  
(David Zabbel, interview 2019)

### **Industry capacity**

The uptake of solar pv in existing multi-owned apartment buildings is also impacted by issues related to the physical installation of the product. According to Roberts et al (2019) the experience of some strata schemes suggests that many solar installers lack experience and understanding of apartment buildings. Catherine Lezer, Botany Cope resident and champion for installation of solar, noted when speaking about her experience with advocating for the installation of solar pv that *"what was happening was that all the sales people coming around were kind of treating us (the strata) like a house", "when the installer came out to inspect the site, they would comment the job was much more complicated than what the sales people think and subsequently quit the job"*.

The lack of skilled workers across the renewables sector (electricians, technicians, estimators) has also been the focus of recent studies commissioned by industry and governments. For example, in its April 2019 *Industry Insights* publication Australian Industry Standards (AIS) flagged there is increasing demand for electricians across the renewables sector that specialise in the design, installation and management of battery storage solutions for photovoltaic systems.

The cumulative impacts of these problem highlight the need for continued advocacy from the 'frontline' policy-makers such as the City of Sydney to federal and state governments to continue to maintain partnerships with industry to develop training and apprenticeships schemes that will reskill existing workers and attract new talent to the industry. It also indicates a need for better 'off the shelf' information available to the consumer about what products are available, and how they should be installed.

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<sup>6</sup> Green Strata; Strata Community Australia – Victoria; City of Port Phillip; City of Yarra; Yarra Energy Foundation and Moreland Energy Foundation.

## 4 Results – what we learnt

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### 4.1 What the experts say – literature review and interviews analysis

#### **Some things never change - ongoing issues need radical disruption**

The challenges of navigating a complex legislative environment and its applications when it comes to installing solar pv is not a new one, nor is it unique to Sydney, NSW or even Australia. There is a common theme that emerges in much of the literature, that the way community organisations operate and the way they apply the policies and legislative obligations within their purview reflects some fundamental issues of collective behaviour and the risks associated with requiring communities to self-govern (Caffrey, 2010).

There has been much discussion as to the limitations of legal and economic frameworks since the early push for solar power following the energy crisis of the late 20th century. Eisen (2010) provides four reasons for the slow uptake of solar pv. Although his study is almost 10 years old and in an American context, the literature reviewed for this report suggests that NSW continues to face the same kind of challenges:

- *The money* - high upfront costs and long payback periods
- *The hassle* - significant associated transaction costs (time spent researching the right system, navigating regulatory context, finding capable installers, project managing)
- *The fragmented industry* - lack of a single entity with comprehensive expertise in legal, financial, technical, and administrative tasks associated with installing solar PVs
- *The motivation* - lack of incentives for any single company to offer a comprehensive solution for urban solar.

Eisen seeks a radical disruption of the status quo (either new tech or cultural shift) by way of solar utilities. In reviewing more recent (and more local) literature, in particular Roberts (2016, 2017 and 2019), the complexity and static nature of energy markets suggests that, 10 years on, the idea of a solar utility remains a radical one. Becoming an energy market disruptor could be a risk worth taking for Local Government Authorities in partnership:

*"Utilities are like homebuilders that reproduce the same boxes repeatedly rather than custom build homes. Rapid scaling up of solar would therefore take disruptive innovation in the business model of the entity accomplishing it. New entrants... have fundamentally different resources and competences than companies burdened with incumbency's disadvantages. They have different technologies and simpler, better ways of doing things that are 'tailored to the nature of competition in these disruptive markets'." (Eisen p 65, 2010)*

#### **We're only human - managing behaviours and governing the governance**

Addressing the challenge of human nature and psychology is necessary in the context of this report given the significant role that governance and decision making have in the process of installing solar pv on strata titled buildings. It is key to understanding the critical challenge at the heart of this question about empowering and enabling strata organisations to collectively manage and implement the installation of solar panels for common property use.

The rapid uptake of apartment living for city dwellers results in a large portion of the population being either directly or indirectly required to engage in processes of governing the communal requirements of apartment buildings. The extent to which all citizens are capable of engaging in those governance processes varies greatly (Sommerfeld et al, 2016) and consequently results in a widely varying and



inconsistent group of people to whom the City needs to provide support and advocacy if the goal of wide-spread uptake of solar and other sustainable energy sources is to be achieved.

Consistent throughout the literature, the case studies, and in the discussions with interviewees, is the challenge of maintaining sufficient momentum amongst owners to carry the initiative through decision making, approvals and installation. As is seen in the case of both the Stucco and Botany Cope case studies (refer Appendix C) - even with a unanimous will to undertake the installation of solar, the drive of particular individuals was required to negotiate desired outcomes in relation to the energy provider and the kW capacity and logistics required for installation. Catherine Lezer indicated that she and one other resident invested significant time, energy and expertise to drive the process of proposing, approving and installing solar pv on the property.

Because the governance at the level of strata and community committees is relatively complex, and the view of interviewees Catherine Lezer and Sue Holliday, is that with less requirement for council decision making on applications<sup>7</sup> this would be easier, the main challenge lies with the ability of owners and members of the strata and community committees to navigate the regulations (Caffrey p735, 2010, Lezer & Holliday in interview, 2019). Lezer, Holliday and Roberts all advocate that mandatory NABERS ratings for apartment buildings would drive better sustainability performance and would support decision making in favour of solar pvs.

Tony Irvine (Director, Strata Community Association of NSW) reflected that in his experience as a Strata Manager, the *Strata Scheme Management Act* requirement for a special resolution of the Community Association (no more than 25 per cent of voters object to the motion) to support installation of solar pv would always prove challenging to achieve. Irvine's experience suggests that AGMs are rarely attended by 100 per cent of members, and that the likelihood of more than 25 per cent of voters objecting to the installation of solar pv is higher because of the practice of gathering proxy votes.

Roberts et al found that although 75 per cent of NSW strata owners surveyed reported that there was some level of co-operation between owners in the management of their buildings, a minority reported issues ranging from apathy and lack of engagement to bullying, intimidation and deliberate exclusion, with decision making (particularly around major expenditure) sometimes hampered by divergent priorities (between owner-occupiers and investment owners or between different household types) and personality clashes, (Roberts, 2019, p102).

Caffrey (2010) suggests exploring Madison's suggested method to control the *effects* rather than the *causes* of 'factional' behaviour<sup>8</sup> - in this context she alludes to owners committees, strata committees and community scheme committees as being examples of factions. The control that she suggests is necessary is driven by governmental involvement (or control of) governance in the form of judicial or legislative action. In this instance, controlling the effects of factions could potentially be achieved through the investment of the City in assessment and control of solar pv installations to a greater degree.

By way of example, Caffrey examines the statute of Florida wherein "A property owner may not be denied permission to install solar collectors or other energy devices by any entity granted the power or right in any deed restriction, covenant<sup>9</sup>, declaration, or similar binding agreement to approve,

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<sup>7</sup> A City of Sydney planning Development Application (DA) is required for solar panels when: the building is heritage listed or in a heritage area, or if the solar PV system is for over 99kW capacity (10-99kW systems require a Complying Development Certificate).

<sup>8</sup> 'The factions' being "a number of citizens, whether amounting to a majority or a minority of the whole, who are united and actuated by some common impulse... adverse to the rights of other citizens, or to the permanent and aggregate interests of the community". (Madison in Caffrey, 2010)

<sup>9</sup> Covenants in the USA are similar to by-laws in Australia

forbid, control or direct alteration or property” (Caffrey 2010). This kind of control is specific to solar panels and does not (seem to) seek to diminish the role of the Home Owners Associations whose restrictive decisions pertaining to solar pv, or other renewal initiatives, are the ‘factions’ in question.

The Queensland ‘Ban the Banners’ policy of 2010 proposes a similar limit to the power of factions to block or ban the installation of solar or other renewable energy initiatives (see case study at Appendix C).

The ACT unit title legislation includes a similar restriction, where body corporate rules may not be amended to prohibit or restrict the “installation, operation or maintenance of sustainability or utility infrastructure” (*Unit Titles (Management) Act 2011* (ACT), section 108(4)(d)).

Another mechanism to circumvent the influence of factional voting within a community scheme may also be to provide a ‘level playing field’ for all community associations. It is generally acknowledged that many community management statements are based on the model by-laws available for the various types of strata schemes.<sup>10</sup> On this basis, there may be merit in reforming Community Scheme standard bylaws to include a clause enabling solar pv and ancillary infrastructure within the community scheme as part of any future legislative review process.

### **A one-stop-shop where one-size does not fit all**

Leshinsky (2015) reflects on the inability of existing legislative frameworks and assumptions to address the issue:

*“Clearly many planners and regulators understand that recognising (the diversities and demography of) community is critical to empowering citizens to address existing urban tensions and sustainability challenges in our post-industrial urbanism (Bailey, 2010). Yet few municipalities, locked into formal administrative boundaries, hold sufficient demographic data or working knowledge on existing or emerging vertically-tenured communities. This results in a tendency for blind, reactionary, and aspirational responses in law and planning policy with few measures of effectiveness.”*

Catherine Lezer reflects that all the required information in relation to installing solar on strata is readily available – “if only you care to look”. The authors’ desktop review of the literature as well as professional and relevant policy information confirms this, however there is no ‘one-size-fits-all’ solution to the question of whether it is possible or appropriate to install solar to power common property. Moreover, not everyone concerned with the installation of solar pv is necessarily able to interpret the available information.

Mike Roberts (Research Associate, School of Photovoltaic and Renewable Energy Engineering Centre for Energy and Environmental Markets) in his research and in interview with the authors, highlights the fact that, in the context of Sydney, the energy requirements for apartment buildings are varied and specific. Consequently, it is not possible to provide a singular template approach for all multi-owned buildings wishing to retrofit solar panels. Roberts’ research has included development of a digital tool<sup>11</sup> which can determine the specific requirements of any given building and that could provide an alternative to the template approach. However, further development would be required to make this type of tool available and accessible on an ongoing basis.<sup>12</sup> Additionally, access to accurate and current energy use data is critical for these to be effective in supporting owners’ decision making as to the viability of installing solar. Roberts suggests that there is insufficient data

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<sup>10</sup> Strataman website, ‘Management Statements – what’s covered’, <http://www.strataman.com.au/community.html#ms>

<sup>11</sup> “A techno-economic tool was created to model, electricity flows and financial outcomes in apartment buildings with rooftop PV and battery storage” (Roberts et al 2019)

<sup>12</sup> Roberts in interview, 2019

being collected in relation to energy use, citing Melbourne as an example of the benefits of more regularly collected energy use data.

Across the country many initiatives have been launched at federal and state levels to promote greater uptake of solar pv (acebodycorp.com, 2018), although these are largely directed towards single-dwelling buildings and consist of limited-time financial incentives such as subsidies for the cost of the technology or attractive Feed in Tariffs (FiTs) for feeding into the grid. However, these incentives have proven unsustainable and insufficiently attractive to the increasing numbers of apartment owners that make up the City's population. This is in part due to FiTs being developed to address individual and separate dwellings, and to rising energy prices decreasing the sustainability of subsidies, but particularly because the available subsidies do not represent a significant saving to many owners in the context of overall costs (Sommerfeld et al, 2016, Roberts 2019, Irvine interview 2019).

## 4.2 Shining the light on solar – understanding how it works and what it costs

While solar installation in the residential sector has enjoyed rapid growth across Australia in the last ten years, there are still pockets of resistance to the uptake of the technology. The literature and responses from interviewees indicate that while many people like the idea of solar pv, within multi-owned properties owners have limited understanding of the relative benefit within their own building and what is possible from a tech perspective.

Anecdotal evidence suggests that some people believe solar panels are too expensive, do not work when the sun is not shining, and are costly to maintain. These misapprehensions become important in the strata and community scheme context where decisions about the installation of solar panels are dependent on achieving a 75 per cent majority vote (no more than 25 per cent dissenting votes). As noted by Roberts, although many sustainability projects are driven by a committed individual or small group within an owners corporation 'a single individual (with either an aversion to OC expenditure or a strong anti-sustainability agenda) could also act as an effective opposition.' (Roberts, 2019, p102).

Concerns around solar panels being expensive to install are largely misguided. In reality the installation of solar pv, like any major common property development in multi-owned residential buildings, is typically funded through the strata scheme sinking fund, by raising a special levy (usually by requiring a special resolution), or by borrowing (Roberts, Macgill & Bruce, 2019).

*"By splitting the costs across the owners corporation (calculated by unit entitlements), the financial burden (and the benefit of lower energy bills) is distributed across owners"*

*Mike Robert interview*

Concerns around solar panels not working in low sunlight fail to recognise that technology over the past ten years has improved the efficiency of solar panels, even when the sun is not shining. For example, manufacturers have been able to create solar panels that are nearly 30 per cent efficient. These high-efficiency panels can produce 25 per cent more electricity than the lower-tier economy panels that made up the majority of the market in the past years (EnergySage, 2018). New products to market have also introduced technology that allows electricity to be generated even in low light conditions or where buildings receive partial shade during the day (Boxwell, 2019).

Concerns around return on investment (ROI) can be tempered by getting the right advice from experts. There are multiple variables to consider when seeking out the best solar pv systems on the market. Investing in the top-of-the-line equipment (higher specification) or larger arrays (KvW size) does not always result in higher savings.

### 4.3 Case studies - key findings

Based on a review of selected case studies (refer Appendix C) it is clear there is a strong appetite for renewable energy as a means to countering rising electricity costs at the individual (household) and building level, with solar photovoltaics the technology of choice across a range of communities and buildings types.

The uptake of solar pv on single storey residential dwellings is more prevalent than on multi-owned properties (Australian Energy Council, 2019 p3) - driven in part by the relative ease at which residential dwellings can install solar panels compared to the more complex policy and regulatory environment that multi-owned properties operate within (e.g. tiered owner structures, strata and community laws, compliance building codes such as fire access). It is important to note that single storey residential dwellings (as a proportion of the overall housing mix) far outweigh apartment number across Australia - with high density urban areas within the City of Sydney a notable exception.

In terms of the various options available for solar pv to be installed in multi-owned properties, it is clear that addressing the energy demands of common areas is much more easily understood (and less complex) to address than 'behind the meter' solutions. Communicating more widely the success stories will help convince 'solar sceptics' that the value of investing in sustainability measures will have a positive impact on reducing building costs.

Botany Cope (Lezer interview, 2019) and Stucco both demonstrate the difficulties experienced, even when there is unanimity amongst owners. While Stucco (Chun, 2017) is not a strata building, it nevertheless demonstrates what is possible when collective effort is harnessed for common benefit, and how difficult it is to achieve this.

Hopetoun Quays (Holliday interview 2019) demonstrates the critical role that Community Associations can play, if led by a champion for the proposal. In this case a by-law was adopted allowing solar panels for the purposes of creating energy for use within individual lots. Although solar pv for common area energy usage can be installed at a later date, this seems unlikely to happen in the near future. The process of adopting the by-law to allow installation of solar pv for an individual lot on common property suggests that consensus as to the use (and even the definition) of common property is unlikely without a clear understanding of what individual benefits are likely to accrue to owners. In the end, the potential common benefit that could come from the adopted by-law at Hopetoun Quays is the by-product of one person's interest in gaining benefit from the installation of solar.

The 'Ban the Banners' policy in Queensland is a useful precedent for methods to curb the effects rather than the causes of 'faction' behaviour (Caffrey, 2010). Since 1 January 2010, new and some existing covenants and body corporate by-laws have been prevented from banning energy efficient features or fixtures and requiring certain design elements in houses, townhouses, units or enclosed garages. The law on these issues was further amended on 23 May 2010. Some covenants and body corporate by-laws had been used to prevent sensible sustainable housing features such as light coloured roofs, solar hot water and solar pv being installed.

*"Considering that new dwellings only contribute 2 per cent of the housing stock; against 98 per cent of inefficient existing dwellings, it justifies the importance of any energy efficiency improvements to the existing housing stocks" (Panahain, Ding & Ghosh, 2016)*

A new approach to the governance of strata communities specifically relating to solar has been tested in Perth, Western Australia. The White Gums Valley (WGV) precinct is a new housing development that demonstrates a shared solar PV and battery storage system utilising the Solar

battery Storage Governance Model. This governance model, developed with Curtin University researchers, was tested at WGV having identified that medium density housing represents the housing typology most likely to successfully implement shared solar systems. One of the key criteria for implementation of the Solar Battery Storage Governance Model is the applicability of strata or community title law over the residential development.

ARENA (the Australian Government's national renewable energy agency) reports that the WGV project has yielded a scalable and generalizable model for shared ownership of solar and storage in medium density developments. The WGV site has served as a demonstration of the effectiveness of the governance model in enabling greater solar PV and battery storage to be adopted across apartment housing in Western Australia and across other parts of Australia (White Gum Valley Project Report, ARENA).

The capacity of the strata body to act as electricity retailer in the case of the WGV project could be an attractive option for large community schemes in the future. The significance of this model is demonstrative of the limiting factors of the current energy retail market in relation to governance of solar energy generation in a community scheme.

Wallis View (Forster, NSW) also serves as a demonstration of the power that energy retailers have to cause additional layers of complexity in the process of deciding to install solar panels in strata or community schemes. Country Energy used the owners' corporation's proposal as justification to require substantial upgrades to the metering in the common property meter room and for the layout of the meters to be changed. However, the proposed system was ultimately approved through the AGM and has now delivered an 83% reduction in energy costs to the owners' corporation.

Panahian et al (2016) examine a Sydney case study concluding that sustainability performance of a multi-unit development should be estimated at the scale of the site, taking unified impacts of different sustainability factors into account. Essentially, this is arguing that the inclusion of all these factors in the sustainability performance assessment could generate better realistic solutions to retrofitting existing multi-unit residential developments. This echoes the experience of Botany Cope and Stucco - both of which undertook retrofit of multiple sustainability measures (eg. replacing light globes, repairs and maintenance of mechanical ventilation systems) which led to a reduced energy requirement for common property areas.

Panahain et al (2016) also provide insight to the extent of data required to determine requirements of a community comprising more than one building. Consistent with those owners interviewed, Panahain et al recommend a holistic approach to achieving energy efficiency. This community-wide view suggests the need for a commitment to sustainability in relation to broader community and environmental interests, beyond payback periods and energy bills for individual dwellings.

## 5 Recommendations – what needs to be done

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This research has identified a number of issues arising from its review of the current context and relevant case studies that have an impact on the uptake of solar photovoltaics to power common areas in apartment buildings in the City of Sydney. These issues are generally consistent with those highlighted in the City's RASP strategy. The actions proposed in this paper are designed to align with, and augment, the objectives of that strategy related to existing apartment buildings and to fill any 'gaps' that may have emerged. Specifically, we propose 10 key actions (outlined in detail below) relating to:

- Building capacity
- Activating upgrades and engaging communities
- Empowering owners
- Planning to support change

The proposed actions include recommendations about the timing for implementation, whether partnerships with other organisations would be required and whether implementation requires action by the City of Sydney or involves advocacy related to the issues.

We acknowledge that the potential implementation of these recommendations is contingent on availability of funding and support across Council as well as the opportunity to advocate on issues and engage potential collaborators or partners.

In addition to our ten key recommendations we suggest that there are additional potential opportunities for action by the City including:

- introducing a cross-departmental working group to share knowledge between planning assessments, sustainability and policy teams who can help to support the Solar Concierge and to build capacity and knowledge across the Council to promote increased uptake of solar PVs
- investigating the potential to promote solar farming (and available land or roof space to accommodate it) within the city for existing apartment buildings that are not suited to retrofitting solar panels but whose owners are interested in renewable energy through solar



## Recommendations focusing on pathways to increase uptake of solar PVs on existing apartment buildings within the City of Sydney

What we'd do	How we'd do it	Partners that could help	Why we recommend it
<b>Building capacity</b> <ol style="list-style-type: none"> <li>1. Provide easy to access, tailored and expert support on environmental performance projects involving solar photovoltaics</li> <li>2. Give owners access to accurate information helping them to approve and install solar photovoltaics on common property</li> <li>3. Encourage strata managers to support and inform owners wishing to install solar photovoltaics</li> </ol>	<p>Develop tailored information site – a 'how to' guide to solar PVs – with information specific to varied apartment typologies to support owners corporations and community schemes to make decisions. This could be expanded to include diverse and integrated sustainability measures.</p> <p><b>NOW</b></p>	<p>In-house experts (the Solar Concierge service)</p> <p>Green Strata</p>	<p>Much of the relevant information is available across a number of websites. The site would support solar concierge advocacy activities and be tailored to include information on what can be achieved with different size solar photovoltaics arrays in a building of similar size, age and construction materials. It would act as a portal to other online sources of information about relevant policy, regulation, installation and case studies (such as Green Strata) - consolidating rather than duplicating existing information, rather like the City's 'What's on?' page, this site would be adaptable, consistent and expandable.</p>
	<p>Integrate solar photovoltaics module (including information on benefits of, costs, selection, installation and maintenance) into Strata Skills 101 workshops.</p> <p><b>NOW</b></p>	<p>NSW Fair Trading</p> <p>Owners Corporation Network</p> <p>Green Strata</p>	
	<p>Incentivise existing apartment building owners to undertake regular energy audits by reintroducing subsidised energy audit scheme. Ensure that data is collected and made publicly visible as part of the City's initiatives towards Net Zero. Advocate that it should be mandatory for Strata AGMs to address energy audit as a statutory motion.</p> <p><b>LATER</b></p>	<p>Green Building Council Australia</p> <p>Owners Corporation Network</p> <p>Strata Community Association NSW</p>	<p>To provide insight to inter-related policy and legislation and dispel some misconceptions, the module should include sections on: legalities, ownership of and responsibility for common property, technical issues and trouble shooting.</p> <p>This would augment existing initiatives offered through the Smart Green Apartments. It would also promote greater awareness of how individual buildings are contributing to the Net Zero target and would provide the City with a much clearer understanding of how this target is tracking.</p>

What we'd do	How we'd do it	Partners that could help	Why we recommend it
4. Ensure public facing documents/portals are available in multiple languages	CoS Community Languages Unit to work with solar concierge to ensure documents can be translated for non-English speaking residents and owners <b>NEXT</b>	Green Building Council Australia Owners Corporation Network	To assist non-English speaking residents and owners with understanding various sustainability measures available to multi-owned properties, including solar photovoltaics.
<b>Activating upgrades and engaging communities</b>  5. Drive active upgrades for environmental performance	Advocate mandatory requirement for advertising of NABERS ratings on the sale or rent of all apartments in the City of Sydney (existing and new buildings) <b>NOW</b>	Real Estate Institute of Australia Department of Planning NSW	Increasing visibility of data and the importance of environmental performance will build awareness, combat misconceptions about solar, and promote more responsible behaviours on the part of owners and strata bodies. Would also strengthen the City's evidence base to support advocacy for policy change.
	Undertake a 'Eco Champions Roadshow' promoting the benefits of solar pvs (cost benefits and how solar can improve property values) and providing information about product types, installation and maintenance.  Targeted presentations delivered in person to relevant community scheme and strata AGMs (and develop supporting online and printed material). <b>NEXT</b>	UNSW School of Photovoltaic and Renewable Energy  Green Strata  In-house experts (the Solar Concierge service + CoS Sustainability team)	Interviewees suggested that increased knowledge and awareness amongst owners would improve decision making and increase likely uptake of PVs on common property.  The number of existing community schemes within CoS is relatively low so this initiative could serve to introduce and promote the solar concierge directly and efficiently.  To increase awareness and encourage community schemes to become 'champions' for change, supporting the owners corporations in the process to retrofit to solar pvs as power source / Promote a shift in focus for Community Schemes as advocates / active champions for renewable energy or sustainability initiatives (instead of regulating or restricting activity, promote positive and estate-wide initiatives, leveraging the collective common property; leverage the 'moral responsibility' of the Community Scheme to protect collective interest).



What we'd do	How we'd do it	Partners that could help	Why we recommend it
<p>6. Make building performance data readily available and relevant to the value of the property</p> <p>7. Increase community awareness of how to contribute to Net Zero targets</p>	<p>Commission research to gather and analyse leasing and spatial data to identify existing strata schemes that do not yet have solar and that could support it.</p> <p><b>LATER</b></p> <p>Support development of online analytics tools to be able to publicly show the contribution that apartment buildings make to the City's performance.</p> <p><b>LATER</b></p>	<p>Green Building Council of Australia</p> <p>Developers (Lendlease et al)</p> <p>Housing Industry Australia</p> <p>NSW Department of Planning</p> <p>UNSW School of Photovoltaic and Renewable Energy</p>	<p>Literature and interviews reveal lack of data relating to energy load use which could help to address the site and building-specific needs and opportunities in terms of available common property. This would also assist in tracking Net Zero targets as well as substantiating advocacy to State and Federal policy makers.</p>
<p><b>Empowering owners</b></p> <p>8. Advocate for changes to the Strata Schemes Management Act and Regulation</p>	<p>Advocate for amendment to Schedule 3 <i>Strata Schemes Management Regulation 2016</i> (Model by-laws for residential strata schemes) to enable installation of solar pvs for common areas as long as they comply with agreed requirements (in relation to product performance in terms of suitability, installation and maintenance).</p> <p><b>NEXT</b></p> <p>Advocate for amendment to the <i>Strata Schemes Management Act 2015</i> to include a requirement for 5 yearly review of strata and community by laws.</p> <p><b>NEXT</b></p> <p>Advocate for amendment to the <i>Strata Schemes Management Act 2015</i> to exempt decisions relating to the installation of solar photovoltaics from decisions by the owners corporation or community scheme as long as they are in keeping with the adopted by law.</p> <p><b>NEXT</b></p>	<p>NSW Registrar General, Land Registry Services</p>	<p>To establish a foundation for governance that is based on a starting presumption that solar photovoltaics are allowable without decision by the owners corporation.</p> <p>Although a by-law is not required for installation of solar pv in common areas (where the owners corporation is responsible for the ongoing maintenance), establishing a guideline by-law could 'fast track' decision making, and would demonstrate the strata scheme's alignment with the City's Sustainable 2030 policy.</p> <p>Regular review of by-laws will encourage adoption of the new guidelines and will also allow by-laws to keep pace with the changes in sustainable infrastructure.</p> <p>Changes to the relevant legislation would also limit the ability of any strata or community scheme to prohibit the installation of solar panels.</p>

What we'd do	How we'd do it	Partners that could help	Why we recommend it
	<p>Advocate for changes to the <i>Strata Schemes Management Act 2015</i> and the <i>Community Land Management Act 1989</i> so that by-laws and community or building management statements may not be amended to prohibit or restrict the installation, operation or maintenance of sustainability or utility infrastructure.</p> <p><b>NEXT</b></p>		
<p><b>Planning to support change</b></p> <p>9. Ensure that local planning controls enable the shift to renewable energy</p>	<p>Advocate amendment to <i>Sydney Local Environmental Plan 2012</i> Part 3.1 to include reference to exempt proposals for solar energy systems contained within the <i>State Environmental Planning Policy (Infrastructure) 2007</i> Division 4.</p> <p><b>LATER</b></p>	NSW Department of Planning	To increase public awareness of exemptions available
	<p>Development application forms to include a standard 'check box' to note whether solar photovoltaics are included as part of the proposal.</p> <p><b>NOW</b></p>	NSW Department of Planning Other councils	To build knowledge about the uptake of solar photovoltaic technology and assist with mapping the location of buildings with solar panels installed.
10. Collect data to support future decision making on environmental strategies	<p>Collate data on location of community schemes within the City. Map existing buildings that have installed solar photovoltaics, and update mapping regularly Review of strategic development policy and DA assessments to minimise potential conflict between future desirable high-rise proposals and low or medium rise buildings with solar panels</p> <p><b>NOW</b></p>	NSW Department of Planning University and private research centres	<p>Allow for targeted community engagement on the benefits of solar panels.</p> <p>Mitigate potential for conflict between strategic densification within the City and the requirements of the Apartment Design Code, Objective 3B-2 / to future proof against desirable development being impacted by restrictions on height due to potential overshadowing of adjacent apartments' solar panels.</p>

## 6 Conclusion

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The research identifies the opportunities to enable a greater take up of solar photovoltaics technology in apartment buildings, and in particular, the potential for future action by the City of Sydney - either by direct action or through advocacy, to remove these barriers and empower owners and the community.

In order to address the challenges of retro-fitting solar panels to existing apartment buildings, there is a need for commitment to reform by federal and state governments in the areas of energy market regulation, planning and strata management law. More fundamentally, if the City is to achieve its Net Zero targets, a cultural and behavioural shift is required that reflects a commitment from the community to actively engage and to take on responsibility for environmental stewardship.

Changes to legislation and regulation should be advocated for in order to remove the opportunity for community associations to block strata schemes from installing solar panels on common property. Our recommendations include specific opportunities to promote change in this area:

### **Empower owners**

- Advocate for changes to the Strata Schemes Management Act and Regulations

### **Planning to support change**

- Ensure that local planning controls enable the shift to renewable energy
- Collect data to support future decision making on environmental strategies

The research reveals the need for mandatory requirements that will drive behavioural change on the part of owners corporations, strata bodies and community associations - without which, the issues of factional behaviour that block smooth governance of strata communities will continue to frustrate the City's efforts to increase the uptake of solar panels. Our recommendations suggest augmenting existing RASP commitments to drive behavioural change:

### **Build Capacity**

- Provide easy to access, tailored and expert support for environmental performance projects involving solar PVs
- Give owners access to accurate information that will assist them to approve and install solar PVs on common property
- Encourage strata managers to support and inform owners wishing to install solar PVs

### **Activate upgrades and engage communities**

- Encourage owners to actively upgrade environmental performance
- Make building performance data readily available and relevant to the value of the property
- Increase community awareness of how to contribute to Net Zero targets
- Demonstrate leading practice in pilot schemes

Perhaps more ambitious, but nevertheless worth considering, is the issue of energy market regulation. If energy retailers were required to enable strata communities to behave in a communal way in terms of energy production and use for common property, there would be increased incentive for individual owners to consider investing in infrastructure for a shared benefit. This could have positive impacts in relation to new build apartment buildings and community schemes as well in relation to the management of embedded networks.

The authors would like to acknowledge the generous participation of all interviewees, and to note that the expertise and experience shared by these individuals indicates that installing solar panels in the City of Sydney can be relatively easy - thanks to initiatives offered by the City to date. We hope that these insights and experience can be shared more widely and will be called upon to support the City's next steps towards Net Zero.

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## Appendix A: Overview of Research Methods

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### Ethics

Ethical approval for this project was obtained from the University of New South Wales, Human Research Ethics Advisory Panel (UNSW HREAP). Standard good practice ethical protocols were followed and written consent was obtained from each participant. The participants were recruited using existing networks from within and outside the University. Each interview lasted approximately 1hr and was digitally recorded, the records of each interview will be held securely by the University.

### Methodology

Our research methodology included several approaches including systematic literature and policy review, qualitative study by interviews, and analysis of the available data.

The literature and policy review was limited to a focus on research in the Australian context with minimal reference to international research, given that this research seeks to examine the specific context of one Local Government Area in NSW. The literature review was also limited in scope to papers published in or after 2010 in order to focus on current interpretation of issues relating to installation of solar panels on multi-owned properties and on experiences relating to current policy and technology.

Systematic literature review included:

- high level information related to technical studies, installation, life of asset and maintenance costs
- case studies
- academic articles
- professional reports

Systematic policy review included:

- legislation
- policy / regulation / standards
- national and international case studies
- submissions
- strategies and action plans
- design guidelines
- development approval processes

In reviewing the literature and policy, the research team considered a number of focus areas, including

- incentives and barriers to installation of solar pv
- pace of change in the sector
- governance (of similar initiatives)

The interviews were designed as a qualitative study intended to give priority to participants' own words and voices in expressing and understanding their day-to-day lived experiences of the issue (Neuman 2011 in Sommerfeld 2016). While time limited us to a small number of interviews, the experience of each interviewee allowed us insight to several behavioural phenomena, including 'factional' management of strata and community associations as well as the motivated individuals who will voluntarily commit their time and effort to implementing change - "in qualitative research, sample size is less important, with the importance on the patterns and themes that accurately represent meaning" (Sommerfeld 2016, p69).

The interview questions enabled us to engage in conversations to explore the interviewees' opinions about the installation of solar PVs and associated issues, including their opinions about its importance, its usefulness and barriers to use. Qualitative research is particularly appropriate for obtaining in-depth insight into issues and topics to understand how social and cultural contexts affect processes, decisions and events (Sommerfeld 2016).

The outcomes of the interviews are summarised below and demonstrate some patterns and consistency of opinions across the field of interviewees. We analysed the interview outcomes by comparison and in relation to the findings of the literature review. All interviewees are expert in the subject, consequently the authors acknowledge that, with a wider field of interviewees, it is likely that more discrepancies would be evident - particularly in relation to perceived barriers or objections to the installation of solar panels.

Context analysis was also informed by de-identified publicly available data from the Australian Bureau of Statistics and de-identified NSW strata property data (held under license by A/Prof Easthope). Access to current and complete data was identified several times through the research as being a challenge to researchers in this area. Ideally a mixed methodology should include collection of qualitative and quantitative, the intent of including some quantitative evidence in this research was to provide a balance to qualitative approaches and a triangulation of information.



## Appendix B: Interviews Overview

Structured interviews were held with individuals, identified through research and advice provided by the City of Sydney, with direct experience in installation of solar panels on multi-owned properties in Sydney and surrounds. Each interviewee was asked a similar set of questions to understand their point of view and experience of the issue.

INTERVIEWEE	POLICY / LEGISLATION	BARRIERS (PERCEIVED & ACTUAL)	DRIVERS & INCENTIVES	OPPORTUNITIES	REFLECTION / RECOMMENDATIONS
<b>David Zabell</b> , Senior Planner (CoS)	Limited requirement for DA process; Development controls protect solar collectors (DCP guideline only); SEPP 65 / ADGs includes min 4hrs solar access for solar collectors; State Govt exempt & complying development controls override Council guidelines; Potential to change the Infrastructure SEPP (remove confusion)	Heritage impacts & aesthetic impact; Question of best use for CP (does PV installation conflict with green roof/ laundry/ other?); Area of CP on the roof is inadequate to accommodate all requirements inc. PV; Insufficient economic value (especially if roof area is too small)	Complying development includes PVs; DA fees are waived for sustainability-related proposals	Mapping to anticipate where future development is likely to impact existing solar collectors & mapping likely uplift to anticipate future impacts; Elevate DCP guidelines to protect solar collectors into LEP; Streamline information to indicate for the public – bringing together info from Infrastructure SEPP with SEPP65 and the LEP; Potential for the City to increase the level of exemption around solar panels; Collaboration between Councils to share knowledge and strategies; Collaborate on a dashboard location for info within the state's planning portal	While David's responses suggest that advocacy for policy reform could be a way to eliminate confusion for people looking to install solar on strata CP, in the immediate future a cross-Council working group to share the relevant policy and legislative information could support better decision making, clearer communication and stronger advocacy.  Pro-active comms campaign to promote a simple pathway regulation to installation (which prompted the Botany Cope project); seek out the champions in strata and community associations and support them.
<b>Melinda Dewsnap</b> , Sustainability Manager &	10-99kW system requires Complying Development Certificate (below 10kW, no approvals);	Community Management Statement (original by-law) can be established to enable blockage to solar	Positive perceptions of solar	Update to BASIX could drive better practices by being more visionary/ambitious (City is on the BASIX working group);	Internal info sessions across Council departments to build capacity. Seems (in multi-strata

<b>Kimberley Camrass</b> , Client liaison (CoS)	EP&A Act relative to by-laws? Community Mgt Act and EPA Act at odds?	(or other initiatives); Finance (access to & payback periods); Confusion about decision making; Lack of access to experienced suppliers/installers; No evidence to suggest uplift in property value; Deregulated energy sector has eroded consumer rights		Collaborate with other Council's to advocate policy/leg. Reform; Collaborate with Department of Planning in reviewing the way that apartment buildings are considered in future policy and legislation	complexes, that Acts can be contradictory).  Where City advocacy to State & Fed govts has been successful, they have provided a strong evidence base. Suggest that supporting increased and more frequent energy audits would provide evidence to support new initiatives and better data to understand how net zero targets are tracking.
<b>Mike Roberts</b> , Research Associate School of Photovoltaic and Renewable Energy Engineering Centre for Energy and Environmental Markets	Complexity of decision making comes from intersection of strata law, energy retail law and planning law; Network charging is not spatially or demand specific, so a bespoke solution is difficult to isolate in terms of energy costs	Access to capital (eg borrowing against CP); short time horizons; Complexity of decision making; Question of best use for CP	what might start out as altruistic environmental motivation often becomes financially driven because the offer is pitched that way; Anecdotal evidence from Victoria suggests that ubiquity of solar on new builds may be driving retrofits to compete	An approach to solar PV in retrofits that takes into account the specific and diverse conditions of different building types is necessary – a tailored service rather than a templated, tick box approach. Tools for estimating need are in development but access to data is difficult - Victoria has meters that measure energy load use which could be replicated here. SolarAnalytics (peer to peer solar trading research underway - opportunity for community estate developments)	Ban the Banners is about planning law, not strata law ( <i>note in lit review</i> ). Does self-assessment need better support. Plug-in panels are coming – early stages in Germany – suggesting that some of the network issues may only be temporary. Can the city support innovation in this space?

<p><b>Tony Irvine</b>, SCA Sustainability Committee</p>	<p>Strata law is a legislative impediment to any alteration / addition to common property; Variability of popularity not</p>	<p>Question of best use for CP (does PV installation conflict with green roof/ laundry/ uplift through additional storeys); Insufficient economic value; Where special resolutions are required, 100% attendance at AGMs is infrequent therefore special resolution more difficult to reach; Payback periods are longer than typical apartment turnover period, so benefits aren't perceived to accrue to owner; Dangers associated with being unable to isolate power supply; Maintenance costs; Structural challenges; Perceived obsolescence of the tech; predominance of 2-storey walk-up strata properties unlikely to be motivated to install solar, partly because CP energy usage too small to justify it</p>	<p>Not a high priority in the market at the moment</p>	<p>owners need opportunity to analyse whether the proposal represents good value to the owners corporation through an independent review at a certain threshold (to protect the minority); Greater participation rates are important - tenants don't attend meetings even though the law has changed to accommodate them;</p>	<p>More frequent energy audits should be required. Suggest this should be mandatory for Strata AGMs to address as a statutory motion.</p> <p>Assistance from the City for potential installers should be clear about the steps to take and clear about how and what the City can do to help.</p>
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<b>Catherine Lezer,</b> resident Botany Cope	Mandatory NABERS for apartment buildings (shifting perceptions about value of solar & other sustainability measures); The current market is lacking the will to act - implying that more and mandatory regulation will change behaviours; "It's wonderful that Sydney is leading the charge and providing an example to all other cities in Australia"	Inexperience on the part of technicians & installers for multi-storey install; "Strata management typically doesn't have the most transparent accountability consequently there's not a great deal of community or trust built"; Many strata titles are small and consequently not easily able to bear the cost of installing PVs	"Solar PV was seen as future proofing"; grants program by CoS provided 50% of costs; cost savings associated with sustainability measures had been proven, making this an easier decision; planning was easy to negotiate, there was no DA required	Very consistent base load of energy use across CP enables clearer decision as to size of service; mandating NABERS rating tool (even if only for a period of time - may result in some unevenness given that those buildings without current rating will be the ones that demonstrate 'improvement' in the first instance)	"State government should require a regular sustainability audit, similar to or connected to the sinking fund"; The way that strata is managed is a barrier - strata managers don't typically have a relationship to the building or its community; Strata mgt is a layer of governance, but without DA or other government decision making directly required, is effectively acting as decision maker, or government, in this context - therefore should be accountable to the same climate change objectives; Mandatory 'how to manage your building' course
<b>Sue Holliday,</b> resident & Chair Community Association, Hopetoun Quays	Council consent is understood as an impediment; By-law was required to enable installation of solar for individual use but was drafted to enable others to use also - Community scheme committee had to undertake this because it was on CP	widespread misunderstanding of the implications of a by-law; There were no objections to this application of the by-law but there were general objections to solar panels; time & energy investment on the part of the individual to advocate & convince other members of the strata body & the Community Scheme committee		Participation counts - being on the Committee (and being knowledgeable in relation to planning) helped; 'Ban the Banners' could work - require Community Management Agreements to enable installation of solar retrospectively	Seek support and vocal action from GBCA, BASIX NABERS potential to support installation of solar should be mandated - while they remain guidelines that rely on market demand, nothing will happen

## Appendix C: Case Studies

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### Botany Cope

Location	Redfern, Sydney
Year building completed	2003
Number of buildings / towers	2 buildings
Total number of storeys	4
Number of residential storeys	4
Number of residential lots	30
Number of commercial storeys	1
Number of commercial lots	4
Number of car parking levels	1
Number of lifts	2

**Botany Cope installed a 4.9 kW solar system that is meeting 23% of its common property electricity demand. <http://greenstrata.com.au>**

#### Background

- An energy audit in 2013 advised that a 15 kW system would be the "right size" for a solar array, based on the scheme's common property energy. Subsequent analysis of energy demand revealed that only a 5 kW system was needed (which occurred in 2015).
- After implementing the "low hanging fruit" recommendations from the energy audit, mostly lighting projects, electricity usage dropped by 49% in 2 years.

#### Decision making, approvals and regulatory context

- *timing & process of approval*: 2 years from decision (2013) to installation (2015)
- *committee group/s governance process*: A subcommittee was formed to manage the solar installation following unanimous owners' agreement to install
- A by-law was adopted in response to this being an improvement to the property

#### Site and context

- Two separate buildings, each on a different street frontage, with a common courtyard between them. A tall building on its northern boundary casts significant shadows at different times of the day. There was too much overshadowing of the building on the western side of the property, so only the rooftop of the eastern building was considered.

#### Installation

- *timing / costs / issues / resolutions*: difficulty identifying appropriate supplier caused delay
- *system configuration; layout & design considerations*: data gathered between 2013 (initial proposal) and 2015 (installation) indicated that the desired savings could be delivered by a smaller system than initially proposed

#### Costs

- *returns to date & further anticipated returns*: initial capital costs recovered within 2 years; \$700 savings over a year

## Stucco

Location	Newtown, Sydney
Year building completed	(unknown – heritage listed)
Number of buildings / towers	1
Total number of storeys	3
Number of residential storeys	(all)
Number of residential lots	8

***Stucco is the first multi-unit residence to achieve a unified solar panel and battery network in Australia – it has achieved 80% self-sufficiency: 114 panels. 36 batteries. 40 residents. 8 units. \$35/month savings. <http://www.stucco.org.au/solar>***

### Background

- *general approach to renewable energy initiatives*: is a test case and demonstration of solar–photovoltaic and battery storage installation in the context of multi-unit residences

### Decision making, approvals and regulatory context

- *issues / resolutions*: There are plenty of embedded systems in apartment blocks elsewhere in Sydney, but the hard part for Stucco is that theirs was a retrofit — and the AER struggled with that. Sturmberg thinks the stumbling block may have been the consumer rights issue around the tenants' option of accepting a PPA from the co-op or sticking to grid power as usual. (Ecogeneration, April 2017 – Project Case Study, p34-35) Spawned the launch of SunTenants – enables solar to be installed on rental buildings and promotes fair sharing of benefits between landlords & tenants.

### Site and context

- Heritage listed building in single title - this is not a demonstration of strata title at work, but rather the ways that the City has (and could continue to) demonstrated how sustainability initiatives can make a significant impact on the costs of living for multi-residential buildings.

### Installation

- *timing / costs / issues* : 2015 \$80k CoS grant; total cost \$130k (\$97k technical system; \$33k labour & install)

### Costs

- *returns to date & further anticipated returns*: \$35/month savings on the energy bill; anticipated costs to have been recovered in 5-6years of operation



The image above shows the extent of solar array that was possible on the roof of the Stucco building - the available roof area and potential scale of solar PV system is critical to feasibility.

## Wallis View

Location	Forster
Year building completed	1987
Number of buildings / towers	1
Total number of storeys	4
Number of residential storeys	3
Number of residential lots	27
Number of car parking levels	1

***“WallisView” demonstrates some of the dynamics of decision-making in Strata complexes and how results can be achieved with good communication and flexibility (GreenStrata website)***

### Background

- *system installed & reason for size/capacity*: 10kW solar array - 2.5kW used by the owners corporation and 1.5kW for each of five owners - on the common property roof of the building, primarily to offset rising electricity costs
- *general approach to renewable energy initiatives*: solar hot water was also considered but proved unworkable for the roof load capacity

### Decision making, approvals and regulatory context

- *issues*: Country Energy also used the owners corporation's proposal as justification to require substantial upgrades to the metering in the common property meter room and for the layout of the meters to be changed.
- *committee group/s governance process*: no objections at the AGM when the proposal was accepted
- *legalities (including by-laws)*: special by-law was required by the Strata Schemes Management Act 1996

### Site and context

- *sun access &/or overshadowing*: little to no overshadowing; additional common roof area available for further production of solar energy

### Installation

- *timing / costs / issues*: 3 months from outset to final implementation; very little knowledge of strata or solar amongst installers
- *system configuration; layout & design considerations*: while only 5x of the owners chose to adopt the scheme for their individual apartments, further capacity on north and west facing roof areas was identified in addition to the original system

### Costs

- *initial outlay & any subsidies*: total costs were \$30,000; NSW Solar Bonus Scheme applied (now discontinued); were eligible for Renewable Energy Certificates (RECs). The installer applied the credits as a discount on the purchase price of the system
- *returns to date & further anticipated returns*: payback period for owners corporation was 3 years and 4 years for individual owners;

- *performance to date*: owners corporation energy usage costs since installation (and with other energy efficient initiatives) have been reduced by 83%



## Ban the Banners

Location	Queensland
Act	Building Act 1975 (Chapter 8A, Sections 246Q, 246T)
Year	2010

### ***New covenant and body corporate by-laws (sustainable housing laws)***

***Since 1 January 2010, new and some existing covenants and body corporate by-laws have been prevented from banning energy efficient features or fixtures and requiring certain design elements in houses, townhouses, units or enclosed garages. The law on these issues was further amended on 23 May 2010. The provisions are not only directed at sustainable building initiatives, they also are designed to impact positively on housing affordability. (Ban the Banners fact sheet produced by Building Codes Queensland, Department of Infrastructure and Planning, Queensland Government)***

### **Background**

- Developers commonly use covenants in the contracts of sale, by-laws or community title schemes to control home designs in residential estates and unit complexes

### **Reasons for policy change**

- “This was in response to concerns raised by home owners who were prevented from doing this by covenants and body corporate by-laws imposed by some developers.”
- Some covenants and body corporate by-laws had been used to prevent sensible sustainable housing features such as light coloured roofs, solar hot water and solar panels being installed.”
- Minister for Infrastructure and Planning, The Honourable Stirling Hinchliffe.  
<http://statements.qld.gov.au/Statement/Id/68651>

### **Reasons for changes**

- Understood to have been industry lobbying for changes relating to material choices and minimum floor areas; no changes were made to the solar panel related

### **Changes relating to solar panels and sustainability**

- Covenants and by-laws made after 22 May 2010, cannot restrict the use of:
  - light roof colours
  - energy efficient windows or window treatments.
- A by-law or covenant cannot prohibit or restrict the installation of a solar hot water system or photovoltaic cells merely for the purposes of preserving the external appearance of a building. This applies to by-laws and covenants made prior to 1 January 2010 as well as on, or after that date.
- These policy changes are not retrospective in the case of bylaws or covenants relating to solar panels. The City could consider developing proposed policy changes that could include retrospective amendments to by-laws or covenants if they could determine that this would enable a significant number of community strata bodies to overcome previous blockages caused by community association objections.

### **Relevant aspects**

- Chapter 8A of the Building Act requires a sustainability declaration to be prepared before certain buildings are offered for sale. The requirements apply to class 1a (houses, townhouses and

duplexes) and class 2 buildings (residential apartments), and relate to the disclosure of sustainability features when sellers advertise a home for sale.

- Guideline - Changes to the Building Act 1975 and other Acts through the Building and Other Legislation Amendment Act 2009, December 2009

<http://www.dlgrma.qld.gov.au/resources/guideline/sustainability/bola-guideline.pdf>

## White Gums Valley Precinct, Perth

***The WGV project is a two-hectare medium density infill housing development built to demonstrate a range of sustainability initiatives and innovations. Among these is an ARENA funded research project that aims to develop a scalable and adaptable governance model to allow shared solar photovoltaics (PV), battery and monitoring systems to be used in strata developments nationwide. (White Gum Valley Project Report, ARENA)***

### Background

Medium density housing represents the housing typology most likely to implement a shared solar PV and battery storage system utilising the Solar battery Storage Governance Model demonstrated at the WGV housing precinct. One of the key criteria for implementation of the Solar battery Storage Governance Model is the applicability of strata or community title law over the residential development.

The WGV project has yielded a scalable and generalizable model for shared ownership of solar and storage in medium density developments. The White Gum Valley site has served as a demonstration of the effectiveness of the governance model in enabling greater solar PV and battery storage to be adopted across apartment housing in Western Australia and across other parts of Australia. (White Gum Valley Project Report, ARENA)

### Decision making, approvals and regulatory context

- *legalities (including by-laws)*: analysis of the governance model undertaken for ARENA by Jackson McDonald and McCullough Robertson suggests “Strata property law also gives rise to a number of considerations, but does not present any barriers to the CUSP model. The most important consideration is to ensure that the strata body corporate’s governing documentation give it adequate powers including acting as an electricity retailer (or contracting with a third party to outsource a retail service), acquiring, operating and maintaining infrastructure, and incurring and recovering costs.”

### Relevance

The capacity of the strata body to act as electricity retailer could be an attractive option for large community schemes in Sydney, both within the City’s LGA and more broadly across Greater Sydney. The significance of this model limited to the City’s LGA is more demonstrative of the limiting factors of the current energy retail market in relation to governance of solar energy generation in a community scheme.