Curtin University

Citizen Utilities

Unlocking Australian Strata Developments to the benefits of solar and battery storage innovations

A report for the Australian Renewable Energy Agency

In collaboration with

Jackson McDonald
Legal | Depth | Breadth | Presence

Lawyers McCullough Robertson

ARENA

Contributions

Editors:

Dr Jemma Green & Prof Greg Morrison

Lead Authors:

Mr James Eggleston & Ms Paula Hansen

Authors:

Mr Matthew Bowen

Mr Ian Hazzard

Mr John Kettle

Mr Ren Nieman

Mr Moiz Syed

Contributors:

Ms Chloe D'Souza (Jackson McDonald)

Ms Elysia Gelavis (CUSP Institute)

Mr Trevor Griffiths (CUSP Institute)

Ms Lauren Henderson (CUSP Institute)

Mr Thomas Jonak (CUSP Institute)

Ms Anu Kothapalli (Jackson McDonald)

Ms Sophie Moscardini (CUSP Institute)

Mr Kenneth Rodrigues (CUSP Institute)

Ms Tayla Ryan (CUSP Institute)

Graphic Design:

Ms Molly Winters

Biographies

Editors

Dr Jemma Green

Dr Jemma Green is a postdoctoral research fellow at Curtin University's Sustainability Policy Institute. She is also Chair and a Co-founder of Power Ledger, a leading full stack energy finance and risk advisory, having worked for 11 years in London in investment banking. Upon returning to Australia in 2013, her doctoral research on "Citizen Utilities" at Curtin University has produced unique insights into the challenges and opportunities for the deployment of roof-top solar PV and battery storage within multi-unit developments and the application of the blockchain that in part led to the creation of Power Ledger.

Jemma is also the Chair of Climate-KIC Australia, a board member of the Water Corp, a founding member of the Global Blockchain Business Council, and contributor to Forbes on blockchain disruption.

Prof Greg Morrison

Greg Morrison is professor in sustainable cities. He came to Curtin in 2015 after close to 30 years research at Chalmers University of Technology in Gothenburg, Sweden. His main research focus is on the system of practice for the home as well as energy, water and resource metabolism for homes and precincts. Greg is the Principal Investigator for this project and also for a new Smart Cities and Suburbs project on renewable energy and water peer-to-peer trading across Fremantle.

Lead Authors

Mr James Eggleston

James Eggleston is a PhD researcher on an ARENA scholarship at Curtin University at the Sustainability Policy Institute within the School of Design and the Built Environment. His work focuses specifically on technological transitions, and service innovations within the electricity utility sector. James' principle area of interest is in the technical challenges and limitations of Blockchain technology. James has more than 10 years' experience in research and development within the technology sector, and in electricity policy for the Australian Senate.

James Eggleston is an Executive Committee member of the Conservation Council of Western Australia, the state's peak environmental group.

Authors

Miss Paula Hansen

Paula Hansen is a PhD researcher at the Curtin University Sustainability Policy Institute within the School of Design and the Built Environment. She holds a combined scholarship from the Australian Renewable Energy Agency and the CRC for Low Carbon Living, and a top-up scholarship from the Australian Housing and Urban Research Institute. Her research interests focus on scaling in the context of shared solar storage set-ups, agent-based modelling, and complex systems thinking. She holds a MSc in Sustainability Science and Policy from Maastricht University, and a BSc in Business Management from King's College London.

Mr Moiz Syed

Moiz Syed is an Electronics engineer and PhD researcher on an ARENA scholarship at Curtin University Sustainability Policy Institute within the School of Design and the Built Environment. Prior to joining CUSP Institute, he worked as a research associate at the Korea Electro-technology Research Institute from where he also received his Master's Degree in Energy and Power Conversion Engineering. Moiz is particularly interested in the renewable energy applications including Solar PV, Battery energy storage, smart metering and Microgrid design.

Mr Matthew Bowen

Matthew Bowen is a Partner in Jackson McDonald's energy team. He practices in energy law, infrastructure access, competition and trade practices law and statutory drafting and interpretation.

Since 1994 Matthew has helped the Western Australian Government in a wide range of legislative reforms in the energy industry, including developing several statutory access regimes for gas and electricity infrastructure, the gas and electricity licensing regimes, the introduction of full retail contestability in gas, the 2004 and 2006 electricity industry restructure, and various other projects. Matthew contributed to the ARENA report with the assistance of energy team members Chloe D'Souza and Anu Kothapalli.

Matthew and his team have a particular interest in renewable and distributed energy resources, advising project proponents and customers on the particular regulatory and commercial issues these projects can involve, and helping Government and industry members develop their thinking on the required regulatory reforms.

Mr John Kettle

John is a partner at McCullough Robertson and has over 20 years' experience in major energy transactional, regulatory, competition and project work in Ireland, the EU and Australia. He has a strong understanding of the impact of shifting government policy in the sector, especially renewables. John's clients have included Elliott Group, BayWa, the Irish Commission for Energy Regulation, the Irish Government, Bord Gais Eireann and SSE plc. John is recognised in Best Lawyers for Energy in Australia and in the Legal 500 Asia Pacific.

Mr Ren Niemann

Ren is a partner at McCullough Robertson and specialises in the areas of construction, infrastructure and procurement and has advised clients on major projects in Australia and the Asia Pacific region over the past 20 years. He has advised on all forms of contracting, including relationship contracts, PPPs, all forms of traditional procurement, and other related agreements. Ren has advised on several renewable projects covering solar (both roof top PV and utility scale), wind, biogas and biomass and is currently advising on renewables projects in excess of 1GW. He is recognised by Chambers and Partners Asia Pacific for Construction and Infrastructure Law, and Project Finance, Best Lawyers for Construction/Infrastructure Law, Legal 500 Asia Pacific and Who's Who Legal: Construction.

Mr Ian Hazzard

Ian is a property Partner at McCullough Robertson and is renowned for his sharp knowledge and passion for the industry. He has been with the firm for over 30 years and over this time has led many strategic and complex property matters for his clients. Ian's experience and understanding of government requirements, process and priorities are invaluable when it comes to tailoring advice and pursuing favourable outcomes for projects. He is listed in Best Lawyers for Real Property Law.

Quantum Opportunity for Solar PV in Apartments

Curtin University Sustainability Policy (CUSP) Institute in collaboration with the Australian Renewable Energy Agency (ARENA) is pleased to present this report on the quantum opportunity that exists for implementing solar and storage into existing medium and high density housing across Australia.

This report has been compiled with the explicit purpose to identify the potential application for increasing the uptake of solar photovoltaics in strata residential developments Australia wide.

The findings of this report identify the percentage of residential buildings that would benefit from the use of the Open Source Solar Battery Storage Governance Model developed by CUSP Institute's Dr Jemma Green and Professor Peter Newman.[1]

The ARENA funded research project is producing scalable and generalizable models for shared ownership of solar and storage in medium and high-density developments.

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

Feedback

We value your feedback on this report because it helps us make our next report better. If you would like more information about any item in this report, just contact us and ask.

Email your feedback or questions to

cusp@curtin.edu.au

Write to us at:

Curtin University Sustainability Policy (CUSP) Institute
GPO Box U1987
Perth WA 6845
Australia

Speak to a Customer Relations Officer on
+61 8 9266 9030

1 *Citizen Utilities - Green, J., & Newman, P. (2017). Citizen utilities: The emerging power paradigm. Energy Policy, 105, 283-293.*

Contents

Introduction

Against the backdrop of nearly three decades of unimpeded economic growth, Australia's energy system is undergoing a major transition. Global awareness of the potential effects of climate change, along with soaring electricity prices nationally, have made solar PV become an attractive option for households across the country.

The total installed capacity of solar PV installations in Australia now exceeds 7.0 GW, representing more than 1.8 million installations. As the technology is maturing, average system size has risen from about 2kW in 2010 to 6 kW in 2018.[2] With little incentives for solar system owners to sell their energy to the grid, energy storage is now emerging as an increasingly interesting option for consumers seeking to further capitalise on energy savings from solar PV. A small but growing market for energy storage now exists, with several companies starting to roll out affordable options for homeowners[3] and costs for the technology is dropping rapidly.

At the same time, another trend in the Australian residential context is that of increasing urban density. Between 2011 and 2016, the portion of housing stock attributable to the medium to high density sector rose from 20 to 30%.[4][5] This percentage is expected to rise further, as governments across the country are setting density targets to counteract the costs of urban sprawl. For example, an infill target of 47% by 2031 was set for the Perth metropolitan area in Directions 2031 .[6] Further driven by affordability considerations, and the desire to reside in close proximity to employment centres and amenities, this densification trend means that increasing numbers of Australians will be living in medium to high density developments.

Despite these growth trends however, the benefits of solar energy have been difficult to access for residents of apartment developments, with most installations in the residential sector having been for freehold dwellings.[7] This report assesses the potential of an innovative governance structure to unlock strata residential developments across Australia to the benefits of solar PV and battery storage. This Strata Utility Governance framework positions the strata management body as a Citizen Utility, managing electricity and financial flows, thus making the sharing of a battery storage system a viable and efficient option for owners, tenants and other stakeholders.

This report is divided into four sections, capturing each of the aforementioned trends and analysed for uptake of solar PV and battery storage in the residential sector. The sections are as follows: Section 1 - The Nation's Housing Mix; Section 2 - Postcodes for Medium Density; Section 3 - City CBD Case Studies; Section 4 – Regulatory implications.

2. 7,803,756 kW reported installed capacity in March 2018, cf. APVI http://pv-map.apvi.org.au/analyses accessed July 12, 2018.

3. REN21. (2016). Renewables 2016 Global Status Report. Retrieved from http://www.ren21.net/wp-content/uploads/2016/10/REN21_GSR2016_FullReport_en_11.pdf

4. Australian Bureau of Statistics (2011) Australia's 16th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml

5. Australian Bureau of Statistics (2016) Australia's 17th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml

6. Western Australian Planning Commission (2010). Directions 2031 and beyond. Metropolitan planning beyond the horizon. Retrieved from https://www.planning.wa.gov.au/publications/826.aspx

7. Roberts, M. B., Bruce, A., & MacGill, I. (2015). PV in Australian Apartment Buildings - Opportunities and Barriers. Paper presented at the 2015 Asia-Pacific Solar Reserach Conference, Brisbane. Retrieved from http://apvi.org.au/solar-research-conference/wp-content/uploads/2016/02/APSRC-Conference-Paper-PV-in-Apartment-Buildings-Feb2016.pdf

WGV Housing Project – Energy Governance Model

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. The governance model is being demonstrated, scaled, adapted and tested over 4 strata developments within the White Gum Valley development in Perth.

The Need for Solar Battery Storage Governance in Apartment Buildings

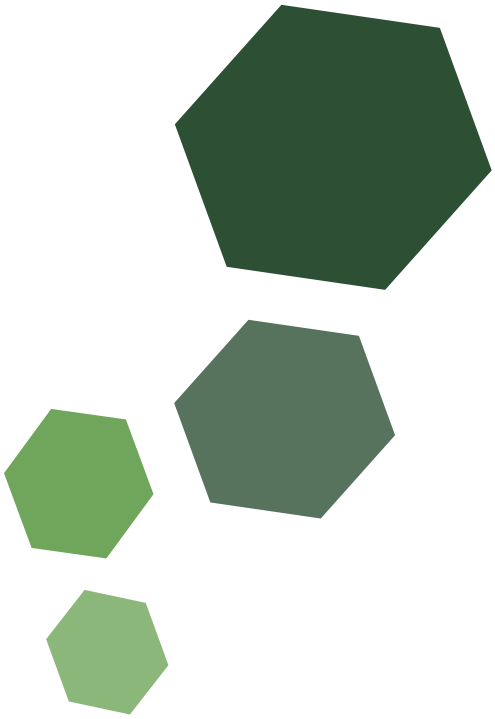
The future energy market will consist of increasing levels of distributed energy. While rooftop solar has become widely accepted by the residential housing market, issues with shared ownership, lack of available frameworks and pricing incentives have prevented renewable energy to be taken up in apartments and other strata developments.
Few multi-unit solar-storage developments with shared governance currently exist and there is no clear Australian model for how to run them.

Project innovation

A governance model has been developed, examining the shared benefits, risks and costs between developers, owners, tenants, strata bodies and utilities. The model includes the energy system design, billing, legal addendums for dwelling purchasers and dwelling leases.
The financial aspects of the governance models are studied, tested and demonstrated in four different strata lot developments. The model has been developed to be adaptable and scalable to suit different development types.

Benefit

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.



Section 1: The Nation's Housing Mix

State of the Nation's housing mix and uptake of household Solar Photovoltaics and Batteries.

States, Territories and Cities Review

Australia is a country of striking landscapes, a rich ancient culture and one of the world's strongest economies. It is the sixth-largest country in land area and is the only nation to govern an entire continent. Australia has 6 states and 2 territories with a total population of approximately 25 million and steadily growing, the bulk of Australia's population is located on the eastern seaboard.

While Australia's economic growth has been fuelled by resources in recent years, it has also become one of the most popular countries in the world for inward migration. Whilst many nations around the world are struggling with population decline and dampening, Australia has attracted a steady inflow of skilled new citizens strengthening Australia's cultural diversification, multiculturalism and has made it one of the most liveable countries in the world.

As a result of strong economic growth and population increase, more Australians than ever are living in increased housing density. Innovative technologies and policies are now needed to accommodate this shift towards enabling denser populations around our cities and throughout metropolitan areas.

Figure 1 - Map of Australia Including States, Territories and Cities[8] as shown above

8. Retrieved from http://www.freeusandworldmaps.com

Medium & High-Density Housing in Australia

Data from Australian Bureau of Statistics (ABS) was compared to examine shifts in housing typologies across Australia between the last two Census surveys. The comparison of data between the years 2011 and 2016 using the Census of Population and Housing[9][10] information has revealed that more Australians than ever are now living in shared ownership scenarios.

Nationally, the proportion of Australia's Medium and High Density housing stock has increased from roughly 20% to 30% between the years of 2011 and 2016. Using the categories highlighted in Table 1, the ABS Structure of Dwelling (STRD)[11] classifications has been sorted into three groups: remaining housing stock, medium density, high density and not categorised.

ABS Census Data from 2011 shows that 24.4% of Australian housing stock can be classified as medium and high density (20.3% Medium Density and 4.1% High Density). The 'Remaining Housing Stock' largely falls under the sub-classification of a 'Separate House' (more commonly described as a freehold title or low density suburban household).

A breakdown of the subsequent housing typologies (by percentage) for each state and territory is highlighted in Figure 1. In 2010, the three leaders in delivering density (by proportion) are the Australian Capital Territory (ACT), Northern Territory and New South Wales (NSW). Notably, high density living makes up a small fraction of the overall housing stock both at national and state/ territory level.

As demonstrated in Figure 2, ABS Data from 2016 shows that 33.0% of Australian housing stock can be classified as medium and high density (24.2% Medium Density and 8.8% High Density). Again, the 'remaining housing stock' largely falls under the sub-classification of a 'Separate House'. In 2016 the leading state and territory is NSW and the ACT, delivering up to 40% density as a proportion of total housing stock.

Table 1 – ABS Structure of Dwelling (STRD) Classifications

Remaining Housing Stock	Medium Density	High Density
Separate house	Semi-detached, row or terrace house, townhouse etc. with one store	Flat or apartment in a four or more storey block
Caravan	Semi-detached, row or terrace house, townhouse etc. with two or more storeys	
Cabin, houseboat	Flat or apartment in a one or two storey block	
Improvised home, tent, sleepers out	Flat or apartment in a three storey block	
House or flat attached to a shop, office, etc.		
Flat or apartment attached to a house		
Not stated		
Not applicable		

Figure 2 - 2011 Australian Housing Stock (ABS, 2011) Classifications

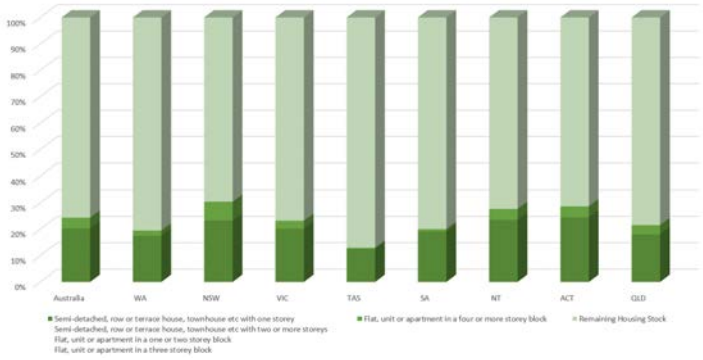


Figure 3 - 2016 Australian Housing Stock (ABS, 2016) 2011) Classifications

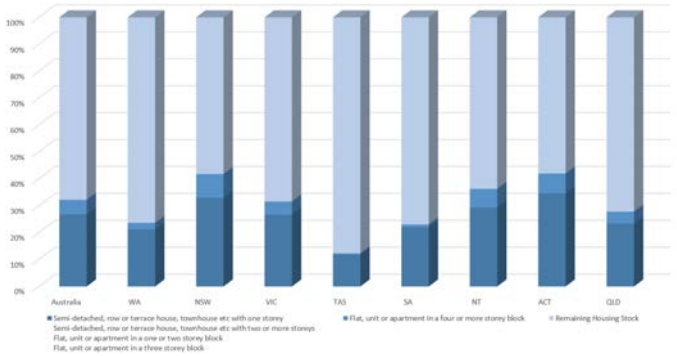
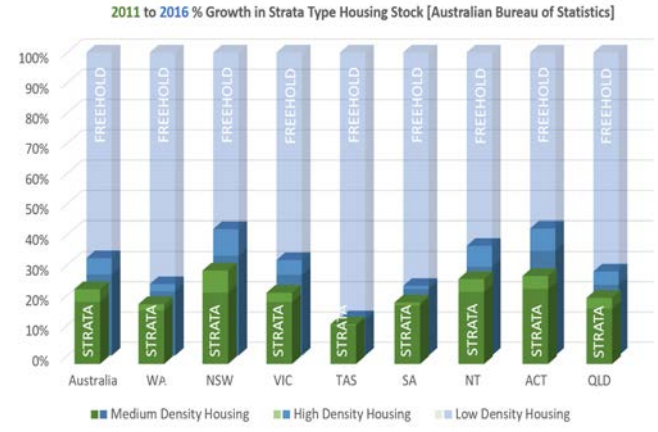


Figure 4 - Growth in STRATA type housing between 2011 & 2016 Classifications



9. Australian Bureau of Statistics (2011) Australia's 16th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml

10. Australian Bureau of Statistics (2016) Australia's 17th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml

11. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2900.0~2016~Main%20Features~STRD%20Dwelling%20Structure~10135

Solar Photovoltaic Uptake in Australia

Residential scale Solar Photovoltaic (PV) uptake has undergone a steady increase in Australia since the year 2000.

One quarter of Australian households now have Solar PV. Solar PV panels are used on the roofs of homes and businesses to use energy from the sun to generate electricity. The conversion of sunlight into electricity takes place in cells of specially fabricated semiconductor crystals. There is ample potential for daily generation nationwide as exemplified by Figure 4.

Solar PV panel uptake and installed capacity (kW) has been the greatest in Queensland, New South Wales and Victoria, measured using two quantities 1) Number of Solar Panels and 2) Generation Capacity (kW), as shown in Figure 5. Although the increase of the number of panels being installed between states has been moderate, increases in the total installed capacity of each state differs dramatically. This is a result of the falling price per kW per panel, meaning newer panels generate more electricity (kW) per panel per household.

Per Capita the strongest performer for Solar PV is South Australia, followed by Queensland and Western Australia. As shown in Figure 6 relative to population data South Australia has almost 0.5kW installed capacity of household rooftop solar for every person in the state.

However, across the country each individual state and territory has seen an increase in the use of residential Solar PV. Figure 7 and 8 reveals a steady breakdown by state and territory, where Queensland is the leading state, closely followed by New South Wales and Victoria.

Figure 5 – Average Daily Production of Solar PV Cells in Australia[12]

Average Daily Production					
City	1 kW system	1.5 kW system	2.0 kW system	3.0 kW system	4.0 kW system
Adelaide	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Alice Springs	5.0 kWh	7.5 kWh	10.0 kWh	15.0 kWh	20.0 kWh
Brisbane	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Cairns	4.2 kWh	6.3 kWh	8.4 kWh	12.6 kWh	16.8 kWh
Darwin	4.4 kWh	6.6 kWh	8.8 kWh	13.2 kWh	17.6 kWh
Hobart	3.5 kWh	5.25 kWh	7.0 kWh	10.5 kWh	14.0 kWh
Melbourne	3.6 kWh	5.4 kWh	7.2 kWh	10.8 kWh	14.4 kWh
Perth	4.4 kWh	6.6 kWh	8.8 kWh	13.2 kWh	17.6 kWh
Sydney	3.9 kWh	5.85 kWh	7.8 kWh	11.7 kWh	15.6 kWh

Figure 6 - State of Solar Uptake by State in Australia[13]

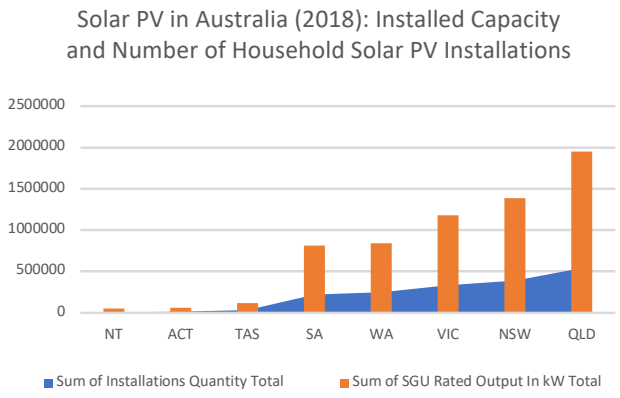
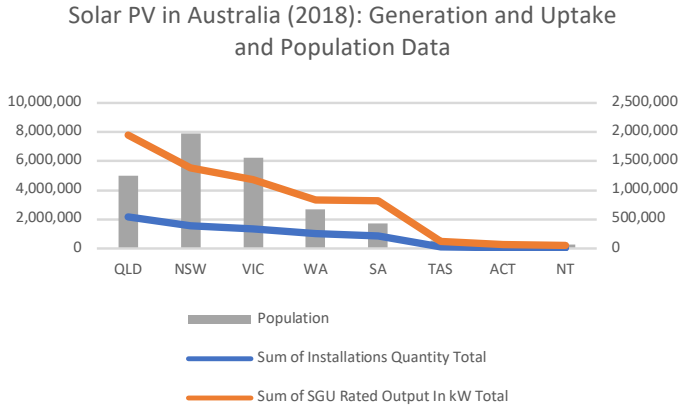


Figure 7 - Solar PV Uptake & Generation Compared to Population



12. Australian Bureau of Statistics (2011) Australia's 16th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml
Australian Bureau of Statistics (2016) Australia's 17th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml
13. Retrieved from http://www.abs.gov.au/ausstats/abs@.nsf/Lookup/by%20Subject/2900.0~2016~Main%20Features~STRD%20Dwelling%20Structure~10135

Figure 8 – Uptake trends of Solar by State in Australia

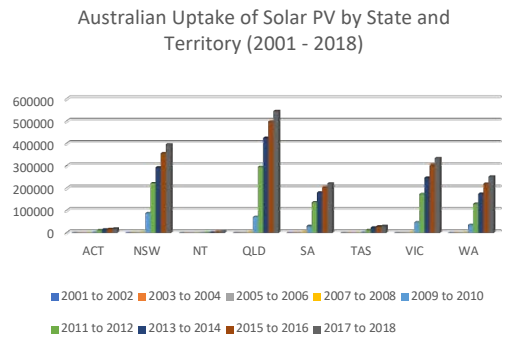


Figure 9 - Uptake trends of Solar by State in Australia

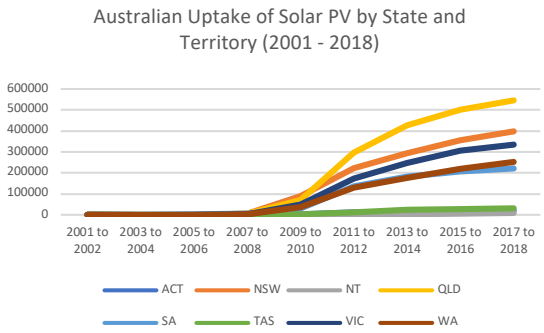


Figure 10 - Household Rooftop Solar PV[14]

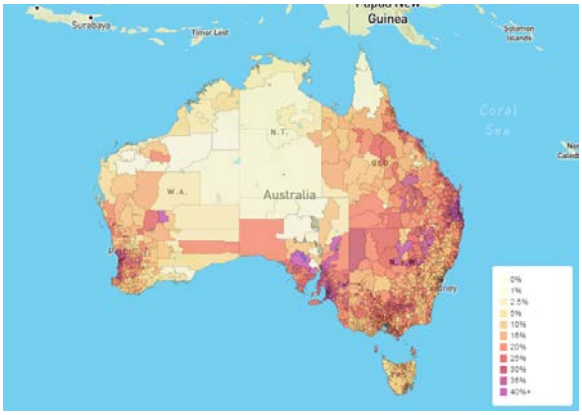
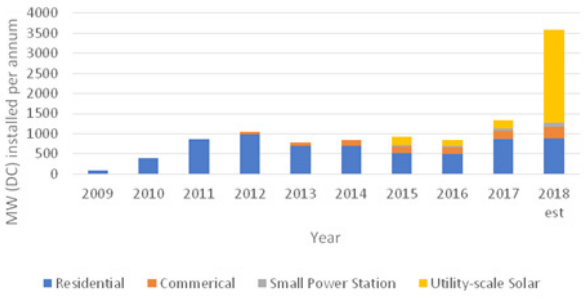


Figure 11 - Australian Solar Residential and Utility Scale Combined[15]



Household Solar PV uptake is widely spread across the country. The Australian Photovoltaic Institute (2018) has released a heat-map of solar installations nationwide. Viewed as a whole it is

clear that large swathes of residential housing have embraced Solar PV (Figure 9). More recently, a significant number of utility scale solar projects have been approved, almost tripling installed Solar PV installed capacity as shown in Figure 10.

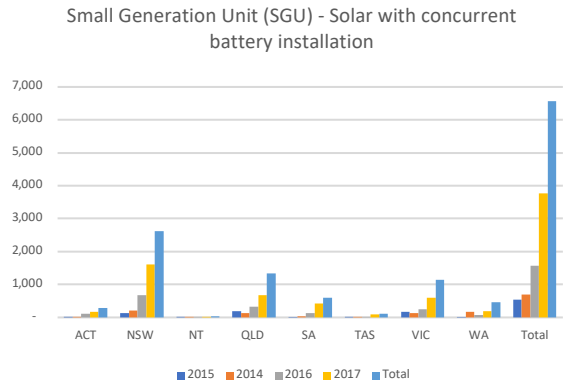
14. http://pv-map.apvi.org.au/historical#4/-27.06/125.07
15. http://reneweconomy.com.au/australia-added-1-3gw-solar-2017-treble-2018/

Combined Solar and Battery Uptake in Australia

Since 2015 Australians have been considering home battery storage as being on the cusp of financial viability. Increasing costs of retail electricity continue to justify installing Solar PV to avoid purchasing daytime electricity, to the point where one quarter of all Australian homes now have rooftop solar. Now increasingly affordable home battery technology offers the ability for solar households to store electricity for night time use, further capturing the benefit of solar energy generated during the day.

Australia's Clean Energy Regulator has been collecting data from Australians self-reporting battery and solar combined installations. The reporting detailed in Figure 11 shows an exponential increase of combined household and battery solar systems nationally. It is important to note that these figures are based on information voluntarily reported to the Clean Energy Regulator and are likely to be much higher than the currently reported 6500 installations.

Figure 12 - Household Battery and Solar Trends in Australia[16]



The trends shown in Figures 12 and Table 2 show a remarkable uptake of household scale battery installations nationwide. This demonstrates the supporting notion that battery uptake will likely follow the same trajectory trailing uptake of rooftop solar PV. Household batteries have long been heralded as the holy grail of distributed renewable generation, allowing prosumers to time shift their energy use into time periods when their renewable generators are not being supplied with energy.

Figure 13 - State by state comparison of solar and battery installations[17]

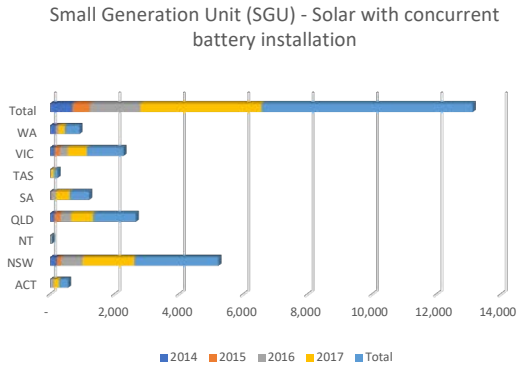
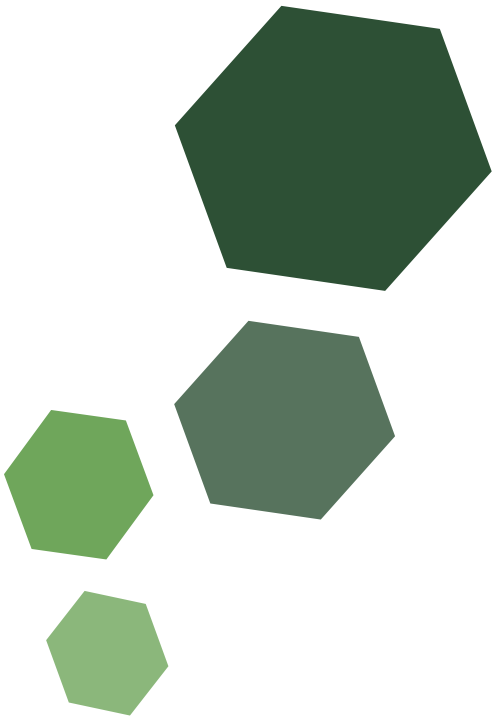


Table 2 - Small Generation Unit (SGU) - Solar with concurrent battery installation [18]

Installation Year	ACT	NSW	NT	QLD	SA	TAS	VIC	WA	Total
2014	8	208	3	129	34	5	137	169	693
2015	3	133	1	186	21	6	163	24	537
2016	105	667	6	330	130	18	240	70	1566
2017	162	1604	16	684	420	87	598	192	3763
Total	278	2612	26	1329	605	116	1138	455	6559

* Data as at 31/12/2017

16. http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations
17. http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/
Postcode-data-for-small-scale-installations
18. http://www.cleanenergyregulator.gov.au/RET/Forms-and-resources/Postcode-data-for-small-scale-installations



Section 2:
Postcodes for Medium Density

Top 10 postcodes in each state and territory for medium density housing

Solar Postcodes

Combining solar PV and medium density housing data to identify areas best placed to use the open source solar battery storage governance model.

Table 3- ABS Structure of Dwelling (STRD) Classifications

Remaining Housing Stock	Medium Density	High Density
Separate house	Semi-detached, row or terrace house, townhouse etc. with one store	Flat or apartment in a four or more storey block
Caravan	Semi-detached, row or terrace house, townhouse etc. with two or more storeys	
Cabin, houseboat	Flat or apartment in a one or two storey block	
Improvised home, tent, sleepers out	Flat or apartment in a three storey block	
House or flat attached to a shop, office, etc.		
Flat or apartment attached to a house		
Not stated		
Not applicable		

This section identifies the top 10 postcodes for each state and territory across Australia for Medium Density housing. 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.

Medium Density housing has been defined in line with a series of classifications outlined in Table 3, with data collected from the '2016 Census - Selected Dwelling Characteristics POA by STRD Dwelling Structure Counting: Dwellings, Location on Census Night' data set. Solar PV data has then also been applied to provide a sense for the existing uptake of Solar PV uptake in those areas, to demonstrate the further opportunity that exits for those postcodes to incentivise solar PV and storage uptake within its medium density housing stock.

The Solar battery Storage Governance Model will be released as open source to unlock sections within the housing market to Solar PV and Battery Storage. This is essential, as boosting supply in middle ring suburbs is the single most important action state governments can take to improve housing affordability while minimising negative collateral impacts. Developments under strata and community title legal frameworks can be unlocked to solar PV and Battery storage through use of the Solar Battery Storage Governance Model, which overcomes barriers such as the split incentive and principle agent issues in shared residential developments.

Solar Postcodes: Western Australia

In Western Australia, the top 3 postcodes for medium density housing are 6061, 6060 and 6210 (see Figure 13). These postcodes contain the Western Australians that would benefit most from the uptake of the Solar Storage Model, due to the amount of medium density housing in those areas. Getting the most from their behind the meter electricity generation.

The definition of medium density is as defined in Table 1, through the analysis of 2016 Census data.[19] Each postcode has examined for its density mix (by number and proportion) and its uptake of residential solar PV. The top 10 postcodes by number of medium density dwellings have been identified in Figure 13, furthermore the density mix by proportion is shown in Figure 14.

All the medium density dwelling postcodes in the top ten contain Greenfield single storey duplex/triplex developments, with very few above the two storey mark. This means there is a sizable amount of roof space to utilise with respect to number of people living within the dwelling, meaning large potential for generation surpluses. Notably, there is also a small portion of high density housing in postcodes 6019 (Scarborough) 6051 (Maylands) and 6151 (South Perth) emerging in these medium density concentrated suburbs. Also, the City of Bunbury is represented – the only postcode not within the Perth metropolitan area.

There is a large opportunity for rooftop solar generation in these postcodes. As shown in Figures 15 and 16, each of the postcodes in the top 10 for Western Australia have an amount of existing solar penetration. These houses could all have a much more thorough use of the solar storage open source governance model. There is a sizable opportunity for each of these postcodes to elicit greater uptake of solar PV in order to reduce costs for electricity use.

Figure 14 - Top 10 postcodes in WA for Medium Density Housing

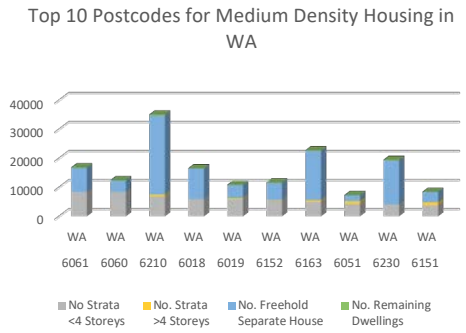


Figure 15 - Top 10 postcodes in WA for Medium Density Housing by proportion

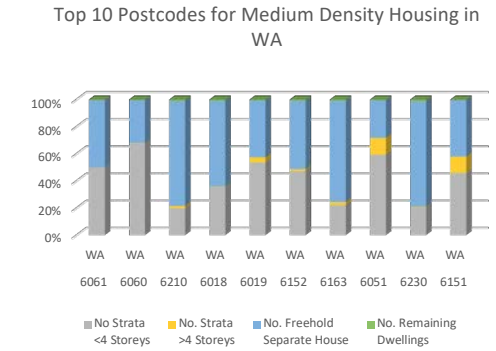


Figure 16 - Top 10 Postcodes total Solar PV Installations compared to housing stock

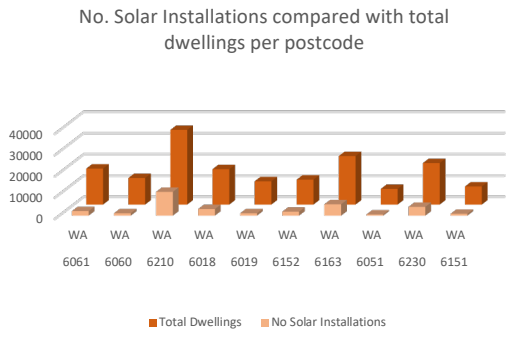
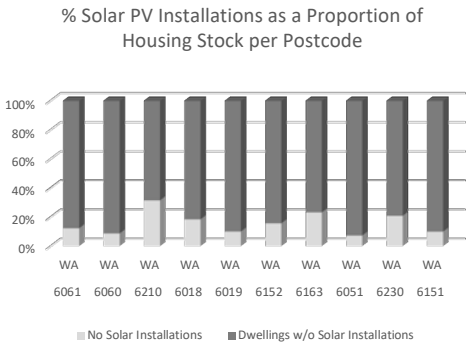


Figure 17 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



19. Australian Bureau of Statistics (2016) Australia's 17th Census of Population and Housing - Selected Dwelling Characteristics. Accessed through TableBuilder Basic. Retrieved from https://auth.censusdata.abs.gov.au/webapi/jsf/login.xhtml

Solar Postcodes: Northern Territory

The top 3 postcodes for medium density in the Northern Territory (NT) are 0810, 0820 and 0870 – see Figure 17. As the population of the NT is quite small, the postcodes listed in the top 10 include the major activity centres in the state: Darwin (the capital) and Alice Springs. There is still a sizable opportunity for the populations in the NT to utilise the governance model given the amount of sunshine that lands on the state year round.

Once again – as with WA, the definition of medium density is as defined in Table 1, through the analysis of 2016 Census data (ABS, 2016). Each postcode has examined for its density mix (by number and proportion) and its uptake of residential solar PV. The top 10 postcodes by number of medium density dwellings have been identified in Figure 16, furthermore the density mix by proportion is shown in Figure 18.

Given the geographical location of the Northern Territory the state receives regular sunshine – perfect for Solar PV. The medium density housing mix is very much comprised of single storey duplex and triplex type dwellings, meaning a large proportion of rooftop space could be utilised for providing distributed generation to mains grid. Figures 19 and 20 show that although these postcodes already have Solar PV, uptake could be dramatically increased across both Darwin and Alice Springs using the governance model.

Figure 18 - Top 10 postcodes in the NT for Medium Density Housing

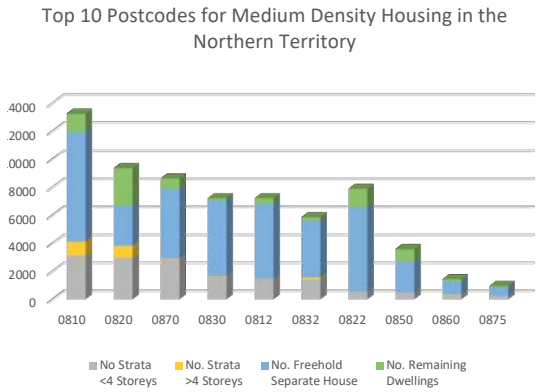


Figure 19 - Top 10 Postcodes total Solar PV Installations compared to housing stock

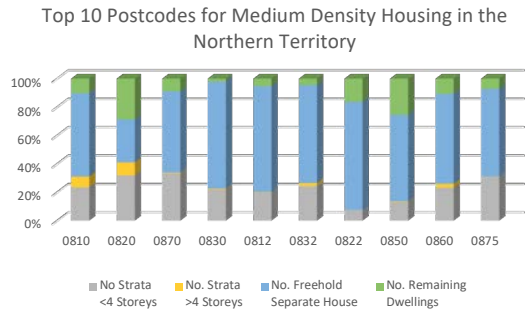


Figure 20 - Top 10 postcodes in the NT for Medium Density Housing by proportion

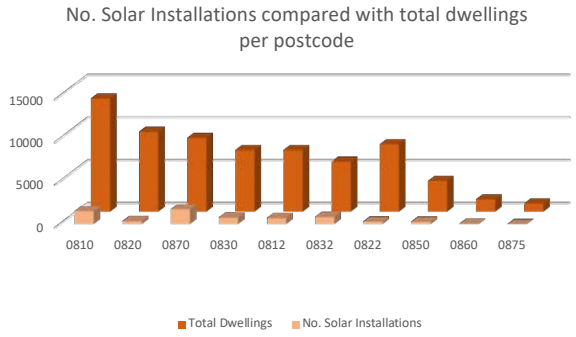
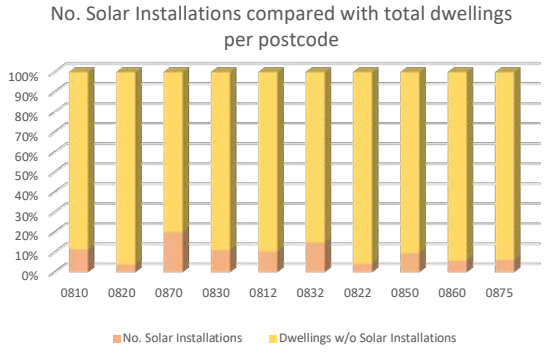


Figure 21 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



Solar Postcodes: Australian Capital Territory

The top 3 postcodes for medium density in the Australian Capital Territory (ACT) are 2602, 2913 and 2617.

The population in the ACT is very heavily concentrated within Canberra – the territory's only city. The entire ACT comprises of only very small land area (2,358 sqkm). Postcode 2602 - just north of the Canberra city centre, contains 35% medium density housing comprised of multileveled strata type developments (ideal for the strata utility governance model). Figures 21 and 22 detail the housing make up in the area, which encompass most of Canberra city.

The ACT has high potential to use the solar storage governance model, given it has committed to a 100% renewable energy target set for 2020, [20] and its high proportion of dense housing stock. In 2016, the ACT Government legislated a new target of sourcing 100% renewable electricity by 2020—from within the ACT or across the National Electricity Market. The high potential for implementation of the governance model is further evidenced by the existing mix of dense housing stock highlighted in Figures 20 and 21.

Figure 22 - Top 10 postcodes in the ACT for Medium Density Housing

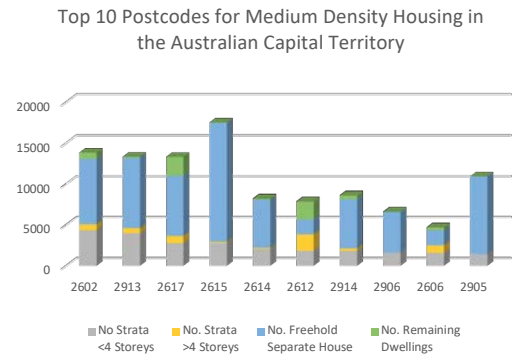
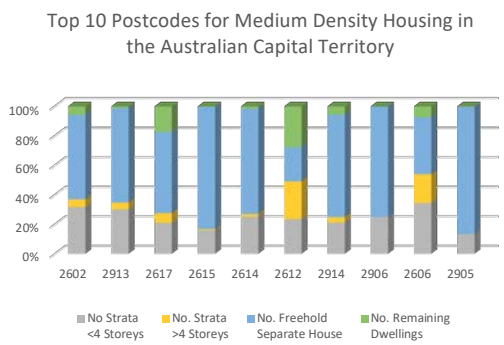


Figure 23 - Top 10 postcodes in the ACT for Medium Density Housing by proportion



Despite its inclement weather, Canberra has enormous potential for distributed solar PV generation (as shown in Figure 4) and is well within the nation's median for average daily output. Although the ACT has demonstrated some household rooftop Solar PV uptake already, the solar storage governance model would remove existing barriers to properties under strata (medium and high density) to install solar PV and battery technology.

Figure 24 - Top 10 Postcodes total Solar PV Installations compared to housing stock

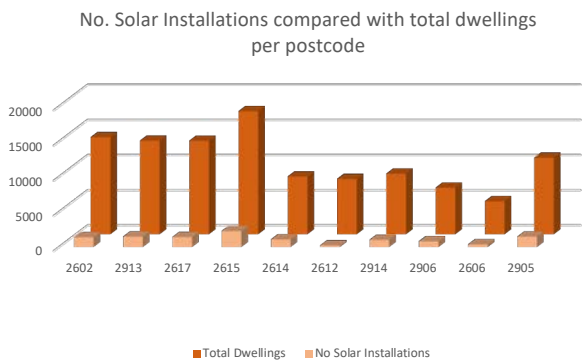
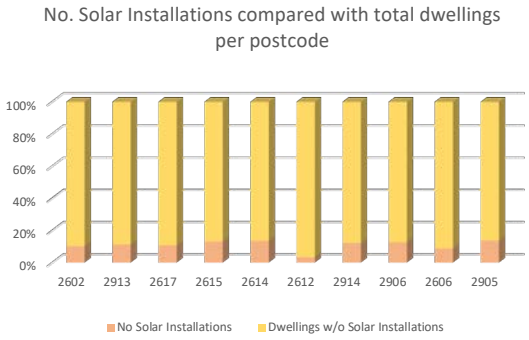


Figure 25 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



20. https://www.act.gov.au/our-canberra/latest-news/2016/may/100-renewable-energy-for-canberra-by-2020

Solar Postcodes: New South Wales

Figure 26 - Top 10 postcodes in NSW for Medium Density Housing

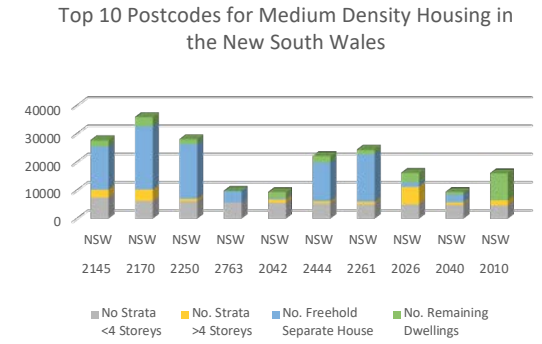


Figure 27 - Top 10 postcodes in NSW for Medium Density Housing by proportion

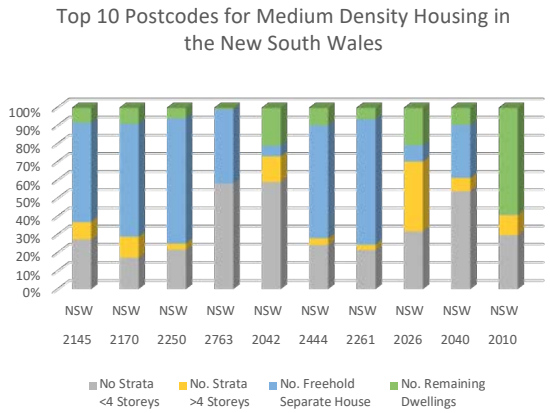


Figure 28 - Top 10 Postcodes total Solar PV Installations compared to housing stock

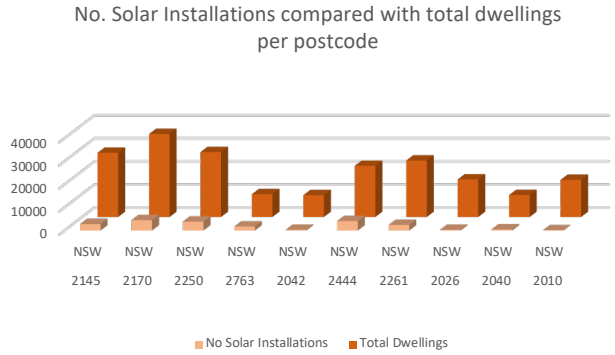
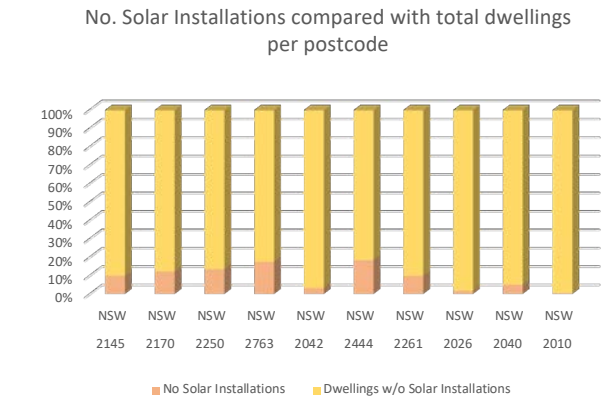


Figure 29 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



The top 3 postcodes for medium density in the New South Wales (NSW) are 2145, 2170 and 2250.

The top three postcodes with the most medium density in NSW are located out of the Sydney CBD centre. Most of the housing stock within postcodes 2145, 2170 and 2250 is single storey strata type arrangements with currently very little rooftop solar PV uptake. This again presents an enormous opportunity for solar PV uptake through adoption of the strata solar storage governance model.

A number of the more prominent inner city postcodes also appear in the top ten, notably 2042 (Newton) and 2026 (Bondi Beach). Aside from the top 3, the remaining 7 postcodes in the top 10 are clustered around Sydney's CBD containing a mixture of single storey and multistorey strata type housing.

With its close proximity to the central Sydney CBD postcode 2010 (Surry Hills and Darlinghurst) would benefit sizably from uptake of the solar storage governance model.

As with the earlier states and territories, although these top 10 postcodes all contain rooftop solar PV uptake (see Figure 27) more could be done. As both Figures 27 & 28 demonstrate, there is a substantial opportunity to increase rooftop solar PV uptake across these areas. The strata solar storage governance model would unlock a sizable amount of strata type developments to behind the meter renewable energy.

Solar Postcodes: Queensland

The top 3 postcodes for medium density in the Queensland (QLD) are 4350 (Toowoomba), 4215 (Southport) and 4870 (Cairns).

Within the state of QLD the top 3 postcodes for medium density housing are not located within the state's capital of Brisbane. Within postcode 4350 (Toowoomba) and 4870 (Cairns) the medium density housing largely is comprised of single storey strata type developments. The same can be said for the Gold Coast postcode of 4215 (Southport), aside from the medium to high grouping alongside the seaward facing boundary of the area. Figures 29 and 30 detail the housing make up in these areas.

The majority of the housing stock within QLD's top 10 for medium density overwhelmingly contain large amounts of Freehold title 'separate house' dwellings typically associated with suburban Australia. However, in line with national trends and density targets set by each state government we would expect density to continue to increase with respect to the remaining housing stock.

Queensland is the nation's leader for Solar PV installations, by measures of total quantity and per capita (shown in Figures 5 & 6). Although Solar PV panels have been widely installed on low density suburban rooftops, very few medium density developments have followed the trend. There is a sizable opportunity within these top 10 suburbs to implement solar and storage under strata using the solar storage governance model. Figures 31 and 32 demonstrate that despite high existing uptake even more can be done.

Figure 30 - Top 10 postcodes in QLD for Medium Density Housing

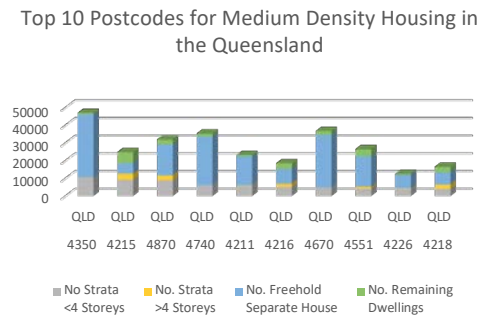


Figure 31 - Top 10 postcodes in QLD for Medium Density Housing by proportion

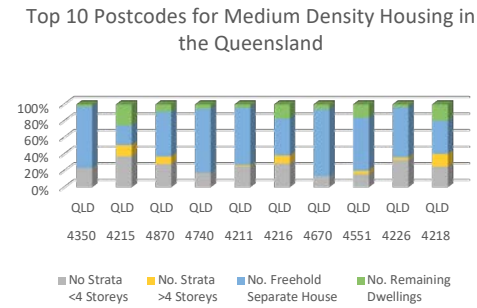


Figure 32 - Top 10 Postcodes total Solar PV Installations compared to housing stock

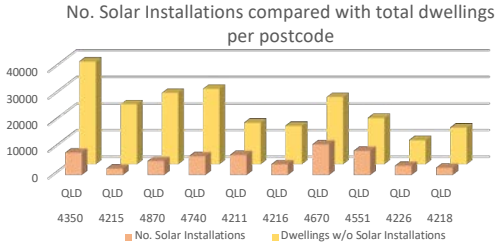
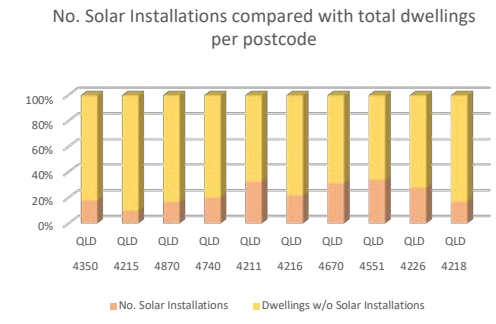


Figure 33 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



Solar Postcodes: Victoria

Figure 34 - Top 10 postcodes in VIC for Medium Density Housing

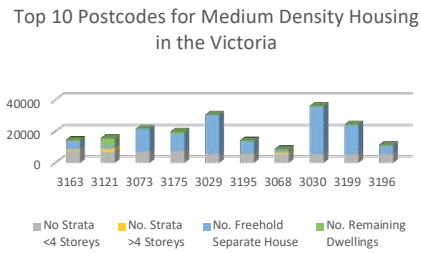


Figure 35 - Top 10 postcodes in VIC for Medium Density Housing by proportion

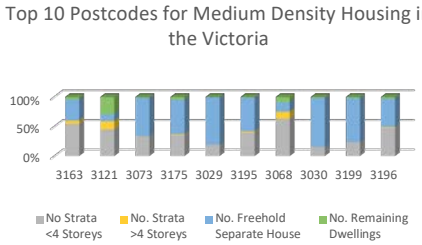


Figure 36 - Top 10 Postcodes total Solar PV Installations compared to housing stock

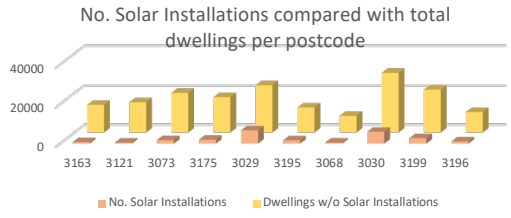
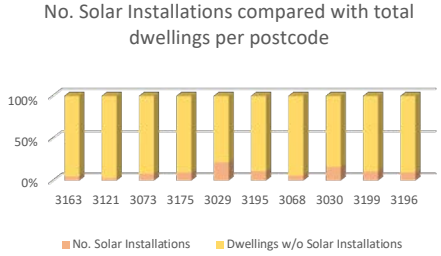


Figure 37 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



The top 3 postcodes for medium density in Victoria (VIC) are 3163 (Glen Huntly, Carnegie and Murrumbeena), 3121 (Richmond, Burnley and Cremore) and 3073 (Reservoir).

All of the postcodes in the top 3 for medium density housing in Victoria are located within the Melbourne metropolitan area. The city of Melbourne has been rated by The Economist[21] as most livable city in the world for its seventh year in a row, based on its urban quality of life. The leading postcode 3163 is located 14km from the CBD, with the majority of the dense housing to be single storey townhouse, duplex and triplex infill type developments. Postcode 3121 is located in close proximity to the CBD contains largely apartments in 2 to 5 storey developments. Postcode 3073, located 11km from the CBD again with the majority of the dense housing to be single storey townhouse, duplex and triplex infill type developments.

The remaining 7 postcodes in the top 10 contain areas within the greater surrounds of the Melbourne metropolitan area, with a number at various locations on the coast of Port Phillip Bay. The bulk of the medium density developments comprise of single storey townhouse, duplex and triplex infill type developments. In this instance, this type of housing promises a high yield of roof space in proportion of floor space, meaning a large amount of electricity could be generated behind the meter.

There is existing rooftop solar PV penetration within all postcodes in the top 10 for Victoria, presenting an excellent strength to improve upon. The greatest existing performers in the top 10 are postcodes 3029 and 3030 with almost 20% solar PV penetration. The strata solar storage governance model would unlock dwellings under strata and community title to the benefits of shared Solar PV and battery storage, which would drive further adoption in these areas.

21. www.eiu.com

Solar Postcodes: South Australia

Figure 38 - Top 10 postcodes in SA for Medium Density Housing

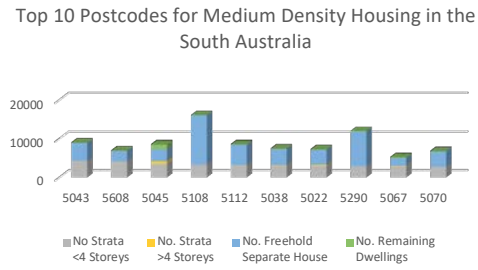


Figure 39 - Top 10 postcodes in SA for Medium Density Housing by proportion

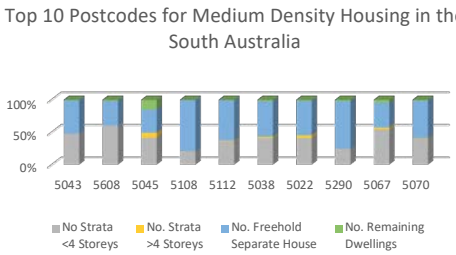


Figure 40 - Top 10 Postcodes total Solar PV Installations compared to housing stock

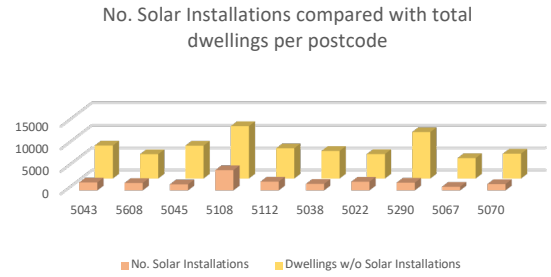
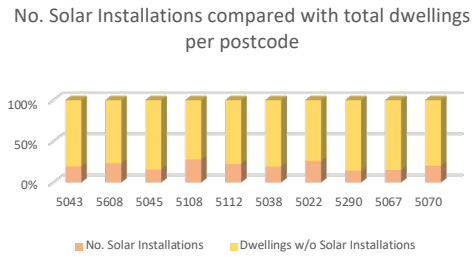


Figure 41 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion



The top 3 postcodes for medium density in the South Australia (SA) are 5043 (Morphettville, Ascot Park, Park Holme, Marion and Mitchell Park), 5608 (Whyalla Norrie) and 5045 (Glenelg, Glenelg North and Glenelg South) – refer to Figure 37.

The top three suburbs in South Australia have close to 50% medium density housing (see Figure 38), which through use of the solar storage governance model could provide a boon for behind the meter uptake of rooftop solar PV and storage and strata in these areas. This would complement SA's existing highest renewable penetration in the country, with over 50% of its grid sourced electricity coming from renewable generation.

As with the rest of the country, the bulk of the medium density housing in SA comprise of single storey townhouse, duplex and triplex infill type developments. The postcode of 5043 with the most medium density housing is located 9km from the Adelaide CBD, just south of the Airport close to the St Vincent Gulf.

Located 230km from the Adelaide CBD is the second rated postcode - 5608, for medium density with up to 60% of its housing stock registering as strata type housing.

The third rated postcode is 5045, which in addition to single storey developments also includes a number of two to four storey apartment complexes, particularly on the St Vincent Gulf shoreline.

Existing solar PV uptake fluctuates between 20 – 30% penetrations in postcodes rated top 10 for medium density housing (Figure 40). As with the previous states and territories in this review, a sizable amount of unused roof space exists on medium density housing across the state. High penetration of renewable energy in the South Australia could be further increased, were the postcodes identified in this study adopt the strata solar storage governance model recommended in this report. There is an incredible strength to build upon in this state with respect to decarbonised electricity, and this model can unlock a sizable portion of the housing stock in these areas to that benefit.

Solar Postcodes: Tasmania

The top 3 postcodes for medium density in the Tasmania (SA) are 7250 (Launceston), 7000 (Hobart) and 7010 (Rosetta and Glenorchy) – refer to Figure 41.

The top 3 postcodes for medium density in Tasmania make up 20% of the housing composition. The top postcode 7250 (Launceston) is the second largest city in Tasmania, although there are some developments up to 4 storeys in height, the majority of the 20% are made up of single storey townhouse, duplex and triplex infill type developments. The second postcode for medium density is the Capital of Tasmania, Hobart. The capital contains a CBD with a number of residential apartment complexes intermixed within the city. Located on the outskirts of Hobart, Postcode 7010 is the third rated area for medium density, and its density is largely comprised of single storey strata infill type dwellings.

Within the top 10 postcodes there has been an average 10% of Solar PV penetration. On whole renewable penetration is incredibly high in Tasmania, as currently 93% of the power the state uses is renewable, predominantly from hydro-generated electricity. New investment in wind farms at Wild Cattle Hill and Granville Harbor are expected to add a further 6 to 7% of renewable generation. As a whole, Tasmania has a fantastic opportunity whereby incentivising solar PV uptake it could be a net exporter of renewable energy back into the National Energy Market (NEM). The solar storage governance model would remove barriers to dwellings under strata law and community title.

Figure 42 - Top 10 postcodes in TAS for Medium Density Housing

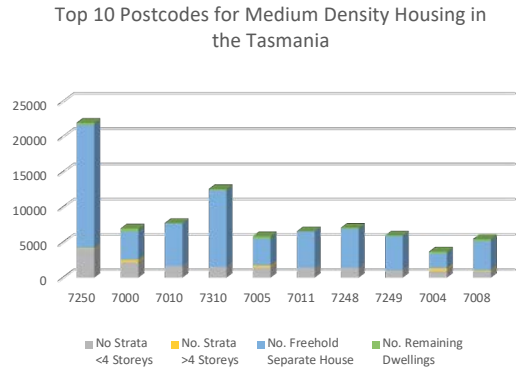


Figure 43 - Top 10 postcodes in TAS for Medium Density Housing by proportion

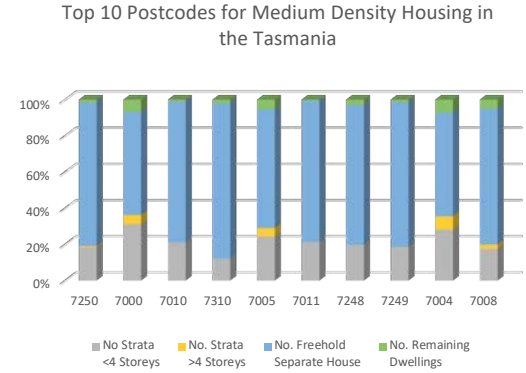


Figure 44 - Top 10 Postcodes total Solar PV Installations compared to housing stock

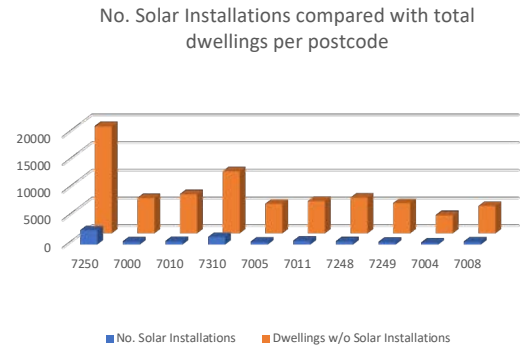
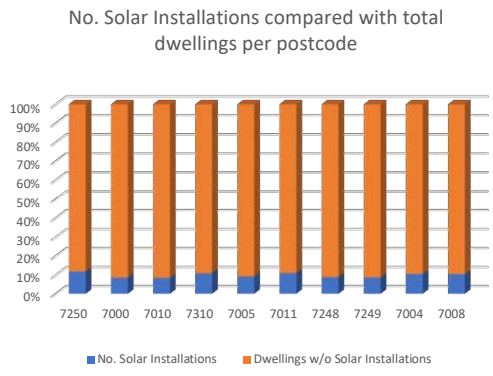
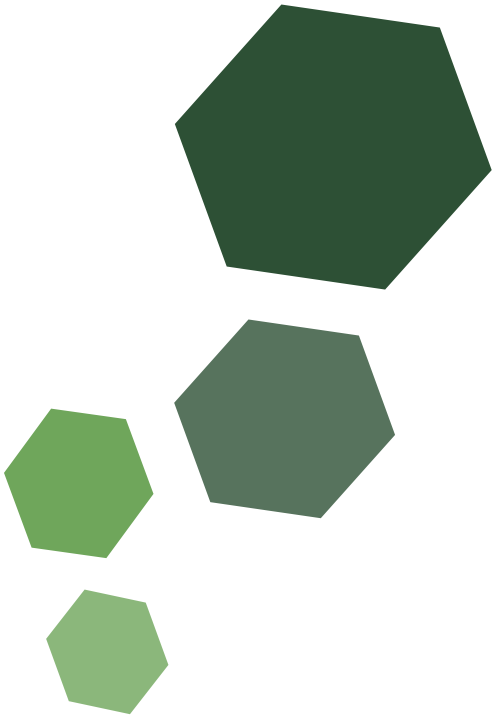


Figure 45 - Top 10 Postcodes total Solar PV Installations compared to housing stock by proportion





Section 3: City CBD Case Studies

A Capital Cities review for uptake of the Solar and Storage Governance model in the Central Business districts across the nation.

Cities Review

In addition to reviewing each state for its opportunity to uptake the Solar Battery Storage Governance model, this report highlights a number of case studies detailing potential uptake within capital cities across the country. Each capital city has been reviewed using a combination of building height combined with zoning.

Table 4 - Summary of Cities Reviewed for use of the Governance model

City	% of buildings suitable
Perth	31%
Adelaide	30%
Melbourne	47%
Darwin	25%

The case studies detailed in this chapter are the cities of Perth, Adelaide, Melbourne, and Darwin. The remaining cities of Canberra, Hobart, Brisbane and Sydney have been omitted due to the unavailability of their City's 3D model by the City Council as free to access, or for the lack of the existence of a 3D model. Access to a 3D model whereby findings can be published in the public sphere is key to the purposes of this review.

Each participating city has been reviewed by overlaying zoning data across a 3D model of each city. Zoning data defines areas of each CBD either marked exclusively as residential or as containing some kind of residential aspect, such as a 'normalised redevelopment area'. This review does not include a study of rooftop composition and is intended to be an indicative overarching review of each cityscape. The 3D model is used to identify buildings below a certain height threshold.

Although there is no maximum height limit for the use of the Strata Solar Battery Storage Governance Model, the five-storey mark signifies the point of diminishing returns for generation. Beyond five storeys the ratio of floor space to roof space reduces to the point where only a small amount of generation is produced with respect to the overall building's electricity consumption. The intention of this review is to identify buildings that would benefit the most from behind the meter generation and storage.

For the purposes of this review the Central Business District (CBD) areas are determined by the extents of their respective 3D model. In some cases, 3D models extend beyond the limits of a single postcode and can omit areas containing freehold title (low density) homes. The state by state solar postcodes review detailed in the previous section would have captured any lower profile buildings that could adopt the governance model. A summary of the overall findings is listed below in table 4.

In addition to acquiring or even 3D modelling the remaining Australian cities, further work could be undertaken by building on this report to more clearly identify buildings that would benefit most from Solar PV and battery Storage. Further work could include a building by building analysis for rooftop suitability, in addition to a discrete generation yield for each suitable rooftop to assist with demonstrating the commercial case to building owners and operators.

Furthermore, this report acknowledges future trends and innovations will likely change the outcome of this study. At the time of writing this report solar PV panels make the most commercial sense for generating electricity behind the meter. However, in the future it is likely surfaces as generators, solar facades and solar glass etc. will achieve sufficient economies of scale to become mainstream technological innovations for buildings to adopt. The strata solar battery storage governance model is agnostic towards the types of generation and storage asset adopted, so will still be applicable as disruptive innovations occur in this space.

Cities Review Method

To assess a 3D model of a city for uptake of the solar battery storage governance model, a two part review process has been undertaken. The objective of this review is to provide a broad overview of which buildings within a city could adopt Solar PV and battery storage technology. It needs to be noted that by no means is this review the only analysis that would be needed for each building, it more indicative of what buildings could adopt the solar battery storage governance model.

Once the 3D model has been obtained, the review method is comprised of two components:

1) Determine zoning within the city using publicly available planning documentation
2) Identify buildings that fall below the 5 storey mark

Obtaining zoning information is pretty self-explanatory. The acceptable range for a 5 storey building height in meters has been determined using the following approach. All equations have been sourced from the Council of Tall Buildings and Habitat[22]

Cities Review Data

A summary of planning data and acquired 3D models is listed below in Table 5.

Table 5 - 3D models and planning data acquired

	City	Model	Zoning and Maps
1	Brisbane	No 3D Model Available	**Brisbane Zoning -** https://www.brisbane.qld.gov.au/planning-building/planning-guidelines-tools/brisbane-city-plan-2014/city-plan-2014-mapping/zoning
2	Darwin	No 3D Model Available	**Darwin Zoning -** https://nt.gov.au/__data/assets/pdf_file/0012/204231/darwin.pdf
3	Hobart	No 3D Model Available	**Hobart Zoning -** http://iplan.tas.gov.au/pages/plan/book.aspx?exhibit=maps&hid=225916 (Click on each individual zone to get details)
4	Melbourne	Received model	**Melbourne Zoning** - http://services.land.vic.gov.au/maps/pmo.jsp (Zoom in closely on Melbourne, then click 'Legend') **Melbourne Online 3D Model** - https://data.melbourne.vic.gov.au/Property-Planning/3D-Development-Activity-Model-Footprints/def8-4wbt **Melbourne Building Height information** - https://lbutler.github.io/MelbBuildingHeights/
5	Adelaide	Received model	**Adelaide Zoning -** http://location.sa.gov.au/viewer/?%20map=hybrid&x=138.72262&y=-34.95088%20&z=10&uids=11,26,113,117,116,118,124,120,102&pinx=%20&piny=&pinTitle=%20&pinText=
6	Sydney	No 3D Model Available	**Sydney Zoning -** https://www.planningportal.nsw.gov.au/find-a-property/property/73802_Unit_296_635_Gardeners_Road__Mascot
7	Canberra	No 3D Model Available	**Canberra Zoning -** http://app.actmapi.act.gov.au/actmapi/index.html?viewer=tp (Need to find the legend using the panel)
8	Perth	Received model	**Perth Zoning -** https://perth.maps.arcgis.com/home/index.html

An upper estimate of a 5 storey office building:

Formula:

*H_office=3.9*stories+11.7+3.9*(stories/20)*

Where 3.9 represents the average floor height, 11.7 accounts for increased ground lobby height/roof features.

Since a 5 storey building does not require a mechanical floor and since an upper estimate is to be calculated the equation becomes:

*H_officeupper=4*stories+12*

*H_officeupper=4*5+12=32m*

Lower estimate of a storey residential building (on average the shortest building type)

Formula:

H_residential=3.1*stories+7.75+1.55(stories/30)
For a lower estimate without mechanical floors the equation becomes:

*H_residential=2.8*stories*

*H_residential=2.8*5=14m*

An upper estimate of a residential building is given by:

*H_residential=3.5*stories+10*

*H_residential=3.5*5+10=27.5m*

Additionally an upper estimate for a mixed (residential and commercial) building can be given by:

Formula:

*H_mixedupper=3.8*stories+11*
*H_mixedupper=3.8*5+11=30m*

Once a building has been classified as either residential or mixed use residential the height range has been applied to assist with the determination of acceptable maximum height. The maximum height numbers calculated above of 27.5m (for pure residential) and 30m (for a mixed use building containing residential).

22. http://www.ctbuh.org/TallBuildings/HeightStatistics/HeightCalculator/tabid/1007/language/en-US/Default.aspx

Cities Review: Perth Results

The City of Perth (map) is the dynamic and rapidly growing capital city of the State of Western Australia. Located on the Indian Ocean Rim within the Asia Pacific region, one of the world's fastest growing and developing economic zones. Perth City has a Mediterranean climate, and enjoys more hours of sunshine than any other capital city in the nation. The estimated resident population of the City of Perth is around 27,000[23] and the gross regional profit is around 40B.[24]

The City of Perth was able to provide us a 3D model of the Central Business District (CBD) in a Computer Aided Drawing (CAD) format. The model of Perth's CBD encompasses the area detailed in Figure 45. Using AutoCad by Autodesk[25] we were able to determine height of relevant buildings articulated in the 'Cities Review Method' in this report. The model provided to us by the City was in 1:1 scale, so identifying height was unimpeded.

The City of Perth contains various planning zones within the CBD. As each state and territory adopt various classifications for zoning, zones within the city were selected based on the fact the contained residential dwellings. The strata solar battery storage governance model - at this point in time, is designed for applications within built strata developments. Figure 46 details zoning within the City of Perth.

31% of Perth's buildings could likely uptake Solar and Battery technology through adopting the strata solar storage governance model. The result of identifying buildings within residential zones and omitting buildings over 5 storeys in height – as shown in figure 47, leaves 31% of Perth buildings that could benefit from Solar PV and battery storage.

Figure 46 - Area encompassed by Perth CBD 3D model

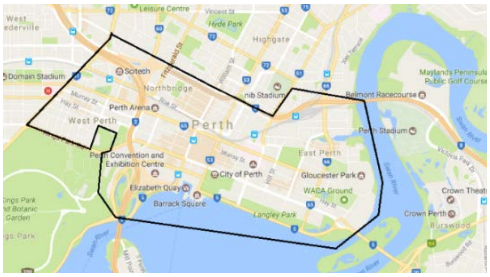


Figure 47 - City of Perth height & zoning

Figure 48 - City of Perth Buildings that could adopt solar and storage

23. http://www.economyprofile.com.au/perth/trends/population
24. http://www.economyprofile.com.au/perth/trends/gross-regional-product
25. https://www.autodesk.co.uk/

Cities Review: Darwin Results

Darwin is the capital city of the Northern Territory and described as Australia's gateway to South East Asia. The city closer to the Indonesian capital of Jakarta than it is to Canberra and is about the same flying time from Singapore and Manila as it is from Sydney and Melbourne. The majority of Darwin's workforce, about 60%, is made up of Government employees. It is also the main service centre for a wide range of industries headed by mining, offshore oil and gas production, pastoralism, tourism and tropical horticulture.

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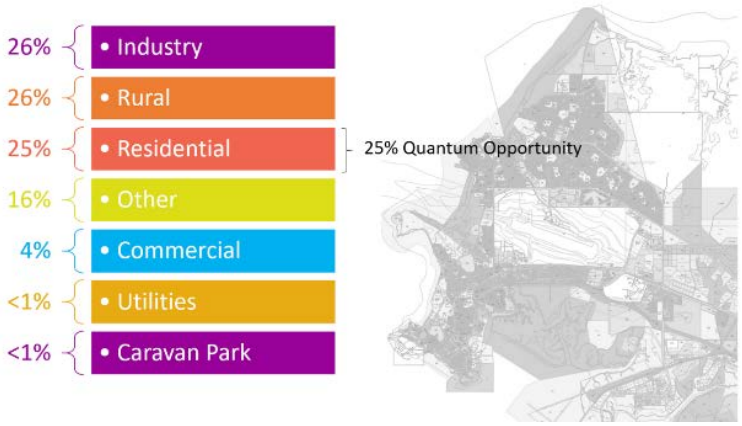
Figure 49 - City of Perth zoning classifications

Figure 50 - City of Perth Buildings that could adopt solar & storage



Cities Review: Melbourne Results

Melbourne is the capital of Victoria, Australia. More than 148,000 people call the municipality home and a further 743,000 people visit every day for work and recreation. The City has one of the most diverse populations in the country with 48 per cent of our residents speak a language other than English at home. As more people seek out the cultural, business, education, work and lifestyle opportunities the city offers, the population is expected to continue growing rapidly. This will drive greater demand for inner city living.

The City of Melbourne make it clear on their website that they are actively seeking research on the renewable energy potential of individual buildings (specifically the solar potential). The comprehensive 3D model of the City of Melbourne was easily obtained from the City council. In line with the method outlined at the beginning of this section, zoning data was coloured into 3D space and buildings over 5 storeys in height were omitted for the review.

As with each of the differing states and territories a number of planning zones have been imposed over Melbourne City. Not all of zones in the city would contain strata type housing, so a number of relevant classifications to implementation of the strata solar battery storage governance model have been identified, namely: mixed use and residential. Figure 51 outlines all of the zoning classifications imposed over the Melbourne City 3D Model

The number of buildings that fit the criteria for uptake of solar PV and battery technology in the City of Melbourne are around 47%. Figure 52 details the proportion of the building stock that falls under 5 storeys in height, and within favourable zoning areas. There is a sizable opportunity for buildings to adopt the strata storage governance model within Melbourne.

Figure 51 - Area encompassed by Melbourne CBD 3D model

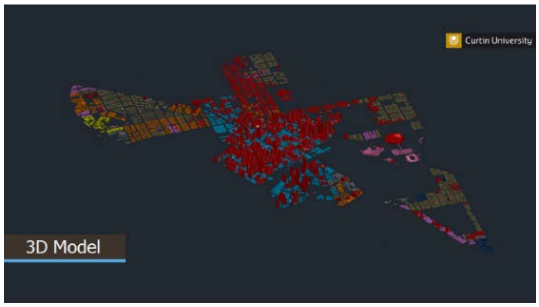


Figure 52 - City of Melbourne height & zoning

Figure 53 - City of Melbourne Buildings that could adopt solar & storage

Cities Review: Adelaide Results

Adelaide is South Australia's cosmopolitan coastal capital and is the business, administrative, cultural and recreational hub of the state. The City of Adelaide is a mixed use area, with residential, commercial, institutional, cultural and entertainment land uses, and substantial parklands. The City encompasses a total land area of about 16 square kilometres. The GRP of Adelaide was $19B over the last year, and is home to 23,000 people.

The CBD of Adelaide is surrounded by a green belt, meaning the entire 3D Model is encompassed a neat rectangle, as shown in Figure 53. Once again the method articulated at the beginning of this section was applied, whereby buildings above the 5 storey mark were omitted and the zoning areas were coloured into the model. Figure 54 details the 3D model detailing height and different planning zones were coloured into the model.

Figure 54 details the 3D model detailing height and different planning zones.

The result for the city of Adelaide is 30% of its buildings fit the height and zoning requirement for the adoption of behind the meter Solar PV and battery installations – see Figure 55. This 30% of Adelaide's CBD housing stock would find it advantageous to implement the strata solar storage governance model. The state of South Australia already sources a large portion of its electricity from renewable energy, a great strength to further improve upon.

Figure 55 - City of Adelaide Map

Figure 56- City of Adelaide height & zoning

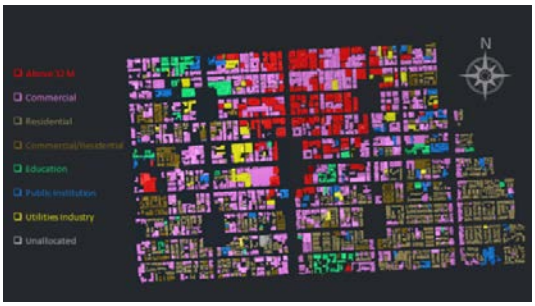
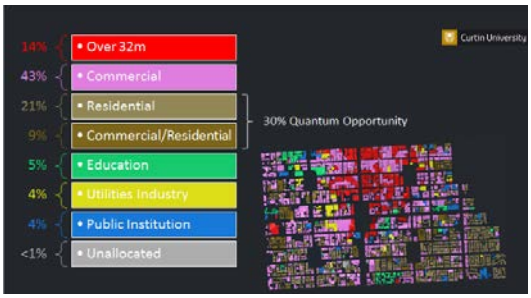


Figure 57 - City of Adelaide Buildings that could adopt solar & storage



Remaining Cities

As detailed, the following four Australian Cities had no available 3D model available for this report.

Brisbane

Figure 58 - Sourced from Google Maps

Sydney

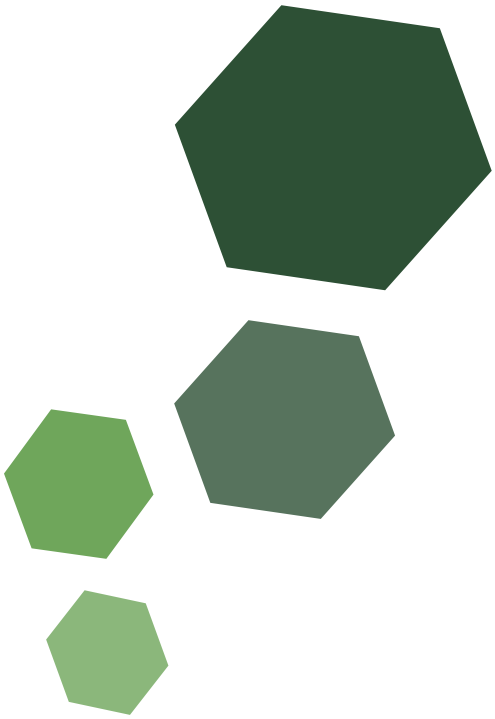
Figure 59 - Sourced from Google Maps

Canberra

Figure 60 - Sourced from Google Maps

Hobart

Figure 61 - Sourced from Google Maps



Section 4: Regulatory implications

Nationwide Electricity Market Regulation Overview.

Legal

To assess the impact of Australia's legal and regulatory environment on the application of the Strata Utility Governance Model, CUSP engaged legal experts at Jackson McDonald and McCullough Robertson.

Part Three of this report lays out the potential of the Governance Model to be adapted across Australia with regards to:

- commercial issues;
- property law and in particular the law governing strata
- developments; and electricity regulation.

The legal review prepared by Jackson McDonald and McCullough Robertson is a general one. The results presented in this Part are not a complete analysis of all legal issues associated with any particular project. The purpose of this section is thus to be of general guidance and is not intended as conclusive legal advice. Any reader planning to implement a project should obtain their own specific legal, tax and accounting advice.

Australia has a federal system in which some matters are regulated by Commonwealth laws, and some by State laws. This means that although there are many commonalities, the specific legal requirements for a project will vary across States and Territories. In particular, each State and Territory has its own law regulating strata developments.

For electricity law and regulation, there are four different regimes, depending on the project's location:

- projects in SA, NSW, Victoria, Queensland and Tasmania fall within the National Electricity Market **(NEM)** in;
- projects in WA (which is not part of the NEM) are governed by separate State laws, which differ depending on whether the project is located:
  - In the south-west of WA, in which case the general State laws are supplemented by the Wholesale Electricity Market **(WEM)** regime which governs the South West Interconnected System **(SWIS)**;
  - elsewhere in WA in which case WEM regime does not apply (and there may be further distinctions depending on whether the project is located within the North West Interconnected system **(NWIS)** or not); and
- NT, which also is not part of the NEM and has its own State laws.

The firms' analysis of electricity regulation concentrated on the NEM and WEM.

It's helpful for this legal analysis to distinguish between barriers and considerations. By "barriers" we point to legal rules which prevent some or all of the model from being implemented. This can be contrasted with "considerations", by which we mean issues that may need to be considered and addressed in implementing the model, but don't block it completely. There is a question of degree here. Sometimes, the solution to a given consideration will be so complex or expensive that it is not practical to proceed with the project. If so, then for that particular project the consideration is in practice a barrier. However, generally the considerations identified by Jackson McDonald and McCullough Robertson can be managed in ways which do not completely block the models' implementation.

To the extent there are barriers in Australia as discussed, they are likely to diminish over the coming years. The common theme across Australia is the trend towards reforming the existing regulatory and legal framework to accommodate new technologies, in particular the facilitation of trading electricity behind the matter and the utilisation of electricity storage. However, as reforms focus on ensuring that consumers don't get left behind in the waves of new technology, sometimes the removal of barriers can come with compliance considerations for the would-be proponent.

Summary

The CUSP model is viable in Australia based on Jackson McDonald's and McCullough Robertson's legal analysis of commercial, strata and electricity regulation issues.Commercial issues a project proponent should consider include: ownership, finance, cost and consumer protection. The proponent will need to ensure that adequate agreements and other measures are in place for the model to be economically feasible and to operate as intended.

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.

Electricity regulation is changing across Australia, in ways which will (generally) make the CUSP model increasingly viable, although some reforms may impose consumer protection obligations which increase the strata company's compliance burden. In most of Australia, strata bodies and residents are free to trade electricity both 'behind the meter' (i.e. inside the strata development), and 'through the meter' (i.e. with people located elsewhere in the network, or with the utility itself), subject to a number of compliance considerations. In WA there are some regulatory barriers which prevent through-the-meter trading, but these are likely to be removed in the next few years. The main considerations for a proponent include ensuring that it complies with the relevant registration (licensing) and consumer protection laws, or comes within an appropriate exemption.

Commercial

There are no commercial barriers, only matters the proponent should consider. To successfully implement this model, the ownership of infrastructure and resulting flow of funds needs to be established at the outset to ensure that financiers, insurers and electricity consumers (i.e. residents in the strata complex, and trading counterparties elsewhere) are protected and know their rights and obligations. In implementing this model, the proponent must consider things such as:

a) Who will own the solar panels, batteries and roof space in the strata complex?

Depending on the answers to this question, the proponents will need to consider, among other things:

b) Does there need to be a security interest created over the panels?

c) Will the panels be covered by existing insurances or is more required, and if so, who pays for it?

d) Are the solar panels and batteries legally 'fixtures? I.e. are they affixed to the land or the building, or are moveable? This will affect ownership rights, insurance, finance, and what happens if the complex is later sold. These considerations impact how the strata company will act in a commercial sense, including allocating the appropriate costs to be recovered from residents. This is discussed further under Property, below.

Another consideration is consumer protection, particularly in relation to the apportionment of costs. All consumers are protected under the Australian Consumer Law (ACL), which applies in all States and Territories. Specifically, the ACL includes a national unfair contract terms law which covers standard form consumer and small business contracts. The strata company will need to consider whether its particular implementation is caught by this legislation. If it is, it will need mechanisms that protect consumers throughout the life of the agreement to avoid having the contract deemed invalid or unenforceable.

Similarly, each State and Territory has a regime under its Strata legislation that deals with termination rights for unfair contracts. For example, in WA, the State Administrative Tribunal (SAT) can deem a strata contract unfair after a duration of five years, regardless of the original agreed duration of that contract. It is also an implied provision in every agreement that the strata company may terminate any agreement by notice in writing to every other party to the agreement after five years, unless the term of the agreement is extended by the SAT. This raises a risk consideration for investors in the project, if the investment model assumes that revenue will be locked-in for a longer period.

Similarly, in Queensland, a body corporate can require a service provider to review any services contract in the first year after establishment of the scheme to determine whether the terms are fair and reasonable. If the body corporate and service provider do not agree to vary any unfair or unreasonable terms, the body corporate can apply to the Queensland Civil and Administrative Tribunal.

There are also responsibilities on developers to act fairly and in the best interests of future owners. This can amount to a fiduciary duty which requires future owners to give informed consent to any service agreement that gives the developer a benefit (for example, if an electricity provider installs infrastructure that will be owned by the electricity provider and not the relevant strata company, or the developer obtains a benefit from allowing the electricity provider to set up an embedded network).

There is a specific commercial consideration regarding the strata company's potential liability. For example, some States may impose limits on a strata company engaging in business that exposes its members to liability. In Victoria, a strata company may not directly engage in business, but may do so through a separate corporation, to protect members from incurring unlimited liability of debt. This does present difficulties for Victorian strata companies, but it can easily be resolved through a separate corporation. It adds more work and can be burdensome, however it generally remains as a commercial consideration, not a barrier.

Also on the subject of liability considerations, in some jurisdictions such as WA the members of a strata company can be jointly and severally liable[26] for the strata company's obligations and liabilities.

Naturally, the commercial considerations for a Distributed Energy Resource (DER) project will include the financial aspects of the transaction, including: tariff levels (and some consumer protections for residential tenants can involve caps on electricity charges); sanctions for non-payment (is disconnection feasible?); the level and likely duration of any feed-in tariffs for electricity exported through the meter to the utility; the lifetime performance of the DER including any over-shadowing risk; and the consequences if the strata body or third party retailer becomes insolvent. In some more complex models, it's possible that an Australian Financial Services Licence might be needed.

Property (strata law)

Australian strata law does not present any barriers to the CUSP model, but does give rise to a number of considerations. Most of these can be addressed within the strata company's governing documentation. Strata laws are different in each state, therefore any individual project will need to closely consider the applicable legislation and its specific constituent documentation.

Powers of a strata company

In all Australian jurisdictions, only a strata company can carry out a task that it is explicitly empowered to do under its constituent documentation. Accordingly, the starting point for considering whether a given strata body can implement a particular DER project, is to examine its governing documentation (variously called by-laws, Articles, constitution, etc.), because that will prescribe what the strata company can and cannot do. Generally, a State's or Territory's strata legislation will prescribe a pro-forma set of governing documentation, which will apply unless the strata company's own constitution varies or amends it.

A strata company can amend its by-laws at any time. This is helpful because it means that any necessary amendments and inclusions can be made to the governing documentation to accommodate our business model. For a new strata development the necessary powers and rules can be built in from the outset. For an existing strata scheme, the strata company will require a majority vote or a special resolution to amend the documentation. The precise voting requirements for these changes varies from jurisdiction to jurisdiction, and body corporate to body corporate.

For new schemes, there may be restrictions on what the original owner or developer can cause the strata company to do. For example, in New South Wales, a developer in the initial period after development of a scheme cannot cause the owners' corporation to incur a debt, for example, by causing the owners corporation to enter an agreement with an electricity provider that requires the owners corporation (strata body) to pay money to the provider. Further, the electricity provider could not alter the common property of the scheme unless the alteration is in accordance with a strata development contract.

26. "Joint and several" liability means that each member can be held individually liable for the whole of the amount.

Acquiring infrastructure

Strata companies generally have a power to acquire infrastructure, where the infrastructure is for use by proprietors in connection with their enjoyment of common property or for use by the strata company in performing its functions. Sometimes there are limits on how much can be spent – these limits vary from jurisdiction to jurisdiction. Infrastructure acquired in this way would usually form part of the complex's common property, in which case the strata company will have various statutory duties to control and manage the common property for the benefit of all proprietors, and repair, maintain, renew and replace that common property. In the event that the infrastructure is to be owned by a third party, the strata company has power to grant the third party a lease or license subject to certain conditions.

Recovery of payment

Strata companies generally have the power to recover payment from residents. The strata company in the CUSP model should consider how it will prescribe the recovery of such payments. For example, will the costs be metered to each individual unit, or will the costs be metered to the whole complex? In the former case, cost recovery may simply be written into the governing documentation, or it may be the subject of a separate agreement between the strata body (or third party retailer) and the resident. In the latter case, the costs may form the "administrative expenses" of the strata company and the company may pass these costs through to tenants by way of strata levies with or without a precise calculation of each entitlement.

Landlord/tenant

If a strata unit is leased, the owner/landlord may need to review its lease agreement with the resident/tenant, to ensure it operates properly under the DER model.

Electricity Regulation

Overview

The NEM regulatory regime does not present any barriers to the model. In fact, changes to the laws to enable and regulate behind the meter peer-to-peer networks, and increase customer choice were implemented on 1st December 2017. The reforms have multiple benefits for consumers, but as a result they come with compliance considerations for network exemption holders in the NEM. We discuss this further below, under licensing.

Part of the reforms, known as "Power of Choice", include increasing access to retail competition for customers in embedded networks by creating a new accredited service provider, the Embedded Network Manager (ENM), who is responsible for market interface services for on-market embedded network customers . The need for this reform emerges from the current regime whereby only Victoria, NSW and SA allow end users within embedded networks[28] to choose their retailer. Given these laws are in place, the CUSP model is viable subject to various compliance considerations.

In the WEM there are some barriers. However, these only limit some parts of the model. Further, we expect them to be reformed in the next few years.

Electricity trading

The NEM accommodates both types of electricity trading in the model: trading on-site behind the meter i.e. only within the strata complex, and trading in front of the meter i.e. through use of the network.

At present, in the WEM, residents can trade on-site behind the meter, but are prohibited from trading through the network due to two barriers:

(a) Synergy's franchise: only the State-owned retailer, Synergy, is permitted to sell electricity through the network to residents who consume less than 50 MWh per annum.[29]

(b) One user per NMI: Western Power has a self-imposed restriction in its Application and Queuing Policy (AQP) that forms part of its Access Arrangement (AA). The restriction is a result of Western Power only permitting one user (i.e. the retailer) per network connection point. There is no legislation mandating that Western Power only permit one user per connection point. There have been some developments that indicate this restriction will fall away,[30] but it is still a barrier at present.

27. On-market refers to where an embedded network customer is purchasing energy from the wider energy market beyond the embedded network.

28. An embedded network is formed when the connection point between the end users and the distribution network becomes a parent connection point and multiple end user connection points become child connection points, each with their own meters.

29. This does not affect the behind-the-meter components of the CUSP model because the exclusive franchise is implemented in a round-about way: Section 7(3) of the Electricity Industry Act 2004 prohibits Western Power (the State-owned SWIS network business) from operating its distribution network without a licence. Section 54(2) of the Electricity Corporations Act 2005 provides that Western Power's licence does not authorise Western Power to use its distribution network to supply electricity for any retailer but Synergy, if the supply is for sale to prescribed customers (i.e. customers who consume less than 50 MWh/a). Thus, there is in WA no prohibition on a retailer (e.g. the strata company) selling electricity to sub-50 MWh/a customers, it's just that Western Power is not allowed to let them use its network to do so.

30. Western Power's AA is currently undergoing revision, and it has proposed modest (and still restrictive) changes to its AQP in this area. See Western Power's AQP change summary for the period of Access Arrangement 4 (AA4), item 21. However, these changes have not yet been approved and Western Power indicates that allowing multiple users at a connection point remains subject to various reforms being introduced.

Licensing

Electricity licensing (known as “registration” in the NEM) comes with relatively burdensome compliance requirements in all jurisdictions. In the NEM, it is administratively and legally complex to “register” as a Distributed Network Service Provider (DNSP) or as a Retailer, in order to convey or sell electricity. Exemptions are available upon application to the Australian Energy Regulator (AER). If a strata company is granted an exemption to allow it to own, control or operate an embedded network, it will become an Exempt Electricity Network Service Provider (EENSP) .[31]

It is a condition of exemption in the NEM that network exemption holders either become an ENM or appoint one when a customer within an embedded network enters into a market retail contract.[32] This is a consideration for anyone who wishes to retail in embedded networks, and adds an additional compliance requirement which protects consumers and facilitates choice.

In the WEM, the licensing exemption regime is difficult to interpret for retailers who are part of a business model which combines on-site solar and grid electricity. This is likely to be reformed, and at present, only arises as a consideration. The result is merely that a retailer may fall under both the Electricity Industry (Solar Power Purchase Agreements) Exemption Order 2016 (Solar Exemption Order); and the Electricity Industry Exemption Order 2005 (General Exemption Order), thus having an additional administrative burden in terms of compliance with the exemption requirements.

Other regulatory matters

There will be a range of compliance considerations in addition to the above, for example regarding metering, battery standards if applicable, etc.

31. See the general exemption under clause 2.5.1(d) of the National Electricity Rules; National Electricity Amendment (Embedded Networks) Rule 2015 No. 15.
32. National Electricity Amendment (Embedded Networks) Rule 2015 No. 15.

Tax Implications

To understand potential tax implications of the governance model, general and non-binding advice was provided by the Australian Taxation Office. Three different ownership scenarios were considered:

- Dwelling owners own solar infrastructure and live in the dwellings
- Dwellings owners own solar infrastructure and rent out the dwellings
- Third party investors own the solar infrastructure

The most central question in this context is whether the payments received (for energy) by the owners of the solar storage infrastructure are considered assessable income.

Scenario One: Infrastructure owned by owner occupiers

If the payments generated by the solar infrastructure offset the cost of electricity for a given year, they are not considered assessable income. Whether this is the case depends on two factors, namely, the size of the solar system, and the intention to make a profit. The two are closely linked, where a system that is considerably larger than needed to provide electricity to a given household for a year, would generally be regarded as demonstrating an intention to make a profit. Generally speaking, if the total power generated by a solar system is larger than the total power used by the household, and the excess is sold on, then any payments received for this are considered assessable income. Deductions may be available for the portion of expenses that relates to the generated excess electricity.

Scenario Two: Infrastructure owned by dwelling owners but dwellings are rented out

In this scenario, payments received for energy generated by the solar infrastructure would generally be considered assessable income. As energy would not be used to offset the owner's own consumption, they may be considered to be carrying on a business.

A number of indicators are used to determine whether this is the case, which are described in Taxation Ruling TR 97/11 Income Tax: am I carrying on a business of primary production. For the scenario considered here, the most relevant of these indicators include the size, scale and permanency of the activity; and whether there is repetition and regularity of the activity. While not decisive on its own, generally, the larger the scale of the activity, the more likely that it will be considered as carrying on a business (cf. Paragraph 77 of TR 97/11). As repeating certain activities regularly is a feature of many businesses, this may also assist in determining whether a business is being carried on (cf. 55 of TR 97/11) (for example through comparison with others in the same line of business).

The ATO's advice concluded that in the case of owners renting out a dwelling, while being aware of the above considerations, the system will likely not be large enough to be deemed as carrying on a business.

Scenario Three: Infrastructure owned by third party investors

Whether investors will be seen as carrying on a business will depend on the size and amount of infrastructure owned, and will be subject to the same considerations as outlined above.

Private Rulings

The ATO's advice summarised here is general in nature. If you are unsure about the implications of a specific arrangement, you may apply for a private ruling.

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