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WATTBLOCK

Virtual Energy Assessments Project Report

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Prepared for:

City of Sydney

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EXECUTIVE SUMMARY

* Over **75% of residents** in the City of Sydney live in residential strata

* City of Sydney has over **1,650 apartment** buildings

* Strata committees underestimate electricity savings**, guessing 17% savings** possible with 7 year payback

* This project has shown **45% savings possible** with 3.6 year payback across tariff and energy efficiency

* **Data analytics** can lower the cost of mobilising strata committees on energy saving

* Apartment building dimensions, energy billing, product data, installation costs, maintenance costs, product lifespan & geo-location are **key data inputs**

* Electricity savings of **$338 per apartment p.a.** possible

* Average apartment **property valuation increase of $8,500** following energy saving

* Sustainable Sydney 2030 target of 70% carbon emission reduction **can be achieved** in existing residential buildings, retrofitting existing solutions

* Potential to reduce carbon emissions in residential strata of 393,000 tonnes p.a., equivalent to **taking 90,350 cars off the road**

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Research Director

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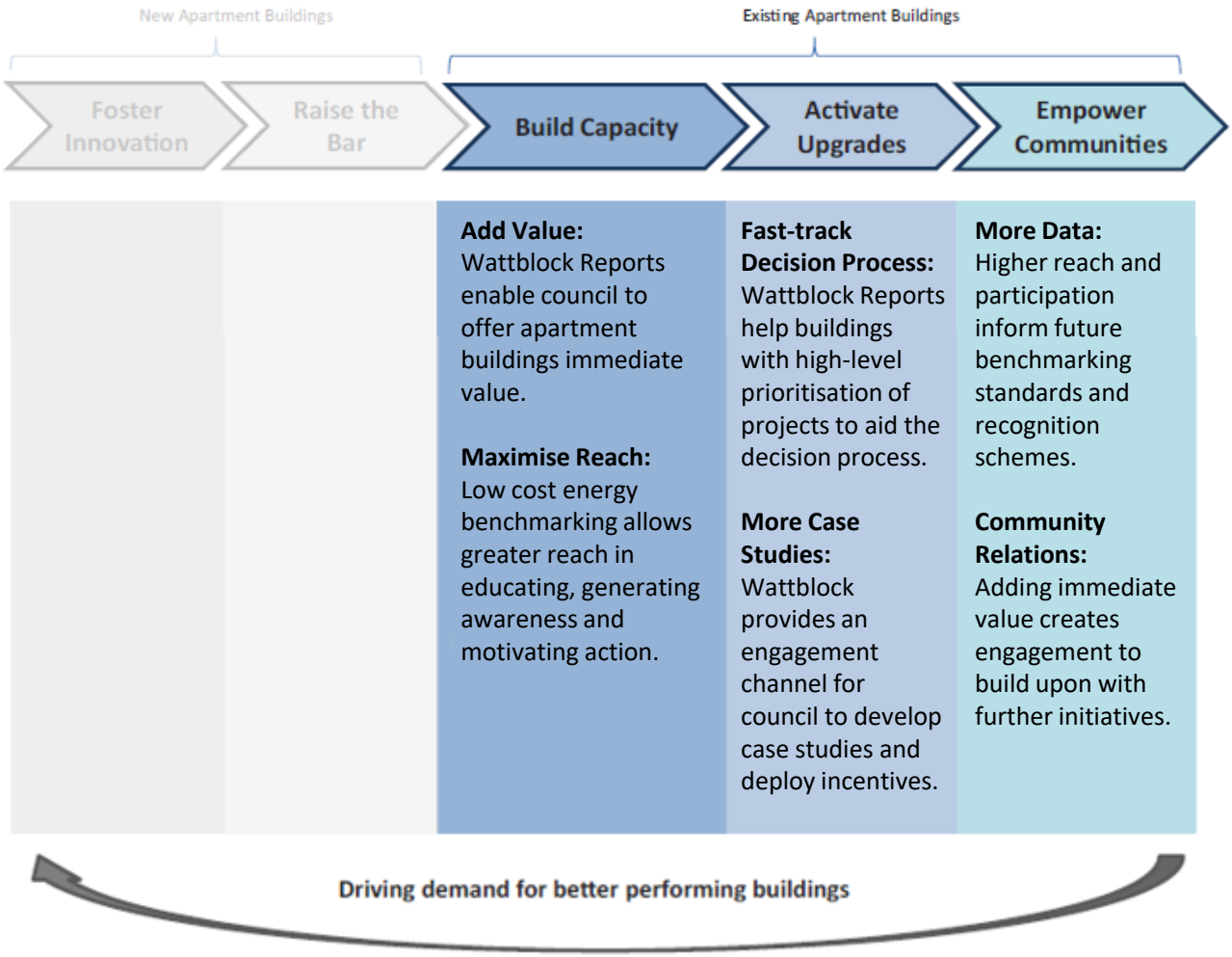
INTRODUCTION

Virtual Energy Assessment Project

On the 19th of July 2015, Wattblock was engaged by the City of Sydney to run a "Virtual Energy Assessments" project to investigate the use of data benchmarking for residential energy efficiency assessment. Via the project, 10 residential apartment buildings were engaged to receive a Wattblock Virtual Energy Assessment report for their building. Participant buildings were selected to cover a cross section of building size, demographics and representation across different suburbs within the City of Sydney.

Project Objectives

The principle objective of the City of Sydney '"Virtual Energy Assessments" project is to investigate the merits of utilising data benchmarking based reporting. This is underpinned by an interest in ***lowering the costs of promoting awareness and mobilising action*** on energy efficiency in apartment buildings and potentially other sectors. A lower cost solution will enable a broader reach to engage and mobilize apartment buildings.



INTRODUCTION

Strategic Fit

The City of Sydney has a broader strategy to achieve a 70% reduction in carbon emissions by the year as part of Sustainable Sydney 2030. For the apartment building sector, the strategy is broadly divided into new and existing apartment buildings. Data benchmarking based reports are being investigated as a complimentary tool to existing strategies and capabilities which include:

- Regular case study based workshops conducted in local community locations.
- Provision of Smartblocks website to assist strata committee engagement processes.
- Online content such as Greenstrata providing information about products and services.
- Detailed energy audits commissioned out to professional energy auditing companies.

While energy audits provide a high level of detailed and customised feedback on a specific building, the process is time consuming and costly which prohibits scalability. On the other hand, less costly strategies including case study workshops and online content do not always arm participants with the level of customisation needed to influence their strata committees to take action. Data benchmark-based reports are designed to bridge the gap in providing an appropriate level of customisation at a sufficiently low cost to be scalable.

About Wattblock

Wattblock is an Australian technology innovation start-up backed by Telstra's accelerator program muru-D, and private investors based in Australia and overseas. The muru-D program seeks to identify and fast track globally scalable technologies which are being developed in Australia. Wattblock has also been supported by Microsoft CityNext, a program which seeks to engage governments internationally with new technology based solutions. It has also been providing industrial training opportunities to solar engineering and low-carbon building students from UNSW and business development opportunities to international MBA students from AGSM.

Wattblock is developing data analytics technology to enable fast and cost effective benchmarking of apartment building energy consumption.

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PROJECT OVERVIEW

Participant Data Sample

Participant buildings were selected to include a range of different building types as well as representative demographics and a cross section across different suburbs within the City of Sydney. Buildings aged between 8 and 50 years were included in the project.

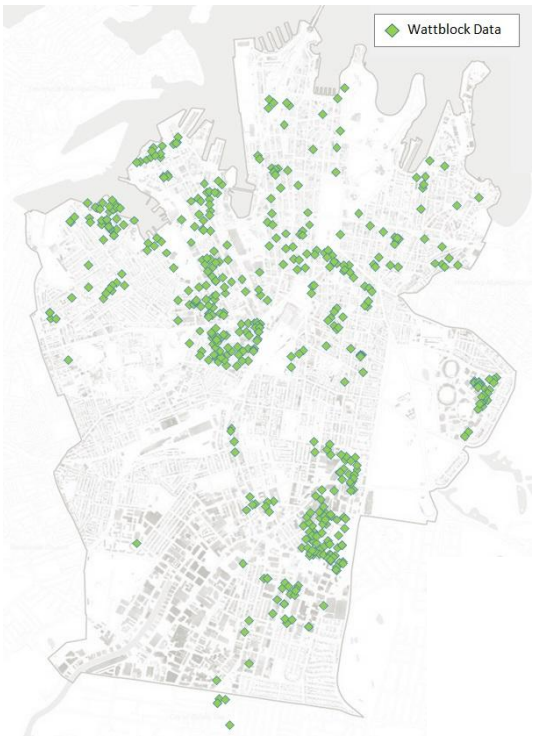
Building:	Suburb	Block size:	Residential levels:	Number of units	Number of residents:	Age (Years)
1	ALEXANDRIA	MID	4	114	219	11 to 20
2	CAMPERDOWN	MID	5	31	60	11 to 20
3	CHIPPENDALE	LOW	3	8	15	11 to 20
4	GLEBE	MID	6	43	83	0 to 10
5	GLEBE	HIGH	12	120	230	41 to 50
6	PYRMONT	MID	7	20	38	0 to 10
7	SURRY HILLS	MID	4	29	56	11 to 20
8	SYDNEY	HIGH	12	127	244	11 to 20
9	SYDNEY	HIGH	20	40	77	21 to 30
10	SYDNEY	HIGH	31	120	230	21 to 30

LOW RISE: 1-3 levels MEDIUM RISE: 4-8 levels HIGH RISE: 9+ levels

Participant buildings were divided into Low Rise, Mid Rise, and High Rise based on the number of floors. Consistent with ABS definitions, Low Rise is classified as 1-3 floors, Mid Rise 4-8 floors, and High Rise as anything above 8 floors. It is noted that 10 buildings is a small sample size and in particular there is only 1 building in the Low Rise classification.

Other definitions of High Rise have been used by City of Sydney with a lower number of floors. Wattblock has adopted the ABS definition because there are more distinct characteristics identifiable in buildings above 8 floors. In particular the presence of common area leisure facilities like swimming pools and spas are more typical in buildings with more than 8 residential levels.

Participants generally indicated that their building residents had a diversity of ages and ethnicity. 33% of buildings were suspected to have Air BnB or other commercial activity within the residential block.



Benchmarking Data Sample

While 10 buildings have been selected for participation in the Wattblock Virtual Energy Assessment project, a broader data set is being collected to inform data benchmarking analytics. With assistance from the UNSW intern program, Wattblock has gathered data on approximately one third of all 1,650 apartment buildings within the City of Sydney.

PROJECT OVERVIEW

Participant Engagement Process

*Initial registrations of interest
*Surveys conducted with the participant to collect demographic and behavioural data
*Buildings selected to represent an initial cross section
*Disclosure agreements signed for participation
*Energy bills collected from strata managers
*Collection of high level building metadata required to run benchmarking
*Site visits to participant buildings to observe any peculiarities
*UNSW students engaged to assist with technology research
*Report scope designed and tested
*Customised reports provided to participant contacts for distribution to their strata committees
*Follow up contact to gauge effectiveness of reports and collect feedback

Participant Survey Results

Wattblock surveyed 15 applicants for participation in the Virtual Assessments Project. Results of the survey are summarised in the Survey Responses section of the report. Most of the applicants were members of the Executive Committee for their building, with more than half holding the positions of Chairperson, Secretary or Treasurer. On average, the respondents owned their unit for 6.1 years and represented on their committee for 5.3 years.

Respondents were generally happy with the management of the building with 53% of buildings having an onsite building manager.

Respondents generally felt that their committee was also effective. The results suggest greater satisfaction with managing cleaning and maintenance and the least satisfaction with water efficiency. Energy efficiency management was viewed slightly more positively than negatively on balance.

Wattblock gauged perceptions about energy efficiency in advance of providing the participants with the Wattblock Virtual Energy Assessment. On average, energy efficiency initiatives were perceived as being able to offer up to 17.3% reduction on energy bills with an average payback of 7.5 years. Wattblock believes this shows most committee members under estimate the value and financial returns of energy efficiency and that this is likely to lead to lower prioritisation being given to investment in energy efficiency.

Overall the respondents indicated that energy efficiency initiatives were likely to be approved in general. Indicatively, the main barriers for gaining approvals were likely to be availability of funding and lack of awareness and information. There is strong indication that providing estimates of costs and savings and guidance on where to start are key to mobilising the committee to approve energy efficiency initiatives.

PROJECT OVERVIEW

Virtual Energy Assessment Report Design

The Wattblock Virtual Energy Assessment Report has been designed to provide relevant information about the building that is easily understood by a strata committee. The primary objective is to achieve rapid and clear communication of the specific financial and environmental impact of energy consumption in their building. A more detailed description of each page of the report is contained in the Report Design section

The following layout and design principles were applied:
- Minimizing the number of pages
- Logical flow and structure
- Minimizing the use of technical jargon
- Use of text and data visualisation (graphs) to convey key messages
- Everything in dollar terms with financial payback and valuation impacts
- Guide the committee to pursue projects in a logical order
- Avoid specific recommendation of any particular product or service providers
- Highlight environmental statistics and contribution toward Sustainable Sydney 2030 targets
- Highlight areas that will deliver the greatest dollar cost impact on carbon emissions

For this reason the first page of the report highlights at the top of the page the overall financial case for areas which can deliver the fastest payback and which are the logical 'next best step' for the committee to consider. Tariff optimisation and energy efficiency initiatives across a number of areas are grouped together in this section while solar power and microgrid investments are not.

It is in the best interests of strata to first complete energy efficiency initiatives in the building before investigating solar power. By completing energy efficiency and tariff optimisation first, the committee will avoid investing in an oversized solar power system and they will be able to better judge the financial case for solar.

Regardless of this, the solar energy analysis is provided based on the projected energy consumption profile of the building after energy efficiency. In some cases the strata committee may be interested in proceeding with solar energy investment prior to the completion of energy efficiency. Therefore it was deemed more useful for strata committees, and in their best interests, to provide the solar energy analysis based on projected load post-energy efficiency rather than based on their current energy consumption.

<u>Report Feedback</u>
Initial feedback from participant buildings and internal review with City of Sydney include:
- Provide more specific recommendations
- Provide specific product and supplier advice
- Provide more detailed guidelines for the committee on how best to proceed
- Include more information about relevant financial incentives
- Greater focus on common areas and less focus on apartments
- Layout and content suggestions to improve clarity
- Include impact on strata levies for an average apartment

PROJECT OVERVIEW

Technologies Selected for Inclusion

Following field research around the typical needs of apartment buildings and energy related technologies currently available, the following were selected for inclusion in the City of Sydney Virtual Energy Assessments project.

Tariff Optimisation

Utilising data capture from billing files and public government databases Wattblock is able to quickly determine whether or not the building is spending more than they need to for energy supply and whether or not the type of meter and tariff is appropriate. There are many providers offering power from renewable energy sources at highly competitive prices and superior data services for better on-going power management.

Energy Efficiency

Wattblock has collected benchmark data on a range of products across lighting, mechanical, HVAC, water, and leisure facilities like swimming pools, spas and saunas. Almost universally, LED lighting is of immediate benefit to building common areas and usually represents the fastest return on investment. Following LED lighting, big areas for savings often include use of variable speed ventilation fans, pool filters, timers, controls and sensors on water pumps, ventilation, lighting, and air conditioning. There are many different vendors across these kinds of technologies and they are generally competitively priced, although quality can vary.

Solar Power

Residential strata buildings are a largely untapped market for solar PV energy solutions, which are a very mature and cost effective technology in the Australian market. There are many vendors with competitive pricing although there is a large range in quality. Solar PV energy also readily lends itself to data benchmarking techniques for high level assessment. Competing dynamics are primarily available roof space and the energy usage profile of common area power supply. Combined with weather data, a high level assessment of Solar PV viability can be determined.

Microgrid or Embedded Electrical Networks

While a more challenging proposition for a strata building to implement, a Microgrid or Embedded Electrical Network has been included due the size of the financial benefits that can be achieved and due to the ability of the strata committee to subsequently manage the energy footprint of the entire building. A Microgrid involves installing a gate meter, which provides power not only to the building common areas, but also into the apartments. This means that power supply can be negotiated on behalf of all owners and tenants for a much lower cost. It also opens the opportunity of utilising more renewable energy sources. While this is included to start committees thinking about this possibility, it is expected that such investment will take a while to approve.

Excluded Technologies

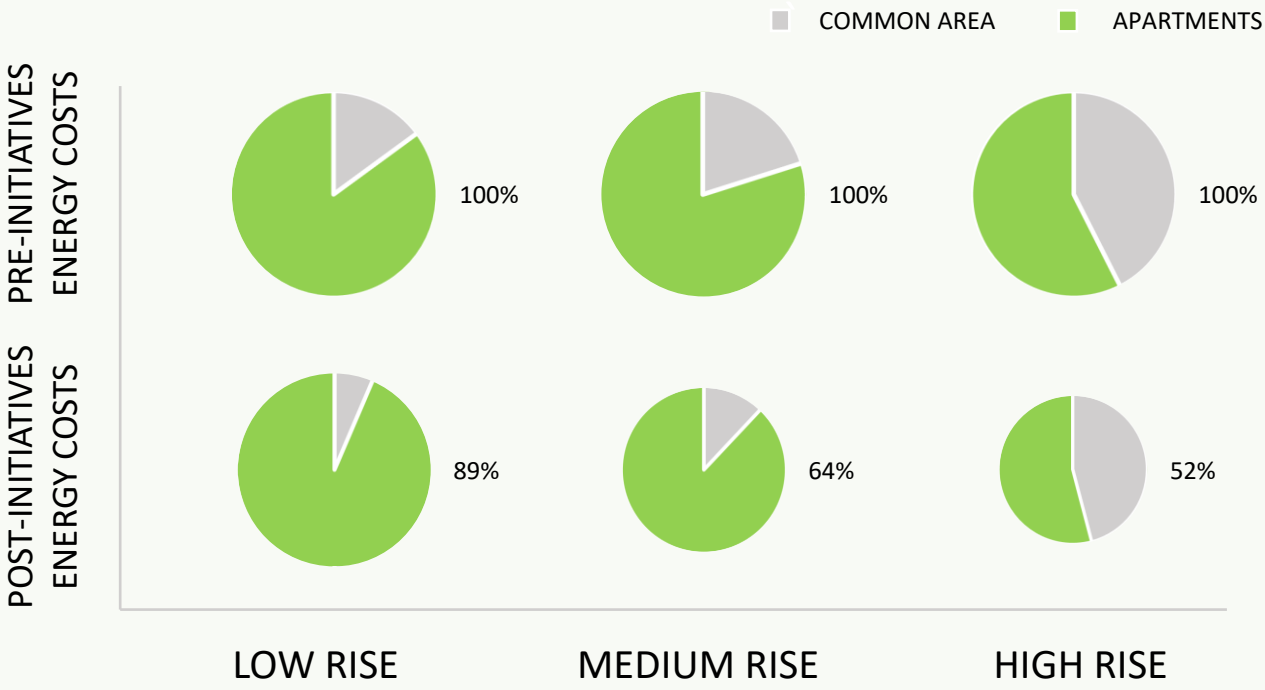
Wattblock investigated a number of other technologies including batteries, electric vehicle recharge, lift replacement, power factor correction, solar hot water heating, co-generation and tri-generation technologies. There were various reasons for not including these technologies at the time including maturity of the technology, commercial viability, investment economics and having sufficient benchmarking data. Following completion of the City of Sydney project, batteries have become a feasible addition to the Wattblock Virtual Energy Assessment including interrelation with Solar PV Energy and Microgrid.

PROJECT OVERVIEW

Data Benchmarking Results

Wattblock Virtual Energy Assessments reports were provided to the ten participant buildings. The reports identify potential for cost and energy savings and CO_2 emissions reductions through a roadmap of energy savings initiatives. Initiatives include tariff optimisation, common area energy efficiency, solar energy and microgrid. The roadmap priority is based on financial payback and lowest-cost carbon abatement outcomes for owners.

The reports identify an average of $72,787 in annual energy cost savings per block across all included initiatives. This represents an average 68% reduction in grid-energy import and CO_2 equivalent emissions. Considering only savings available from tariff optimisation, energy efficiency and solar installation, annual common-area energy cost savings averaged 45%.



The Wattblock reports highlight Tariff Optimisation and Energy Efficiency for common areas as offering the fastest financial payback with an average of 3.6 years. Subsequent solar energy investment has a longer payback.

The average valuation impact of tariff, energy efficiency and solar initiatives is estimated at $8,498 per unit across the 10 participant buildings.

Extrapolating these savings from a scope of ten buildings to the whole City of Sydney apartment sector demonstrates an energy cost savings opportunity of $25m p.a.

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Participant Data Analysis

Average Energy and Emission Reduction Potential

Cost Reduction Potential

Emissions Reduction Potential

Average Common Area Energy Consumption

Recommended Next Steps

Payback Period

Solar Energy Potential

Valuation Impact

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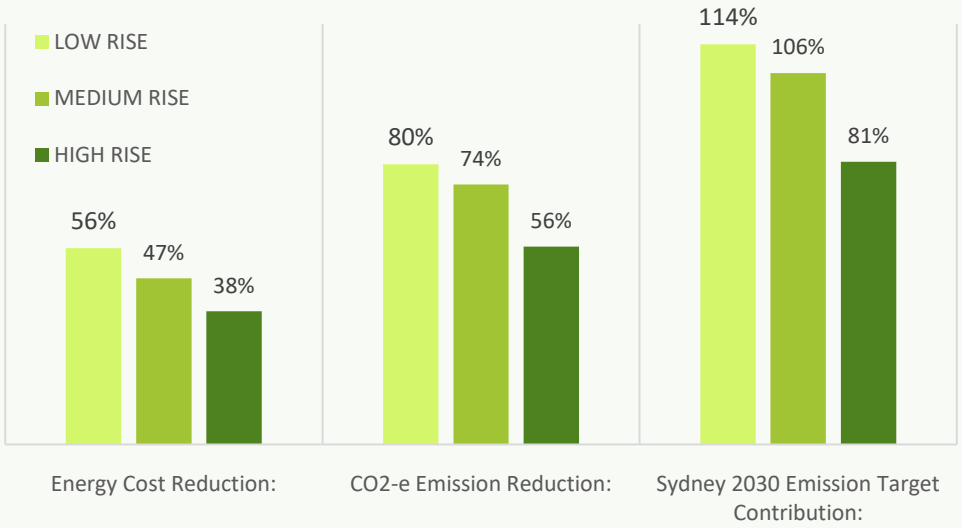
AVG. ENERGY AND EMISSION REDUCTION POTENTIAL

Better outcomes for low to medium rise blocks are to be expected due to the large component that common-area lighting contributes to their load (see graph). Efficiency upgrades are highly effective in reducing energy costs and emissions.

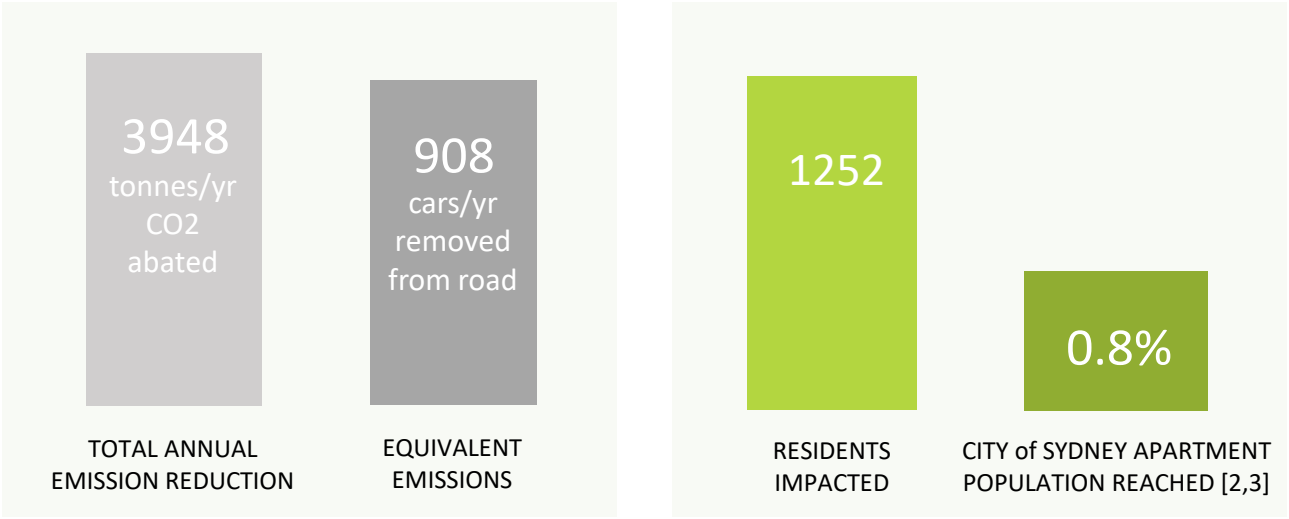
City of Sydney 2030 CO_2 emission reduction target: 70%.



Wattblock has outlined total solar potential of 306.6 kW across the ten buildings selected. Coupled with tariff optimisation and improved energy efficiency, total potential CO_2 abatement is estimated to be 3,948 tonnes per year, or an equivalent 908 cars removed from the road per annum. This represents an average CO_2 emission reduction per building of 68%, and an average contribution of 97% towards the 2030 City of Sydney CO_2 emission reduction target of 70% [1].

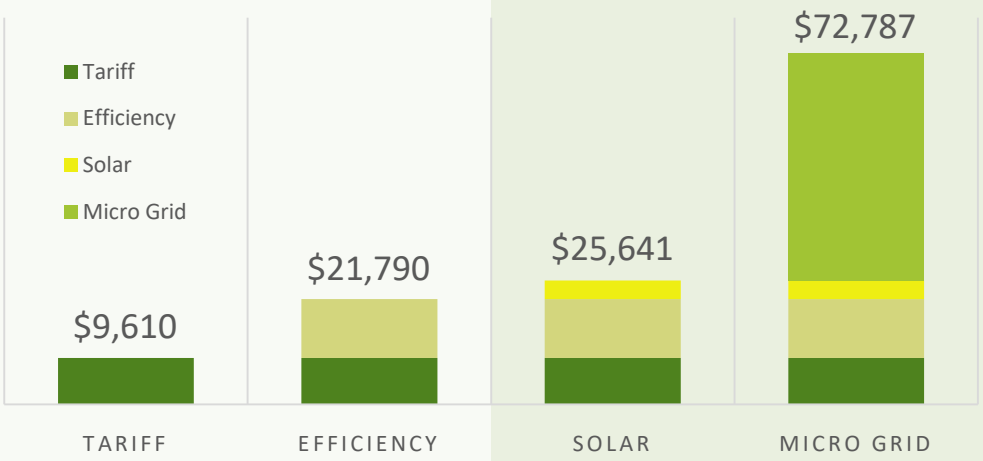
The total number of apartment residents that will benefit from these savings is estimated at 1,252, or 0.8% of the entire City of Sydney apartment-residing population [2,3].

Averages:	LOW RISE	MEDIUM RISE	HIGH RISE	Overall Average
Common area energy cost reduction	56%	47%	38%	45%
CO2 emission abatement	80%	74%	56%	68%
Contribution to City of Sydney 2030 emission reduction target	114%	106%	81%	97%



COST REDUCTION POTENTIAL

CUMMULATIVE AVG. COMMON ENERGY COST SAVINGS

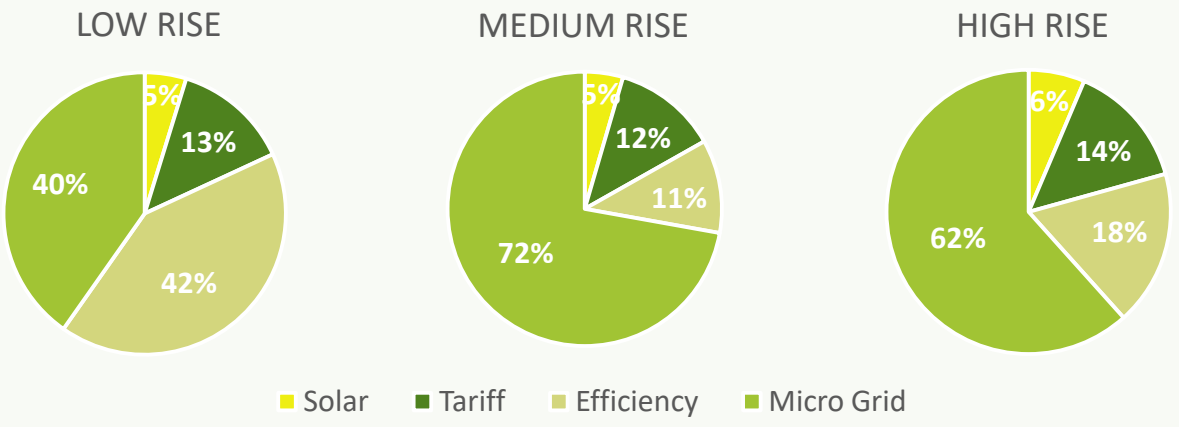


Averages:	Tariff Optimisation	Energy Efficiency	Solar Installation	Micro-Grid Billing
Energy savings per initiative ($)	$9,610	$12,181	$3,850	$47,146
Cumulative savings per initiative ($)	$9,610	$21,790	$25,641	$72,787

On average, common-area energy savings of $72,787 per block per annum have been identified.

COST REDUCTION POTENTIAL BREAKDOWN by BLOCK SIZE

The relative percentage contribution to total energy cost savings by each initiative, broken into block heights:
Low (1-3 levels), Medium (4-8 levels), High (9+ levels)



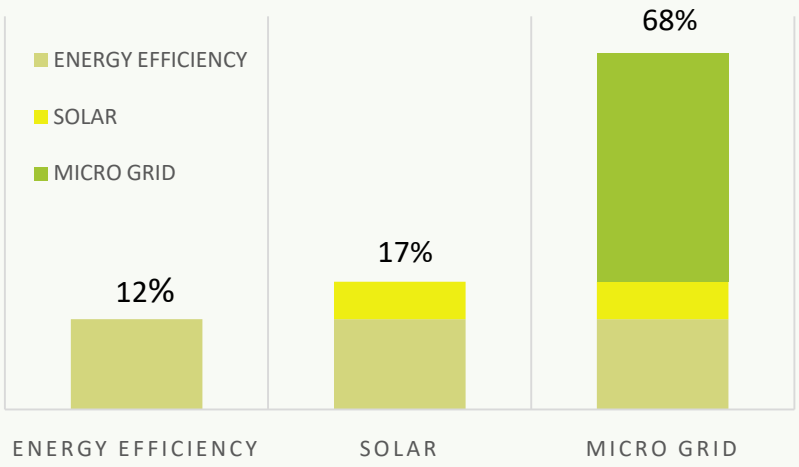
	Tariff Optimisation	Energy Efficiency	Solar Installation	Micro-Grid Billing
Low Rise	13%	42%	5%	40%
Medium Rise	12%	11%	5%	72%
High Rise	14%	18%	6%	62%
Average contribution:	**13%**	**17%**	**5%**	**65%**

Transition to micro-grid offers the greatest potential savings, contributing on average 62% to all identified savings per block. Efficiency upgrades contribute 17%; tariff optimisation, 15%; solar, 6%.

EMISSION and ENERGY IMPORT REDUCTION POTENTIAL

Average reduction on non-renewable grid imported energy and resultant CO_2 emissions:

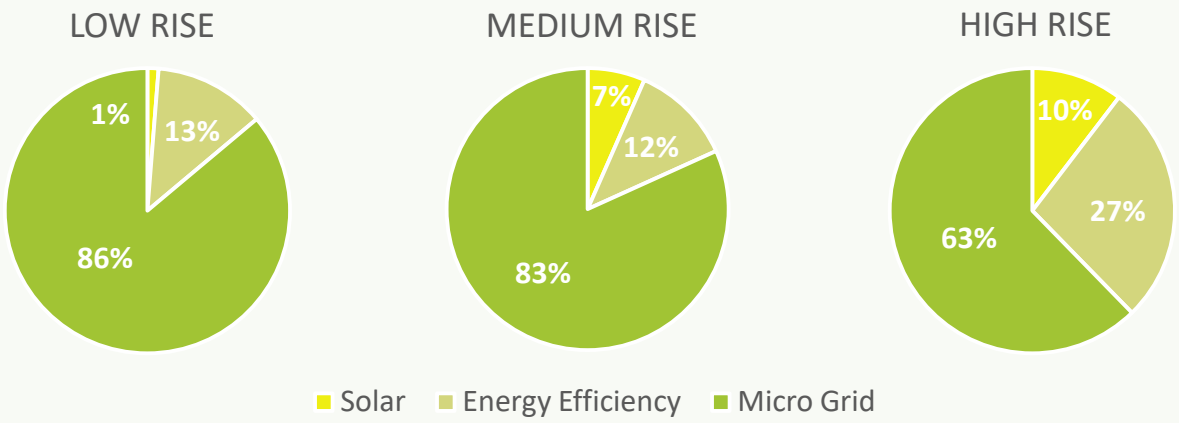
Note: micro-grids reduce energy costs, not usage. They also allow blocks to switch up to 80% of grid imported energy to renewable sources. Thus, they reduce energy costs as well as non-renewable energy usage and subsequent emissions.



Average reductions in:	Energy import (kWh)	Emissions (kgCO2)	Percentage (%)
Energy Efficiency	103,382	109,585	12%
Solar	42,686	45,247	5%
Micro Grid Aggregate Billing	261,377	277,060	52%

Grid energy usage and resultant emissions are reduced 12% by efficiency upgrades and 5% by solar. Non-renewable grid energy usage and emissions are reduced 53% on average by micro-grids. This amounts to an aggregate reduction of 68%.

EMISSION REDUCTION POTENTIAL
BREAKDOWN by BLOCK SIZE

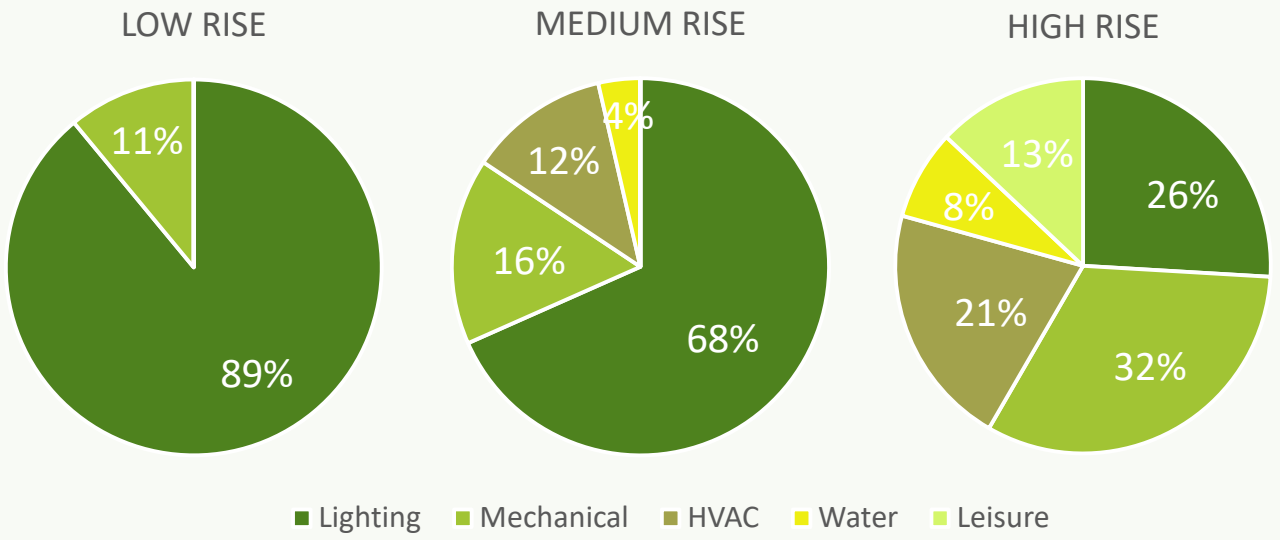


	Energy Efficiency	Solar Installation	Micro-Grid Billing
Low Rise	13%	1%	86%
Medium Rise	12%	7%	83%
High Rise	27%	10%	63%
Average contribution:	**19%**	**8%**	**73%**

Transition to micro-grid again offers the most savings, contributing on average 73% to all identified energy and emissions savings per block. Efficiency upgrades contribute 19% and solar 8%.

AVG. COMMON AREA ENERGY CONSUMPTION

Understanding which assets are likely to be contributing to the common area energy consumption of a block is the first step in building an energy reduction roadmap.



Percentage contribution to total common-area energy consumption:	**LOW RISE**	**MEDIUM RISE**	**HIGH RISE**
Lighting	**89%**	**68%**	26%
Mechanical	11%	16%	**32%**
HVAC	0%	12%	21%
Water	0%	4%	8%
Leisure	0%	0%	13%

Due to the range of facilities offered by blocks of varying sizes, breakdown of common-area energy usage is correlated with block size. The load of low to medium rise blocks consists primarily of lighting – 89% and 68% respectively. Mechanical consumption contributes 11% in low-rise, and 16% in medium-rise, with HVAC and water pumping making noticeable contributions in medium rise blocks. In high rises, HVAC, water pumping and leisure energy usage increases to 21%, 13% and 8% respectively, mechanical to 32% and lighting drops to 26%. Common energy usage per unit is on average 37,130 MJ per year.

Common-area energy costs are significantly reduced by tariff optimisation, energy efficiency and solar. Tariff optimisation reduces expenditure to 80% of current costs. Following energy efficiency these costs reduce further to 55%, and finally to 47% after solar installation.

Optimising tariffs does not impact a building's energy usage, only its energy costs. Therefore, following optimisation, consumption remains at 100% of current usage. Energy efficiency initiatives, however, reduce consumption to 62% on average, and solar to 46% of current usage.

RECOMMENDED NEXT STEPS

QUICK PAYBACK OPPORTUNITIES

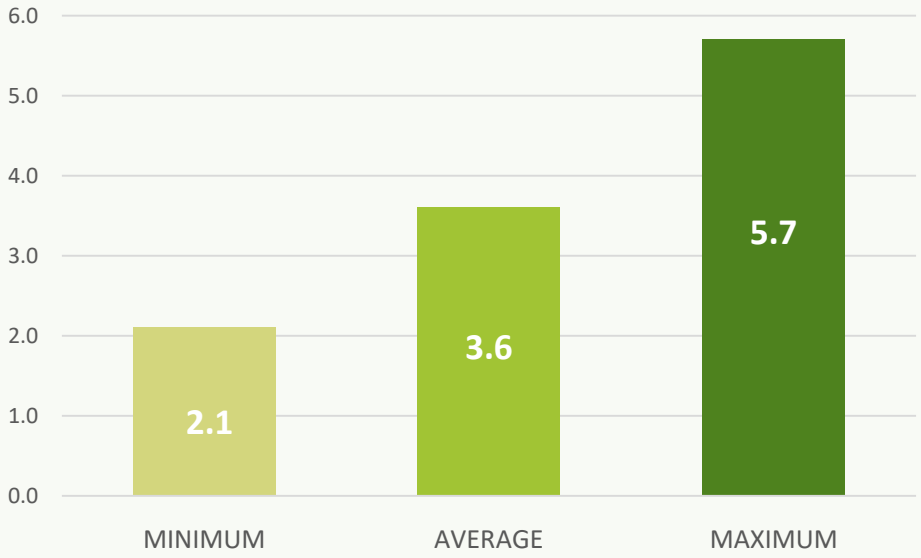
Or “lowest hanging fruit”: tariff optimisation and energy efficiency benchmarking with fast payback.

AVERAGE ESTIMATED COMMON ENERGY COST REDUCTION	AVERAGE ESTIMATED COMMON ENERGY SAVINGS (PER ANNUM)	AGGREGATE ESTIMATED COST SAVINGS (PER ANNUM)	AGGREGATE ESTIMATED ENERGY SAVINGS (kWh)
45%	38%	$312,250	1,460,681
Electricity Bills	Grid-Imported Electricity	Energy & Maintenance	Grid-Imported Electricity

The fastest payback, “lowest hanging fruit” opportunities uncovered are tariff optimisation and energy efficiency upgrades, reducing common energy costs by 45% on average, and energy usage by 38%. This represents cost savings totalling $312,250 across the ten blocks in the project, with aggregate energy savings, in terms of grid imported kWh, of 1,450,681 kWh per annum. The average payback period for these initiatives is 3.6 years.

PAYBACK PERIOD

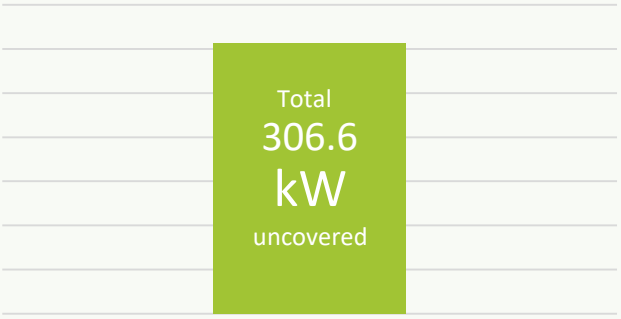
Average payback periods for tariff optimisation and energy efficiency initiatives. Average payback of 3.6 years; minimum payback period found, 2.1 years; maximum, 5.7 years.



Averages:	LOW RISE	MED. RISE	HIGH RISE	Average
Payback period (years) *For tariff optimisation and energy efficiency upgrade*	2.9	3.8	3.5	3.6

SOLAR ENERGY POTENTIAL

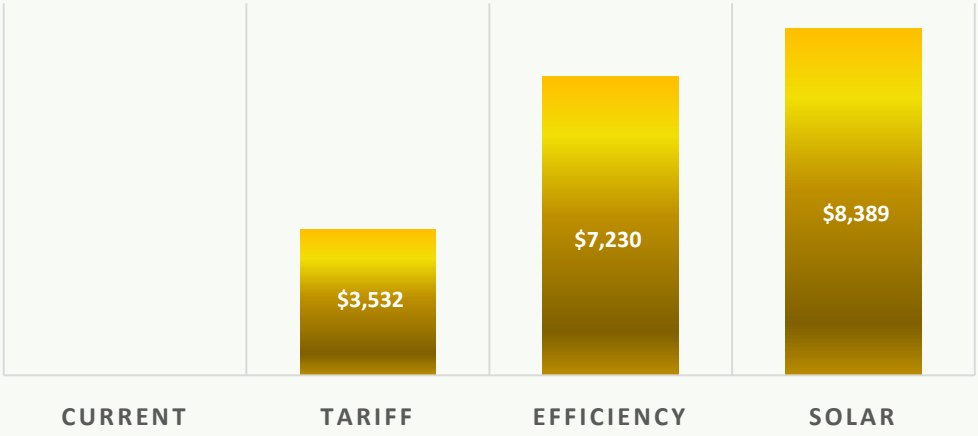
Total solar potential of 306.6 kW has been uncovered over the ten buildings analysed in the project. The smallest system found was 0.5 kW, through to 100 kW. Systems of up to 100 kW can utilise government Small-Scale Technology Certificates (STC's), thereby reducing the capital expenditure required for system implementation.



VALUATION IMPACT

A building with lower operating costs is worth more because net income to property owners is increased. Property valuation is therefore positively impacted by tariff optimisation, energy efficiency improvements and solar installation.

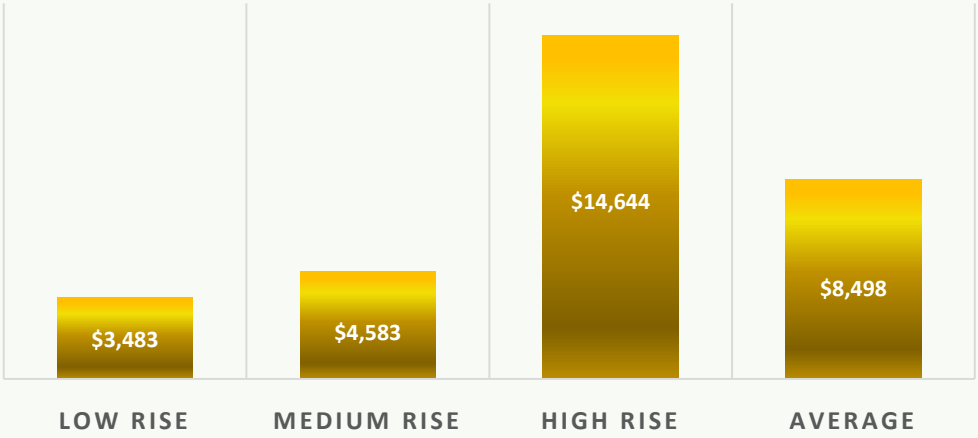
AVG. PROPERTY
VALUATION IMPACT per UNIT by INITIATIVE



Note: Valuation impact is based on 20x multiple of cash flow.

The average total valuation impact after tariff optimisation, efficiency upgrade and solar installation is estimated at $8,498 per unit. Tariff optimisation and efficiency upgrading contribute most toward total average valuation: $3,532 and $3,698 respectively.

AVG. PROPERTY
VALUATION IMPACT per UNIT by BLOCK TYPE



Common area consumption is generally greater in high rise blocks. There is, therefore, more potential for energy savings and improved property valuation due to reduced expenses. The average valuation impact for low rise units is $3,483; medium rise, $4,583; high rise, $14,644.

Avg. valuation impact per apartment	**LOW RISE**	**MEDIUM RISE**	**HIGH RISE**	**Overall Average**
Per building type ($): *Includes impact of tariff optimisation, efficiency upgrade and solar on property*	$3,483	$4,583	$14,644	$8,389
	CURRENT	**TARIFF**	**EFFICIENCY**	**SOLAR**
Per initiative ($): *Average impact of energy savings initiatives*	$0	$3,532	$7,230	$8,389

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Extrapolated Results

Participant CO_2 Emissions Reduction Potential

Extrapolation of Results to City of Sydney

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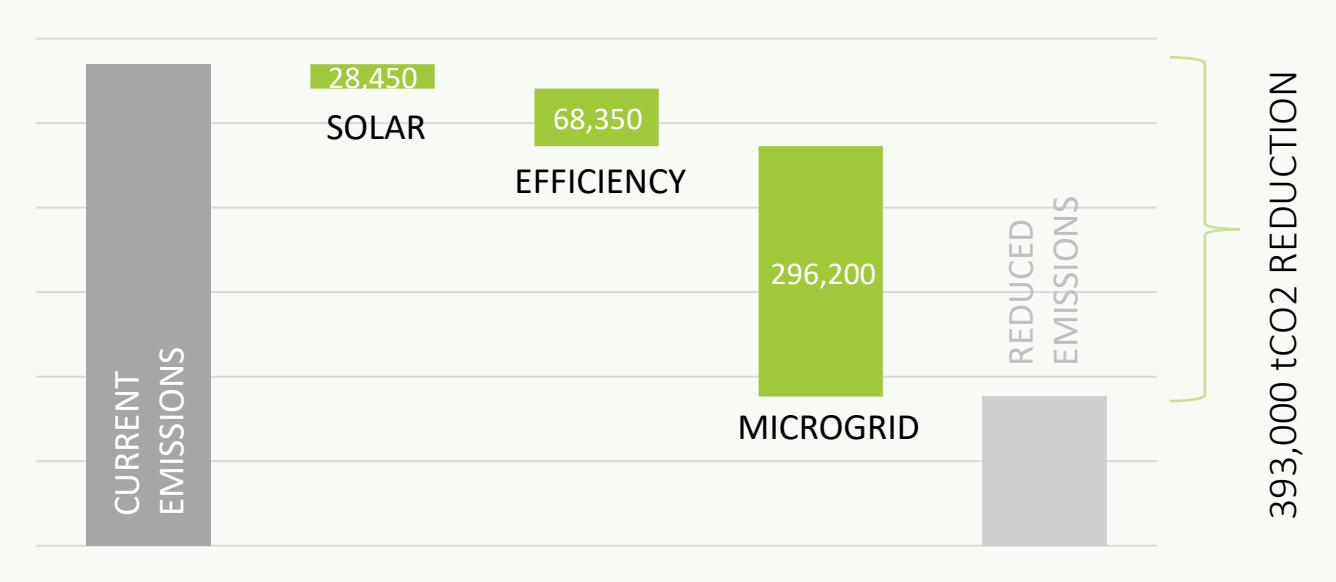
PARTICIPANT CO_2 EMISSIONS REDUCTION POTENTIAL

Following all identified initiatives the 10 participant apartment blocks will almost exceed Sydney's 2030 carbon reduction target. If every block initiated similar upgrades, we would be well on our way to meeting the target.

TOTAL CITY OF SYDNEY RESIDENTS IMPACTED 1,252	CITY OF SYDNEY APARTMENT POPULATION REACHED 0.8%	AVG. ANNUAL ENERGY PER UNIT ELECTRICITY + GAS MJ / YR 37,130	AVG. ANNUAL CO_2 EMISSIONS ABATEMENT 68%
TOTAL CURRENT BLOCK CO_2 EMMISSIONS (TONNES/YR) 6,975	EMMISSIONS AFTER ALL INITIATIVES (TONNES/YR) 3,027	TOTAL CO_2 EMMISSIONS SAVINGS (TONNES/YR) 3,948	CITY OF SYDNEY CO_2 REDUCTION 2030 TARGET CONTRIBUTION 97%

The total number of residents within the ten buildings analysed by Wattblock is estimated at 1,252, or 0.8% of the City of Sydney apartment residing population. Across the ten buildings, emission savings identified total 3,948 tonnes CO2, an average abatement of 68% per annum per block. This represents an average contribution to the City of Sydney CO_2 emission reduction target of 97%.

The City of Sydney apartment sector generates an estimated 10% of all LGA emissions [2]. Taking City CO_2 emissions at 2006 levels and multiplying by this 10%, we have a conservative estimate of City apartment sector annual carbon emissions.



Wattblock's analysis of 10 City of Sydney apartment buildings shows average reduction in emissions and grid-energy import due to solar installation is 5%. Extrapolating this reduction to total apartment sector emissions, it is estimated that City emissions would reduce by 28,450 tonnes CO_2 per annum if every apartment building utilised its solar potential to offset grid-energy usage. This would be equivalent to removing 6,550 passenger cars from Sydney roads every year.

Similarly, from Wattblock's study, the average emissions reduction potential from efficiency upgrades is 12%. The average reduction from renewably sourced micro-grid billing is 53%. Extrapolating these reductions to all City apartments suggests further cuts of 68,350 and 296,200 tonnes CO_2 may be achieved. The sum of these savings is 393,000 tonnes CO_2 per annum.

EXTRAPOLATION OF RESULTS TO CITY OF SYDNEY
ANNUAL ENERGY COST SAVINGS POTENTIAL

Extrapolating the potential energy cost savings uncovered by Wattblock to all City of Sydney apartment blocks, total potential energy cost savings would amount to $25,380,000 per annum. This estimate is equivalent to $338 per annum, per apartment dwelling.

	LOW RISE	MID RISE	HIGH RISE	TOTAL
Total City of Sydney Estimated Energy Savings ($/annum)	$ 5,848,000	$ 7,582,000	$ 11,949,000	$ 25,380,000
Average Energy Savings per Unit ($/unit/annum)	$ 195	$ 253	$797	$338

CO_2 EMISSION REDUCTION POTENTIAL

Equivalent to removing 90,350 cars from roads

12% of all abatement needed for City to meet 70% reduction target

Should all City of Sydney apartment blocks achieve savings similar to those uncovered for the 10 buildings analysed, total City emissions would reduce by an estimated 393,000 tonnes CO_2 per annum. This estimate is formed from the average per unit emission reduction potential in the Wattblock study, weighted for variation in block height, and extrapolated to all 1650 apartment blocks in the City [3]. This is equivalent to removing 90,350 cars from Sydney roads. It would amount to an estimated 7.3% reduction on 2006 City emission levels, or 12% of all savings necessary for the City of Sydney to meet its 2030 70% emissions reduction target.

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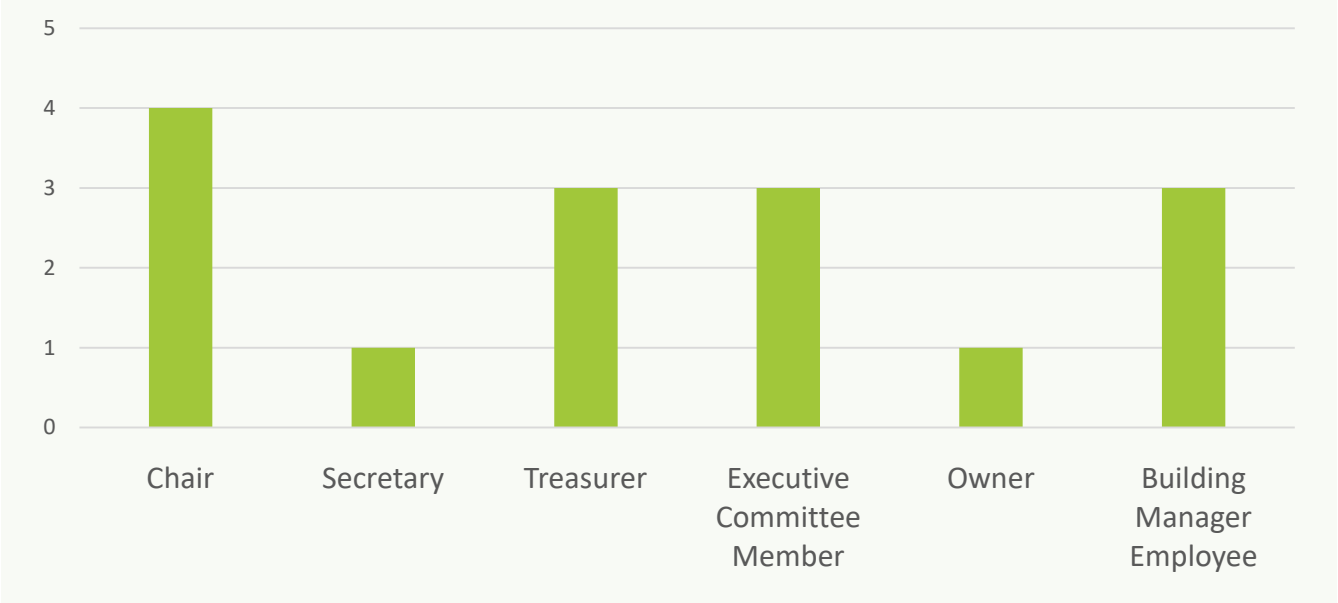
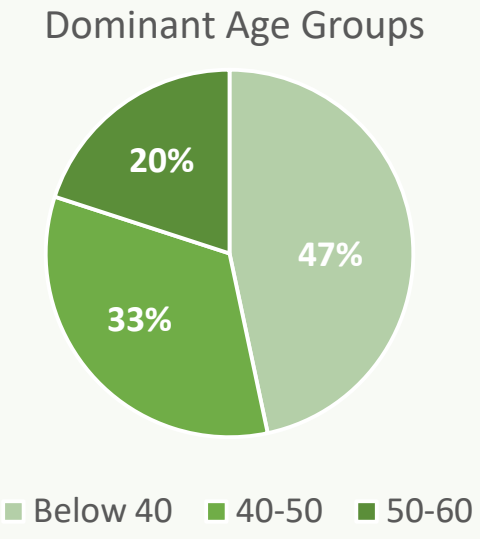
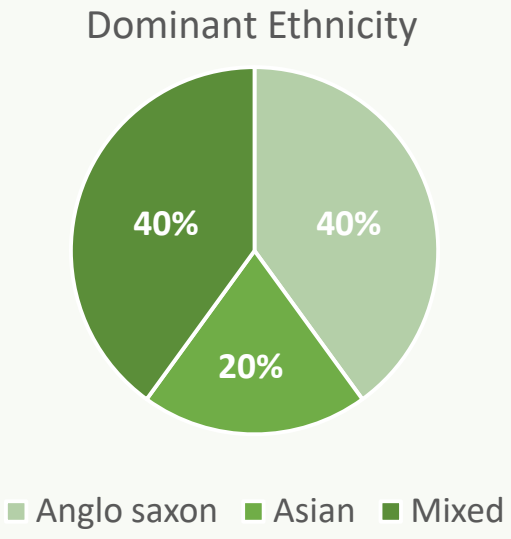
WATTBLOCK SURVEY RESULTS
SURVEY PARTICIPANTS

15 respondents completed a survey on building management and factors impacting building energy efficiency. 73% of these respondents are owner occupiers. The average respondent has owned their unit for 6.1 years, and has been on the building committee for 5.3 years.



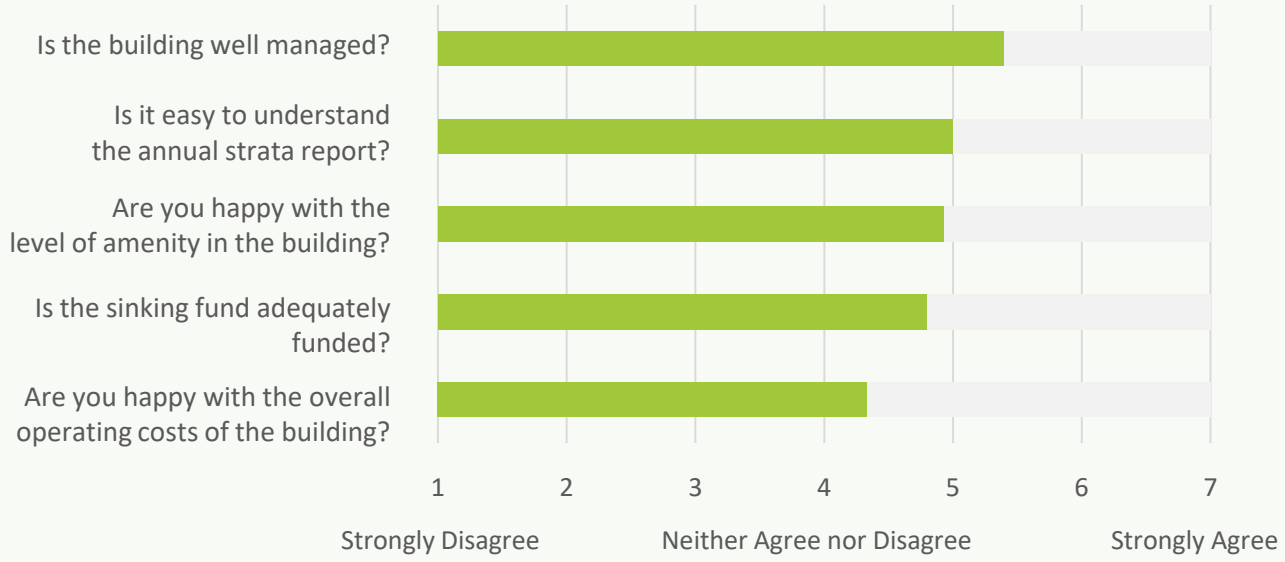
BUILDING DEMOGRAPHICS





Buildings range in age between 8 and 50 years. The average respondent agrees that their building has a diversity of age and ethnicity. 33% of respondents indicate that there may be an AirBnB or other commercial activity within their block.

BUILDING MANAGEMENT



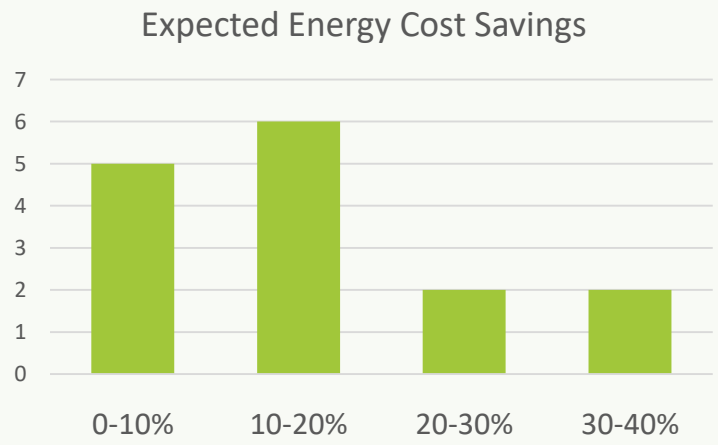
53% of buildings have an on-site manager, while the average strata levy is $7,655 p.a. respondents generally agree their building is well managed (5.4/7), yet neither agree nor disagree that they are happy with the overall building operating costs (4.3/7).

COMMITTEE EFFECTIVENESS

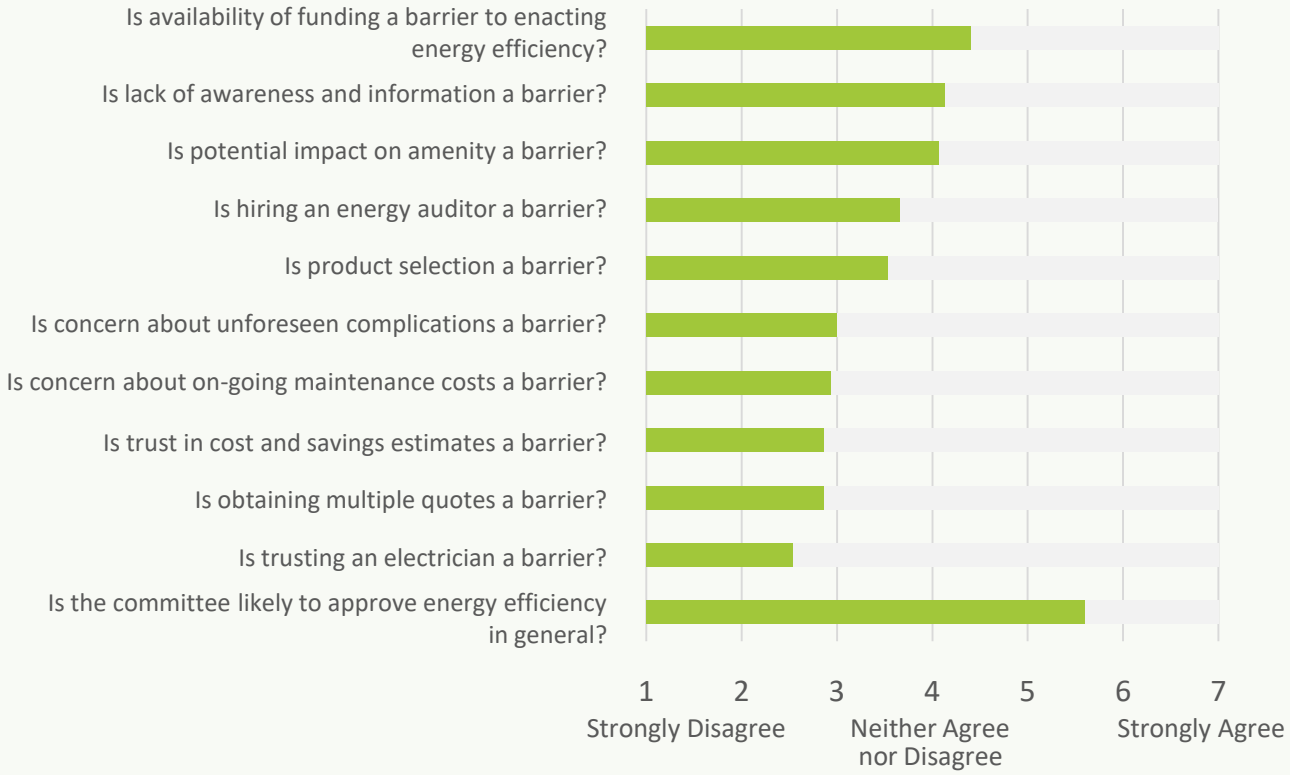
Buildings have, on average, 5.9 members on their committees. Respondents are generally happy with the effectiveness of their executive committees (5.6/7), yet are ambivalent regarding committee activeness toward managing energy efficiency (4.4/7). Respondents generally disagree that the committee is active in managing water efficiency.

PERCEPTIONS ABOUT ENERGY EFFICIENCY

- Respondents expect to be able to reduce energy costs by 17.3% on average
- Average expected common-area energy cost savings of $12,563 p.a.
- Average expected total project capital costs of $93,975
- Average payback period expectation of 7.5 years

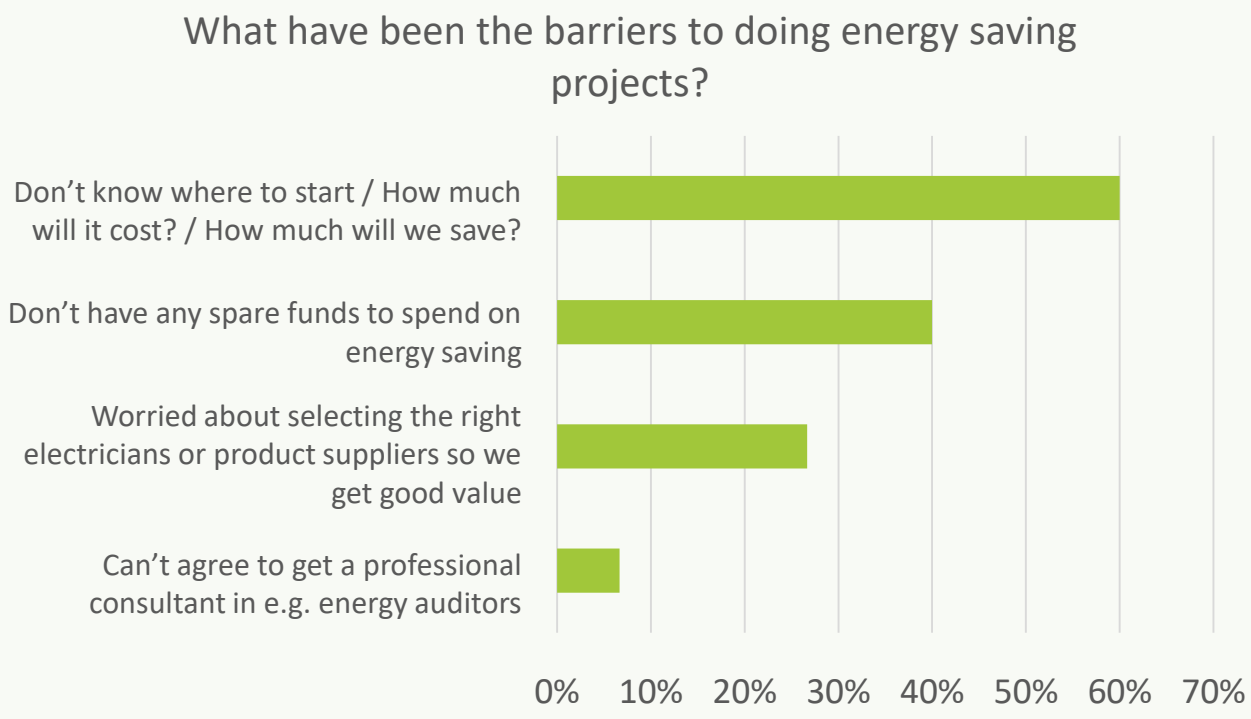


BARRIERS TO ENERGY EFFICIENCY

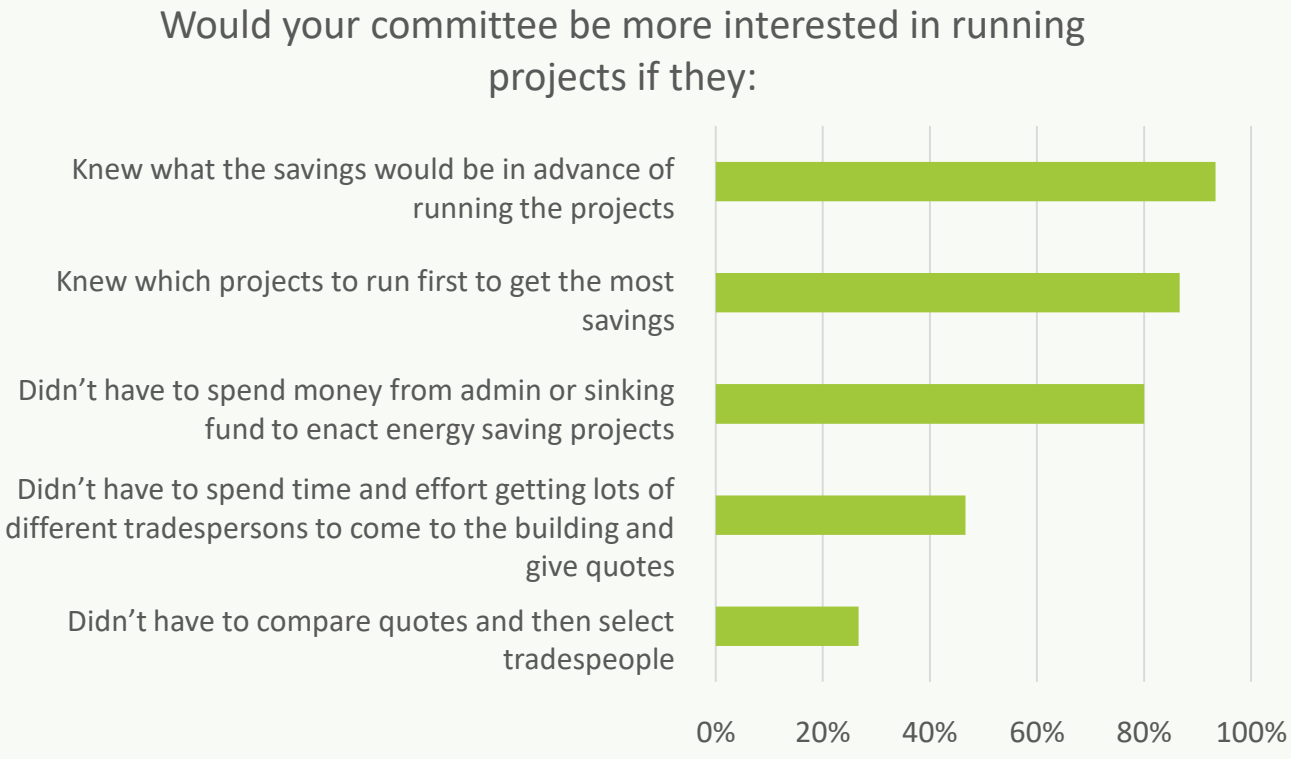


Respondents largely agree (5.6/7) that committees are likely to approve energy efficiency in general.

BARRIERS TO ENERGY EFFICIENCY



MOBILISING ENERGY EFFICIENCY



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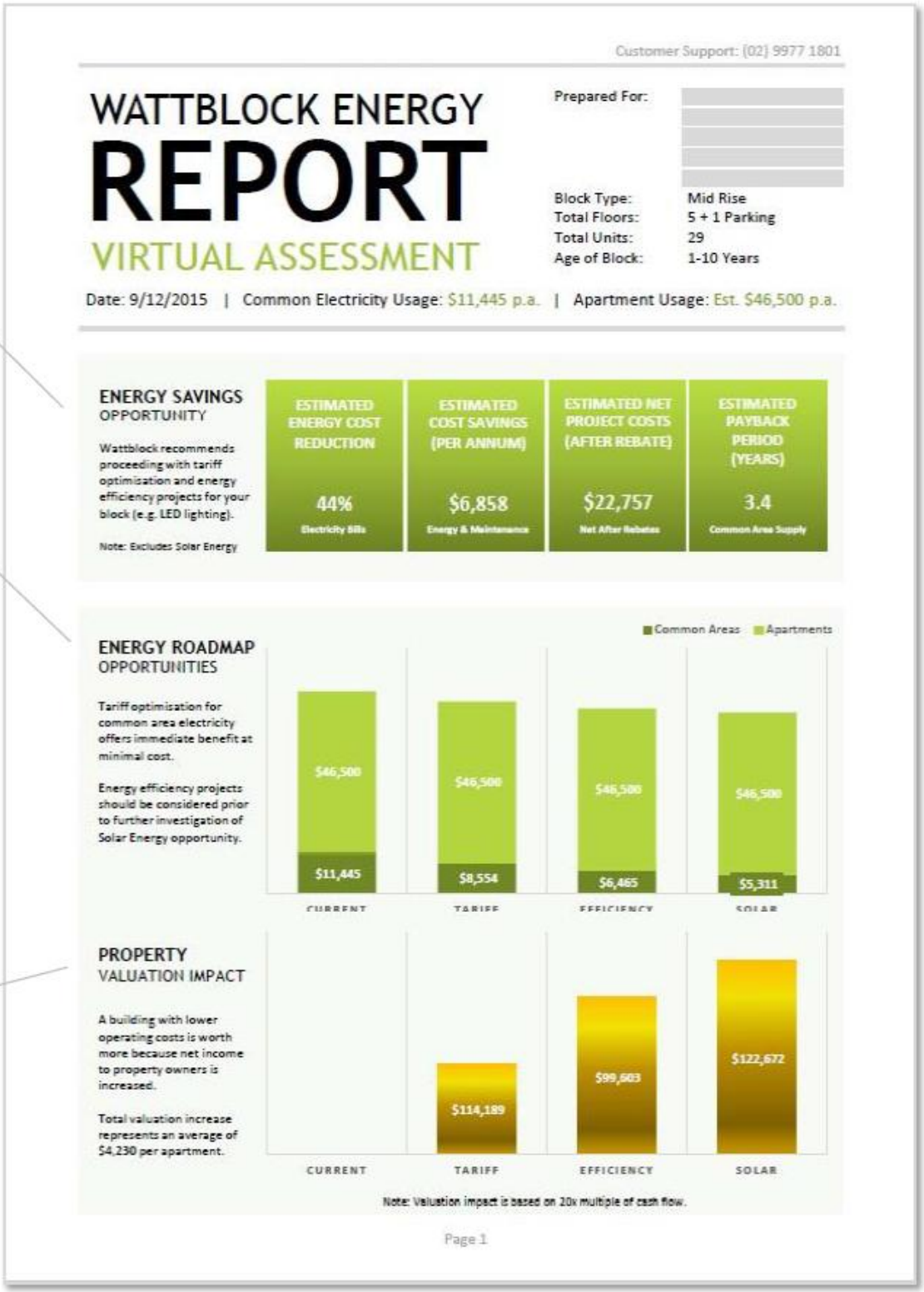
Page 1 | Wattblock Energy Report Overview

Wattblock reports indicate the building address, category, size, and the overall energy expenditure estimates for common areas and apartments.

ENERGY SAVINGS OPPORTUNITY
Highlights potential savings or least-cost options.

ENERGY ROADMAP OPPORTUNITY
Compares the benefits brought on by tariff optimisation, energy efficiency, and solar separately for the common areas and for the apartments. It is shown as the total annual energy bills for each scenario.

PROPERTY VALUATION IMPACT
Shows how reducing strata levies through reduced energy bills can increase the value of your building in the same three scenarios as above.



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WATTBLOCK ENERGY REPORT
VIRTUAL ASSESSMENT

Prepared For:

Block Type: Mid Rise
Total Floors: 5 + 1 Parking
Total Units: 29
Age of Block: 1-10 Years

Date: 9/12/2015 | Common Electricity Usage: $11,445 p.a. | Apartment Usage: Est. $46,500 p.a.

ENERGY SAVINGS OPPORTUNITY

Wattblock recommends proceeding with tariff optimization and energy efficiency projects for your block (e.g. LED lighting).

Note: Excludes Solar Energy

ESTIMATED ENERGY COST REDUCTION	ESTIMATED COST SAVINGS (PER ANNUM)	ESTIMATED NET PROJECT COSTS (AFTER REBATE)	ESTIMATED PAYBACK PERIOD (YEARS)
44%	$6,858	$22,757	3.4
Electricity Bills	Energy & Maintenance	Net After Rebates	Common Area Supply

ENERGY ROADMAP OPPORTUNITIES

Tariff optimisation for common area electricity offers immediate benefit at minimal cost.

Energy efficiency projects should be considered prior to further investigation of Solar Energy opportunity.

PROPERTY VALUATION IMPACT

A building with lower operating costs is worth more because net income to property owners is increased.

Total valuation increase represents an average of $4,230 per apartment.

Note: Valuation impact is based on 20x multiple of cash flow.

Page 1

NOTE: Energy savings opportunity identified in the first section is designed to highlight the combined return on investment results from projects with rapid payback. Solar Energy is excluded due to longer payback.

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Page 2 | Common Area Energy Efficiency

COMMON AREA ENERGY CONSUMPTION

This is separated into five main categories: lighting, mechanical, HVAC (heating, ventilation, and air conditioning), water, and leisure. Each of these is broken down further and summarised in the *Energy Wheel*.

COMMON AREA ENERGY SAVINGS

It takes these categories and visually shows how much energy each is using compared to the average best case that other buildings can achieve in energy efficiency.

The table the graph highlights areas that will save the most on energy bills when energy efficiency measures are implemented.

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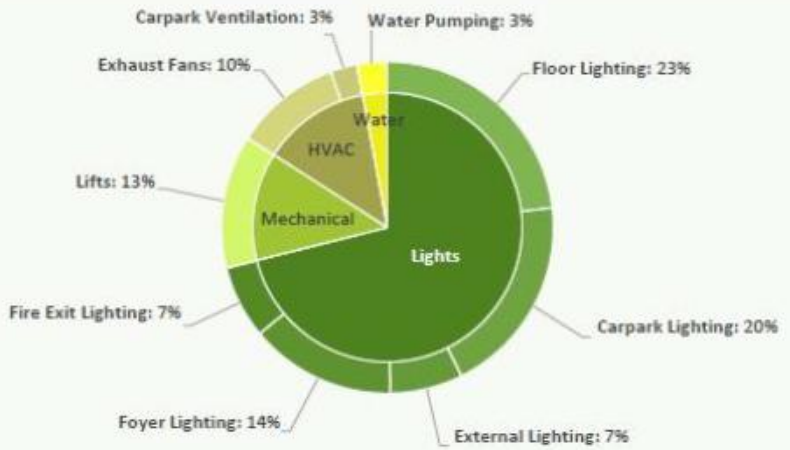
COMMON AREA
ENERGY CONSUMPTION

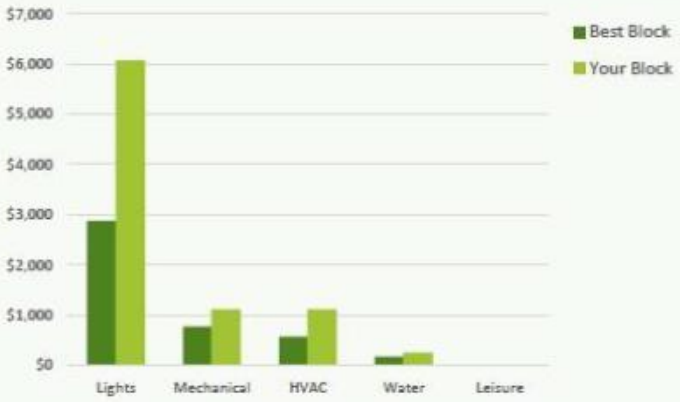
Understanding which assets are likely to be contributing to your block's common area energy consumption is the first step in building an energy reduction roadmap



COMMON AREA
ENERGY SAVINGS

The following is a typical energy consumption footprint for your common areas and a Best-in-class block based upon similar blocks which have been analysed.

HVAC stands for Heating, Ventilation, and Air Conditioning systems.



	Best Block	Your Block	Difference	
Lighting	$2,876	$6,070	$3,194	×
Mechanical	$773	$1,110	$338	✓
HVAC	$569	$1,110	$541	×
Water	$178	$251	$73	✓
Leisure	$0	$0	$0	✓

Page 2

Page 3 | Solar Energy Impact Assessment

LOAD PROFILE ASSESSMENT

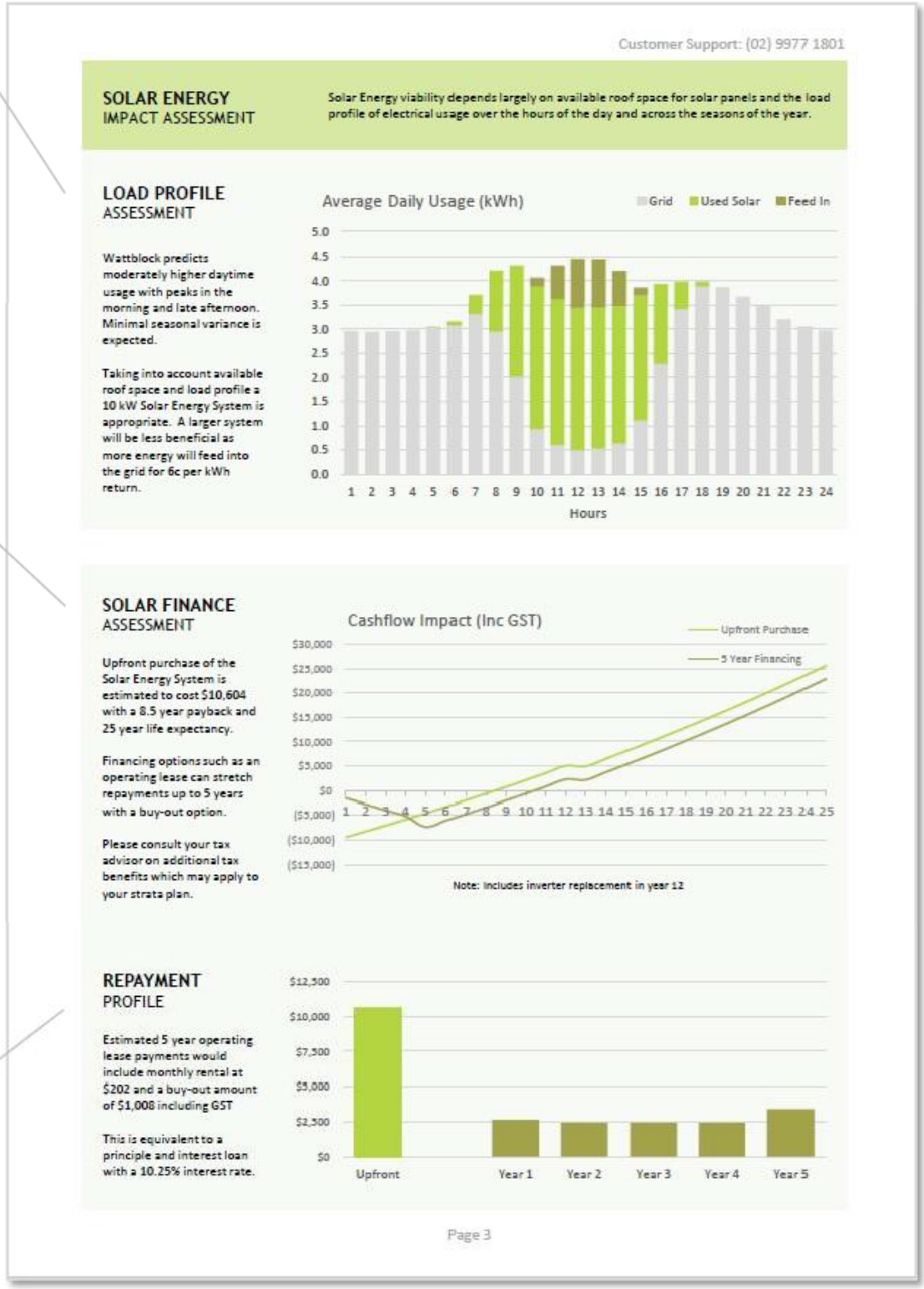
Shows the average hourly energy use over a day with solar generation included. If there is any *feed-in* the solar is generating more energy than is required and is being fed into the grid.

SOLAR FINANCE ASSESSMENT

Compares a 5 year operating lease to buying the solar system upfront throughout a 25-year lifetime. Where the lines cross the graph is the payback period for each, while anything above is additional revenue earned by reduced energy use and feed-in tariffs.

REPAYMENT PROFILE

Visualises how the costs of the two options compare and then likens the 5-year financing option to a loan. This gives an equivalent interest rate to compare with other loan options.



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SOLAR ENERGY IMPACT ASSESSMENT

Solar Energy viability depends largely on available roof space for solar panels and the load profile of electrical usage over the hours of the day and across the seasons of the year.

LOAD PROFILE ASSESSMENT

Wattblock predicts moderately higher daytime usage with peaks in the morning and late afternoon. Minimal seasonal variance is expected.

Taking into account available roof space and load profile a 10 kW Solar Energy System is appropriate. A larger system will be less beneficial as more energy will feed into the grid for 6c per kWh return.

SOLAR FINANCE ASSESSMENT

Upfront purchase of the Solar Energy System is estimated to cost $10,604 with a 8.5 year payback and 25 year life expectancy.

Financing options such as an operating lease can stretch repayments up to 5 years with a buy-out option.

Please consult your tax advisor on additional tax benefits which may apply to your strata plan.

Note: Includes inverter replacement in year 12

REPAYMENT PROFILE

Estimated 5 year operating lease payments would include monthly rental at $202 and a buy-out amount of $1,008 including GST

This is equivalent to a principle and interest loan with a 10.25% interest rate.

Page 3

Page 4 | Individual Apartment Energy Usage

INDIVIDUAL APARTMENT ENERGY CONSUMPTION

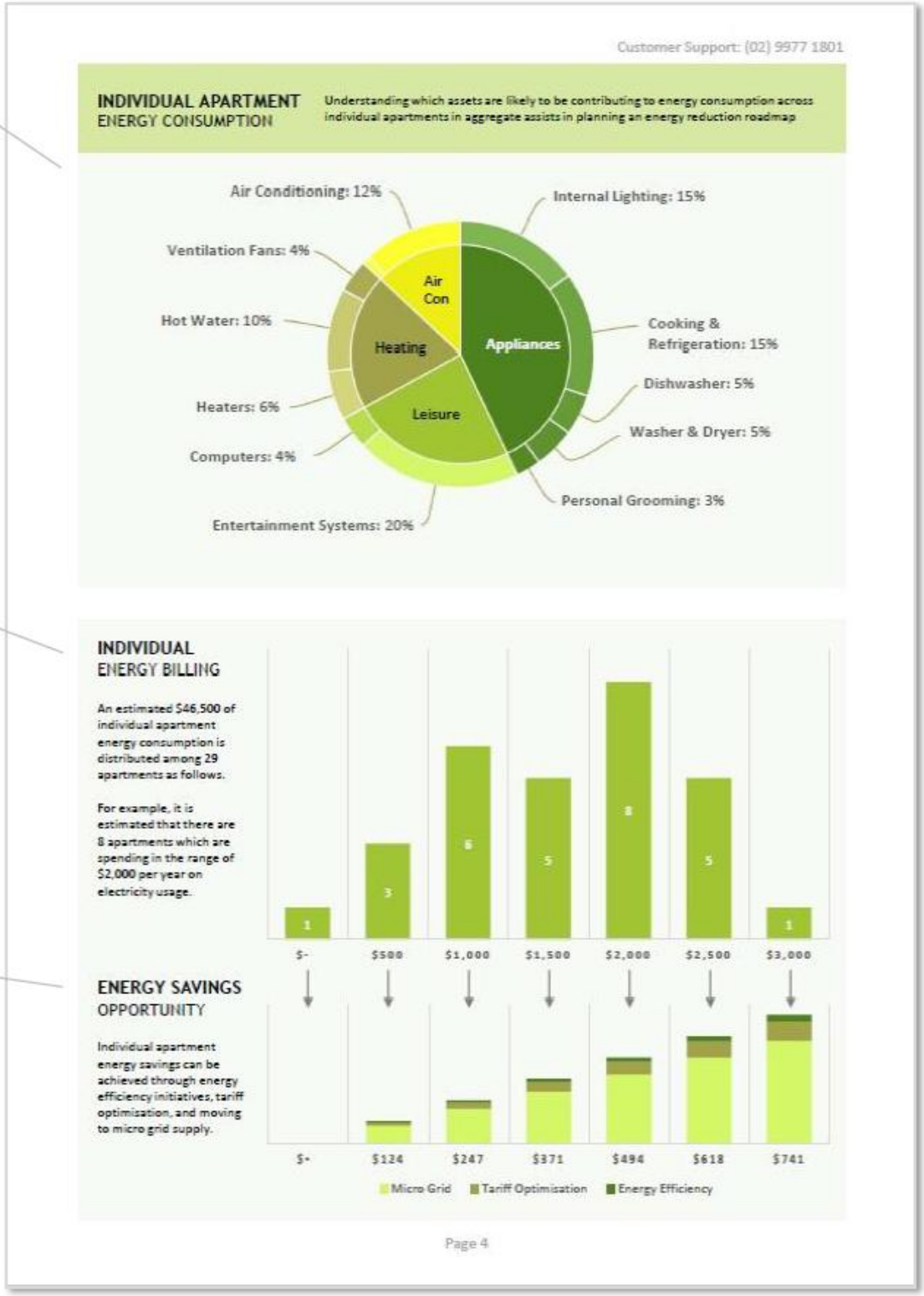
This energy wheel shows the annual energy use of the average Sydney apartment broken down into its constituents. This gives an idea where energy efficiency can take place to reduce electricity bills.

INDIVIDUAL ENERGY BILLING

This graph uses statistics to distribute the individual apartments by their energy bills into different annual cost ranges.

ENERGY SAVINGS OPPORTUNITY

Shows the estimated savings for each group identified in the table above. Savings are broken into energy efficiency, tariff optimisation and 'Micro Grid'.



NOTE: 'Micro Grid' or Embedded Electrical Networks are when apartments buy energy from the strata at lower rates instead of directly from retailers. There are pricing, payment, and notification laws governing the resold energy from the strata to protect the apartments.

Page 5 | Progress and Environmental Achievement

CUMULATIVE ENERGY SAVINGS
This demonstrates a step-by-step approach to implementation and how much is saved after each step.

QUARTERLY PROGRESS
This consists of previous energy bills and future projections. It demonstrates the seasonal changes in energy consumption for all apartments and the common areas.

ENVIRONMENTAL ACHIEVEMENT
The bottom row shows the impact of the solar and energy efficiency on your carbon footprint, and how much the upgrades will contribute to the City of Sydney 2030 carbon reduction target.

NOTE: Uses City of Sydney 2030 target of 70% for carbon emissions reduction.

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Conclusions

Conclusions, Acknowledgements and References

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CONCLUSIONS
FROM THE 10 CITY OF SYDNEY WATTBLOCK ENERGY REPORTS

Over 75% of residents within the City of Sydney local government area already live in apartment buildings and the upwards trend is set to continue. A young and vibrant apartment dwelling community is receptive to energy efficiency and renewable energy with previous studies showing 88% of Australians thinking the government should do more to increase the use of solar power. Communicating energy savings in terms of 'hip-pocket' expenses and apartment property valuation uplift shows early signs of resonating within the apartment dwelling audience.

The highlights from the Virtual Energy Assessment projects are:

* Combined energy savings of over $25m a year are possible within existing residential strata buildings in the City of Sydney, equivalent to $338 savings per individual apartment p.a.

* Average apartment property valuation will increase by $8,500 following tariff, energy efficiency and solar project implementation

* Strata representatives expected that on average, common area energy costs could be reduced by 17% with a 7 year payback. The project data suggest on average 45% energy cost reduction is possible, with a 3.6 year payback

* If strata communities work as a unified residential community to retrofit a single billing infrastructure, energy costs for common areas and individual apartments could be reduced on average by 68% through bulk-buying and reduced connection fees

* Carbon Emissions from existing residential strata buildings in the City of Sydney can be reduced by 393,000 tonnes per annum, the equivalent of taking 90,350 cars off the road

* 60% of survey respondents cited 'not knowing where to start / how much it will cost or how much they will save' as the biggest barrier to energy efficiency

* The fastest way to lower carbon emissions in residential strata buildings is to switch the grid-based energy retailer for common areas to an energy retailer with a certified high renewable energy share

* LED lighting upgrades continue to be the hardware implementation with the fastest payback, typically less than 2 years

CONCLUSIONS
FROM THE 10 CITY OF SYDNEY WATTBLOCK ENERGY REPORTS

* 90% of committees would be more interested in running projects if they knew what the savings would be in advance of running the projects

* Residential apartment buildings can meet the 70% carbon emissions reduction target under Sustainable Sydney 2030 using existing technologies which can be deployed immediately in 2016

Virtual Energy Assessment Project Recommendations

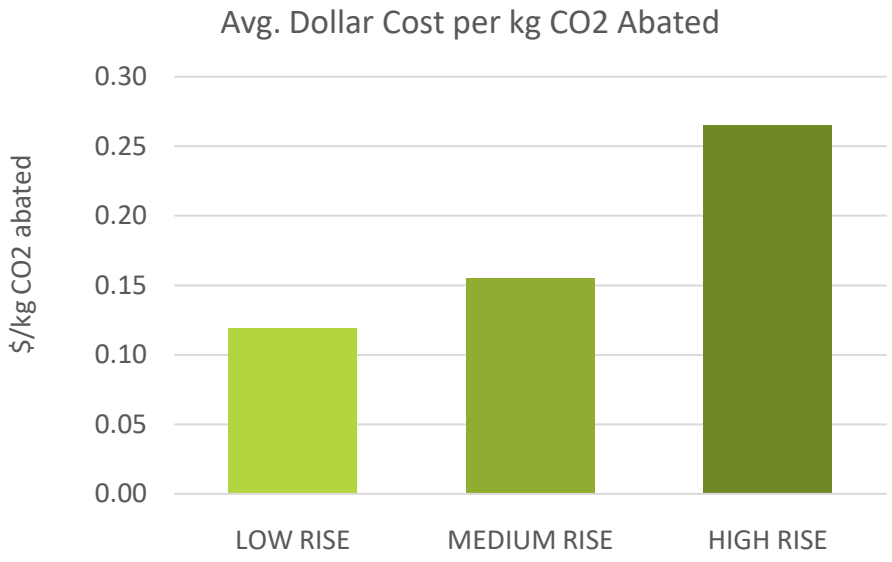
* Invest further in social media channels to create awareness and community engagement, given young populations residing in City of Sydney apartment buildings

* Add battery analysis as a means of increasing the size of solar photovoltaic implementations and making solar viable on smaller residential strata buildings

* Pilot low-interest rate lending to residential stratas to incentivize 'big-bang' energy upgrades and reduce strata committee 'project fatigue'

* Match-make strata committees with proven vendors and suppliers to stimulate the downstream upgrade of residential strata buildings

* Engage a further 20 residential strata buildings to improve sample size of Virtual Energy Assessments



Acknowledgements

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Chief Data Officer and Co-Founder
Wattblock

Ross is the Co-founder and Chief Data Officer of Wattblock. Winner of the SCA Innovation of the Year in 2016, Wattblock has developed a “smart city” analytics platform to reduce energy waste in high density urban environments. Previously Ross spent 10 years working for First Data in Australia, Hong Kong, Singapore and China. He has consulted to tier 1 banks on high volume transaction data for ATMs and merchant acquiring. Ross has a masters in finance and an honours degree specialising in product development and innovation from the University of NSW.

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Source [1]:	Sustainability', City of Sydney, 2015, http://www.cityofsydney.nsw.gov.au/vision/towards-2030/sustainability
Source [2]:	Residential Apartments Sustainability Plan 2015
Source [3]:	City at a Glance', City of Sydney, 2015, http://www.cityofsydney.nsw.gov.au/learn/research-and-statistics/the-city-at-a-glance