

Waverley Council

Solar in Strata Webinar

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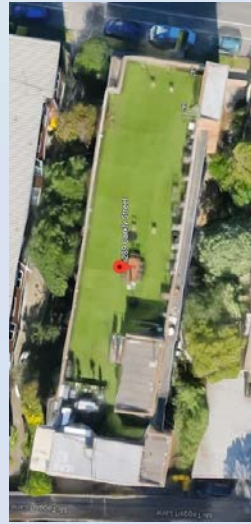
Energy Smart Strata

www.energysmartstrata.com.au

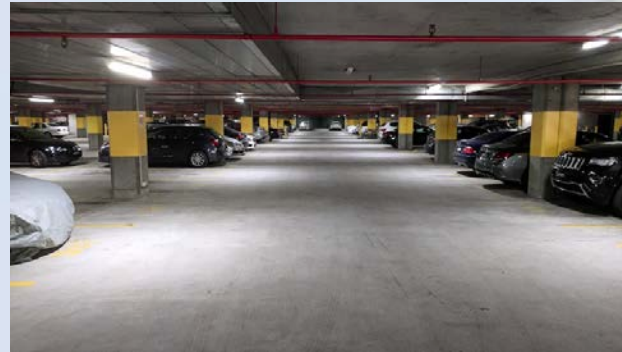
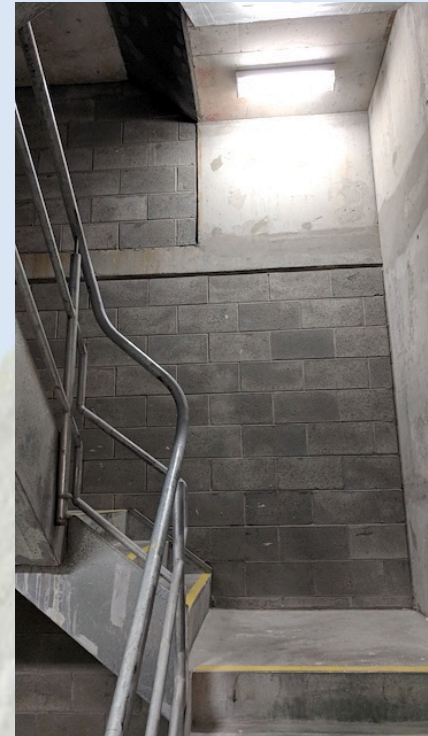
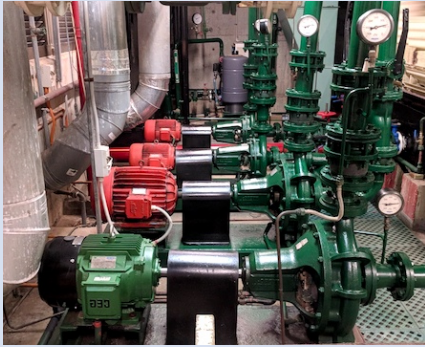
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Before considering solar

What are the best uses for your roof?



First, energy efficiency

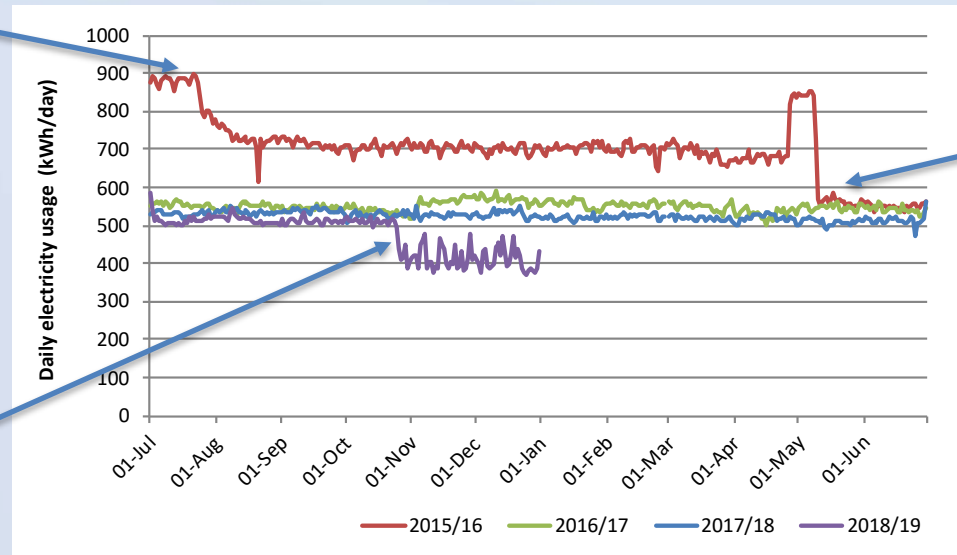


First, energy efficiency

Apartment building with 129 apartments.
Achieved total energy savings of >50%.

1st - Controls
on car park
ventilation

3rd - 25kW
solar array



2nd - Lighting
upgrade

Is your site ready for solar?

There are 3 key issues to understand before getting a quote:

1. Roof condition / roof membrane condition.
2. Electrical infrastructure. How will a solar array connect to your site?
3. Roof access.



Roof condition

The condition of your roof is an important issue impacting whether solar is viable.

- Are there any leaks? Have there been any historical issues?
- Check capital works program. When was the roof / membrane last maintained, when is the roof due for an upgrade?
- Solar suppliers (should) offer a 5 + warranty on workmanship. However are cautious about installing solar on roofs they have existing issues and water leaks.



Anchored or floating?

For flat concrete roofs (with a water proof membrane) there are 2 options to fix the solar array to the roof. Both have their pros and cons.

Anchored / membrane piercing

- An anchored system is preferred for sites with high wind loading.
- Is the 'standard' installation.
- Accepted industry practices and best practice guidelines for installing solar systems on concrete roofs and waterproof membranes.



Floating / ballasted

- Does not pierce water proof membrane.
- Weight down by blocks.
- Can be more expensive.



Electrical infrastructure

How will a solar connect to your electricity supply?

- Run cables back to the main switchboard (typically basement or ground floor).
- Connect to a distribution board (mechanical services or house lights and power) on the roof.
Can this board handle the load?

Upgrades may be required to ensure electrical infrastructure can handle the load, is safe, and meets Australian Standards.

Does your switchboard look like this?



Or this?....



Roof access



This site had easy access to roof through fire stairs. However one section was narrow and hand rails needed to be installed for safe work on the roof






This 20-storey had site had an un-safe roof that no solar suppliers were willing to work on



Many roofs are accessible by small hatches that can not fit a solar panel. Cranes are required to lift equipment to the roof

Types of solar installations

1. Common Areas Only	2. Common Areas & Apartments	3. Apartments only
<ul style="list-style-type: none">• High common area electricity usage.• Small usable roof area.• High number of apartments.	<ul style="list-style-type: none">• High common area electricity usage.• Large usable roof area.	<ul style="list-style-type: none">• Low common area usage.• Large usable roof area.• Low number of apartments.
Tower	Large low-rise apartment complex with a large footprint.	Brick walk up
		

Solar for Common areas

Example building in Waverley

8 storeys

48 apartments

1 common area electricity meter

56,352 kWh pa

\$11,125 Ex GST pa

53.5 tonnes CO2 pa

Already upgraded lights to LED



Solar for Common areas

Steps to get solar

Assess roof capacity

Determine daytime electricity usage

Identify kW size

Cost-benefit analysis

Identify potential issues

Seek and compare quotes

Obtain final firm quote

Develop business case

EC Approval



Roof capacity

- A solar array requires $\sim 8\text{m}^2$ per kW
- The site has a large area of 600m^2 . However only a fraction is usable and suitable to install solar panels.
- May accommodate a 30kW to 40kW solar array.

Usable area is restricted due to:

- Shading
- Ventilation equipment
- Access / anchor points
- Orientation



SunSpot

<https://pv-map.apvi.org.au/>

The screenshot displays the SunSpot web application interface. At the top left is the SunSPOT logo. At the top right are links for 'Help' and 'Return to the PV Map site'. The main area is an aerial map of a residential street with a color-coded solar radiation overlay. A search bar is present with the placeholder text 'Type to search for an address or suburb'. A 'Switch to street map' button is located above the search bar. A large white instruction box on the left reads: 'Draw a solar roof face ? Locate your roof and draw an area for your solar on one roof face only. This must not include more than one roof plane. Click '?' for more.' Below this is a 'Draw roof face' button. At the bottom left, there is a 'Solar radiation ?' slider set to 40%, and a 'Radiation key' showing a color gradient from blue (1.33 kWh/m2/day) to red (5.53 kWh/m2/day). A 'Continue to system details' button is at the bottom right.

What kW size?

A solar array should be sized to meet your daytime electricity usage.

We need to understand how much electricity we use during the day.

Rough guide: A solar array kW size should be around 1.5 to 2 times your daytime kW demand for electricity.

The maximum output of a solar array is only around 70% to 80% of its rated size.

A 10kW solar array may only generate a maximum 7kW or 8kW during the middle of the day in summer, and much less in winter.

Daytime electricity usage

Billing data

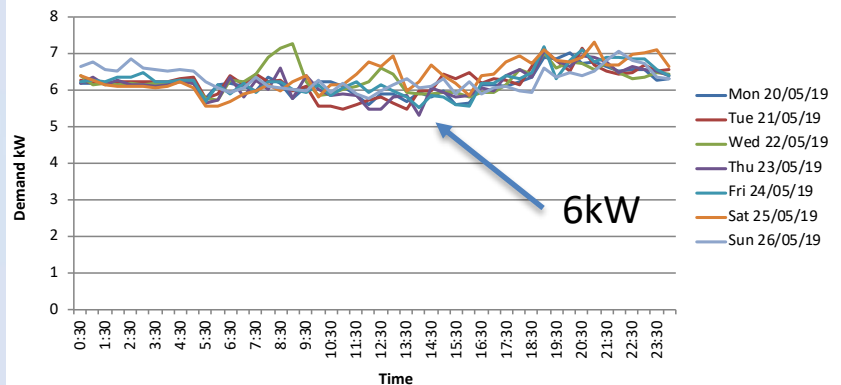
- Only shows total electricity usage per month or per quarter.
- Should not be used to size a solar array.
- Bills are used to determine the daytime cost of electricity purchased from the grid.

Interval data

- Interval data is your electricity usage data in 30-minute intervals.
- Shows when and how you use electricity.
- Shows daytime electricity usage, this is required to work what size solar array you need. Your solar supplier will need this data to quote your system.
- Interval data can be requested from you energy retailer, or downloaded from your online account / web portal.

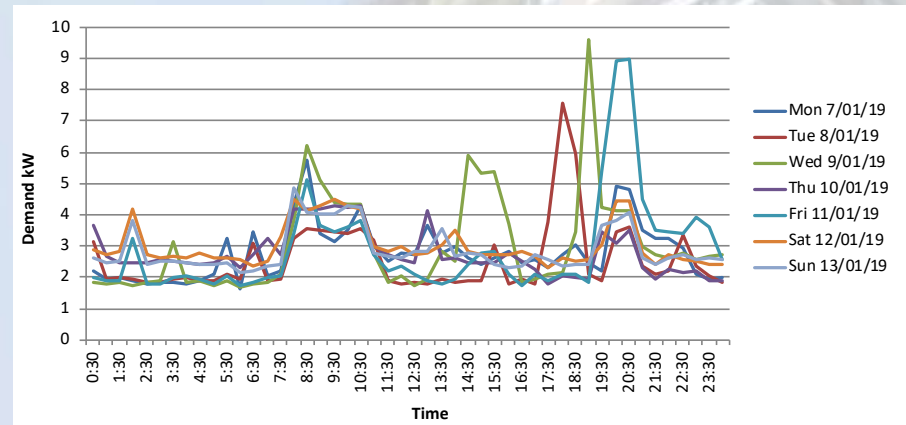
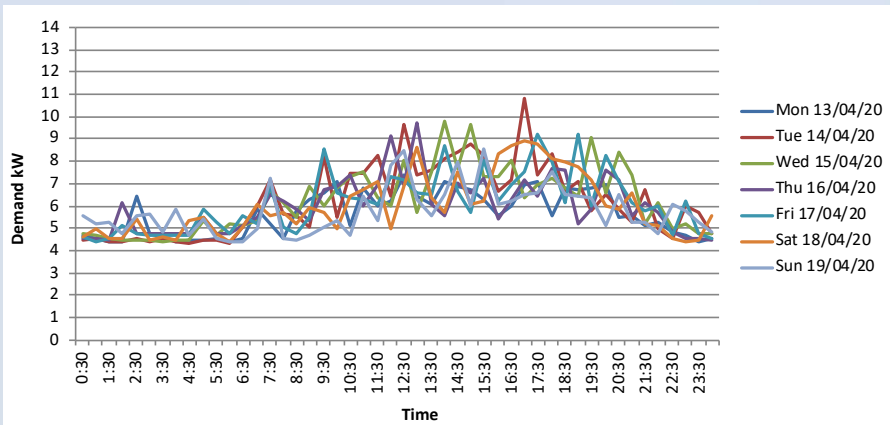
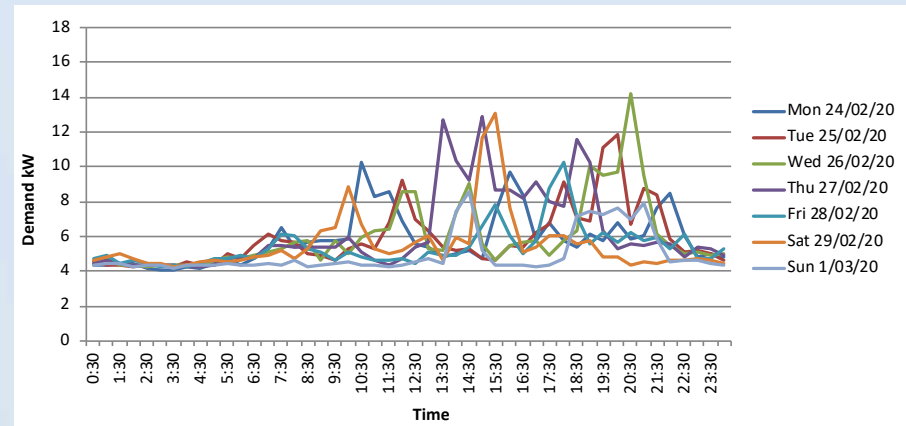
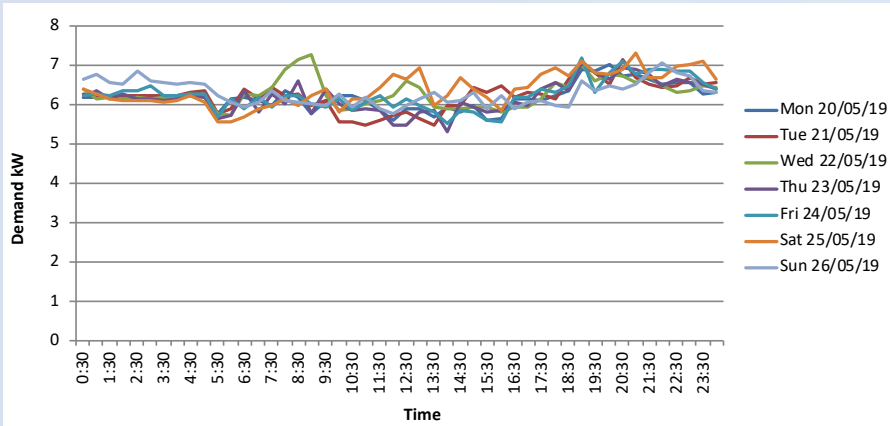
New charges and credits.

Usage and supply charges	Units	Price	Amount		
Peak	2232.756kWh	\$0.539	\$1,203.46		
Off peak	4894.386kWh	\$0.1495	\$731.71		
Shoulder	5827.724kWh	\$0.2295	\$1,337.46		
Supply charge	86 days	\$0.96	\$82.56		
<i>Total charges</i>				+	\$3,355.19
Credits					
Reversal - Debit(\$12.73 + \$0.00GST)			\$12.73cr		
32% Guaranteed Discount			\$1,047.25cr		
<i>Total credits</i>				-	\$1,059.98cr
<i>Total new charges and credits</i>				=	\$2,295.21
<i>Total GST</i>				+	\$230.79



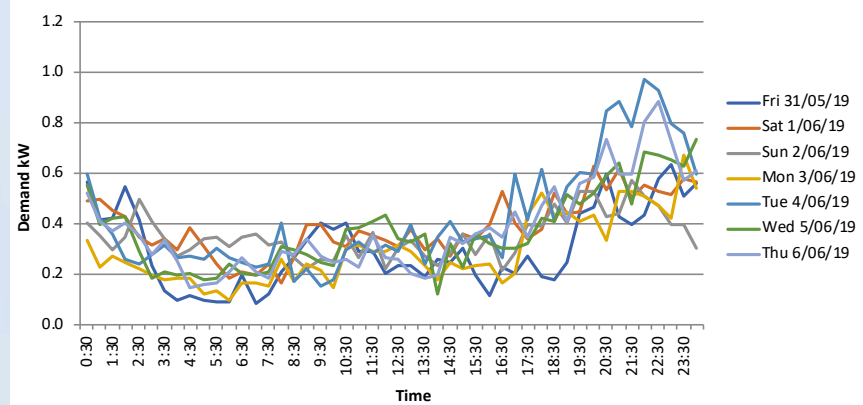
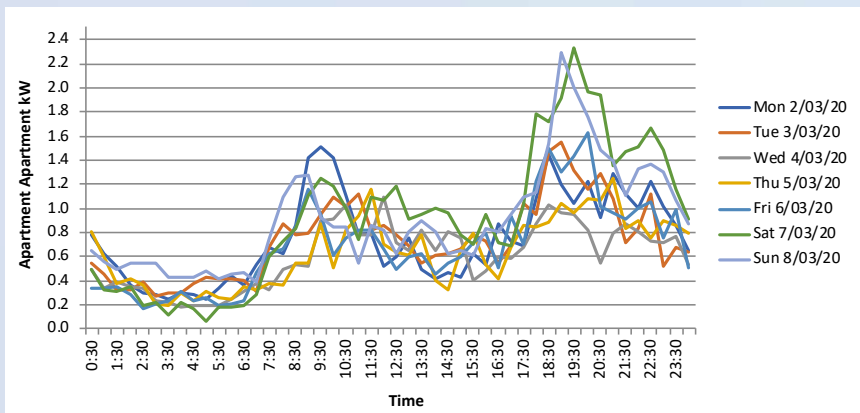
Daytime usage – common areas

The pattern of electricity usage of the common areas of 4 small to medium sized apartment buildings

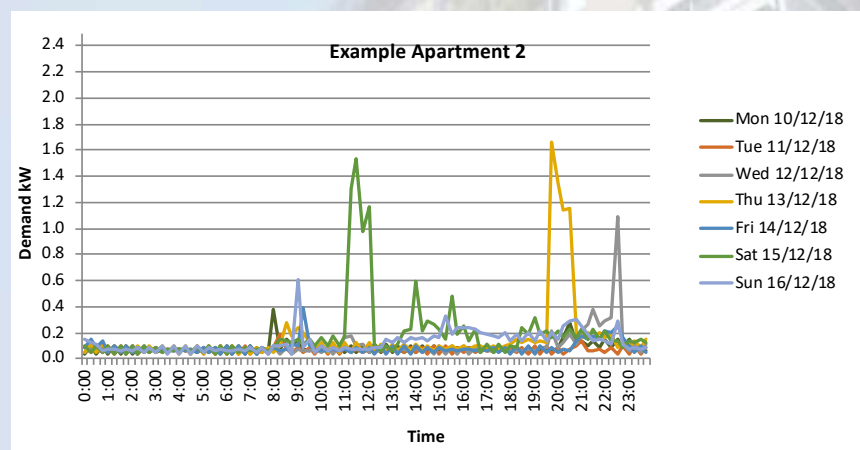
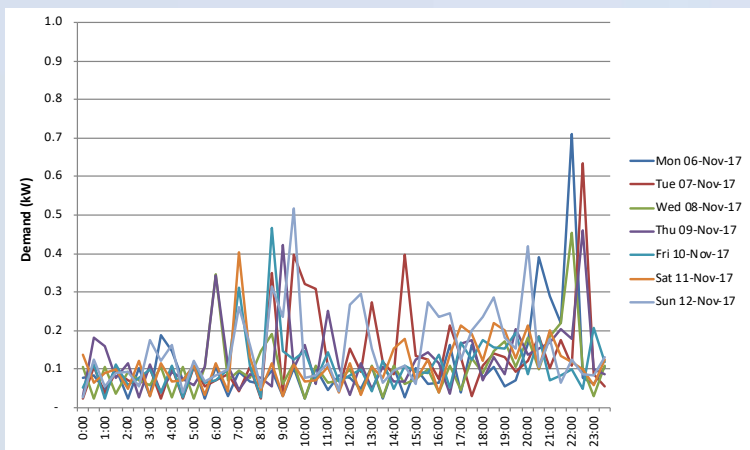


Daytime usage – apartments

Average apartment electricity usage – data logging on entire building



Individual apartment electricity usage



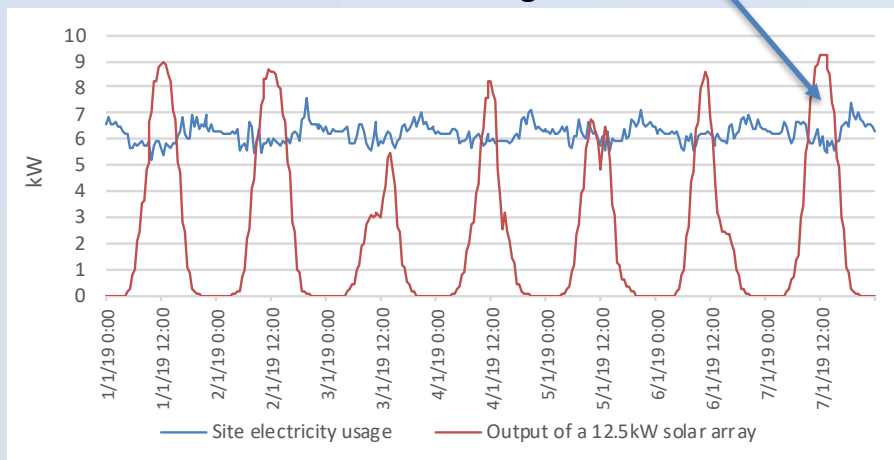
Export ratio

Export ratio: ratio of the electricity generated by the solar array that is exported back to the grid.

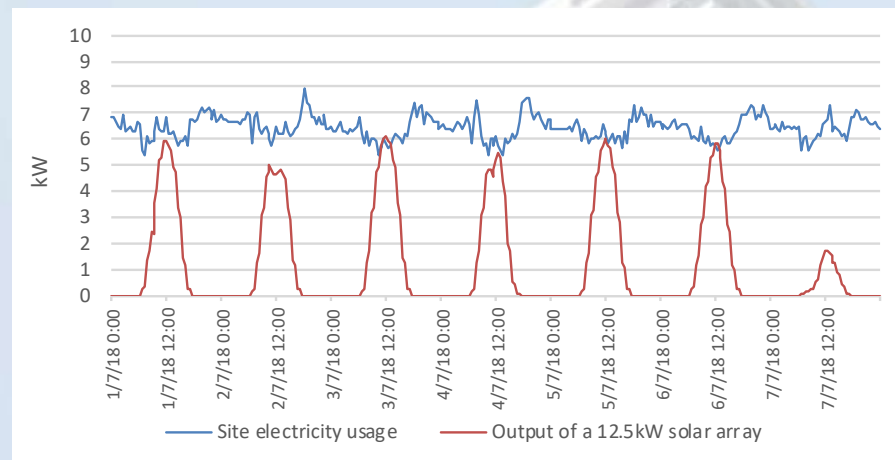
An export ratio of ~10% is considered ok.

Any higher, and your solar array may be over-sized.

Some electricity will be exported to the grid during summer



Comparison of site energy usage and output of a 12.5kW solar array in summer



Comparison of site energy usage and output of a 12.5kW solar array in winter

Feed in tariff

IPART Benchmark 2019/20:	8.5 to 10.4 c/kWh
Current rates offered by retailers:	0 to 21c/kWh

A higher feed in tariff does NOT
always mean lower costs

Plan	Peak	Shoulder	Off Peak	Daily Supply charge	Solar feed in tariff	Total costs
	c/kWh	c/kWh	c/kWh	c/day	c/kWh	\$ pa
AGL Residential Solar Savers	54.36	23.14	15.08	103.4	21	\$11,061
AGL Residential Smart Saver 18% discount	44.58	18.97	12.37	84.79	10.2	\$9,525

Apartment building 24.6kW solar array.
18% export ratio.
6,490 kWh pa exported to the grid



Solar cost benefits

Summary of cost benefits

Cost	<p>Variable – installer, products, site-specific issues</p> <p>An installed cost of \$1.4k to \$1.8k per kW is reasonable.</p>
Savings	<p>1 kW of solar panels generates around 1,350 kWh pa</p> <p>However not of all this may be a 'saving'. A % may be exported back to the grid</p> <p>Can not be calculated without interval data</p>
Payback	<p>Typically 4 to 8 years</p>

Simplified cost benefit analysis

Item	Notes	Value
Daytime demand for electricity	Use interval data to determine the typical / average daytime demand for electricity	6kW
Solar roof capacity	Use APVI sunspot to approximately work out what size your roof can accommodate	30kW
Solar array size	~1.5 to 2 times the daytime demand may be suitable. Above this the export ratio becomes too high. Solar array should be > 10kW to be viable.	10kW
Installed cost	An installed cost of \$1,400 to 1,800 is reasonable	\$16,000 Ex GST
Daytime rate	Use the average of peak, shoulder and off peak rates (using their time of use periods). Apply any usage discounts. Is your cost Ex GST?	26 c/kWh Ex GST
Electricity savings	A solar array may generate ~1,350 kWh pa / kW	13,500 kWh pa
Cost savings	Electricity savings x daytime rate	\$3,510 Ex GST pa
Payback	Capital cost / cost savings	4.6 years

Get solar quotes

Recommended to obtain quotes for 3 suppliers:

- Experience working in strata.
- Reputation.
- Installer CEC accreditation (required to be eligible for STC Rebate).
www.cleanenergycouncil.org.au/consumers/buying-solar/find-an-installer



Provide each solar supplier with:

- ✓ Recent electricity bills.
- ✓ Interval data (if possible) or a LoA for them to access this data.
- ✓ Note any site specific issues: roof condition, electricity infrastructure, roof access.
- ✓ Suggest solar array kW size (they will recommend a different size but good to have a starting point).
- ✓ Site contact details to arrange a site inspection.
- ✓ Project timeframe e.g. need quotes before AGM.

Compare quotes

- Each solar supplier provides a quote in a vastly different format, presents different information, and may use different terminology.
- It can be difficult to compare.
- Need to extract key information to allow for a like-for-like comparison.
- What is not included in their quote, can often be more important than what is included in their quote.

Solar Quote checklist

- Size of system kW
- Cost
 - Not the most important factor.
 - Is it a firm cost? Has the installer conducted a site inspection?
- Product quality.
- Warranty:
 - Panel product warranty.
 - Inverter warranty.
 - Workmanship.
- Mounting type:
 - Anchored or ballasted.
 - Flat or tilt mounted.
- Installer:
 - Experience working in strata.
 - Reputation.
 - Installer CEC accreditation (required to be eligible for STC Rebate).
- What is included?
 - Meter upgrade.
 - Ausgrid approvals.
 - Access to roof, lifting equipment to roof, and working safely on the roof.
 - Switchboard / electrical upgrades.
 - Connecting the solar to the site e.g. cable run to meter.
- Monitoring.
 - Should be included in all installations.
 - Is there an annual subscription fee.
- Maintenance.

Warranties

Warranty	Description	Range
Solar panel product warranty	For defects in materials and workmanship. From manufacturer.	10 to 25 years
Solar panel performance warranty	Panel output over a specific period From manufacturer.	Progressively reduced performance guarantee of 25 years. Can be around 80% to 82% over 25 years
Inverter warranty	For defects in materials and workmanship. From manufacturer.	5 to 12 years
Workmanship	From installer. Standard 5yr warranty for CEC approved installer on the operation and performance of the whole solar system including workmanship and products.	5 to 10 years

Government incentives

Solar rebate:

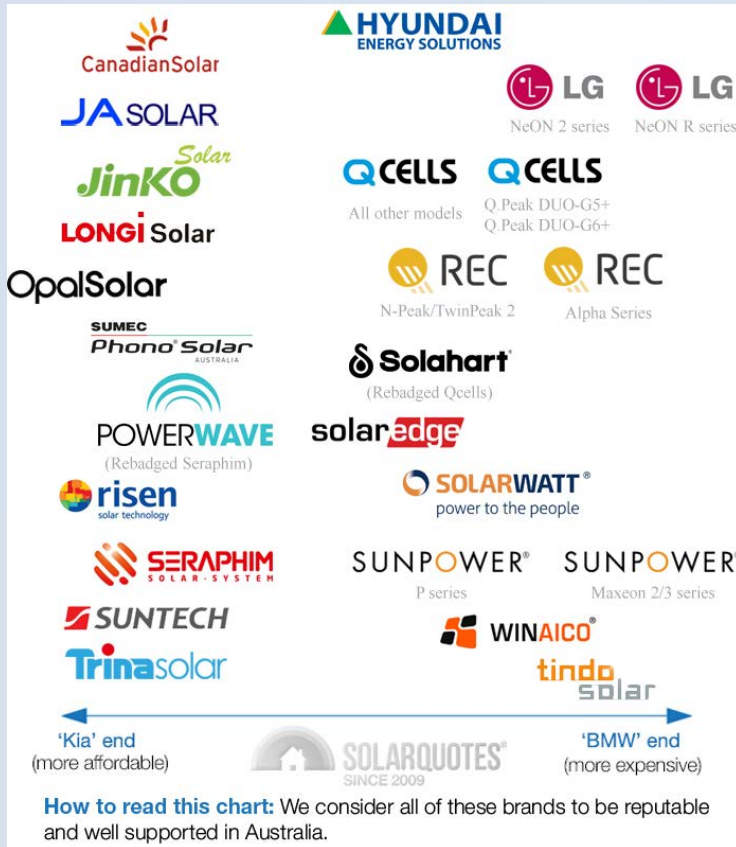
- Installing a solar array < 100kW generates a STC rebate.
- Small-scale technology certificate - Federal Government Small-scale Renewable Energy Scheme.
- About \$500 per kW.
- This will already be included in your quote from your solar supplier.

Comparing panels & inverters

Online resources to compare and rank products E.g.:

<https://www.solarquotes.com.au>

Panels



Inverters






Comparing panels

<https://www.solarquotes.com.au/panels/comparison/compare-solar-panels/>

Product name	Canadian Solar LuPower Poly	Hyundai RG Series (HS)	JA Solar JAM510	Jinko Solar Eagle PERC 60M 280-300	LG NeON 2	QCells Qcells Q, MAXX	Risen RSM60P
Manufacturer Logo							
Panel Image							
Model number(s)	CS3K-295P CS3K-300P CS3K-305P CS3K-310P	HS-S300RG	JAM60S10-320/PR JAM60S10-325/PR JAM60S10-330/PR JAM60S10-335/PR JAM60S10-340/PR	JKM280PP-60 JKM285PP-60 JKM290PP-60 JKM295PP-60 JKM300PP-60	LG340N1C-V5 LG345N1C-V5 LG350N1C-V5 LG355N1C-V5	Q,MAXX 320 Q,MAXX 325 Q,MAXX 330 Q,MAXX 335	RSM60-6-270P RSM60-6-275P RSM60-6-280P RSM60-6-285P RSM60-6-290P
Wattage	295W 300W 305W 310W	300 W	320W 325W 330W 335W 340W	280W 285W 290W 295W 300W	340W 345W 350W 355W	320W 325W 330W 335W	270W 275W 280W 285W 290W
Panel efficiency	17.75% 18.05% 18.36% 18.66%	18.44%	19.0% 19.3% 19.6% 19.9% 20.2%	17.11% 17.41% 17.72% 18.02% 18.33%	19.8% 20.1% 20.4% 20.7%	19.0% 19.3% 19.6% 19.9%	16.5% 16.8% 17.1% 17.4% 17.7%
Approx Cost per Watt – AUD Retail incl GST	\$0.66	\$0.75	\$0.75	\$0.60	\$1.19	\$0.79	\$0.67
Approx cost per panel – AUD Retail incl GST	\$198	\$226	\$255	\$180	\$415	\$261	\$187
Panel technology	Polycrystalline	Monocrystalline	Monocrystalline	Monocrystalline	Monocrystalline	Monocrystalline	Polycrystalline
Country of manufacture	China	China	China	China	China	South Korea/China/Malaysia	China
Company origin	China	South Korea	China	China	South Korea	Germany (now owned by Korean Hanwha)	China
Annual turnover of company (USD)	\$2.85 billion	\$39 billion	\$2.41 billion	\$3.2 billion	\$47.91 billion	\$2.42 billion	\$808 million
Panel weight	18.5 kg	18.2 kg	18.7 kg	19kg	17.1 kg	18.7 kg	18 kg
Number of busbars	5	5	5	4	12	12	5
Operating temperature	-40°C – 85°C	-40°C – 85°C	-40°C – 85°C	-40°C – 85°C	-40°C – 90°C	-40°C – 85°C	-40°C – 85°C
Temperature coefficient (Pmax)	-0.37%/°C	-0.41%/°C	-0.35%/°C	-0.39%/°C	-0.36%/°C	-0.39%/°C	-0.39%/°C
Salt mist corrosion level	IEC 61701 certified, level 1	IEC 61701 level 1	TBD	TUV NORD certified	IEC 61701 certified, level 6	IEC 61701 certified, level 6	IEC 61701 level 1 claimed
Front load resistance	6000 Pa	5400 Pa	5400 Pa	5400 Pa	5400 Pa	5400 Pa	5400 Pa
Rear load/wind resistance	4000 Pa	2400 Pa	2400 Pa	2400 Pa	4000 Pa	4000 Pa	2400 Pa
Product warranty length	12 years	25 years	12 years	10 years	25 years	12 years	15 years
Warranted annual performance degradation year 2-25	0.60% per year	0.70% loss each year	0.6% per year	0.70% loss each year	0.33% loss per year	0.54% per year	0.7% per year
Power output warranted at year 25	83.10%	80.2% (after 25 years)	83.10%	80.20%	90.08%	85.00%	80.70%
Does warranty include labour costs for removal and reinstallation of panels?	No	No	No	Yes	Yes	Yes	No

Inverters

Traditional string inverter	Solar edge inverter	Micro inverter
1 inverter on the wall. All panels are connected in series (string) to the inverter.	One inverter on the wall, each panel has a solar optimizer.	Each panel has a small micro-inverter on its back.
One poor performing panel (e.g. shading) can affect performance of the entire array	One under-performing panel will not affect the panels. Advanced monitoring of each panel.	One under-performing panel will not affect the panels. Advanced monitoring of each panel.
Simpler and less expensive	More advanced and more expensive	More advanced and more expensive. Best for sites with heavy shading.
		

Batteries

Not currently cost-effective or recommended for apartment buildings. May not pay for itself over its life.

Better to size a solar array to meet daytime demand for electricity. And receive a feed-in tariff for any electricity exported to the grid.

Batteries are suited to off-grid applications.

Enphase 1.2 kWh



Tesla Powerwall 13.5 kWh



Funding & Business case

Funding:

- Purchase outright through capital works fund
- Or other financing options:
 - Leasing
 - Power Purchasing Agreement

Business case:

- Payback
- Have conducted a cost-benefit analysis
- Once system has paid for itself it delivers free clean energy
- Long system life
- Low maintenance
- Good quality products with a long warranty
- Reputable experienced installer
- Have addressed issues
- Growing number of buildings installing solar



Alternatives to solar



- GreenPower is generated by accredited renewable energy generators and purchased by your energy company on your behalf.
- GreenPower is renewable energy sourced from the sun, the wind, water or waste.
- Purchasing GreenPower can improve the NABERS Energy rating for your building.
- GreenPower provides investment in new renewable energy generation.

For our example site, they could supply 25% of their common area electricity usage by:

- Installing a 12.5kW solar system at a cost of \$18,000
- Or they could purchase 25% GreenPower at a cost of \$775 pa.

Energy Saving Opportunity	GHG Savings	Capital Cost
	tCO ₂ -e pa	\$ Ex GST
Purchase GreenPower to supply a portion of electricity usage		
10%	5.4	\$310
25%	13.4	\$775
50%	26.8	\$1,550
75%	40.2	\$2,325
100%	53.5	\$3,099

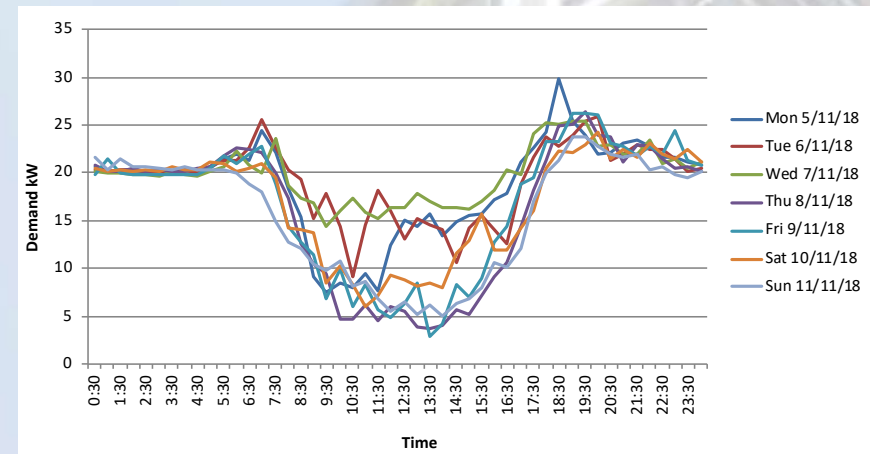
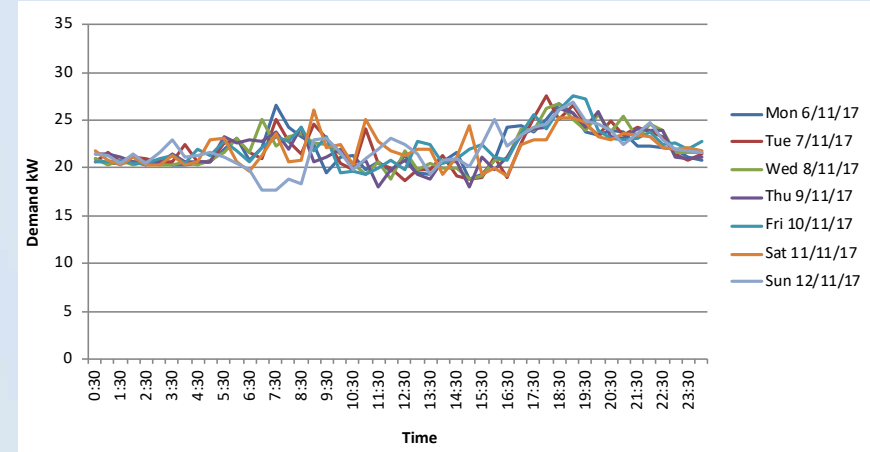
Case study

Apartment building in Zetland with 129 apartments.

- Total energy savings: >50%:
 - Ventilation controls
 - Lighting upgrade
 - 25kW solar array
- Solar savings: 17%.
- Total GHG savings: 35 tCO2 pa



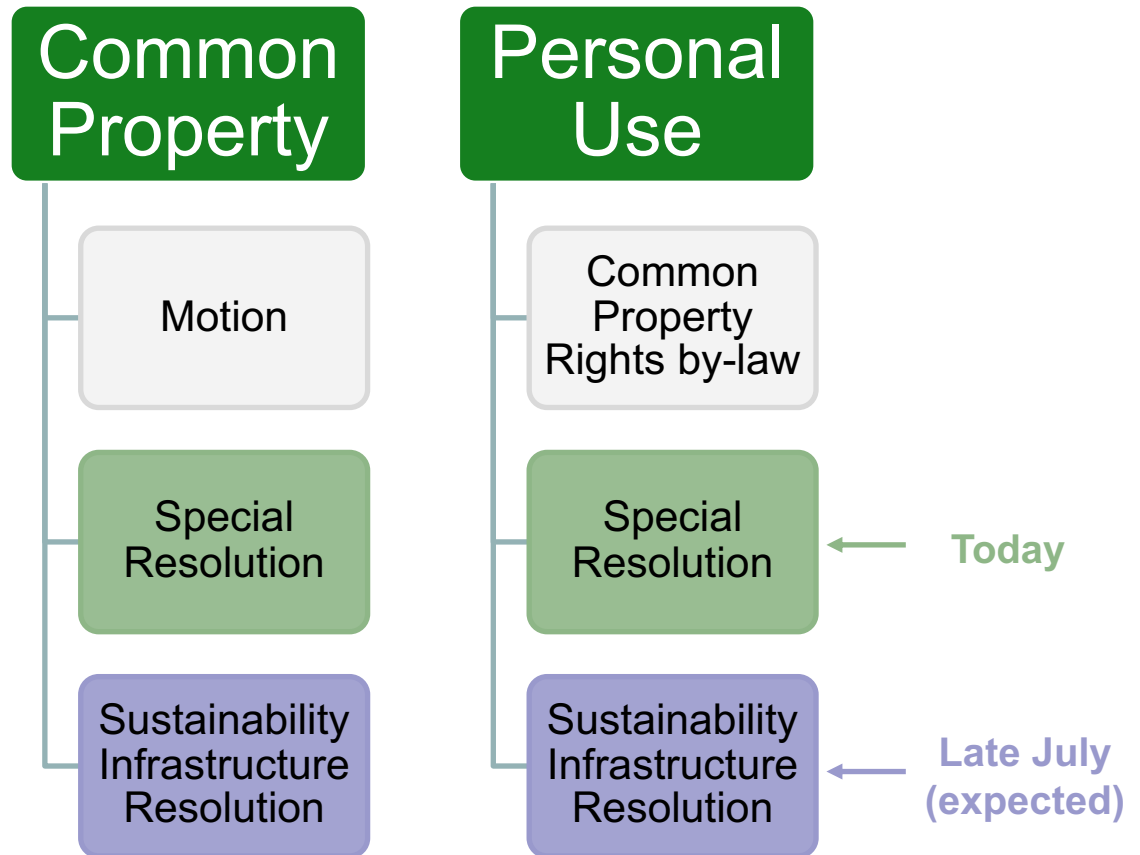
Common area electricity usage – pre solar



Common area electricity usage – post solar

Approvals at a General Meeting

- Annual General Meeting (AGM)
- Extraordinary General Meeting (EGM)



Voting Thresholds

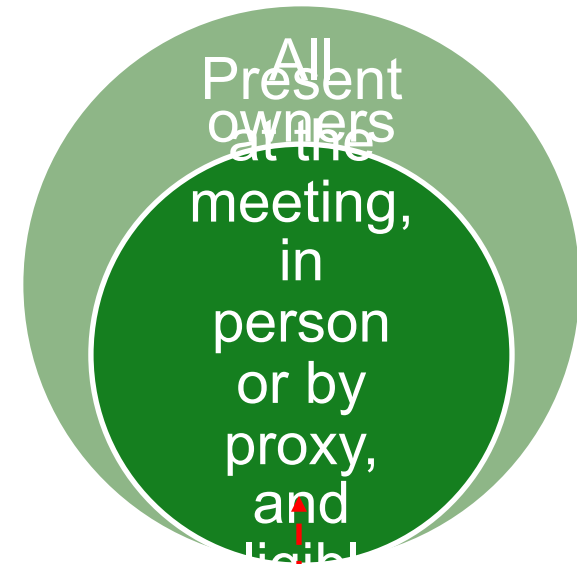
Special Resolution

- not more than 25% of the value of votes cast are against the resolution
- not the same as 75% or more in favour, because some may abstain from voting

Sustainability Infrastructure Resolution

- less than 50% of the value of votes cast are against the resolution

* the value of a vote is the unit entitlement of the lot



The percentages apply to this subset of owners
– not ALL owners

Sustainability Infrastructure (as presented to Parliament)

Changes to common property to:

reduce the consumption of energy or water or to increase the efficiency of its consumption

reduce or prevent pollution

reduce the amount of waste sent to landfill

increase the recovery or recycling of materials

reduce greenhouse gas emissions

facilitate the use of sustainable forms of transport

Common Property Rights By-laws

- ▶ Give the owner(s) of the lot(s) specified in the by-laws
 - personal use of common property for renovations; and/or
 - sole use and enjoyment of the whole or any specified part of common property
- ▶ Need the written consent of the owner(s) concerned
- ▶ Must specify who is responsible for the maintenance and upkeep of the relevant part of common property
- ▶ Can specify whether any payments are to be made for the maintenance and upkeep

- ▶ Can only be passed at a general meeting of the owners corporation
- ▶ Extra costs for owners
 - Calling EGM if none already scheduled
 - Legal fees to draft by-law

A cost-effective Solar By-law Kit will be available VERY soon!

