

Sharing solar

White Gum Valley research

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White Gum Valley, Fremantle



Curtin University



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ARENA



Australian Government

Australian Renewable
Energy Agency



Curtin University



SolarBalance
YOUR ENERGY SECURITY



westernpower

synergy



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LANDCORP



**ACCESS
HOUSING**

Leaders in Affordable Housing



**YOLK
PROPERTY
GROUP**



CONTEMPO
LIVING HOMES



City of
Fremantle



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WGV DEVELOPMENTS



Title	GenY
Tenants	3
PV (kW)	9
Battery (kWh)	10
Status	Completed



Title	SHAC
Tenants	12
PV (kW)	19.6
Battery (kWh)	40
Status	System compliant



Title	Evermore
Tenants	24
PV (kW)	53.6
Battery (kWh)	120
Status	System compliant

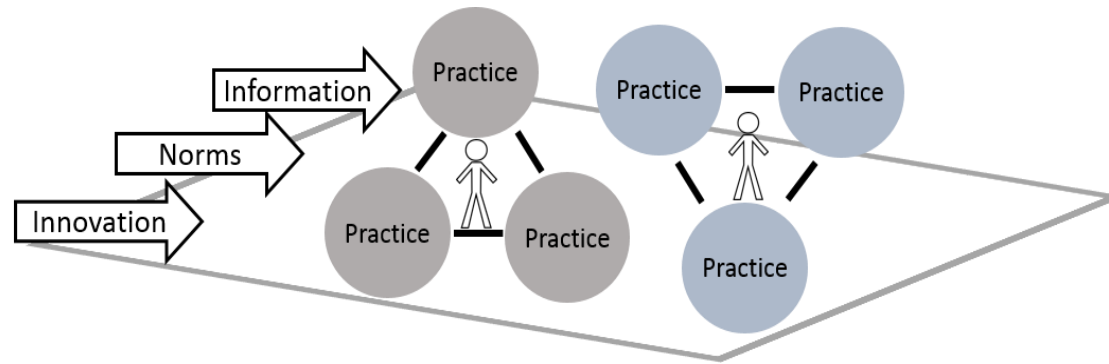
Tracking of practices and routines:

- Energy
- Water
- Waste
- Transport
- Food purchasing
- Appliance purchasing
- Social networks

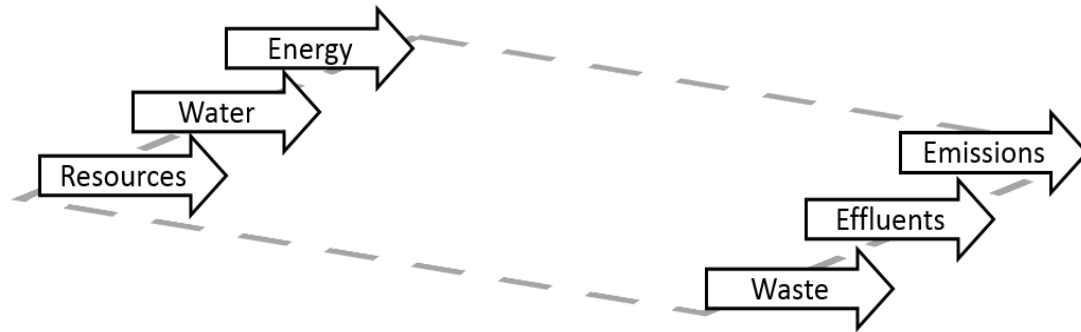


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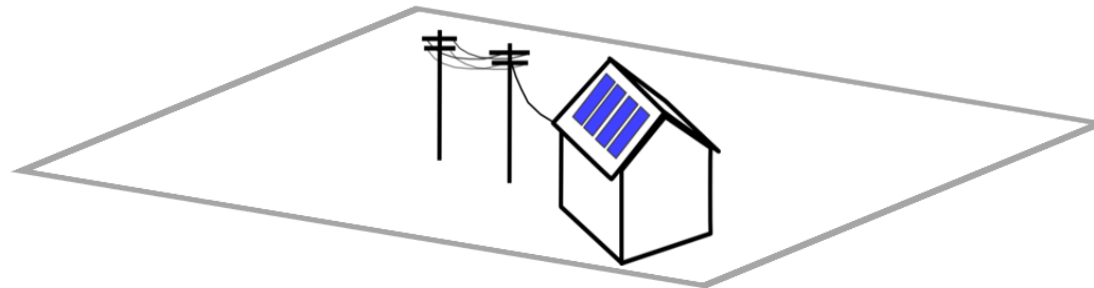
Social System



Metabolic System



Physical System



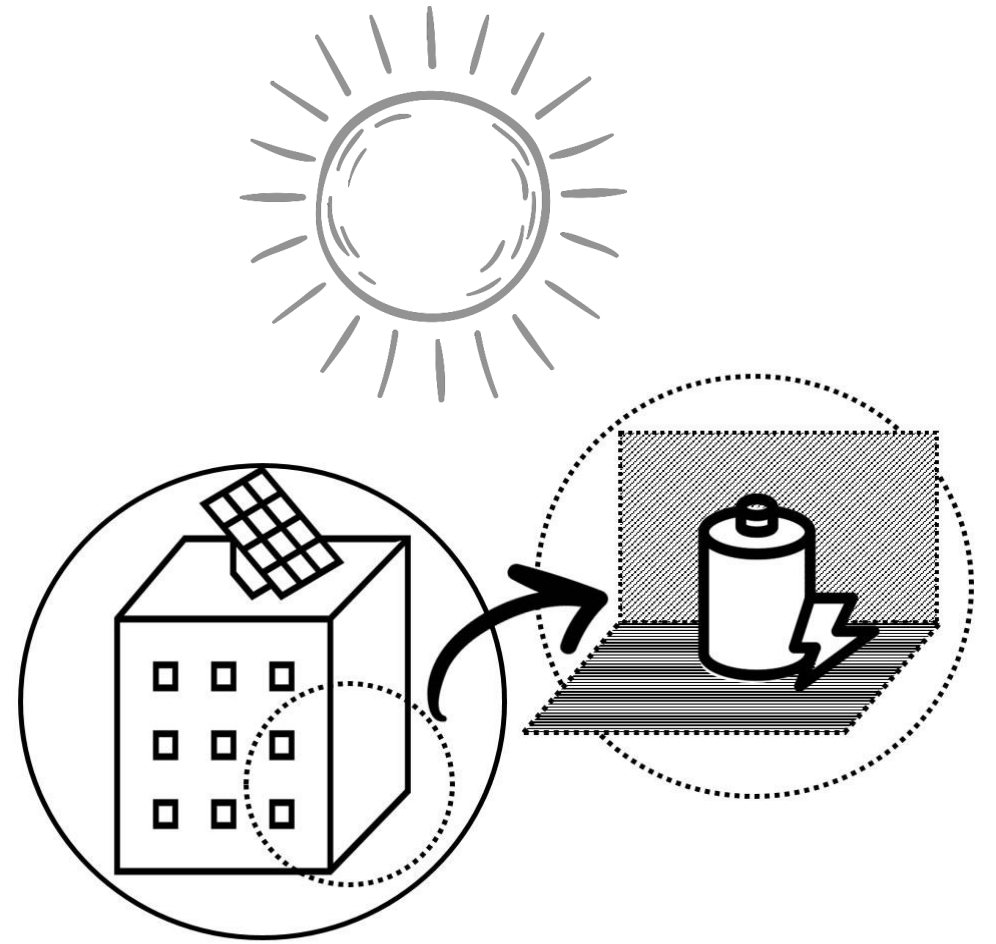
System of Practice
Meaning
Skills
Technology



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Open source, scalable models for governing shared ownership of solar and storage in medium density developments

- Fostering uptake of behind the meter solar PV and battery storage in apartment buildings.
- Reducing carbon emissions.
- Incentives for tenants and owners.



- **Most energy produced during day when most people not at home to consume — storage**
- **Prices falling**
- **Batteries: Australia world leader in residential battery storage installations in 2017, almost 21,000 installations**

Solar in apartment buildings

Solar PV + battery storage system

+ Sub-metering infrastructure

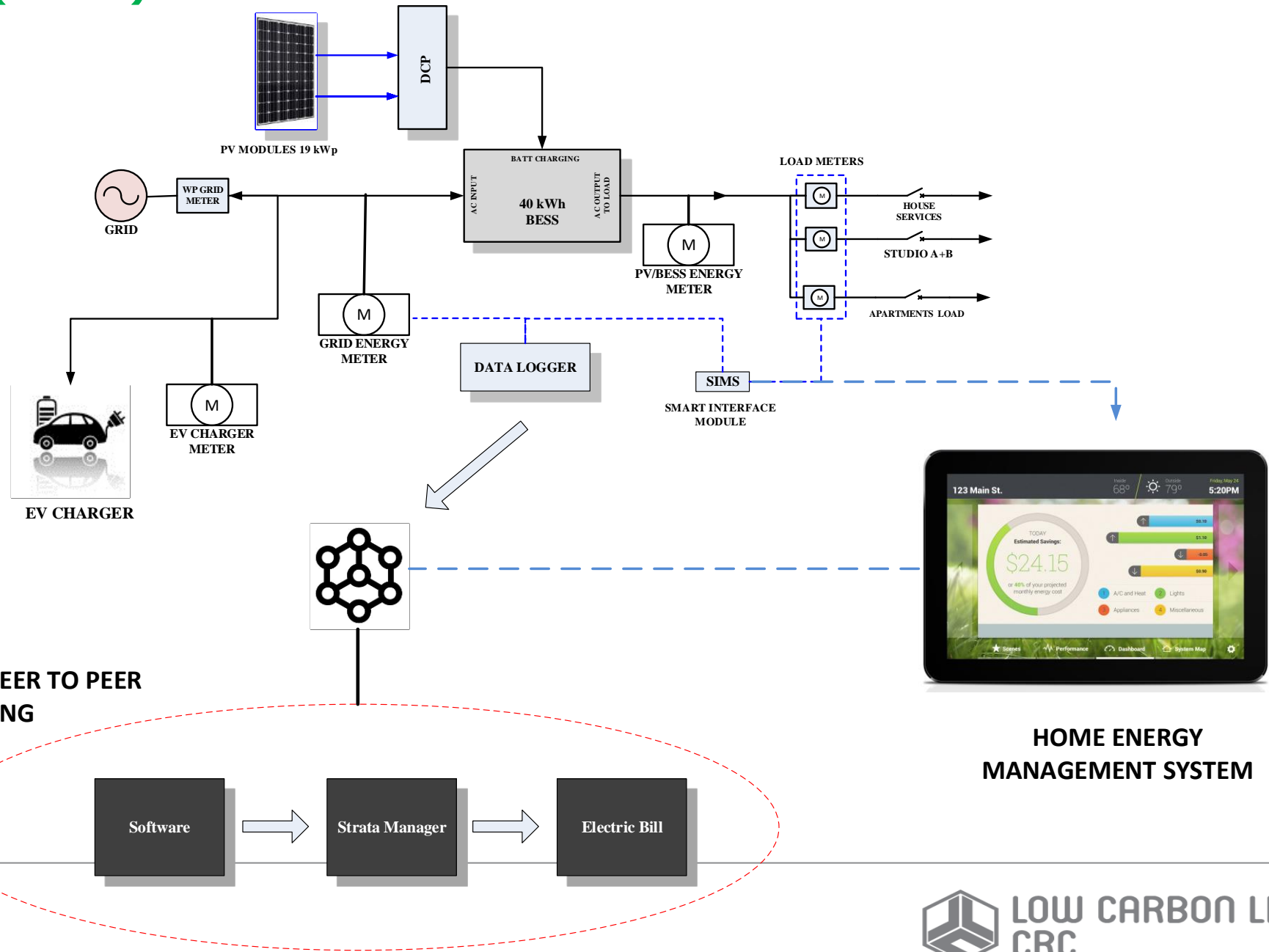
+ Trading mechanism/ accounting software & internal tariff structure



governance structure enabling fair
& efficient sharing of solar energy



WGV MICROGRID (SHAC)



Gen Y Demonstration Housing

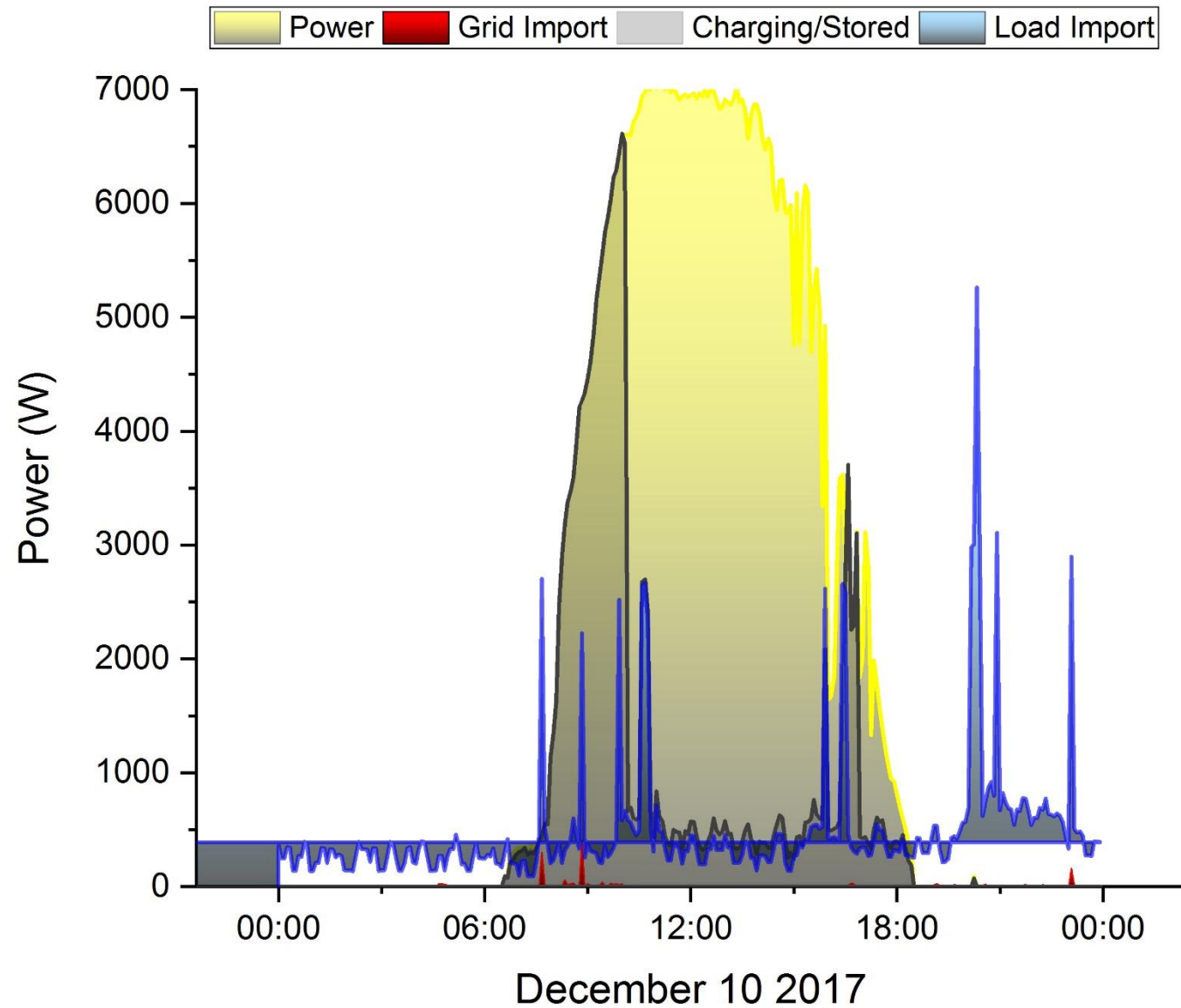


Units: 3 | Occupants: 4 | PV: 9 kW | Battery: 10 kWh

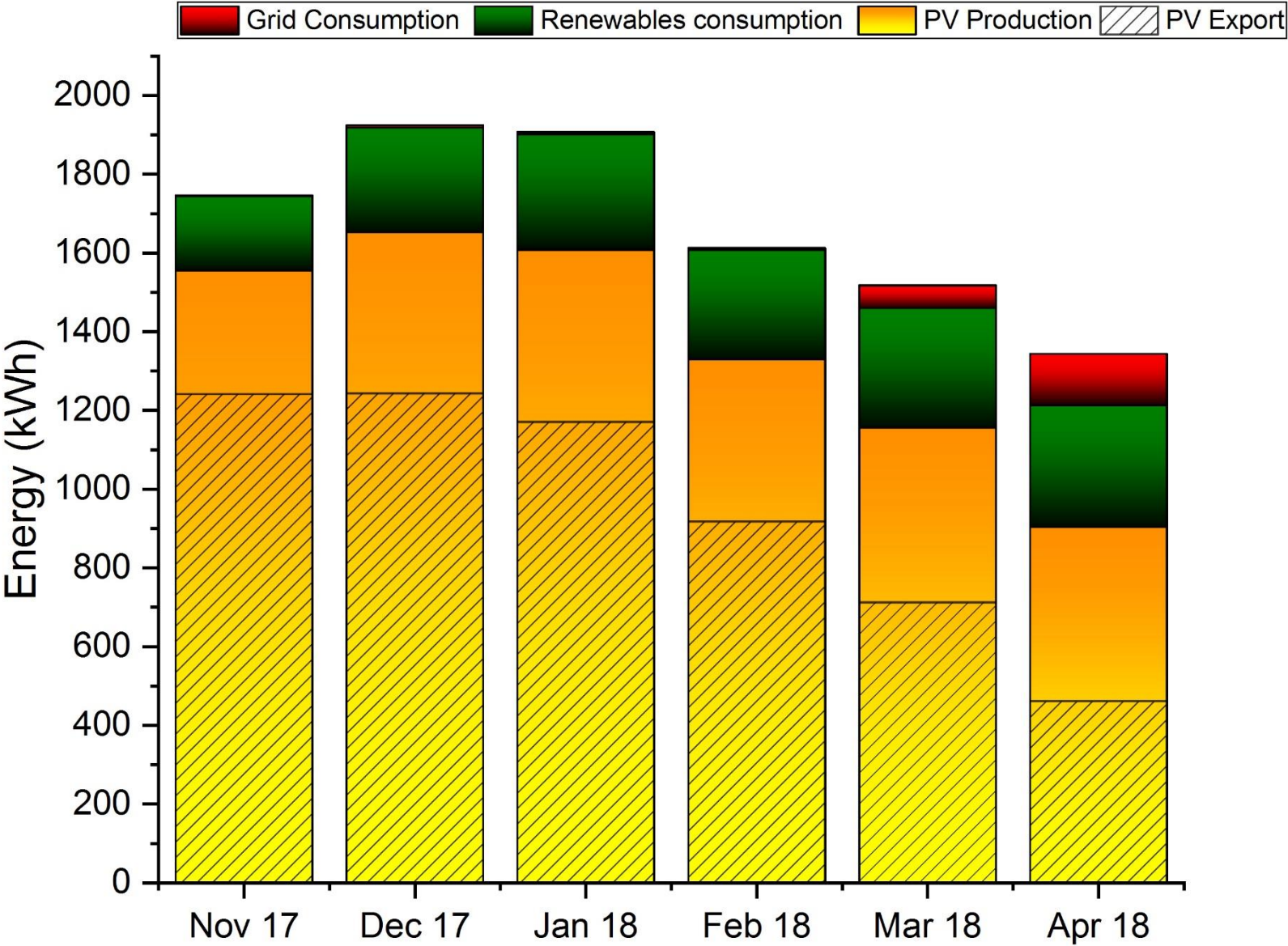


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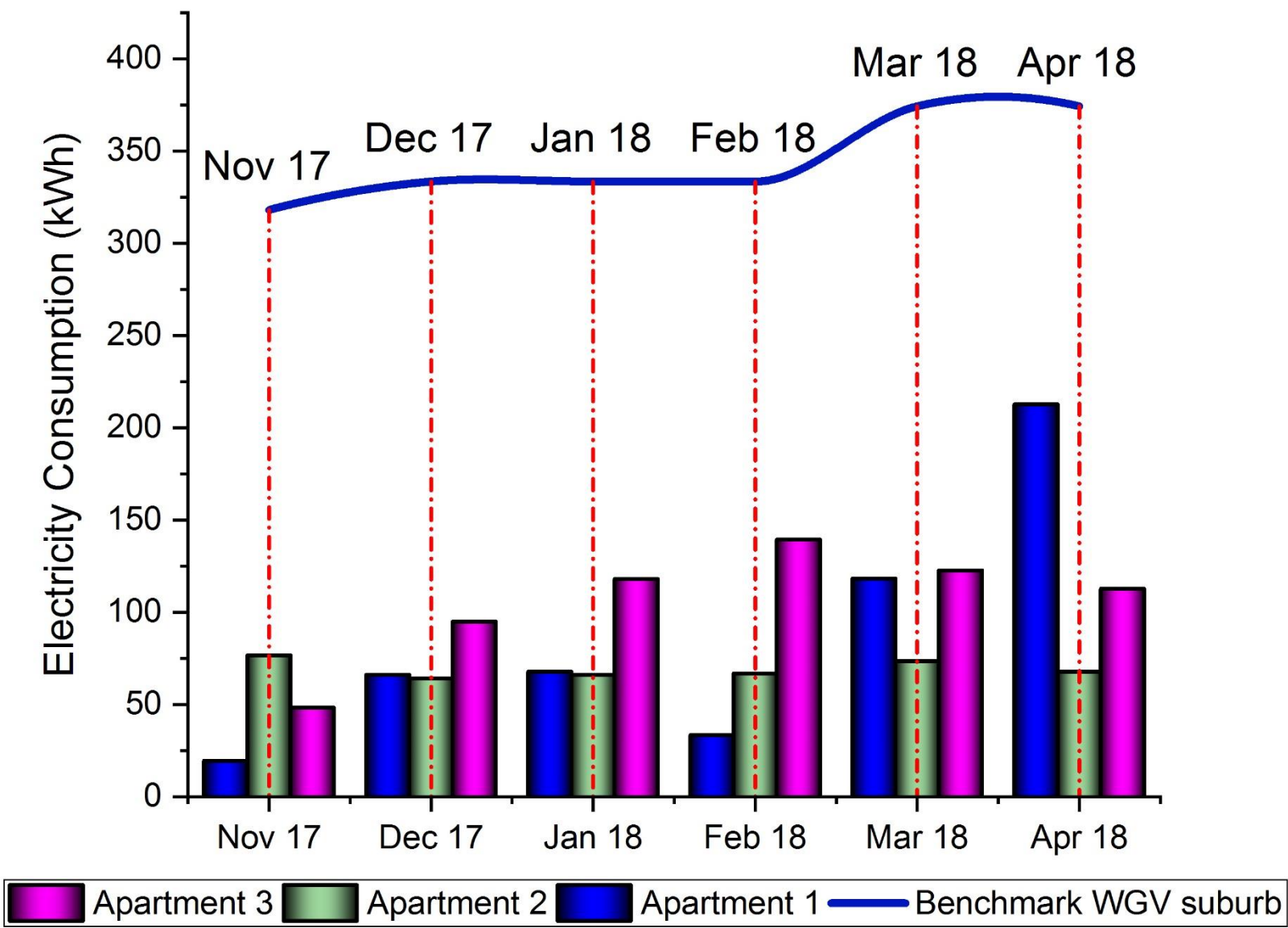
Daily Profile



System Performance



Electricity Consumption





DASHBOARD FOR USERS

WGV
WHITE GUM VALLEY

**GEN Y HOUSE
OVERVIEW**


Green House Gases ... Last 12 Months

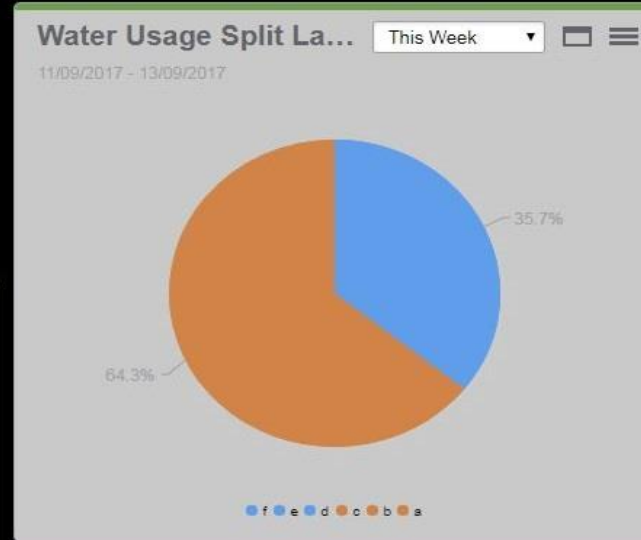
1/10/2016 - 13/09/2017

**40.84 trees**


Gen Y House is the equivalent of having this many trees on the site in terms of carbon offset.

Yearly Water Usage

**0.03 ML**

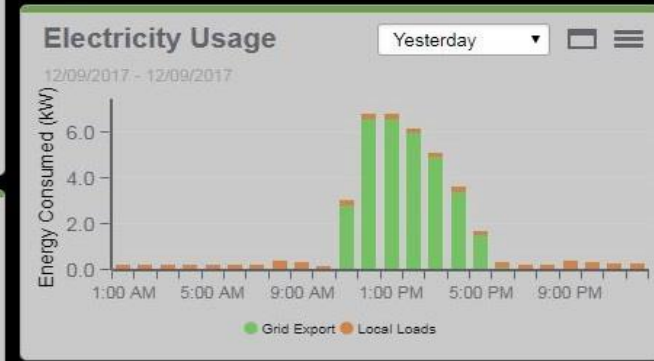


Yearly Energy Usage

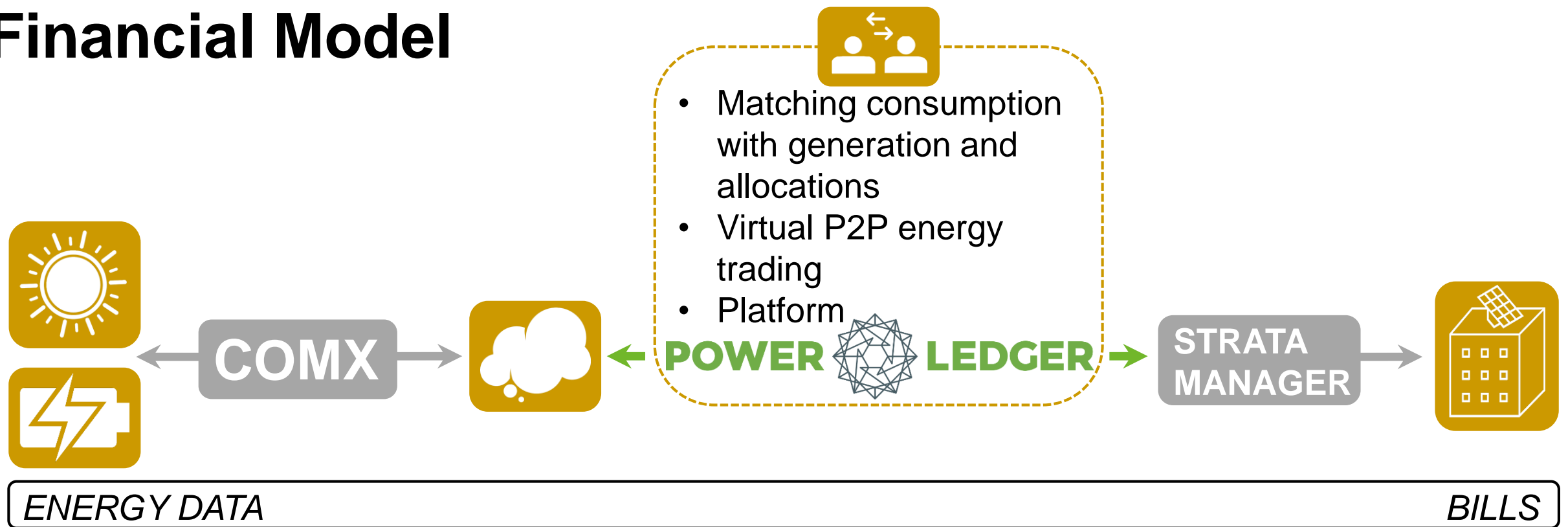
**0.97 MWh**

Yearly Gas Usage

**0.00 kUnits**

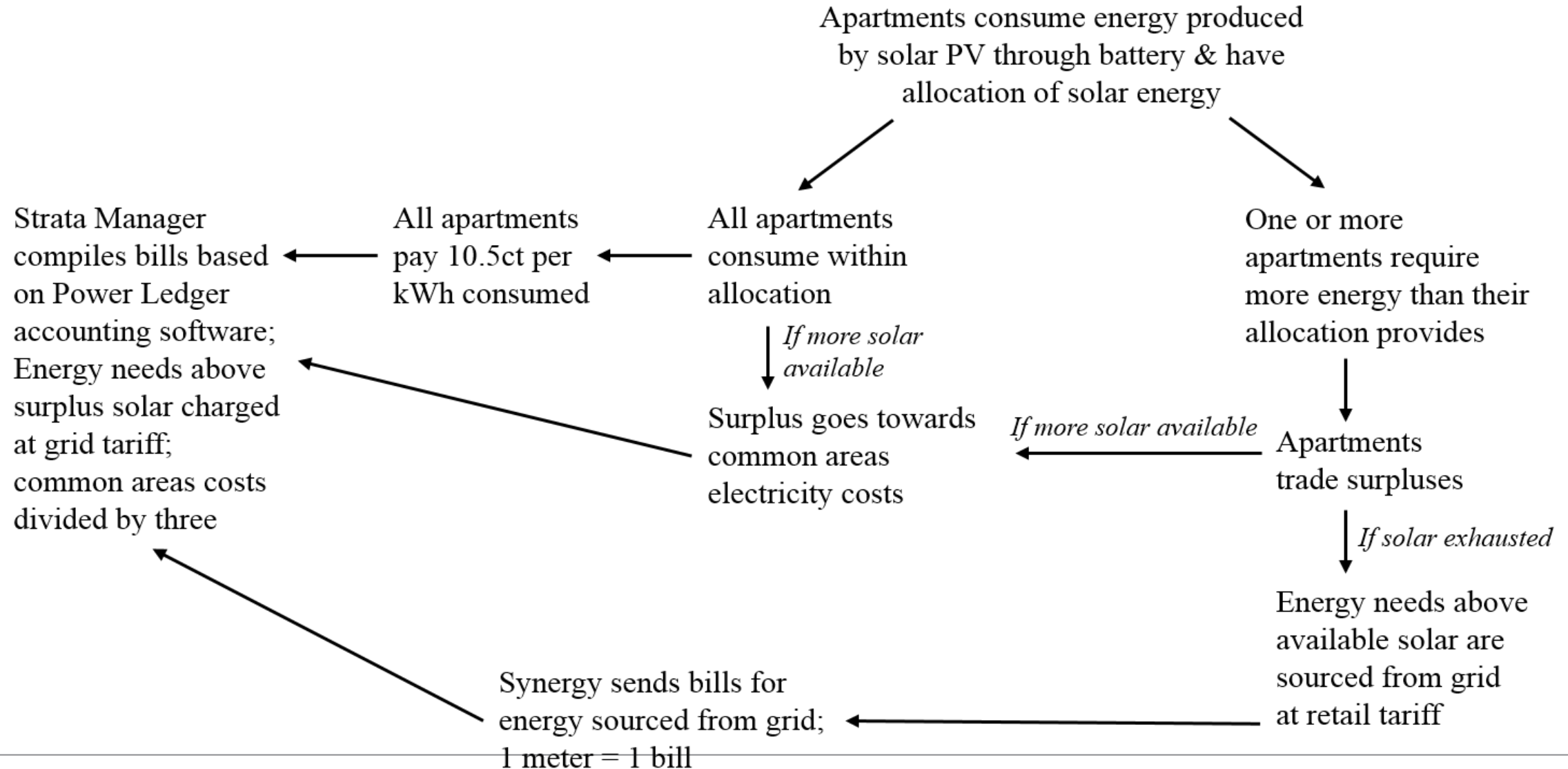


Financial Model



- Infrastructure co-owned by the 3 apartment owners
- Equal allocation of solar energy as % of energy generated by the system
- Set allocation based on generation independent of electrical flows at any given point in time
- If allocation not exhausted, energy is traded with neighbour at price below retail tariff, thereby maximizing value for occupant

WGV: Sharing example Gen Y





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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

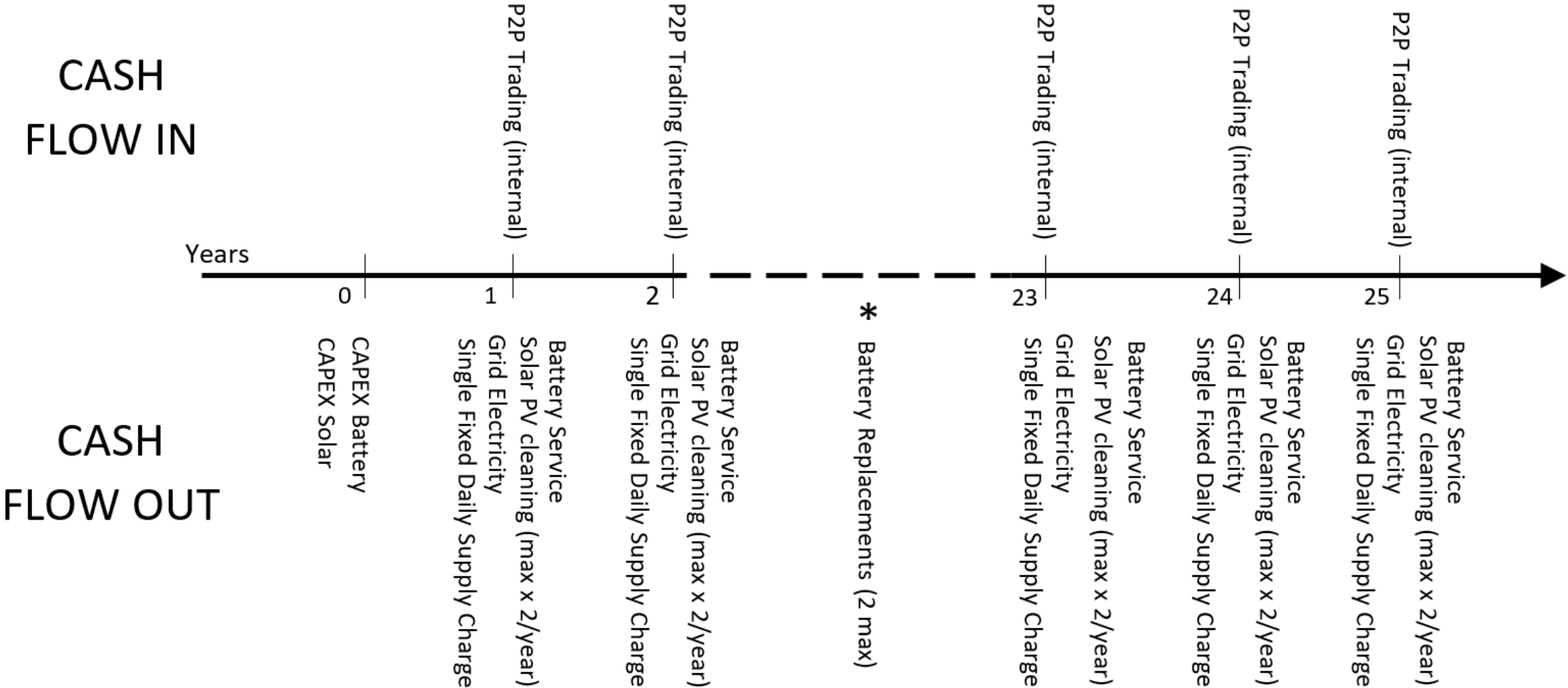


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WGV – Economic Analysis

An economic analysis of the integrated battery and solar systems located in the WGV housing Development Fremantle, Western Australia. The three sites examined are the medium density strata titled GenY, SHAC and Evermore apartments

Cash Flow Diagram



Evermore - Net Present Value (NPV)

- A positive NPV means the combined Present Value of all cash inflows exceeds the Present Value of cash outflows
- In the case of Evermore the NPV of -\$28,669.59 suggests that the combined Present Value of all cash flows inflows is less than the present value of cash outflows by that amount.
- However, this project was funded prior to NPV of integrated battery and solar became acceptable. Discounting the ARENA funding from the capital investment the revised NPV is \$211,330.41 meaning the project is cash positive, thus good for the end users
- The Return on Investment (ROI) is 8.25%

Evermore - Savings

- Over the course of the 25 years of the integrated Solar/Battery system the savings to the residents are as follows:
 - Electricity Savings (from avoided grid electricity) of roughly \$1,597,774.03
 - Avoided Fixed Daily Supply Charge (1 connection instead of 4) of \$525,844.04
 - Total savings over 25 years are estimated to be \$2,123,618.07

WGV Economic Summary

Site	NPV (all inclusive)	NPV (less ARENA contribution)	IRR	Est Savings on Electricity Bills	Est Savings on Fixed Daily Supply Charge
GenY	\$13,965.94	N/A	10.04 %	\$216,374.61	\$65,730.50
Evermore	-\$28,669.59	\$211,330.41	8.25%	\$1,597,774.02	\$525,844.04
SHAC	-\$97,796.04	\$52,203.96	3.64%	\$522,047.39	\$262,922.02

WGV questions, challenges, findings so far

- Is the system working? Technical? Social? Together?
- Scaling-up? What? How?
 - agent interactions, socio-technical innovation, scaling vs diffusion
- Differences in \$ values depending on intervals applied
- Financial viability – lack of uptake of model on smaller systems
- Information transfer/ communication
- Energy consumption: prediction was ca 60% of energy from solar storage system; reality over summer months ca 98% autonomous
- Occupant understanding of system? ... importance?
- Regulatory barriers: SHAC and Evermore inverter system; trading across the meter