Benefits and barriers facing community batteries

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Acknowledgement of Country

Wiradjuri reserve

Community batteries

- Medium scale
  (0.1-1 MW/MWh)
  energy storage device in distribution network
- A defined set of households, buildings or customers who form the ’community’

Community batteries are well suited to the management of local network conditions

- Daily network management – support increased rooftop solar and large loads like AC and EVs by controlling voltage and power flows
- Reliability – providing power for short duration outages e.g. due to maintenance
- Resiliency – providing power over extended periods of time at reduced power levels, e.g. fires and floods.

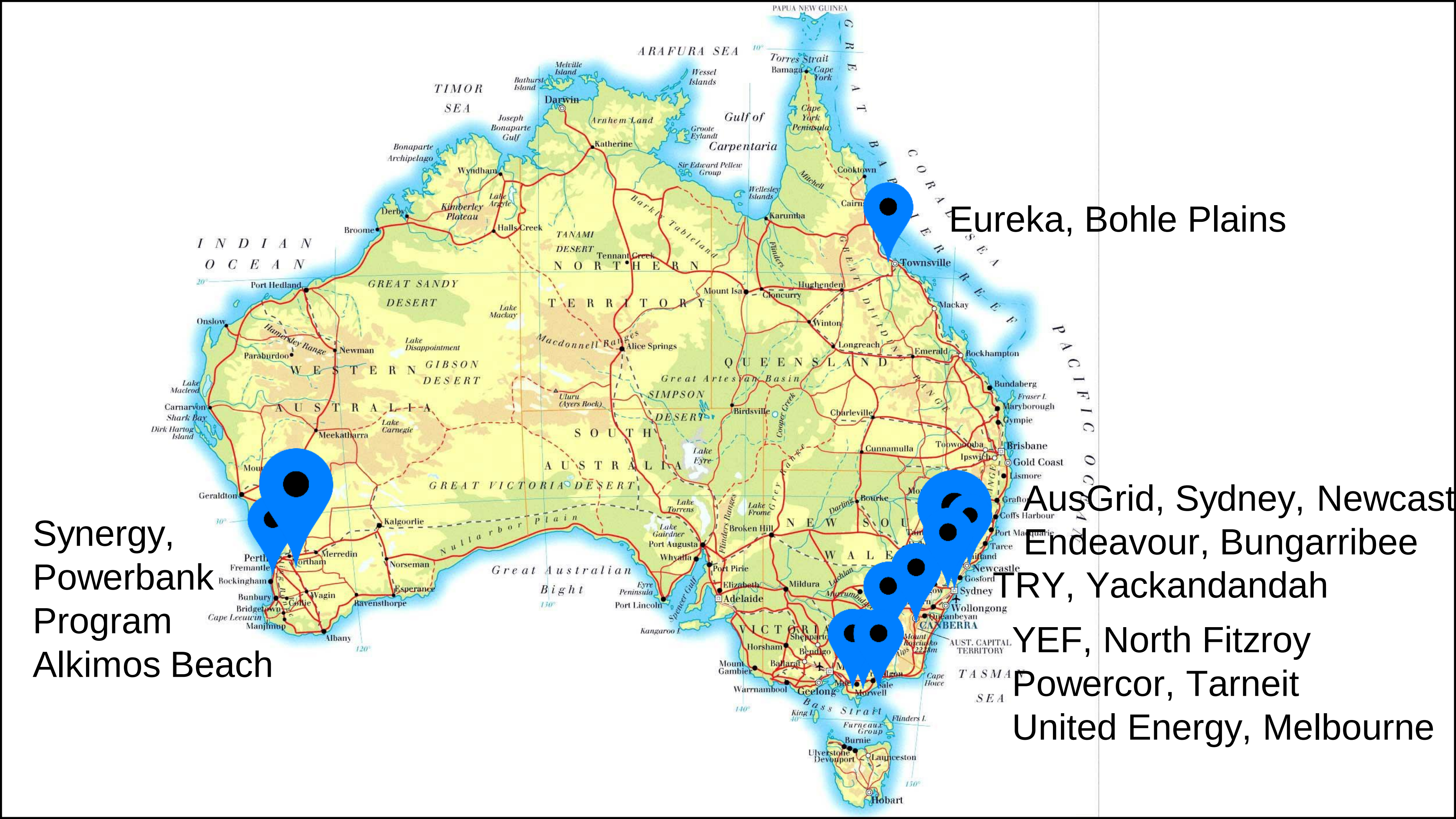
→ Less well suited for competing with grid-scale batteries for arbitrage and FCAS

Alternative technologies that should be considered

- Demand management / load shifting (hot water systems ~ 10kWh energy)
- Operating envelopes (smart network software)
- Network upgrades (poles & wires, transformers)
- Smart inverters (VWatt and Vvar modes enabled)


Government community battery programs

- Commonwealth *CB for Household Solar* program
  $200M, 400 community batteries
  - DCCEEW – Business Grants Hub $29m, 50 CBs
    (incl Noosa, Merri-Bek, Mornington Peninsula, Melbourne, Brimbank Shire/City Councils)
  - ARENA - $120m, Round 1 (closed Jun 23) – at least 5
- VIC DEECA
  - NBI – 3 rounds 2021-22
    (incl Darebin, Manningham, Melbourne)
  - 100NB Program (closes Oct 23)


Eureka, Bohle Plains
AusGrid, Sydney, Newcast
Endeavour, Bungarribee
TRY, Yackandandah
YEF, North Fitzroy
Powercor, Tarneit
United Energy, Melbourne
Synergy,
Powerbank
Program
Alkimos Beach

Expectations and challenges

Expectation	**Barriers and challenges**
Generates local value for the community	Energy system requirements make this difficult Also local risks and responsibilities
Decarbonisation	Emissions could increase if maximising profit Potentially enables more solar locally
Sharing/reducing inequality	Limited by revenue, inequality also in engagement Could end up exacerbating
Lowers electricity prices	Only if it solves a network problem (other revenue too small for now)
Resilience/back-up	Limited time (a few hours)

Community batteries enthusiasm

- Community batteries showing us people want to be involved and to accelerate the renewable energy transition
- Community batteries can offer more efficient use of storage (around half that to household batteries)

Our work focuses on understanding & quantifying the potential benefits of neighbourhood batteries

Image credit: YEF

For example:

1. How much can neighbourhood batteries improve hosting capacity over household batteries?
2. How do different ownership and operation models impact the potential benefits of neighbourhood batteries?
3. How do tariffs impact the potential benefits of neighbourhood batteries?

Typical costs associated with community batteries

- Capex: capital expenditure
  ~800-1,600 $/kWh
- Opex: operating and maintenance costs
  ~10-60 $/kWh

CAPEX
Feasibility study
Expert advice
Design
Marketing & communications
Community engagement
Battery
Other battery components
Grid integration/connection
Meter and meter installation
Control and communication costs
Land and site preparation
Legal
Retail
Artwork, landscaping and/or treeplanting

OPEX
Project Management
IT operations
Cloud hosting
Software license (commercial)
Battery maintenance
Network charges
Land lease
Site maintenance
Insurance
Marketing & communications
Community engagement

Potential revenue associated with community batteries

Revenue stream
Energy arbitrage
Revenue paid to aggregator
FCAS
Cap contracts
Network services
Subscriptions, memberships
ACCUs/carbon incentives
Funding, grants etc

Example from YEF Solar Sponge (120kW/309kWh):

The table below summarises FN1's first year revenue (ex-GST):

Revenue / cost	Value
Metering	-$704
Market charges	-$71
Network income	$1,329
Arbitrage	$7,864
Total:	**$8,417**

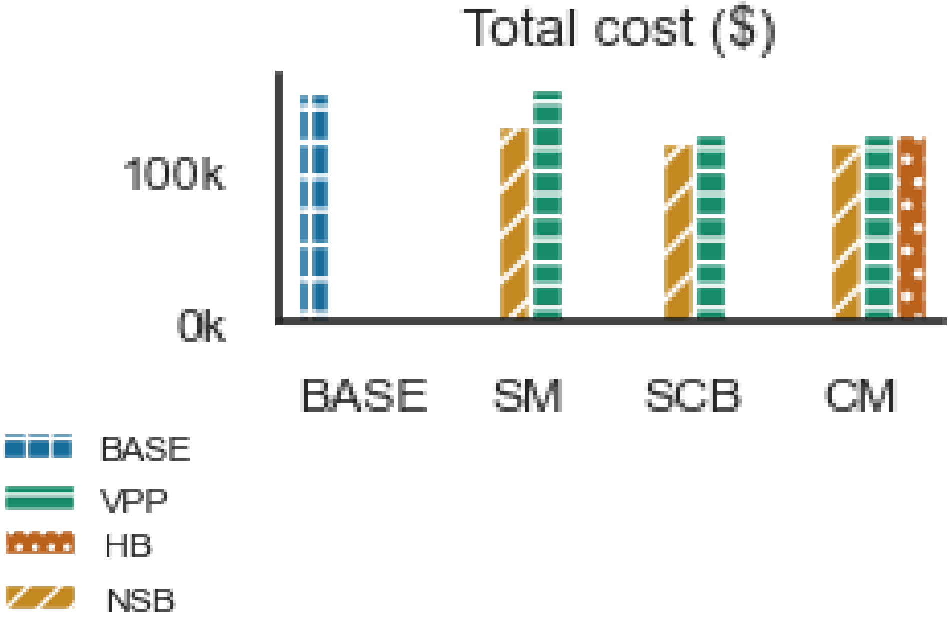
Year 1 Performance Report FN1 YEF, 2023

- FCAS requires min. 1MW
- Actual revenue compared to forecast can be ~50-80%

Role of tariffs

Currently costs greater than expected revenue

Modelling showed Ausgrid and EvoEnergy CB trial tariffs had minimal impact on battery profitability



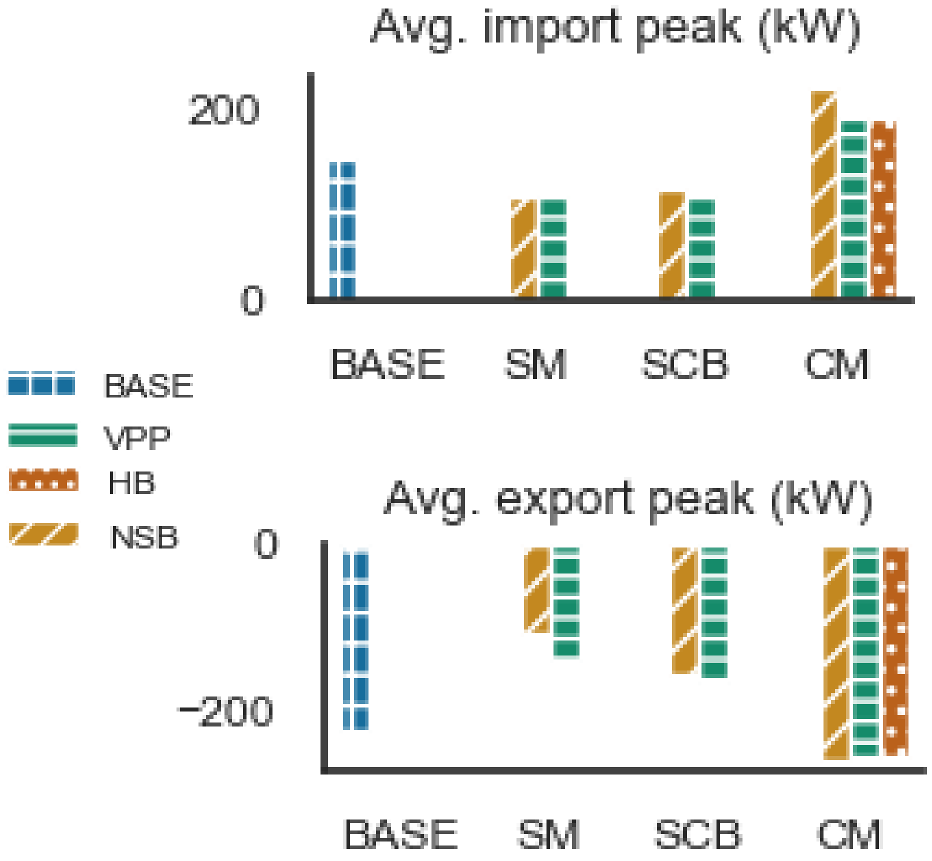
Impact of battery location

- Battery can be installed at numerous locations on distribution network, which will impact services it can provide

	Voltage management/ network support	Energy arbitrage, FCAS	Need for new NB tariff	Improve reliability/ resilience
Co-located behind meter with solar (e.g. sports stadium, community centre)	?	X	X	?
At distribution transformer (beginning of feeder)	?	✓	✓	?
Middle or end of feeder	✓	?	✓	?

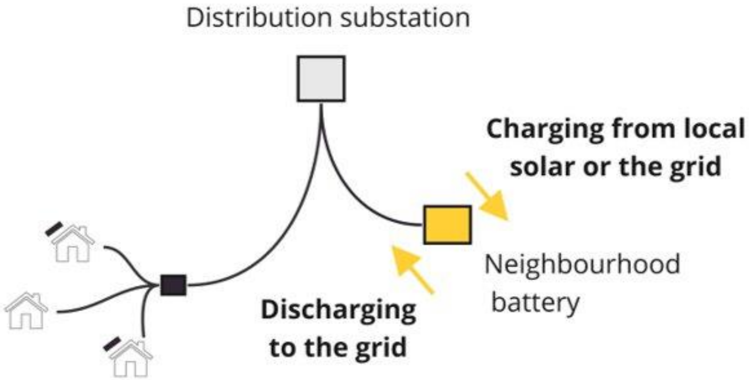
Neighbourhood batteries and virtual power plants better peak demand management than household batteries

However, some operation modes can increase peak demand for all storage options



Environmental impacts

- Energy used to charge neighbourhood battery **not** guaranteed to be zero emissions
- Emissions impact depends on solar penetration of that suburb
- Energy market price and marginal emissions of grid energy are **anti-correlated**
- Solar soaking doesn't mean emissions are being reduced – part of broader energy transition
- Potential role of tariffs to incentivise particular behaviour



Role and risks for local government in community battery projects

- Community members often trust councils more than energy businesses – good ‘honest brokers’ in projects
- Uncertainty re returns, benefits; value balancing
- Community opposition
- Safety
- Continuity

Needs for community battery projects

- Evaluation & learning
- Policy leadership - Establish social & environmental standards, integrated planning
- Recognise trust issues
- Capacity building across the sector

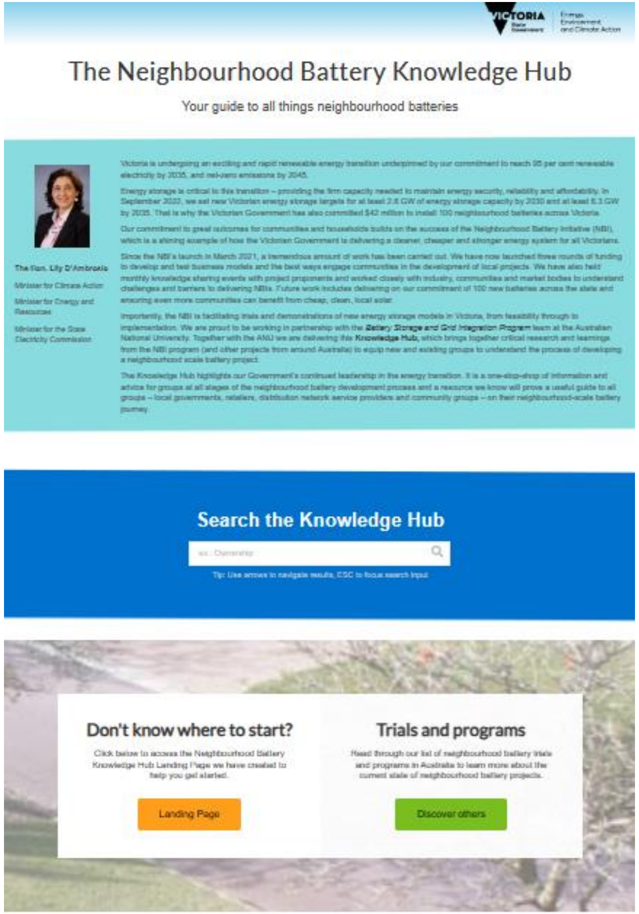
Table 1: Overview of the ANU neighbourhood battery impact framework

SUSTAINABLE ENERGY TRANSITION	• Decarbonisation and integration of community energy resources • Trust and participation • Security, stability and resilience • Safety and lifecycle impacts • Accountability
SOUND GOVERNANCE AND SOCIAL ACCEPTANCE	• Trusted project governance and accountability • Benefits without burdens • Engagement and consultation • Ethical data governance • Evaluation and learning
ECONOMIC IMPACTS	• Project viability • Economic benefits

Thank you

Visit https://bsgip.com:

- Neighbourhood Battery Knowledge Hub
- Neighbourhood Battery Impact Assessment Framework



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Community battery operating models

Model	Example project	Features
Passive Indirect benefits	United Energy Pole Mounted batteries YEF solar sponge	Network support reduces customer energy costs long term and allows customers to feed in more solar DNSP may pay battery owner for network support through special battery tariff
Market participation	YEF solar sponge in future?	Retailer gains revenue in energy markets, may pass on via special tariff for customers in neighbourhood of battery or through community co-investment
Peer-to-peer trading	Enova ‘Beehive’ project	Participants buy and sell their energy to the battery – reducing their energy costs. Technical and commercial complexity of peer-to-peer trading is expected to limit uptake

Community battery operating models

Model	Example project	Features
Virtual storage	Western Power/Synergy	Virtual battery for customers for a subscription ($/day)
Behind-the-meter	Yackandandah	Battery is attached to a facility or building with solar. Exports earn through aggregation and energy market participation or feed-in tariffs

	Ausgrid		EvoEnergy	
	Times	Rates (c/kWh)	Times	Rates (c/kWh)
Current time-of-use tariffs for residential consumers				
Peak time	Working weekdays: 2pm-8pm, Nov – Mar 5pm-9pm, Jun – Aug	27.7957	Everyday: 7am-9am, 5pm-8pm	17.511
Shoulder times	Working weekdays: 7am-2pm, 8pm-10pm, Nov – Mar 7am-5pm, 9pm-10pm, Jun – Aug Weekends, holidays and other working weekdays: 7am-10pm	4.7936	Everyday: 9am-5pm, 8pm-10pm	9.306
Off-peak times	10pm-7pm	3.3095	Other times	4.56
Fixed charge	Daily	48.923	Daily	29.111
Trial time-Of-Use tariffs for residential consumers with storage				
Peak time	Everyday: 2pm-8pm	import: 27.7957 export: -27.7957	Everyday: 7am-9am, 5pm-8pm	import: 10.529 export: 0
Shoulder times	Everyday: 10am-2pm	import: 0 export: 1.85	Everyday: 9am-11am, 3pm-5pm, 8pm-10pm	import: 6.816 export: 0
Off-peak times	Everyday: 12am-2pm, 8pm-12am	import: 3.3095 export: 0	Everyday: 10pm-7am	import: 3.354 export: 0
Solar times	N/A	N/A	11am-3pm	import: 1.676 export: 2.567, Sep – Feb 1.552, Mar – Aug
Fixed charge	Daily	48.923	Daily	29.111
Trial tariffs for neighbourhood-scale batteries				
Anytime	Any	import: 1.6098 if energy was imported from the grid to the network segment and 0 otherwise	Any	import: 4.1 c/kWh export: -4.1 c/kWh
Demand charge times	N/A	N/A	5pm-8pm, Jun – Feb 7am - 5pm, Sep – May	import peak: 43.05 c/kVA/day, Jun – Feb 37.532 c/kVA/day, Sep – May
Capacity charge times	N/A	N/A	Any	import peak: 2.799 v/kVA/day