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Neighbourhood Batteries: an opportunities assessment for local government

City of Melbourne

HIP V. HYPE

WHO WE ARE

HIP V. HYPE Sustainability provides advice that is commercially grounded, yet ambitious. We pursue exceptional outcomes that are socially, economically and environmentally sustainable and enable action across government, institutions and organisations.

We seek to partner with those who are willing to think strategically to achieve better. We lead, collaborate and support others to deliver impact and build Better Cities and Regions, Better Buildings, and Better Businesses.

HIP V. HYPE partnered with Bridgeford Group to deliver this assessment. Bridgeford Group is a multi-disciplinary renewable energy, building services and energy efficiency engineering consultancy, that operates at the intersection between class leading engineering and sustainability. They provided high level advice during the project, culminating in a review of the report.

WURUNDJERI WOI-WURRUNG TRADITIONAL CUSTODIANS

Both the HIP V. HYPE and Bridgeford Group offices are located on the lands of the Wurundjeri Woi-wurrung people. We honour their ongoing connection to these lands, and seek to respectfully acknowledge the traditional custodians in our work.

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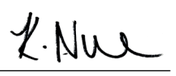
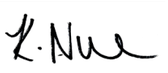
1.0	6.12.21	Draft	Kate Nicolazzo, General Manager	
2.0	20.12.21	Final	Kate Nicolazzo, General Manage	

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Contents

Executive summary

Victoria is in the middle of a rapidly accelerating, and disruptive, transition to an all-electric, zero-carbon energy system powered by 100% renewables. We know that increasing energy storage at all scales is critical to support this transition.

This paper explores the potential role that neighbourhood scale batteries can play and seeks to understand how local governments can best support their deployment.

HIP V. HYPE were engaged to review existing research, interview several key stakeholders and analyse case studies to come up with a set of potential use cases for neighbourhood batteries in metro Melbourne within specific contexts, clearly defined roles for local governments and a series of recommended next steps.

These recommendations can be inform the development of council policies to guide the installation of neighbourhood batteries and the design of programs.

CURRENT STATE OF PLAY

Energy storage offers a critical solution to the growing problems in our energy system - solar curtailment, peaky (and changing) loads, voltage issues. Batteries, at multiple scales, are one of the simplest, most cost-effective forms of storage. They offer significant environmental (e.g. ability to use more of the solar energy we generate), social (e.g. increased reliability of the grid) and financial (e.g. savings from avoiding grid upgrades) benefits.

In Australia, sixteen large-scale batteries were under construction at the end of 2020, representing more than 595 MW of new storage capacity. More than 45,000 households installed batteries in 2019 and 2020, with that number increasing each year. According to modelling from the Australian National University (ANU), household batteries already help solve grid issues by reducing exports by around 25%, but neighbourhood batteries could reduce exports by around 50%, further stablising the grid.

For most households and small businesses though, batteries continue to be prohibitively expensive. Neighbourhood batteries (often called community batteries) are often perceived as a more cost effective (and possibly more environmentally friendly) option. However, there are only a handful of neighbourhood battery pilot programs operating in Australia, and even fewer that have undergone an evaluation to demonstrate successful models that could be drawn upon for this assessment.

As well as the many potential benefits for neighbourhood batteries, the assessment also uncovered a wide range of barriers and issues any model for a neighbourhood battery will need to overcome. Despite common logic indicating it should be more cost effective than deploying storage at an individual household scale, the complexities that come with each model has the potential to quickly erode any financial, environmental or social benefits.

Community battery installed at Port Kennedy as part of a WA trial.
Photo sourced from onestepoffthegrid.com.au

Executive summary

Solar PV installed on the Davison Collaborative. Image by Guy de Vos

WHAT WE HAVE LEARNED

Several key lessons have emerged from this assessment that are highlighted below.

Not easy to scale or replicate

Neighbourhood battery projects are not easily scalable and the models are not necessarily transferable to new neighbourhoods. They are highly contextual.

The design and implementation of a pilot program depends on the use case (i.e. are there specific network constraints that are already having an impact that the community and the network want to fix), the business model and ownership structure (i.e. who is paying, who gets the financial benefits), the public/community amenity impacts (i.e. is it an eyesore on council land, perceived to be taking up precious open space or can it be accommodated on land owned by the network).

A model for a community battery that is working in Yackandandah in regional Victoria will not translate to inner city Melbourne.

Areas of new or major precinct development offer the best opportunity

One of the more complex barriers to overcome appears to be community engagement and building a social licence to locate the battery (in particular in the right place!).

Greenfield and urban renewal projects, with either a smaller community of stakeholders or an existing multi-stakeholder process, therefore offer improved potential for installing neighbourhood batteries. Areas where energy demand can be effectively modelled and planned for - including high solar photovoltaic (PV) penetration, electric vehicle (EV) charging and a mixture of load profiles - allow neighbourhood batteries to be more effectively integrated into the broader plan.

There is a role for council

Council does have a very clear role in facilitating the deployment of neighbourhood batteries, particularly councils that are setting ambitious targets for their community to move to a zero carbon, 100% renewable energy system.

The most important role is in ensuring that neighbourhood battery projects are optimised for all stakeholders and create genuine shared benefit. This includes stakeholder engagement and alignment, community engagement and enhancing existing statutory and strategic planning roles.

These findings, and more, are explored in more detail throughout this paper.

Several potential roles for councils have been identified and are summarised along with recommendations on the following page.

Executive summary

POTENTIAL ROLE	IMPACT	EFFORT	DIRECTION
Stakeholder engagement & knowledge sharing	Medium	Medium	Recommended as a primary role for local government including City of Melbourne (CoM).
Community engagement & education	Low	Low	Recommended as a secondary role for local government, including CoM.
Statutory & strategic planning	High	Medium	Recommended as an extension of council's existing planning influence role.
Future proofing (monitoring technical and industry development)	Low	Low	Recommended as an enabling mechanism to support other roles for CoM.
Assessing shared benefit	Low	Medium	Recommended where substantial community investment is required, however Council should exercise caution in publicly endorsing projects.
Aggregating benefit (and directly participating in projects)	Medium	High	Recommended only in very specific circumstances.

Background

Local governments have been leading Victoria's energy transition with the State Government for the past decade. Setting ambitious targets, breaking new ground and building innovative models of collaboration.

The success of initiatives like the Melbourne Renewable Energy Project (MREP) and the Victorian Energy Collaboration (VECO) demonstrate the potential of local governments to drive significant change in the energy transition.

Now local governments are turning their attention to one of the next key barriers to an all-electric, 100% renewable energy system (an electricity network that wasn't designed for its future use) and exploring the potential solutions.

A rapidly changing grid

At a household and small business scale, the rapid uptake of solar is continuing to transform the power system. According to Solar Victoria, there are now 510,000 small-scale solar PV systems in Victoria – all together they generate almost a third of the state's total residential electricity demand[1]. Although positive for the shift to 100% renewable energy, this level of adoption is creating a significant challenge to existing network infrastructure.

There are growing reports that parts of the electricity network are reaching capacity in terms of the amount of renewable energy that can be fed back into the network directly. "Solar export limits" have been put in place by four of Victoria's five distribution companies (or networks) due to concerns about the safety and security of the grid[2]. The high penetration of solar is also leading to reduced feed in tariffs, changing times for peak/off peak/shoulder rates (to encourage storage, alternative energy or east/west facing solar systems) and has seen the implementation of large grid-scale batteries.

The grid was initially designed as a one-way system – sending electrons from huge coal-fired power plants, hundreds of kilometres away, to neighbourhood streets and homes. Solar PV systems now make it possible to send electricity back into the grid but sending too much can cause network stability issues, as well as put pressure on markets, causing volatility, and issues for base-load generators.

In addition to this, renters and people living in apartments continue to be locked out of direct participation in the solar revolution, with the complexity of ownership structures, split incentives, physical access to roof space, body corporate contracts and regulatory barriers all creating obstacles which prove very difficult to overcome. Whilst this does not limit their ability to support the renewable energy transition (through investment in renewable energy companies, purchasing GreenPower, superannuation companies which invest in renewable energy etc) actual direct ownership through community ownership models are attractive.

Solar PV on Burwood Brickworks. Photography by Kim Landy

These challenges are amplified by the pace of transition to all-electric buildings, potentially increasing demand when it is not paired with energy efficiency as we move away from fossil fuels (gas) as our main fuel for heating, cooking and hot water. And while Australia lags behind the rest of the world, the growing uptake of EVs (and consumer preferences to be able to charge from home or work[3]) is expected to change load profiles significantly.

References

1. www.solar.vic.gov.au/victoria-renewable-energy-powerhouse
2. www.theage.com.au/politics/victoria/power-failure-homes-hit-by-solar-limits-as-distributors-protect-network-and-profits-20210311-p579xz.html
3. https://electricvehiclecouncil.com.au/wp-content/uploads/2021/08/EVC-State-of-EVs-2021-sm.pdf

Background

Emerging questions

While the sector is embracing storage as a key solution in responding to changing needs of community and the grid, there are critical questions emerging that need to be addressed.

- How do we maintain the momentum of solar uptake as a critical component of our transition to an all-electric, 100% renewable system?
- How do we ensure that everyone has equitable access to renewable energy as we transition to a zero-carbon electricity network?
- Can (and should) neighbourhood batteries play a role in supporting the uptake of renewables and emissions reduction?
- And what is the role of local government in supporting or facilitating their uptake?

Neighbourhood batteries as a solution

Although alternative technologies exist to support the grid at a large scale, such as pumped hydro or scheduled EV charging, batteries are available in multiple scales (to solve problems at varying scales), and are incredibly fast acting in response to grid fluctuations. This has led to batteries becoming well accepted as a solution to some of the growing problems with the electricity network. The specific role of neighbourhood scale batteries - as opposed to household or large scale batteries - is subject to many constraints and factors, with less clarity on a preferred solution (and unlikely to become clear in the short to medium term as significant piloting and evaluation needs to be undertaken).

For this assessment we defined neighbourhood scale batteries as 30kW-1MW in capacity and primarily operate in front of the meter. They may be installed in the public realm, owned by communities, retailers, third parties, or the unregulated arms of distribution network service providers (DNSP's), can operate for profit or not-for-profit, but have to include an element of community benefit.

Local government context

Most local governments in Melbourne are either actively supporting, or have ambition to support, their community in the shift to 100% renewable energy.

Given their role in town planning, community engagement, and the scale of ambition for renewable energy, councils could have a variety of roles in supporting the deployment of neighbourhood scale batteries.

However, the best role(s) for local governments, given limited resources and ambitious targets, is yet to be defined. This role needs to be considered alongside the role of other actors, including community energy groups, DNSP's, and the private sector including the unregulated arms of DNSP's.

Report purpose

This research and report have been designed to help the City of Melbourne, and other councils, understand the highest value contributions they can make to supporting increased renewable energy in the grid. HIP V. HYPE have undertaken desktop research, led stakeholder interviews, explored case studies (of pilot programs as the sector is in its infancy) and worked with Bridgeford Group as a technical advisor to identify the potential roles for local government, along with a range of possible models for energy storage that could work at a neighbourhood scale.

Report structure

The report is structured as follows:

1. Executive summary - highlights the key findings
2. Background (this section)
3. Existing knowledge - a review of previous and current research
4. Stakeholder insights
5. Case studies
6. Battery use cases
7. Recommendations (key findings and further research required)

References
1. www.cleanenergycouncil.org.au/resources/technologies/energy-storage

Existing knowledge

While this assessment aims to better understand the opportunities for neighbourhood scale batteries in the context of Victoria and within the City of Melbourne, there is existing Australian research that can be leveraged to accelerate the design of an effective pilot.

Funded for a five-year period from 2018-2022, the Battery Storage and Grid Integration Program (BSGIP) hosted within the Australian National University is undertaking research into battery materials and the development, integration, operation and optimisation of energy storage in electricity grids and electricity markets globally.

Some of this research has focused on community scale batteries, with key findings highlighted on this page. While BSGIP's work provides valuable insights, case studies and stakeholder conversations as part of this project, detailed later in this report, seek to provide additional learnings.

'Implementing community-scale batteries: Final report for the ARENA-funded Community Models for Deploying and Operating DER project, carried out by the Battery Storage and Grid Integration Program' Australian National University (2020)

Key findings

- *Community-scale batteries can increase the amount of distributed energy resources (e.g. solar panels and electric vehicles) that can be integrated into the distribution grid i.e. increase hosting capacity.*
- *Network tariffs and market signals shape how the battery's actions contribute to hosting capacity.*
- *Community-scale batteries are already financially viable, particularly if FCAS markets can be accessed.*
- *The technical capability for implementing community-scale storage on the NEM already exists.*
- *Only DNSP-owned community-scale batteries currently require regulatory exemptions (and only if the battery is being used for anything other than regulatory network services). All other models we investigated can proceed within the current rules and regulations.*
- *Reduced local network tariffs are crucial for incentivising battery charging from locally generated solar energy and sale of energy to local customers.*
- *Industry professionals saw significant potential benefits of community-scale batteries, including over behind the- meter (BTM), virtual power plant (VPP) storage. They also consider the dynamics between actors in disaggregated markets to be a major challenge.*
- *Householders care about more than just affordability when it comes to energy storage e.g. strong concern over battery life-cycle, promoting local energy use, reducing carbon emissions, questions of fairness and how this technology would fit in the broader energy transition to renewables.*

'Stakeholder views on the potential role of community scale storage in Australia' Australian National University's Battery Storage and Grid Integration Program (2020)

Key findings

- *Community batteries hold broad appeal for both energy sector professionals and the general community, for different reasons - some of which overlap.*
- *Community batteries can be designed to achieve different aims, and as such model design and ownership has implications for who benefits.*
- *Community batteries face a number of practical and regulatory barriers, although some of these are overstated are relate more to entrenched ways of doing, rather than formal rules.*
- *Energy sector participants welcome investment in trials and demonstrations of different models to explore their viability in 'real world' settings.*
- *Householders are likely to be sceptical of community battery models that cannot clearly demonstrate that they will genuinely benefit the local community. A strong preference was shown for models that are simple to interact with, owned by local government and that are run as a not for profit entity.*

Stakeholder insights

Building on existing insights from research such as that conducted by the BSGIP (highlighted in the previous section), interviews and conversations were held with a range of stakeholder types including:

- Distribution Network Service Providers (DNSP's)
- Retailers / Energy Service Providers
- State Government
- Developers
- Local government and community energy representatives

Through these conversations, the role of neighbourhood batteries and barriers to their establishment was explored. Insights into pros and cons for different community battery models became evident, and opportunities for Council's role became clearer.

The insights from each group of stakeholders have been summarised in three sections: the role of neighbourhood batteries, key issues and barriers, and potential roles for local government.

THE ROLE OF NEIGHBOURHOOD BATTERIES

Most stakeholders interviewed acknowledged that neighbourhood scale batteries have potential to play a key role in the energy transition, but each opportunity for neighbourhood batteries needs to be assessed individually and there are many barriers that need to be overcome.

Each of the stakeholders acknowledged that storage was critical to support the increasing uptake of renewable electricity by the community, however not all stakeholders were convinced that the neighbourhood battery scale was the best technology solution for increased energy storage.

While there may be a technical and economic argument to have end of street (or edge of the park) batteries rather than at the household level, several stakeholders highlighted that governance is obviously much more complicated and these challenges can outweigh the benefits. In fact the considerations around governance and ownership are among the most challenging considerations. Stakeholders also acknowledged that future storage solutions such as electric vehicles may be more appropriate than neighbourhood storage (when technology allows).

There was agreement that network providers can (and should) work with stakeholders to identify network constraints and strategic opportunities for optimal battery locations. Using neighbourhood batteries to alleviate grid constraints in key locations was acknowledged as a critical role to start with.

However in the medium to long term, electric vehicle charging (e.g. fleets and major car parking areas) could be optimised as potential neighbourhood batteries (as technology evolves to allow vehicle to grid transmission this becomes increasingly possible).

The developers interviewed didn't have any direct experience with batteries at a neighbourhood scale but were both working on all-electric residential developments at different scales. They identified that we should be developing net zero buildings that limit their impact on the grid, deeply considering how to integrate generation and storage from the beginning to manage demand. They also acknowledged that there is a proactive role networks can take to collaborate with developers (and potentially council) to limit the impact of new developments on the grid.

Staff at a development site. Photography by Kim Landy

Stakeholder insights

ISSUES AND BARRIERS

The following summarises issues and barriers which were raised during stakeholder conversations. Some may be common to all ownership models while others are more specific to a certain stakeholder group, use case or business model.

Governance and ownership

Unpacking ownership and governance models has been consistently identified as one of the most critical barriers to establishing a neighbourhood battery. These issues are specific to each stakeholder group or model.

For networks: the ring-fencing legislation (ensuring network operators cannot trade in the National Electricity Market) is often a barrier as it makes it difficult to innovate (i.e. build a comprehensive business model), and there is currently a lack of clarity as to whether networks can add the battery to their Regulated Asset Base (with one stakeholder suggesting they shouldn't be able to as it will erode community benefit).

For communities: community ownership and governance models rely on such a high level of government support and volunteer time and effort they often take a very long time to be realised (and often have to compromise the original vision after years of planning and negotiations).

For developers: they are limited in what they can negotiate with networks (i.e. connection requests are set at generic modelling for peak demand and don't account for energy efficiency or smarter load management) and they don't necessarily feel equipped to pro-actively negotiate (i.e. understand what is possible).

For energy service providers: they feel best equipped to work with partners to develop models that unpack shared benefits and deliver the best returns, however the market is not sophisticated enough (yet) to allow these models to evolve.

Financial

A battery of this scale can be a big upfront investment, particularly for community owned schemes. It is often difficult to build a strong value stack or business case that generates shared benefit. This is further exacerbated by the fact that models are bespoke, the technical considerations are context specific and not easy to scale cost effectively.

One of the energy service providers interviewed acknowledged that neighbourhood batteries are currently good for marketing, and energy service providers might 'buy' projects by under-quoting which means the true cost of neighbourhood batteries might not be properly reflected and understood.

Stakeholders agreed that it isn't clear whether the cost of batteries will significantly decrease in the near future due to resource shortages, supply chain issues and growing labour costs (and the growing uptake of EVs utilising the raw materials required). This is likely to have a significant impact on the viability of specific energy storage models.

Technical

The critical technical issue centred around the need to accurately model for expected demand and to develop approaches for generation, storage and demand management that will allow for more flexibility in the future. Proactive conversations between developers, council and networks were identified as a critical opportunity to deal with this issue.

Stakeholders reported that locations where a battery may be beneficial (Hot Spots) are fairly transient, there are very few circumstances that it is a permanent problem that can be fixed with the neighbourhood battery (i.e. any cost savings from deferring investment in the network are likely to be short lived).

There was also concern for the potential over-engineering of the capacity of the grid.

Planning

Planning suitable locations is a significant constraint for neighbourhood batteries, particularly in established neighbourhoods (all stakeholders identifying the challenge of finding an acceptable place to locate the battery).

Stakeholders had some concerns about the capacity and experience amongst city planners to understand the technical, social and environmental considerations that need to be made and an investment will need to be made (by state or local governments) to upskill them.

When it comes to net zero, all-electric buildings the DNSP's reported that they are included so late in the planning process, only receiving a connection request after the builder is appointed, they don't have any capacity to influence design of the energy requirement or load profile. This is leading to poorer outcomes. They identified a potential role for council's to lead proactive discussions between the DNSP's and developers.

Stakeholders also highighted the delay from State Government (in their role in planning schemes) in catching up with technology / terminology and clarifying the classification of a battery (i.e. as minor utility installation or other) which will help overcome technical, financial and governance barriers.

Social

Community members often do not want to see the battery, have it take up open space or may have concerns about safety, raising serious concerns about where they can be located.

Despite the widely held assumptions that neighbourhood batteries can deliver models where "everyone wins", shared value distribution means that this is very hard to deliver in practice.

Stakeholder insights

STAKEHOLDERS AND THEIR ROLE

Roles for key stakeholders (in addition to local government) have begun to emerge. Some of these roles can be coordinated or amplified by local government.

Distribution Network Service Providers

- Own and operate the local electricity network (including identifying network constraints where storage solutions may be beneficial)
- Work with developers / proponents in understanding impact of development and neighbourhood battery proposals (this is currently reactive, but could be more proactive)

Retailers / Energy Service Providers

- Work with stakeholders to develop and deliver neighbourhood battery models with shared benefit

State Government

- Evolve planning policy to support all-electric, net zero buildings and precincts, with a view to minimising electricity network impact
- Ensure broader regulation reduces barriers to neighbourhood batteries

Developers

- Adopt an all-electric approach which minimises impact on the electricity network through energy efficiency, demand management (including scalable load management for EV's)

Community energy groups / volunteers

- Work with stakeholders to help assess community / shared benefit for projects, support community engagement and education

POTENTIAL ROLE(S) FOR COUNCIL

These was significant discussion during the interviews about the potential roles for local government in piloting and supporting the uptake of neighbourhood scale batteries. These included:

- Coordinate knowledge sharing across DNSP's, retailers, developers, community energy sector and researchers
- Work with networks to identify areas of grid constraint, and in turn work with other partners (retailers, energy services, community groups) to develop models to deal with constraints
- Facilitate conversations between networks and developers to highlight potential issues and opportunities at the outset
- Develop guidance for developers to consider future proofing net zero buildings with detailed planning for energy generation and storage (including electric vehicle charging)
- Common assessment criteria for understanding and articulating the technical, economic, environmental and social benefits of neighbourhood batteries
- Identify potential sites for neighbourhood batteries
- Educate the community on the potential benefits of a shared battery in their neighbourhood
- Support community engagement on key issues such as location, ownership and operation, maintenance etc
- Some stakeholders expressed interest in models where local government own and operate neighbourhood scale batteries (the ANU research also reported a desire from the community for local government to own these assets)
- Depending on appetite from council, there may also be a role in billing etc through rates (or via the retailer model)

For the remainder of this report these roles have been summarised as:

- Stakeholder engagement & knowledge sharing
- Community engagement & education
- Statutory & strategic planning
- Assessing shared benefit
- Aggregating benefit
- Future proofing

Case studies

BEACON HILL PROJECT

East Coast electricity distributor Ausgrid launched a community battery in Beacon Hill, NSW as part of a two year trial. The trial location was selected because of the high number of solar households in the area (over 20% of households). Northern Beaches Council have been supportive of this pilot but not actively involved.

Snapshot

- Two year trial launched February 2021
- Stores excess solar power from local homes (Ausgrid customers in the Northern Beaches area who have or will soon have solar PV systems)
- Multiple households within a certain radius 'share' the storage system
- 150kW / 267kWh battery (MTU Energy Pack QS)
- Cost around $400,000
- Owned and maintained by Ausgrid
- Situated on council land (under a lease agreement)
- Location selected where there is a high number of customers served by local distribution kiosks (trial area contains approximately 170 households which can register interest)

Proposed benefits

- Reduces residents' electricity costs (estimated between $50 and $250 a year)
- Helps avoid the upfront cost to a household of an individual battery, making access to battery storage more equitable and accessible
- Cost effective way to increase the amount of clean energy into the grid
- Reduces peak demand
- Alternative to traditional poles and wires investment
- System security benefits

Model

- Each household can store up to 10kWh of excess solar energy per day
- Energy stored is credited against the household's energy use of that day. Credit will vary and depend on amount of excess solar exported, usage amount and time and individual electricity pricing plans
- Credits paid to participant each quarter
- Note that there are no costs to participate and no need to change electricity retailer. Credits are currently being paid via a third party as a direct cheque to each household - it isn't a credit on the bill and households receive their solar feed-in from the retailer as well as credit from the battery. The complexity of including a retailer in a three way agreement it proving prohibitive and beyond the scope of this pilot
- Excess energy will be stored for use across the grid when the sun goes down and the air-conditioners go on, thereby helping to smooth demand and cut the energy costs of the broader community.

Objectives

- Test how neighbourhood batteries can help manage local networks
- Test different service offers with participants
- Test overall experience with participants
- Learnings to inform potential wider scale roll out

Links

- Ausgrid community battery trial media release
- Ausgrid community battery trial FAQ
- Ausgrid community battery trial registration
- RenewEconomy article

Applicability to local government

This model provides a very clear potential role for the City of Melbourne and other councils in neighbourhood scale batteries that are designed, owned and maintained by network businesses. Within this model council has a role to work with the networks to:

- Identify potential council land holdings in areas of grid constraint (as identified by the network)
- Negotiate a fair and reasonable lease agreement (consider how any reduction in amenity can be offset with alternative investment for the community)
- Support / lead community consultation and engagement regarding the benefits of the battery, key considerations and constraints
- Provide billing support (reduce messy, third party application)

It is important to note that Ausgrid has not included retailers as a partner in this project in part due to the complexity of negotiating with multiple parties. For this model, participating households need to be within a specific location, as opposed to other models where households could be recruited from one retailer for example.

Beacon Hill community battery. Photography by Nadine Morton

Case studies

THE BEEHIVE PROJECT

Enova Energy is working with Enosi and the University of Newcastle to trial a transformative energy solution that will be the first of its kind in Australia. The Beehive is a shared community battery and peer-to-peer solar energy trading project involving up to 500 households (located anywhere in NSW) who are customers of Enova.

Snapshot

- The Community Battery is a 1 megawatt (1.07MW) Tesla Megapack battery with 2 megawatt hour (2.14MWh) of capacity
- It is approximately the size of a shipping container, and can power approximately 115 homes each day (based on an average usage of 19kWh per household)
- The battery will be located in Kurri Kurri, in the Hunter Region of New South Wales
- Participants will be able to use Powertracer, an online peer-to-peer energy web-based trading and sharing platform developed by project partners Enosi
- It will include up to 500 participants, 250 with and 250 without roof top solar panels
- A research team at the University of Newcastle will track and monitor the pilot

Proposed benefits

- This pilot is primarily aiming to ensure everyone can get the most out of the solar energy generated from their rooftop panels and households without solar can access solar generated by their neighbours
- Instead of unused solar energy going back to the grid, The Beehive provides a way of enabling it to continue circulating amongst a community of participants so that more value can be gained by all

Model

- The battery is not designed to store and discharge power connected to a particular building or group of buildings, or to a wind or solar farm and is not defined by a geographic neighbourhood
- Instead the 500 households who join (250 with and 250 without rooftop solar) will have to be Enova customers and, by using the Enosi Powertracer App, can buy and sell solar energy stored by the battery with each other (note that Enova customers already only buy 100% renewable energy - some from solar customers and the rest from renewable energy generator Diamond Energy)
- The use of smart technology and peer-to-peer trading platform means households have greater access more renewable energy, at a price they can decide on
- The Powertracer App and a virtual, rather than physical network allows Enova to include households throughout NSW in the pilot and to locate the battery in regional NSW

Objectives

- Enable participating households to get more out of their rooftop solar as a community
- Test whether the battery can help small and mid-size electricity retailers, like Enova, better ride the impacts of days of very high electricity demand, by accessing the stored energy
- Share the knowledge and learning generated from the project with the wider community and industry

Links

- Enova Energy shared community battery

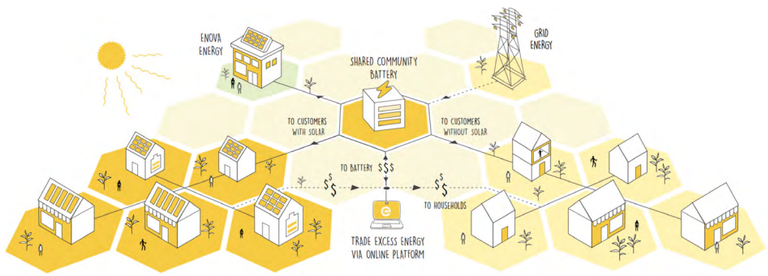
Applicability to local government

The flexibility (i.e. geographical spread, solar and non solar homes, peer to peer trading) offered by Enova's Beehive makes it an interesting and potentially highly relevant model that councils may wish to explore, particularly if the proposed local retailer option for local governments is realised.

It is easy for renters to join this pilot and purchase locally generated solar power, without having solar on their rooftop, people can move and take their participation in the battery with them.

Within this model the key interaction with a local government has been with Cessnock City Council for planning approval. Enova had to work with a consultant and council to examine any environmental impact of the battery installation and operation. It was found that the impact of the battery does not have environmental impacts because it is to be installed at a site with no ecological or heritage significance.

The City of Melbourne and the broader Battery Collaboration should keep a watching brief on this pilot as it aligns strongly to council's objectives. It is important to note that Enova has received approximately $800,000 in funding from the NSW Government to support the pilot.



How the Beehive project will work. Image from www.enovaenergy.com.au

Use cases for batteries

There are several key use cases emerging for batteries that are described in this section of the report:

- Integration into existing network assets (the poles and wires)
- Installation in a specific sub network
- Establishing a virtual network

These use cases are then applied to specific development contexts to highlight how each use case can be practically applied to generate shared benefit and accelerate the transition to a 100% renewable energy system.

Each context has been described at a high level, with the potential benefits articulated and the potential role for local government as well as other stakeholders.

As has been discussed throughout this paper - the ultimate design for a neighbourhood battery model is highly contextual (and unlikely to be easily replicable or scalable), it depends on community demographics, the geography and the technical limitations or constraints.

THE EXISTING NETWORK

In situations where the grid is already constrained, households may be prevented from exporting their solar to the grid and new connections may require significant investment to connect. In this situation networks can install a network of batteries on their existing infrastructure - like the poles they own and operate.

United Energy is taking this approach with their ‘Electric Avenue’ program which will install 40 unique 30kW batteries on power poles within their network. Each battery has the capacity to service up to 75 homes in the immediate vicinity for 2 hours (providing 66kWh of energy).

These batteries are specifically designed to help improve electricity reliability and enable greater solar PV exports in local areas where the low voltage distribution network is constrained. There is limited financial benefit to users (and therefore benefit unlikely to be able to be shared).

Key considerations

- Community acceptance / trust is low regarding networks
- Use case doesn’t adequately address equity issues (i.e. growing gap between haves & have nots with regards to solar)

Potential roles for council

- Community engagement & education
- Statutory & strategic planning: i.e. lease agreement with battery owner (if on council land), reviewing environmental impact

Codrington wind farm. Photography sourced from www.port-fairy.com

Use cases for batteries

SUB NETWORK

Currently, this model is primarily deployed to ensure more households and smaller businesses can connect their PV system to the grid where there is network constraint and export limitations. In the future, as we move to all-electric buildings and EV charging, there will likely be a greater need for batteries deployed at a sub network level.

Households within a specific geographic location (connected to a specific sub network) store their unused solar and can either withdraw it when they need or be paid for it by a third party (retailer or via peer to peer). These neighbourhood scale batteries can either by owned by the DNSP's (like Ausgrid's Beacon Hill Battery) or by a third party (like the Yarra Energy Foundation's proposed battery in North Fitzroy).

They need to be located within a specific geography and therefore require significant community engagement and consultation to build a social licence for the project. This is likely to be particularly difficult in inner-city Melbourne. Solving the problem of ownership will be critical to building social licence - the ANU's research shows that people are more comfortable the closer to "home" the battery is owned because they like the idea of taking back more local control of the governance of their energy system (which would make local government ownership very attractive to the public).

Key considerations

- Location
- Ownership
- Community / social benefit (beyond more solar)

Potential roles for council

- Stakeholder engagement
- Community engagement & education
- Statutory & strategic planning: i.e. assessing potential locations, lease agreement with battery owner (if on council land), reviewing environmental impact

Household battery. Photography by Kristoffer Paulsen

VIRTUAL NETWORKS

Smart technology focused models where storage is virtual (not geographically bound) provide much greater flexibility to all parties. Virtual networks are increasingly being developed to help stabilise the grid and provide increased opportunity for local generation, distribution and trading.

Enova is trialling this model through the Beehive Project and Western Power is currently growing their PowerBank trial in WA. The PowerBank model integrates bulk solar battery storage into the existing electricity grid, while also providing customers with virtual storage for their excess solar energy.

Customers who generate solar energy through panels on their rooftops can virtually store their excess solar energy in the battery (between 6 and 8 kWh). Then later on, when the sun isn't shining, they can withdraw their energy for use. If they don't use it, they get paid a normal feed in tariff. Evaluation from the pilot shows that it's around 30% cheaper for consumers than buying a battery for their home.

Enova takes this model even further by integrating their peer to peer trading platform (PowerTracer) to allow neighbours without solar to buy power generated by their community (without geographic limitations).

Key considerations

- Requires a retail partner with a high degree of trust
- Ownership of the battery (or network of batteries)
- Management of ongoing costs

Potential roles for council

- Community engagement & education
- Assessing or aggregating benefit

Use cases for batteries

GREENFIELD DEVELOPMENTS

There is much greater potential for geographically specific batteries within Greenfield Developments (like the Jacka Community-Scale Battery Project in the ACT). As part of the ACT's aim to achieve zero emissions suburbs, the Jacka project will see 700 new homes that all have solar systems, connected to a neighbourhood (or suburb) scale battery to ensure the estate balances consumption and generation with the grid.

Detailed feasibility, along with proactive discussions between the developer (Suburban Land Agency), the network (Evo Energy) and the ACT Government demonstrate that within a Greenfield site it is possible to achieve a payback period of around three years and through trialling innovative ownership and operation models generate significant community benefit.

Key considerations

- New developments can save on high capacity infrastructure and eliminate the need for gas connections
- Ownership structure needs to be carefully considered
- Community / social benefit (cheaper energy, zero emissions suburb, future proofing for EVs)

Potential roles for council

- Statutory & strategic planning: support to ensure neighbourhood scale storage is considered in Greenfield developments and capacity is aligned to network needs
- Statutory & strategic planning: support to review environmental impact
- Statutory & strategic planning: i.e. seek developer contribution for batteries similar to public parks
- Future proofing: i.e. lead /support research into on occupancy data to create a profile for an all-electric developments, to help prevent over sizing

URBAN RENEWAL

Urban renewal is a strategic and staged transition from an existing (usually lower density) mix of uses to an increased density mixed use precinct. This process is characterised by significant change and therefore the energy system must be adapted to accommodate new development and new uses.

Generally speaking this process of change is guided by multi-stakeholder strategic planning processes where alignment between organisations, local government and community is already taking place. Recent examples in the City of Melbourne include Arden and Fishermans Bend.

When considering future energy demands, the opportunity to deliver zero carbon with or without storage is able to occur at scale and in combination with the siting of other major infrastructure including public transport networks, waste and resource recovery etc.

Key considerations

- The fundamental nature of change allows for decision making with longer term benefits to be considered
- Community members can be engaged in infrastructure location discussions as part of a holistic strategic planning projects where localised impacts can be managed
- Most major stakeholder are already engaged in the process through infrastructure planning

Potential roles for council

- Strategic planning: support to ensure neighbourhood scale storage is considered in urban renewal in response to changing needs of the local energy system
- Strategic planning: environmental impact can be assessed as part of the urban renewal area planning processes
- Benefits aggregation: opportunity to align benefits whilst stakeholders are engaged
- Community engagement: Location considerations can be integrated with consultation on planning documents

COMMERCIAL & INDUSTRIAL PRECINCTS

Shared storage at a neighbourhood scale makes commercial and environmental sense within an embedded network, as can already be found within many commercial and industrial precincts.

While outside the initial scope of this paper (that was specifically looking at in front of the meter solutions), behind the meter generation and storage within an embedded network where there is significant space to generate solar power is a key opportunity for neighbourhood scale storage. In order to maximise the benefit from a model like this, a storage solution could be designed to capture excess generation from oversized systems across the precinct that could be fed into the grid when required by the local network. If there was an opportunity to locate storage next to or near a residential development the storage could be shared even more locally.

Key considerations

- Ownership (likely the embedded network owner)
- Equitable sharing across the site, between businesses and equitable return for excess generation (dependent on the metering solution)
- Community / social benefit (beyond more solar)
- Evening electricity demand to benefit from stored electricity
- Potential cost reductions through energy purchasing arrangements embedded network

Potential roles for council

- Community engagement & education: i.e. promote the benefits of shared storage solutions to businesses in Council's network, education to ensure tenants and landlords understand the offer / contracts etc
- Assessing and aggregating benefit: identify energy solution providers that the business community can trust
- Statutory & strategic planning: review environmental impact

APARTMENTS

Similar to commercial and industrial precincts, apartments are beyond the scope of this paper, however new apartments provide an opportunity to integrate with neighbourhood scale batteries to allow greater use of renewable energy. While apartments are limited in the amount of solar they can generate on-site (and likely to use all energy they do generate rather than needing to store it) a well designed storage solution could draw energy from the grid during peak solar times (10am to 3 pm) to be used in common areas, for EV chargers and within apartments out of hours.

Key considerations

- Space likely to be a challenge - consider how storage can be integrated into EV charging infrastructure within new developments (as technology evolves to allow vehicle to grid transmission)
- Ownership (likely an embedded network provider or the OC)
- Equitable sharing across the site, between apartments - particularly EV owners (dependent on the metering solution)
- Cost sharing
- Understanding the potential cost savings to networks, developers and owners through reducing the capacity requirements (and avoiding gas connections)

Potential roles for council

- Stakeholder engagement & knowledge sharing: i.e. education for developers and strata managers on emerging technology solutions and commercial arrangements for embedded networks
- Stakeholder engagement & knowledge sharing: facilitate discussions between developers and networks to allow for innovative solutions
- Statutory & strategic planning: develop guidelines for developers regarding planning considerations (for all electrical, level-load buildings)
- Future proofing: occupancy research to continue building a range of profiles for an all-electric building, to help prevent over sizing

Recommendations

While neighbourhood scale batteries are gaining significant interest in the industry as a potential solution to network constraints, solar export limits and increasingly distributed generation, they are yet to be rolled out at scale, particularly within a Victorian context.

It is critical to note that almost all of the case studies included in the research are either still in feasibility or have only recently commenced operation (and operate with heavy government investment, not as a result of particularly strong commercial drivers). The community battery models from WA at Western Power are the furthest progressed and operate within a very different context to the Victorian market.

If the City of Melbourne, in partnership with other local governments, wants to lead development and implementation of batteries at this scale there are several key considerations that have to be addressed. These are highlighted opposite.

Although outside the scope of this assessment, there are alternative models for supporting the uptake of batteries such as group (or bulk) purchasing, incentives (that build on state government funding) or on-bill finance (through rates or in partnership with retailers) that could be explored in future work.

The table over the following pages highlights the potential roles for local government alongside an evaluation of the opportunities and risks associated with pursuing these roles.

UNDERSTAND & ARTICULATE THE PROBLEM

It is essential that the specific problem and use case that each neighbourhood battery is trying to address is well understood and articulated with all key stakeholders. All the research and stakeholder conversation have consistently highlighted that battery solutions at this scale are contextual. While there are undoubtedly many co-benefits associated with any model, the design of the solution has to start with a very specific problem (or the range of problems prioritised).

For example designing a pilot to support solar households that cannot export to the grid (and are missing out on feed-in tariffs) is a different problem to solve than renters from low income backgrounds unable to access locally generated solar.

Understanding the specific problem will also allow Council to more objectively assess whether neighbourhood-scale batteries are necessarily the right solution (including whether there is a role for local government at all), or if there are alternative models and energy innovations that better serve the purpose.

LOCATION, LOCATION, LOCATION

As has been consistently highlighted in this paper, while community appetite for local storage solutions might be strong, the physical reality of a battery in a park or other public space creates a significant hurdle to overcome, particularly in inner metropolitan Melbourne. Understanding where to locate batteries is going to be critical (and a key consideration when assessing a physical versus a virtual network of batteries). Urban renewal areas such as Arden and Fishermans Bend offer scope as provision can be integrated with land use change and reduce impacts on the community. Optimising placement of neighbourhood batteries regardless of ownership or operational roles will be a key role of Council. Potential next steps are outlined in the following table under strategic planning.

OWNERSHIP

While it would seem simpler in many ways for ownership to remain with incumbent energy businesses like the retailers or networks, community trust is a critical ingredient in the success of neighbourhood batteries (and often very low with businesses in the energy sector). Therefore establishing and communicating a transparent rationale for the ownership structure for the battery is critical.

However, if ownership rests with a third party such as a local government or community energy group it will be critical to upskill and support the staff as this will be a complex and very new field to work in. A variety of risks exist through an ownership role for local government.

ASSESSING COMMUNITY & SOCIAL BENEFIT

Noting that one of the key criteria for establishing neighbourhood scale batteries for the City of Melbourne is to ensure that they deliver community and social benefit, Council should develop a clear set of criteria that each project can be assessed on. At minimum this should address benefit to various community members (including those that are locked out of other methods of participation) and the extent to which the benefit is localised compared to any visual or other impact of the infrastructure.

This would include the extent to which projects allow additional solar to feed in to the grid (accelerating the goal of 100% renewables within the municipality), or the extent to which they allow people locked out of solar to buy locally generated renewable power.

SCALE

While local government has very ambitious plans (including a network of storage options, partnering with retailers etc), there is so much to learn in this space (it is very clear from this research that EVERYONE is learning). Finding opportunities for lower risk piloting of small scale solutions with their own assets may provide momentum, build knowledge and critical capability development.

Recommendations

POTENTIAL ROLE	IMPACT	EFFORT	DESCRIPTION	RISKS AND OPPORTUNITIES	DIRECTION
Stakeholder engagement & knowledge sharing	Medium	Medium	– This potential role involves leveraging CoM's role as a key stakeholder to align stakeholder discussions and share knowledge more broadly – This may include facilitation of stakeholder connections, between for example DNSP's and developers – A key part of this role would be to share knowledge, including dissemination of key learnings to stakeholders, including to developers on how private land opportunities could be pursued	**Low risk** as a known role for Councils (no capital investment, low risk of community opposition) Opportunities exist for – Reduced duplication of effort – Clearly articulated barriers and potential for multistakeholder solutions – Avoidance of repeatable mistakes – Assists benefit alignment – Informs technical industry development and knowledge of 'hot spots' – Can connect planning opportunities with other stakeholders – Collaboration with other local governments through for example the Greenhouse Alliances	Recommended as a primary role for local government including CoM. Exact role to be defined, but recommended to be focused on stakeholder connection and facilitation. Detailed stakeholder mapping to be undertaken as next step.
Community engagement & education	Low	Low	– This potential role includes ongoing outgoing communications and education to community (both residents and businesses) – This would include community information sessions relating to neighbourhood battery information and also collecting community feedback on specific issues – Could also include community access to purchasing arrangements (similar to solar programs in the past - vetting potential installers, or connecting up local trades to install)	**Low - Medium Risk** (no capital investment, some risk associated with CoM as a communications source) Opportunities exist for: – Community testing of suitable siting of neighbourhood batteries – Connecting community interest to community battery projects – Promoting the benefits of (shared) storage solutions to businesses – Communicating CoM's ongoing role in the development of neighbourhood batteries	Recommended as a secondary role for local government, including CoM. Awareness raising and general communication align with CoM's existing role, however CoM should clearly articulate its role in testing suitable siting of neighbourhood battery infrastructure which it does not propose to own / operate i.e. limit involvement around specific sites and test the site characteristics which have greatest community benefit.

Recommendations

POTENTIAL ROLE	IMPACT	EFFORT	DESCRIPTION	RISKS AND OPPORTUNITIES	DIRECTION
Statutory & strategic planning	High	Medium	– This potential role involves using CoM's influence as a responsible authority and in the development of planning policies and place based plans to deliver a supporting operating environment for neighbourhood batteries to be delivered – This includes clarifying planning definition for neighbourhood battery infrastructure	**Medium Risk** (no capital investment, some risk associated with CoM developing specific policy and strategy to facilitate neighbourhood batteries in CoM locations) Opportunities exist for: – Development of siting guidelines incorporating community feedback – Highlighting locations for potential neighbourhood batteries in strategic planning documents such as urban renewal area structure plans – Development of ESD policy to support implementation of batteries in private development and to capture the benefit of EV vehicle batteries as a 'solar sponge' and in the future to aid vehicle-to-grid capability – Encouraging neighbourhood batteries as a development option within strategic sites	Recommended as an extension of council's existing planning influence role. Whilst a statutory role already exists, decision making would be improved through further strategic work on battery siting. A key role is for strategic planning to advocate for local energy storage solutions through urban renewal planning where a clear community benefit can be established and amenity impact addressed. Further work is required to monitor and implement best practice in relation to building based approaches to incorporation of neighbourhood batteries and integration of vehicle-to-grid capacity.
Future proofing (monitoring technical and industry development)	Low	Low	This role involves future proofing CoM's own asset management, its stakeholder relations and planning system by keeping a highly active watching brief on technological and industry development on neighbourhood batteries.	**Low Risk** (no capital investment) Opportunities exist for: – Improving the value of stakeholder relationships with DNSP's and others – Improving the value of assets by maintaining a working understanding of neighbourhood batteries and when investments may be worthwhile (reduced risk or significantly improved benefit) – Improve planning policy and associated guidelines by maintaining awareness of evolving best practice	Recommended as an enabling mechanism to support other roles for CoM. A critical role is to upskill those with influential roles within the organisation to make informed decisions, including statutory and strategic planners and asset managers. As a highly complex space, these staff members would require ongoing support.

Recommendations

POTENTIAL ROLE	IMPACT	EFFORT	DESCRIPTION	RISKS AND OPPORTUNITIES	DIRECTION
Assessing shared benefit	Low	Medium	– This potential role involves assessing the benefits which are available from neighbourhood battery projects with a view to taking a role in communicating benefits more broadly	**Medium Risk** (capital investment not required, operational risk (including financial and reputational) Opportunities exist for – Assisting community groups to participate in neighbourhood batteries – Endorsing a proposal as a project partner (Council are in a much improved trust position compared to energy stakeholders)	Recommended where substantial community investment is required, however Council should exercise caution in publicly endorsing projects. Council could reduce risk by providing support to community projects (e.g. legal), may assist project development where a clear community benefit case exists (e.g. equity considerations met)
Aggregating benefit (and directly participating in projects)	Medium	High	– This would include assessing individual project opportunities proposed by others for potential investment / involvement or even leading a neighbourhood battery project – The major value is in reducing barriers for further projects, however the circumstances are so contextual that replication is challenging	**High Risk** (capital investment required, operational risk (including financial and reputational) – Being the proponent of a neighbourhood battery on Council land (potentially in conjunction with a Council owned car park allowing EV integration) – Aggregating the benefit for a project where benefits are not sufficient for any one party to lead, but Council absorbs the risk by aggregating and then distributing benefits	Recommended only in very specific circumstances. The level of risk associated with any capital investment is high, so CoM should restrict capital investment in projects to those that meet existing grant requirements, where a strong project business case exists. This opportunity is very different to MREP, where the model could be scaled / adapted by others.

We respectfully acknowledge that every project enabled or assisted by HIP V. HYPE in Australia exists on traditional aboriginal lands which have been sustained for thousands of years.

We honour their ongoing connection to these lands, and seek to respectfully acknowledge the traditional custodians in our work.

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For additional information, questions unturned, collaboration opportunities and project enquiries please get in touch.

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