THE MCKELL INSTITUTE

Power to the People:

Proposals to Increase the Rollout of Community Batteries

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About this Report

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Overview

Australia as a renewable energy superpower

Australia has the best solar resources and some of the best wind resources in the world. As more and more countries commit to zero net emissions by 2050, Australia can become a renewable energy superpower, creating permanent, secure jobs – if it makes a similar commitment backed by decisive action. During sunshine hours and windy parts of the day, renewables are a cheaper form of electricity than fossil fuels, because renewables have no fuel costs.

The biggest challenge in making the transition from fossil fuels to utilising Australia's abundant renewable energy sources is to meet the demand for electricity when the sun isn't shining and the wind isn't blowing and to ensure the system remains stable. That requires the storage of electricity. Batteries are a big part of the solution.

Batteries are a big part of reducing electricity prices as Australia becomes a renewable energy superpower.

There are three broad sizes of batteries: grid-scale batteries serving large parts of the national electricity grid; customer-owned batteries such as home batteries that service the needs of an individual customer; and local community batteries that serve small groups of a few dozen up to a few hundred households.

Grid-scale batteries

Already the private sector is installing grid-scale batteries at a rate far exceeding the expectations of the Australian Energy Market Operator (AEMO). These grid-scale batteries, like the Tesla big battery installed as part of the Hornsdale Power Reserve in South Australia in 2017, help stabilise the grid through frequency control when massive amounts of electricity from renewables are sent into the grid at times when lots of solar and wind are available.

Grid-scale batteries complement pumped hydro, which is also a form of grid-scale storage. Pumped hydro involves using some of the electricity generated at very low cost by wind and solar to pump water back up for release in the evenings when electricity is expensive. In this way, pumped hydro makes hydroelectric power available around the clock.

Grid-scale batteries will operate in tandem with private pumped hydro generators and with Snowy 2.0 and Tasmania's proposed Battery of the Nation that is expected to connect new Tasmanian pumped hydro generators to the mainland via the Marinus Link, complementing the existing Basslink interconnector.

Hydrogen is also likely to become a viable form of storage in the future but isn't commercially ready yet.

Already the private sector is installing grid-scale batteries at a rate far exceeding official expectations.

Rooftop solar systems

Australia has the highest uptake of rooftop solar in the world, with almost 2.6 million rooftop solar systems installed across the nation on more than one in five homes. Despite small-scale solar having grown at the phenomenal rate of 43 per cent per annum over the last decade, renewables – both small and large scale – still account for only 28 per cent of all electricity generated in Australia.

As Australia's ageing coal-fired power stations are retired, including Liddell in 2022-23 – and with no private-sector plans to replace them with more coal-fired generation – Australian households will become ever more reliant on electricity generated by renewables. Gas will play a vital role during peak demand times of the day when solar and wind are unavailable, typically in early evenings, but burning gas is expensive and will be run in tandem with renewables and storage where available. Coal-fired generation is not suitable since it must run the clock even if it is not being dispatched and not earning revenue.

Australia has the highest prevalence of rooftop solar systems in the world, but large-scale and small-scale renewables still account for only 28 per cent of all electricity generated in Australia.

Very few households with rooftop solar also have home batteries

While households with rooftop solar systems can typically generate enough electricity for their own needs during the day, at present they are mostly dependent at night on the grid currently supplied by fossil fuels; only one in 13 Australian solar households have their own battery storage.

One reason for this difference in the prevalence of rooftop solar and household batteries is that rooftop solar systems have been subsidised by governments whereas batteries have not. This is beginning to change, with states and territories offering modest subsidies for the installation of household batteries.

Only one in 13 Australian solar households have their own battery.

Community batteries as an alternative to home batteries

The zero fuel costs of renewables make them superior to coal and gas when the sun is shining and the wind is blowing. Some energy demand can be shifted to coincide with the times of day when renewables are generating supply, through measures such as turning on water heating and air-conditioning units and charging electric vehicles at those times. But a major challenge remains: how best to store excess electricity generated by rooftop solar for use when the sun isn't shining and the wind isn't blowing.

The answer is community batteries. A community battery is a locally based shared battery that enables customers to store excess electricity generated by rooftop solar systems which they can utilise at a later time – typically in the evenings – to reduce their need to import electricity from large coal generators.

Community batteries cut down on the total capital cost of each household installing its own battery and avoid the problem of some households installing too much battery storage for their own needs and others installing too little. Furthermore, as people go on holidays, their household battery capacity is unused,

whereas a community battery's stored electricity can be used to maximum advantage for all concerned, reducing overall electricity prices.

Community batteries cut down the cost of each family having to pay for the installation and maintenance of its own household battery.

A community battery can also be used to support the operation of the local distribution system. Local distribution network companies are responsible for ensuring the reliability, safety and power quality of their networks. Surges of rooftop solar electricity into the local grid can adversely affect a local network, necessitating network upgrades. Storing some of the electricity generated by rooftop solar systems in community batteries can minimise the need for these upgrades. Similarly, by discharging into the network during periods of peak demand, community batteries can help avoid the cost of expensive power at these times.

Community batteries can avoid the cost of local upgrades to strengthen the grid.

Electricity prices can be very low or even zero when the sun is shining but rise sharply in the early evenings when it isn't shining. Community batteries can store electricity generated by rooftop solar systems during the day for sale in the evenings when prices are high. Since community batteries are connected to wholesale energy markets, households can benefit from financial participation in these markets, through the energy they don't use themselves being sold into the market at times of high demand and high prices.

Community batteries can enable households with rooftop solar systems to benefit from selling electricity into the grid and/or using that stored energy in the evenings when prices are high.

Of course, those households that prefer to manage their own energy systems would remain free to install their own batteries. Community batteries are well-suited to new developments and to established local communities that prefer them over household batteries.

Community batteries can be to the 2020s what the solar panel revolution was to the 2000s.

Where are community batteries being installed?

Community batteries are beginning to be rolled out in various locations around Australia, including in Sydney, Lake Macquarie and Kurri Kurri in NSW, Black Rock and Highett in Melbourne, Mandurah and Ellenbrook south of Perth and several other locations in Western Australia, in various remote communities in the Northern Territory and, in the planning stages, in the new Canberra suburb of Jacka.

Community batteries are being installed at locations right around Australia.

Just as has happened with rooftop solar systems, the cost of community batteries will continue to fall. They can readily be installed in new housing sub-divisions, regional areas and country towns.

Since community batteries are usually the size of a 4WD vehicle or a garden shed, they can also be located on suitable local council or state government land in established suburbs or, as in the case of Melbourne's Blackrock and Highett, smaller versions can be installed on poles.

Community batteries are the size of a 4WD vehicle and can be installed in new suburbs and on government land in existing suburbs, towns and remote communities.

Community batteries can increase the take-up of rooftop solar

As community batteries become more widely available, homeowners who have considered but not yet made the switch to solar are likely to find rooftop solar plus a community battery an attractive proposition.

Community batteries can increase the take-up of rooftop solar and increase the amount of locally produced solar is used locally, further reducing household electricity costs.

Community batteries can increase the take-up of rooftop solar by providing a cost-effective solution to the unavailability of solar when the sun isn't shining.

Community batteries enable renters and apartment dwellers to gain

At present, renters and people living in apartments do not have the opportunity to share in the benefits of rooftop solar because they cannot install rooftop solar systems. Community batteries enable these people to reduce their electricity bills by drawing electricity stored in batteries.

Community batteries can enable renters and apartment dwellers to benefit from rooftop solar.

Are community batteries economically viable?

A report prepared for the Australian Renewable Energy Agency (ARENA) by experts at the Australian National University has demonstrated that community batteries, properly configured, are economically viable, with benefits outweighing costs. A report by KPMG for Ausgrid in NSW reached similar conclusions.

The most viable community batteries at present appear to be small-scale batteries of 500kWh in low-voltage, larger distribution centres of up to 250 customers. However, this is likely to change over time as battery technology improves and costs continue to fall.

Well-designed and located community batteries are already economically viable and will become even more so as costs continue to decline.

How government and regulators can support community batteries

In his Budget Reply of 2020, Labor Leader Anthony Albanese announced a Labor government would establish a Rewiring the Nation Corporation with off-budget funding of $20 billion to rebuild and modernise

the national energy grid. The corporation would make investments and partner with industry to deliver AEMO's Integrated System Plan.

Where investment in community batteries satisfies the commercial guidelines governing the Rewiring the Nation Corporation, and a case can be made on cost-benefit grounds for bringing forward particular investments, a portion of funding for the Rewiring the Nation Corporation could be used for community batteries. Alternatively, community batteries could be supported by a separate fund.

A portion of funding from the Rewiring the Nation Corporation announced by Labor Leader Anthony Albanese could be used to facilitate the rollout of community batteries.

The Regional and Remote Communities Reliability Fund – Microgrids offers grants of between $100,000 and $10 million to support feasibility studies into more reliable, secure and cost-effective energy supply to regional and remote communities in Australia. This fund could be continued beyond 2023-24 and is appropriate for community batteries and stand-alone power systems in regional and remote communities.

The existing Regional and Remote Communities Reliability Fund could be extended to assist in the rollout of community batteries in regional and remote communities.

Electricity distribution network companies are demonstrating enthusiasm for community batteries. Three additional possible policy measures to accelerate the rollout of community batteries are set out below. They are not mutually exclusive; any one of them could be implemented on its own or all three could be implemented together.

Proposal 1: System strength obligation on distribution networks

Recent changes to the regulatory framework have resulted in transmission networks being tasked with providing system strength so that individual large-scale renewable generators are not burdened with an obligation that is difficult for them to achieve. A similar obligation could be placed on distribution networks to provide system strength commensurate with the small-scale renewables connected to the distribution network.

This would result in community batteries becoming a more competitive solution when networks consider investments and would unlock system benefits that could push down prices for customers.

Proposal 2: Communities can request a battery

Distribution networks would be required to assess the feasibility of installing a community battery requested by a community or local council and, if a proposal is found to be feasible, proceed with it.

This would create a simple option for community members who want to take advantage of sharing in a community battery rather than each investing in their own. Where community batteries alleviate network constraints or are leveraged to support the wider system, all customers would benefit.

Proposal 3: Networks can own batteries that are metered

Under the current regulatory framework, distribution networks are prohibited from generating electricity. Consequently, as soon as a battery is used to generate electricity, distribution networks have a problem. The regulatory arrangements need to change to permit community batteries and to permit those batteries to provide frequency and inertia services. The restrictions could be removed through established mechanisms for rule changes overseen by the Australian Energy Market Commission. Allowing batteries to remain network assets when metered would make it possible for networks to invest in community batteries. Some steps are being taken in this direction.

Comment on these options in most welcome, as are any other practical proposals for accelerating the rollout of community batteries.

Further policies could be considered to roll out community batteries: an obligation on distribution networks to provide system strength; requiring distribution networks to proceed with feasible community battery requested by a community or local council; and allowing distribution networks to own metered community batteries.

Batteries in stand-alone power systems

A battery can be a component of a stand-alone power system comprising rooftop solar panels, a battery and a backup diesel generator. Stand-alone power systems are being planned for exposed communities such as Mallacoota that was ravaged by last summer's bushfires. In NSW, Essential Energy is trialling the installation of stand-alone power systems on rural and semi-rural properties.

While stand-alone power systems can operate disconnected from the grid, they still need a backup diesel generator to maintain supply for extended periods of bad weather and peak daily demand.

In the aftermath of last summer's bushfires, stand-alone power systems that include batteries should be considered for communities that are vulnerable to extreme weather.

Required regulatory reforms for stand-alone power systems

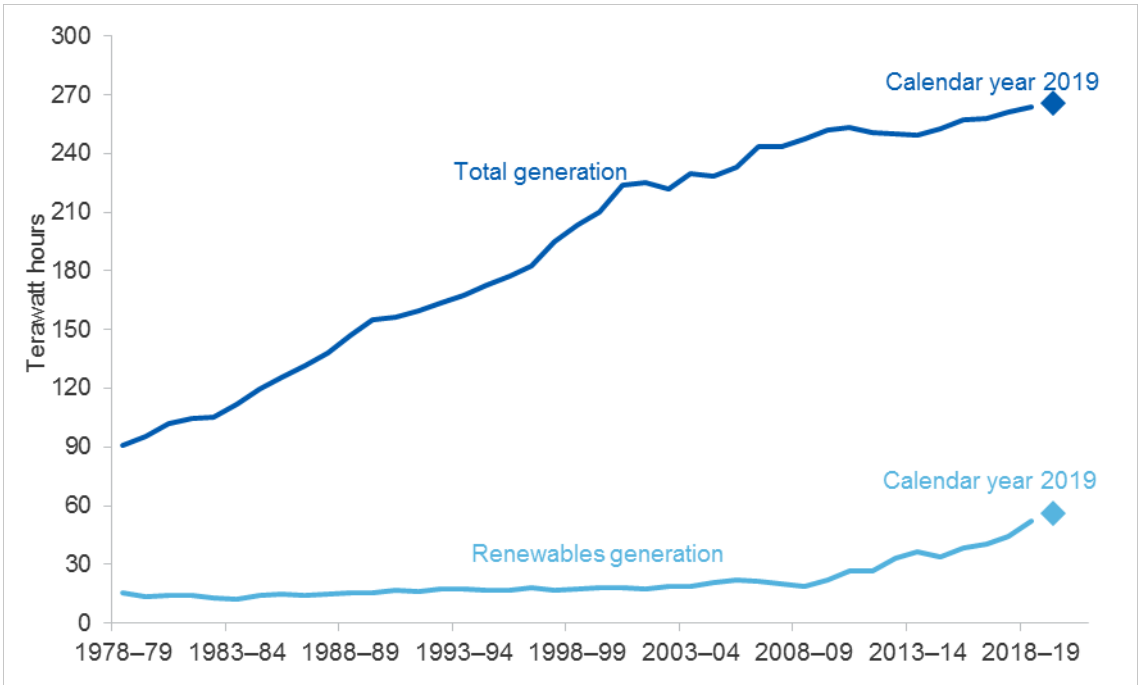
The necessary regulatory changes to facilitate the installation of stand-alone power systems have already been agreed by federal and state governments and the enabling legislation was introduced into the South Australian parliament in November 2020. When it is passed it will be replicated in the other jurisdictions.

The required regulatory reforms for stand-alone power stations are already in train.

Why batteries?

Wind and solar, as well as hydro, are contributing an increasing share of Australia's electricity generation (Figure 1). Although the average growth in electricity generation from renewables over the last 10 years has exceeded 10 per cent per annum, while electricity generated by fossil fuels has declined by around 1 per cent per annum, Australia still relies heavily on fossil-fuel generation. Fossil fuels account for around 72 per cent of electricity generated and renewables about 28 per cent.

Figure 1: Australian electricity generation



SOURCE: DEPARTMENT OF INDUSTRY, SCIENCE, ENERGY AND RESOURCES (2020), P. 26.

By far the fastest-growing source of electricity generation over the last decade has been small-scale solar, which has grown at a phenomenal average rate of 43 per cent per annum. However, small-scale solar still accounts for only 4.7 per cent of electricity generated (Department of Industry, Science, Energy and Resources 2020, Table 3.2, p. 28 and Table 3.3, p. 31). Small-scale solar's share of electricity generation is expected to increase from 4.7 per cent to around 10 per cent by the mid-2020s.

Australia has the highest uptake of rooftop solar in the world. More than 21 per cent of homes have rooftop solar systems. Almost 2.6 million rooftop solar systems have been installed across Australia.[1]

[1] https://www.energy.gov.au/households/solar-pv-and-batteries

As Australia's ageing coal-fired power stations are progressively retired, beginning with Liddell in 2022-23, we will need to install much more capacity to store electricity for the evenings when it is most needed. A proportion of the required storage capacity will come from pumped hydro, where electricity predominantly generated during the day when electricity is cheaper because of the availability of solar, is used to pump water back up for release in the evenings, when electricity is in short supply and therefore more expensive.

Private pumped hydro power stations are being installed, along with the Commonwealth-owned Snowy 2.0 and Tasmania's proposed Battery of the Nation that is expected to connect new Tasmanian pumped hydro generators to the mainland via the Marinus Link, complementing the existing Basslink interconnector.

Grid-scale batteries will operate in tandem with pumped hydro in providing storage capacity. The market is rolling out grid-scale battery storage at rates far exceeding those forecast by the Australian Energy Market Operator (AEMO) (PV Magazine 2020; Macdonald-Smith 2020).

As long as governments do not intervene in the market in ways that increase the commercial risk associated with grid-scale battery storage, their rapid rollout could be expected to continue.

Examples of grid-scale batteries

Examples of grid-scale battery projects in various states and territories are set out below.

South Australia

Australia's first grid-scale battery – the Tesla big battery – was installed by Neoen as part of the Hornsdale Power Reserve in 2017 following major power outages when severe storms blew down transmission towers and lines. In 2020, the capacity of the Neoen battery was expanded by 50 per cent to 150MW.

ElectraNet's Dalrymple battery is a 30MW battery array on Yorke Peninsula adjacent to ElectraNet's existing Dalrymple substation.

Neoen has filed a development application for what ultimately could be 900 MW of battery storage in the Goyder region of South Australia. The first stage of 300MW is very likely to go ahead.

AGL has announced it will build a grid-scale battery system in stages on the site of the Torrens Island Power Station, with a capacity of up to 250MW.

Victoria

Neoen has announced it will also build a 300MW battery near Geelong.

Two grid-scale batteries are already operating successfully in Victoria: northern Victoria's Gannawarra Energy Storage System with a 25MW battery and the Ballarat Battery Energy Storage System with a 30MW battery.

NSW

AGL has announced plans for a grid-scale battery of up to 500MW on the site of its Liddell coal-fired power station in the Hunter Valley, which it expects to fully retire in 2023-24. AGL has also signed agreements with Maoneng Group to develop four 50MW grid-scale batteries in NSW.

Also in the Hunter Valley, Origin Energy has announced plans to build a 700MW grid-scale battery at its coal-fired power plant at Eraring, south of Newcastle.

CEP Energy has announced plans to build a 1,200MW grid-scale battery at the industrial centre of Kurri Kurri in the Hunter Valley, the same location as the Morrison Government's foreshadowed publicly owned battery. The CEP battery is likely to displace the Morrison Government's proposal. The site is zoned for heavy industrial use and is adjacent to existing substation infrastructure. The battery, one of the world's largest, will help fill the gap left by the closure of the nearby Liddell coal-fired power station.

Neoen plans to build a 500MW grid-scale battery at the site of the former Wallerawang power plant near Lithgow.

Transgrid has secured federal and state government funding to install a 50MW grid-scale battery at its Wallgrove substation in western Sydney.

Queensland

AGL has announced a 100MW grid-scale battery for Wandoan in the Western Downs to be built, owned and maintained by Vena Energy Australia.

Planning approval has been granted by the Queensland Government for Wambo Wind Farm, also in the Western Downs, involving a 50MW grid-scale battery, which is being developed jointly by UK-headquartered renewables firm Cubico Sustainable Investments and Australian company Renewable Energy Partners.

Northern Territory

The Northern Territory Government has approved a 30 MW battery for the Darwin-Katherine grid expected to be operational in the second half of 2022.

ACT

The ACT Government has announced that two grid-scale batteries will form part of the next stage of its renewable energy plan.

Community batteries delivering power to the people

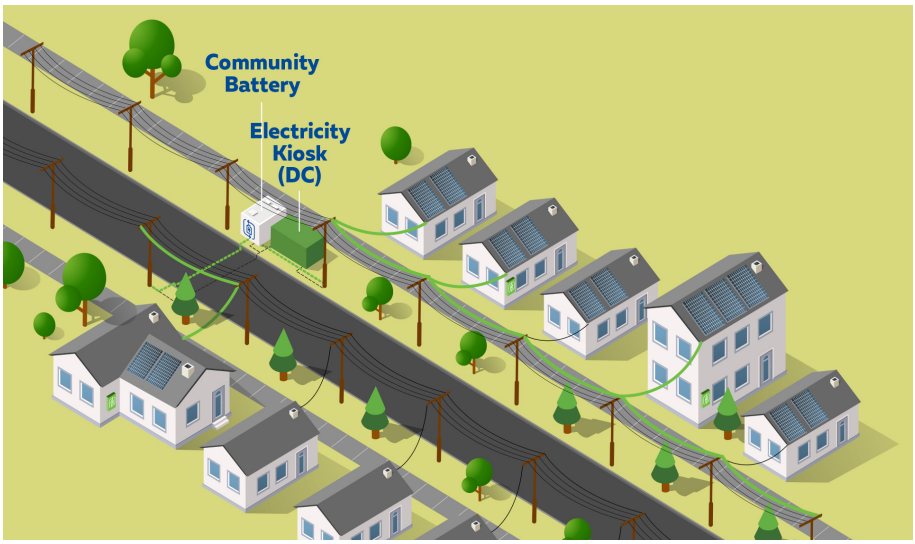
What are community batteries?

A community battery is a locally based shared battery that enables customers to store excess rooftop solar-generated electricity which they can utilise at a later time – typically in the evenings – to offset their need to import electricity from the grid.

Only one in 13 Australian solar households – less than 8 per cent – also have battery storage (Renew Economy 2020). A limitation on the rate of installation of new rooftop solar is the cost-effective storage of electricity for use when the sun is not shining.

An efficient and effective way of accelerating the rollout of battery storage – thereby increasing the attractiveness of rooftop solar – can be community batteries. Community batteries can be expected to add to the nation's storage capacity.

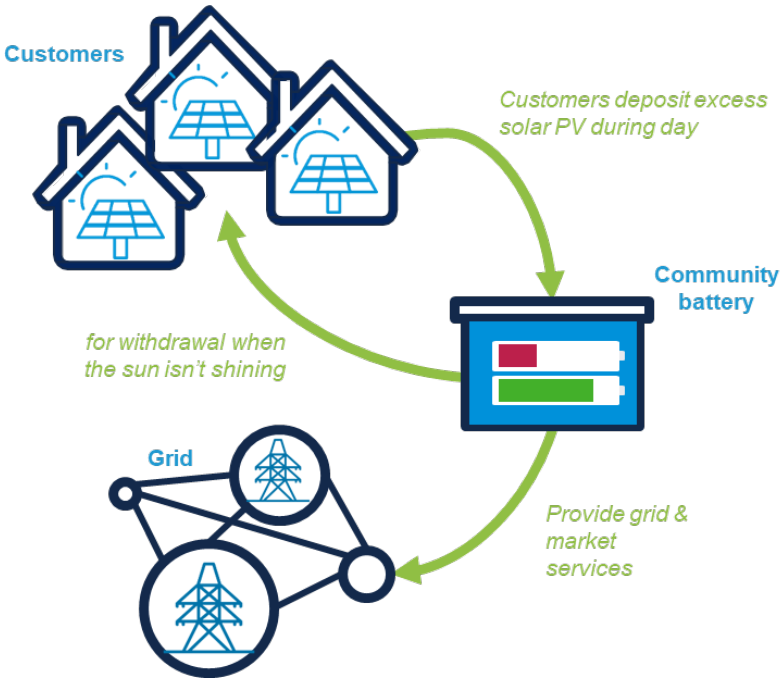
Chart 1: A community battery



A community battery is an energy storage system shared with a local community. It is an alternative to installing a household battery. It is about the size of a 4WD car or a garden shed. It offers households with rooftop solar systems the opportunity to store their energy in a battery and use it later, usually in the evenings, when the cost of electricity from the grid would otherwise be higher.

A community battery can store the equivalent of around 25-45 average household batteries. A community battery enables households with rooftop solar systems to obtain the benefits of a battery without having to buy one upfront.

Chart 2: How a community battery works



Household rooftop solar systems generate electricity during the day and deposit excess electricity into a community battery. A proportion of this stored electricity is withdrawn by households for use when the sun isn't shining. The remainder of the electricity stored in the community battery is made available to the grid, to help stabilise it where necessary and for sale at times of the day when electricity prices are high.

Benefits of community batteries

Economic benefits

The economic benefits of community batteries include:

1. Reduced costs of storing solar-generated electricity;
2. Savings in fuel costs from fossil fuels;
3. Supporting more solar connected to the local network;
4. Creating flexibility for a range of energy futures;
5. Stabilising the grid; and
6. Facilitating household participation in the market.

Reduced storage costs

Community batteries offer savings in capital costs overall compared with the cost of each household installing its own battery. They also offer savings in maintenance costs, since maintenance would need to be performed on only one piece of capital equipment per community area rather than on up to hundreds of household batteries. Moreover, households would not be stuck with a fixed storage capacity, enabling them to change storage sizes if their rooftop solar size increases or if their consumption patterns change.

Savings in fuel costs

The increased availability of electricity through greater storage capacity can reduce the need for non-renewable, fossil-fuel capacity with expensive fuel costs at times of peak demand, such as in the early evenings. This, too, can place downward pressure on household electricity prices.

Supporting more solar

Community batteries can store energy from rooftop solar that would have otherwise been curtailed because of congestion on the local network. This means not only can storage shift the energy to the evening when it is of use, but more rooftop solar can be supported in the local network, improving the return for households investing in rooftop solar.

Creating flexibility

In a rapidly changing environment, community batteries offer network operators additional flexibility in addressing a range of future scenarios. For example, community batteries are equally capable of supporting a sudden take-up of electric vehicles in an area as they are in supporting an increase in rooftop solar. This flexibility means community batteries can reduce or avoid the need for network reinforcement, reducing total network capital costs and overall electricity prices.

Stabilising the grid

Large numbers of rooftop solar systems discharging electricity into the grid at peak generation times during the day create problems of grid stability that are costly to mitigate. Storing a proportion of peak rooftop solar electricity into community batteries would ease the problem of grid instability, thereby reducing grid management costs and electricity prices.

Household participation in the market

Community batteries can enable the participation of householders in the supply of electricity at times of day, typically early in the evening, when electricity is in heavy demand and prices are high. Electricity stored in community batteries that is not needed by a local community can be discharged into the market at peak times, reducing overall electricity prices.

Cost-benefit analyses

A report prepared for the Australian Renewable Energy Agency (ARENA) by experts at the Australian National University (Shaw 2020) has demonstrated that community batteries, properly configured, are economically viable, with benefits outweighing costs.

A report by KPMG (2020) for Ausgrid in NSW reached similar conclusions. As part of its feasibility study, KPMG analysed a sample of 2,800 customers in Ausgrid's network. While a majority of daily storage requirements fell in the range 3-5kWh, if a household installed a 5kWh battery it would be undersized for some households and oversized for others at different times of the year. A community battery would

substantially solve this problem, while the diversity in households' energy profiles would result in a smaller overall battery capacity to meet most households' storage needs (KPMG 2020, p. 15).

The most viable community batteries at present appear to be small-scale batteries of 500kWh in low-voltage, larger distribution centres of up to 250 customers. However, this is likely to change over time as battery technology improves and costs continue to fall.

Community batteries are good for household electricity bills and good for the planet.

Social benefits

Renters and apartment owners usually cannot benefit from rooftop solar systems. They can, however, benefit from being able to use the electricity generated by rooftop solar systems through their access to community batteries. In this way, community batteries spread the benefits of rooftop solar systems to a larger proportion of the population.

Installed and planned community batteries

Community batteries are being trialled at various locations around Australia. Some examples are described below.

New South Wales

A Community Battery Initiative is set to be rolled out by Ausgrid in NSW. Phase 1 trials are expected to be undertaken from early 2021 in cooperation with three local council areas: City of Canterbury Bankstown Council, Lake Macquarie City Council, and Northern Beaches Council. These council areas have been chosen on the basis that they have a large number of customers served by Ausgrid's local distribution kiosks who already have rooftop solar systems.

An objective of the Ausgrid trial is to allow households with rooftop solar to share in a community battery as an alternative to installing their own individual batteries. The Ausgrid trials will inform how best to combine the uses of community batteries. Additional batteries in other locations are likely to be considered in future phases of the trial.

Ausgrid's Community Battery Initiative has been informed by a feasibility study conducted by KPMG (2020). The KPMG report concludes Ausgrid's Community Battery Initiative is feasible. For the trial, KPMG recommends a standardised Ausgrid "K-Type" kiosk (3.7m x 1.8m) with a capacity of 500kWh, serving 100-200 customers.

The Beehive Project, led by Enova Community Energy, will trial a shared community battery involving up to 500 households. It will feature a 1MW Tesla battery around the size of a shipping container located in the town of Kurri Kurri. The battery will be paired with an online platform, developed by Enosi, which will enable trading and sharing for participating solar and non-solar households situated anywhere in NSW. It will share data with researchers at the University of Newcastle for use in evaluating the trial.

Western Australia

Western Power has partnered with Synergy to install three community-scale batteries utilising Tesla technology: at Meadow Springs, Mandurah, with the first trial launched in October 2018; an extension of that trial to Falcon, Mandurah; and at Ellenbrook, a PowerBank trial launched in February 2020.

A further nine PowerBank batteries have been installed as part of the Western Australian Government's Distributed Energy Resources (DER) Roadmap, at Canning Vale, Dunsborough, Ellenbrook, Leda, Parmelia, Port Kennedy, Singleton, Two Rocks and Wanneroo.

In a project for Kalgoorlie-Boulder, Synergy will recruit 50 local customers through a partnership with Western Power, who will then be able to store up to 8kWh per day of excess rooftop generation. Householders can then draw electricity back from the PowerBank during the afternoon and evening peak without the need to install their own battery systems.

The PowerBank community battery is the first in Australia to integrate bulk solar battery storage into the existing grid which also provides customers with a retail storage option. Charges to household customers for the use of community batteries have been in the order of $1.10-$1.50 per day.

Victoria

United Energy is installing two pole-mounted batteries for local communities in Melbourne, in the suburbs of Black Rock and Highett. Both these suburbs are areas where there are constraints on the network such that on peak demand days there is a risk of outages because the network cannot physically move enough electricity to meet customer demands.

Installing batteries to provide an alternative source of electricity for these areas can therefore help maintain reliability while deferring more costly network investment. This project does not offer direct benefits to households, but they stand to benefit from the avoided cost of network upgrades through retail prices being lower than they otherwise would have been.

In March 2021, the Victorian Government launched a $3 million Neighbourhood Battery Initiative. It will facilitate trials and demonstrations of new energy storage models, ideally in the range 100kW to 5MW, from feasibility through to implementation. It will improve understanding of the role community batteries can play in Victoria's electricity system as it moves towards renewables, and demonstrate the benefits for Victorian communities, energy users and electricity networks.

Queensland

A 4MW community battery has been installed at Bohle Plains on the northern outskirts of Townsville and is being charged with excess solar power from Townsville's residential rooftop solar systems. The Townsville system will form part of a 135 MW Virtual Power Plant, owned and managed by Yurika, an arm of publicly owned Energy Queensland. The 135 MW of excess solar will be provided by 10 suppliers around Queensland. This project operates in the market and does not offer direct services to households.

ACT

The new 700-home development of the suburb of Jacka in the ACT is designed to have solar panels on every house, making it a potentially attractive site for a large community battery. The ACT Government and Evoenergy are partnering with the Australian National University to examine the feasibility of a battery for the development.

A team led by Dr Marnie Shaw, Senior Research Fellow in the School of Engineering and a Research Leader in the Battery Storage and Grid Integration Program at the Australian National University, has estimated a battery would generate customer savings of double the cost of the battery (Chirgwin 2020).

Northern Territory

Community batteries are being installed in various remote Aboriginal communities, reducing those communities' reliance on diesel generation to complement solar power.

Building regional and remote community resilience through stand-alone power systems

Last summer's bushfires claimed 33 lives directly and scores more from smoke inhalation, along with more than one billion animals, devastating farmlands and regional communities. The fires also exposed a lack of resilience in electricity systems.

In NSW alone, Essential Energy, which owns, maintains and operates the electrical distribution networks for much of the state, estimates the fires destroyed 3,200 poles, the previous largest losses from fires being 400 poles (Bainbridge 2020).

Many rural properties are supplied by long lines of poles, which can be destroyed by fires. Not only does this cut off power, including to power water pumps, it is also very expensive to replace them.

Regional and rural communities could be candidates for stand-alone power systems, which combine solar and wind power with batteries and diesel backup.

Essential Energy is trialling the installation of stand-alone power systems on rural and semi-rural properties, comprising 10KW of solar panels, a 30KW battery and a 10KW backup diesel generator.

The town of Mallacoota that was ravaged by fire last summer is connected to the grid by a long, single powerline. AusNet Services is building a large battery storage system that will begin discharging electricity if there is a disruption to the main power line. The system will be reinforced by a backup diesel generator. Mallacoota will be able to operate off the grid for up to three days from this system.

Stand-alone power systems are already common in Western Australia and are becoming increasingly prevalent in other states and the Northern Territory.

Required regulatory changes for community batteries

Regulatory changes to enable the rollout of community batteries have been analysed and do not appear to be insurmountable. For instance, KPMG (2020, pp. 31, 82-85) proposes four groups of changes related to how energy is settled in the market, how community batteries provide grid stability support, appropriately pricing the use of the local network and ensuring the regulatory framework for distribution networks support the rollout of community batteries where these result in net benefits.

Where it is consistent with the prevailing legislation, anyone can request a rule change of the Australian Energy Market Commission (AEMC), as set out here. A request becomes the subject of consultation and a decision is reached. The decision can be to accept the proposed rule change, modify it or reject it.

Required regulatory changes for stand-alone power systems

Reasonably, the relevant regulation requires that a stand-alone power system provides the same level of reliability and service as the previously connected service. Commonwealth and state energy ministers have

drafted new legislation that will solve many of the regulatory problems holding back the rollout of stand-alone power systems (Bainbridge 2020).

An explanatory note relating to the legislation for stakeholder consultation was released in July 2020. A bill was introduced into the South Australian Parliament on 11 November 2020 and, when passed, will be replicated in other jurisdictions.

When enacted, the legislation will enable electricity users in disaster-prone and remote communities to be supplied with stand-alone power generation and battery storage systems. Distribution networks, which hitherto have been required to maintain long and fragile network connections to small communities, will be able to replace costly poles and wires with stand-alone systems – improving reliability to those communities while reducing electricity bills for all consumers, city and country.

How government and regulators could support community batteries

In his Budget Reply of 2020, Labor Leader Anthony Albanese announced a Labor government would establish a Rewiring the Nation Corporation with off-budget funding of $20 billion to rebuild and modernise the national energy grid. It would make investments in electricity transmission infrastructure that might not be built quickly, or at all, by the private sector. The corporation would make investments and partner with industry to deliver AEMO's Integrated System Plan.

Where investment in community batteries satisfied the commercial guidelines governing the Rewiring the Nation Corporation, and a case can be made on cost-benefit grounds for bringing forward particular investments, a portion of funding for the Rewiring the Nation Corporation could be used for community batteries.

The Regional and Remote Communities Reliability Fund – Microgrids offers grants of between $100,000 and $10 million to support feasibility studies into more reliable, secure and cost-effective energy supply to regional and remote communities in Australia. Announced in the 2019 Federal Budget, the $50.4 million program runs until 2023-24. Already, 17 microgrid projects have shared in more than $19 million in grant funding under the first round of the fund.

This fund could be continued beyond 2023-24 and, by design, is appropriate for community batteries and stand-alone power systems in regional and remote communities.

Electricity distribution network companies are demonstrating enthusiasm for community batteries. Three additional possible policy measures to accelerate the rollout of community batteries are set out below. They are not mutually exclusive; any one of them could be implemented on its own or all three could be implemented simultaneously.

Proposal 1: System strength obligation on distribution networks

Recent changes have resulted in transmission networks being tasked with providing system strength so that individual large-scale renewable generators are not burdened with an obligation that is difficult for them to achieve. Historically, this has easily been provided by coal-fired and gas-fired power stations. A similar obligation could be placed on distribution networks to provide system strength commensurate with the small-scale renewables connected to the distribution network.

This obligation would require network businesses to optimise for system strength and support the transition to inevitably high levels of solar generation. This would result in community batteries becoming a more competitive solution when networks consider investments and would unlock system benefits that could push down prices for customers.

Proposal 2: Communities can request a battery

Distribution networks would be required to assess the feasibility of installing a community battery requested by a community or local council and, if a proposal were found to be feasible, proceed with it.

This would create a simple option for community members who want to take advantage of sharing in a community battery rather than each investing in their own. It would allow communities to request a shared community battery and access the low cost of capital of doing so through their local distribution network operator. Where community batteries alleviate network constraints or are leveraged to support the wider system, all customers would benefit.

Proposal 3: Networks can own batteries providing network services

Under the current regulatory framework, as soon as a battery is acting as a generator, distribution networks are prohibited from owning it. This restriction could be removed through established mechanisms involving developing proposed changes, public consultation and a final decision by the Australian Energy Market Commission. Any changed rule would be subject to appropriate regulation and ring-fencing requirements to ensure networks do not abuse their monopoly power in the market.

Allowing batteries to remain network assets when metered would make it possible for networks to invest in community batteries and lease some of the battery to a market partner, reducing the proportion of the costs of the battery that the network passes onto customers.

Comment on these options in most welcome, as are any other practical proposals for accelerating the rollout of community batteries.

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CONTACT THE MCKELL INSTITUTE

T. (02) 9113 0944 **F.** (02) 9113 0949 **E.** mckell@mckellinstitute.org.au
PO Box 21552, World Square NSW 2002
@McKellInstitute www.facebook.com/mckellinstitute
www.mckellinstitute.org.au