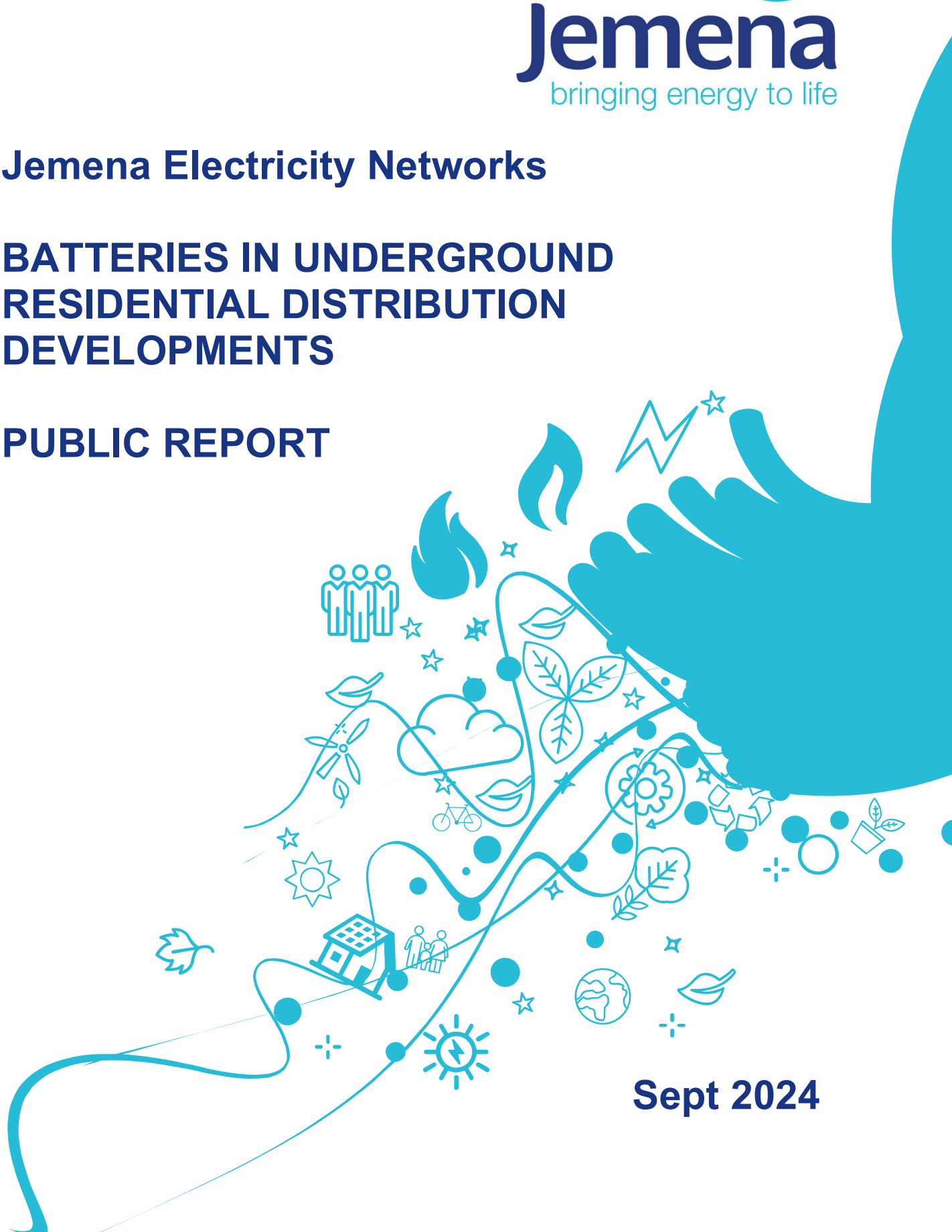
Jemena
bringing energy to life

Jemena Electricity Networks

BATTERIES IN UNDERGROUND RESIDENTIAL DISTRIBUTION DEVELOPMENTS

PUBLIC REPORT



Sept 2024

Acknowledgement of Country

Jemena acknowledges the Traditional Owners of the land on which we operate and recognises their continuing connection to land, waters and culture. We pay our respects to their Elders past and present.

Artwork is by Chern'ee Sutton a contemporary Indigenous artist from the Kalkadoon people from the Mount Isa area in Queensland.

PROJECT SUMMARY

BATTERIES IN UNDERGROUND RESIDENTIAL DISTRIBUTION DEVELOPMENTS (BURDD)

Jemena is exploring how, where and when network owned neighbourhood batteries (NBs), also referred to as Community Batteries, can best support sustainability-focused outcomes for our customers.

Jemena's project, Batteries in Underground Residential Distribution Developments (BURDD), was selected and co-funded by the Victorian Department of Energy, Environment and Climate Action's (DEECA) Neighbourhood Battery Initiative Round 3.

The BURDD project demonstrates that NBs can be an integral part of the future electricity network to maintain reliable, affordable and sustainable energy for our communities. In this respect, NB solutions can be deployed, just like any other piece of essential infrastructure - substations, poles and wires - as an additional tool within a new standard electricity network design for residential communities.

A LOCALISED AND SCALABLE NEIGHBOURHOOD BATTERY SOLUTION

Residential and mixed-use greenfield developments, known as Underground Residential Developments (URD) by the electricity industry, offer opportunities to efficiently accommodate NBs at the precinct design stage. From this setting, the scalability of NB solutions can be tested to see how a range of localised and broader electricity system (network and market) benefits can be delivered for customers, avoiding the potential challenges of brownfield NB deployments.

Jemena developed engineering designs and assessed the business case for applying network owned NB solutions for two URD case studies, Clarkefield and Merrifield. These developments require connection to the Jemena electricity network and are in Melbourne's northern growth corridor, which is experiencing significant electricity demand growth, as well as solar energy export back into the grid.

The project found that a standardised network owned NB (160kW/480kWh) integrated with each kiosk distribution substation (DSS) in the URD development can meet future customer demand and reduce the need for additional DSSs by up to 25 per cent. This localised NB design, when aggregated, can provide the scale to support the wider electricity network to improve the economic viability of the solution.

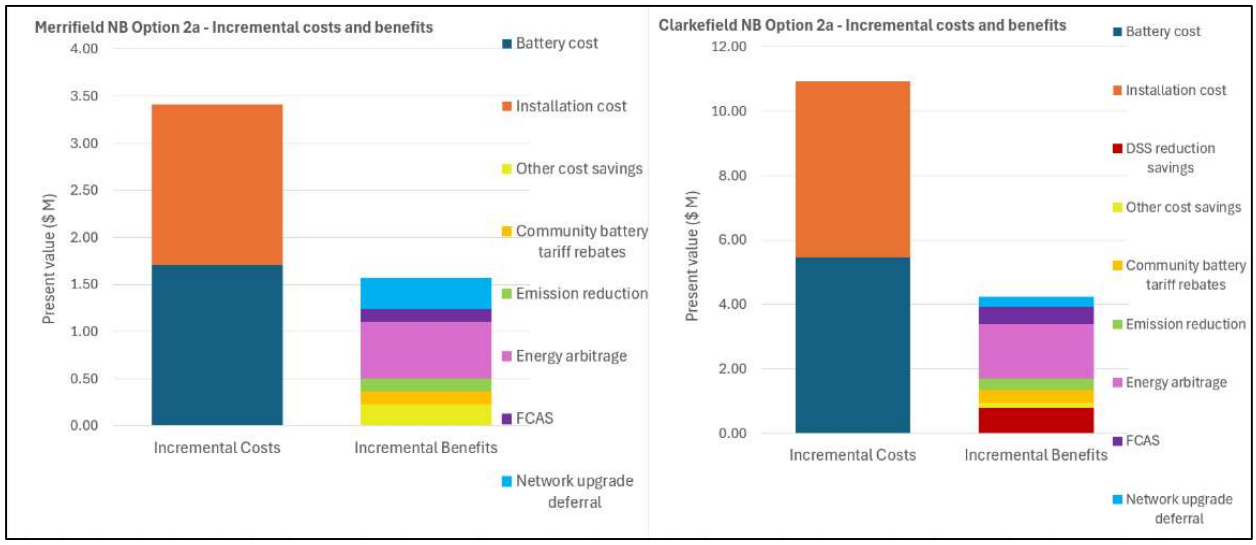
A scaled solution requires coordination of the NB fleet on the network to optimise its operation and match the real-time network needs. As the local Distribution Network Service Provider (DNSP), Jemena is well placed to use its systems and knowledge to manage, build, own and operate these assets. Hence the BURDD project was evaluated on the basis of the NBs being network owned, operated and maintained.

To test the scalability, additional NBs were added to the localised design to assess the broader network benefits and optimise the deferral of major upgrades of the upstream high voltage distribution network. Consideration was also given to market benefits, in particular energy arbitrage and frequency ancillary control services, which, as a regulated network with ringfencing requirements, Jemena would need to partner with third party retailers / aggregators to access.

EXPLORING THE PATHWAY TO ECONOMIC VIABILITY

The NB case studies unlock a range of benefits, including localised, network and market-related, however the cost-benefit analysis in Figure 1 indicates there is still a financial gap (~$0.4m per NB) for both Merrifield and Clarkefield NB solutions when compared to upstream network upgrade. Both NB solutions are optimally sized for a two-year deferral of upstream network upgrade projects – 5 NBs for Merrifield and 16 NBs for Clarkefield – longer deferrals were ruled out as significantly more NBs are required and hence have a significantly larger financial gap (refer to Business Case Assessment Section 5.3.3 and Appendix 2 for further detail).

Figure E.1 – Incremental cost-benefit analysis*



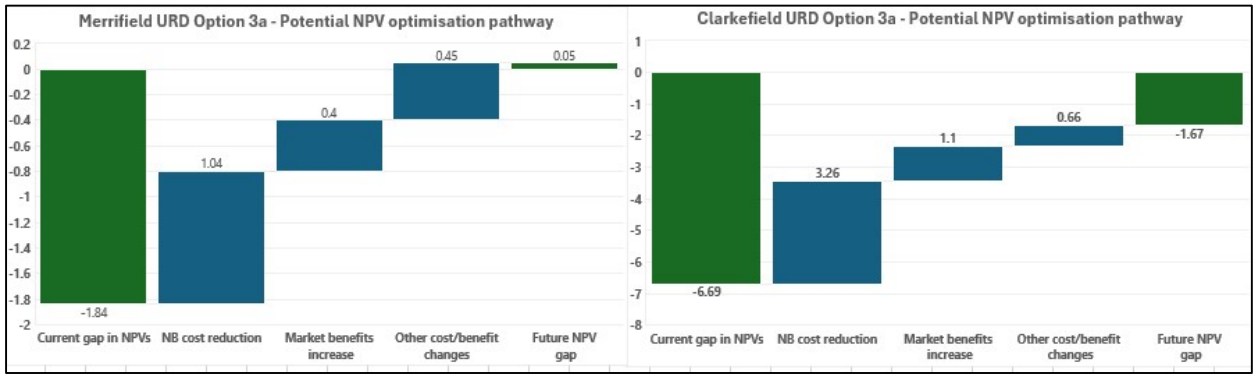
*Note key inputs include (refer to Business Case Assessment Section 5.3 for further detail):

5.5% discount rate (consistent with the AER's mandatory rate of return instrument
$750/kWh cost of NB equipment (or $360k for 480kWh NB)
$360k cost of design, install & commission per NB

A sensitivity analysis was undertaken to understand how key cost and benefit drivers can be combined to optimise the NPVs of URD network-integrated NB solutions, by applying:

- 30% reductions of NB costs (procurement to installation)
- 50% improvements of market benefit estimates (energy arbitrage and FCAS)
- 50% improvements to other cost and benefits (cost of network upgrades, community battery tariff rebates and emissions reduction benefits)

Figure E.2 – Exploring potential NPV optimisation pathway for the NB solutions



As can be seen by the results in Figure 2, the optimisation pathway tested had mixed results, with the financial shortfall (compared to network upgrades) being met for Merrifield NB case study option, but not for the Clarkefield case study.

ENABLING NEIGHBOURHOOD BATTERY SOLUTIONS

The sensitivity analysis highlights that each development is different, with a number of considerations and factors that will influence the value stacks for the NB solutions and that a “one-size fits-all” approach cannot be applied. Further considerations around a range of cost and benefit factors need to be addressed over time to achieve NB project and market viability. While battery costs will be a factor, additional factors should also be considered to improve the economics of NBs.

For example, deployment of NBs in network areas with higher upgrade costs will be a key factor to improve the relative economics of NB solutions. Each network will have different risks, challenges and upgrade requirements and will need to consider whether these can provide a large enough benefit that may improve the economics of the NBs, whether owned by networks or third parties.

Regulatory settings, including incentives that increase the network and/or market benefits from NBs will also be important to further support the deployment of network owned NB solutions at scale[1]. This includes a class waiver from the Australian Energy Regulator to allow distributors to share battery capacity with market participants, in order to deliver market benefits from the full NB value stack.

Given the current financial gap, grant funding will continue to be an important enabler to support deployment of NBs for the foreseeable future. Examples of key policies currently providing grant-based incentives to support NB project enablement include the Victorian Government’s 100 Neighbourhood Batteries grant program[2] and the ARENA Community Batteries Funding Rounds[3].

Ongoing collaboration between the community, industry and government (at all levels) will be crucial to bridge the gap to viable URD network-integrated and owned NB solutions that can maximise value for customers. With the range of factors to address, it is clear that there is a strong need for greater policy coordination at a state and national level to fully enable NB solutions in Victorian communities and across Australia.

Jemena is committed to sharing the BURDD project learnings with our key stakeholders, including collaborating with developers, policy-makers and via industry working groups, to explore opportunities to maximise the benefits and reduce the costs of NB solutions for the benefit of our customers. More detailed technical information on the BURDD project is publicly available in the Business Case Assessment.

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[1] Leveraging the Distribution Grid in support of the Energy Transition (energynetworks.com.au)

[2] 100 Neighbourhood Battery grant (energy.vic.gov.au)

[3] Community Batteries Funding Round 1 - Australian Renewable Energy Agency (ARENA)

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- It must make and rely upon its own evaluation of any such information; and
- Neither the State nor the project proponent who prepared the information is responsible to the recipient for any interpretation or conclusion reached by the recipient as a result of examining the information provided, or any derivation of it.

ACKNOWLEDGMENT

Jemena would like to acknowledge the work of the following consultants on this project

Dr. Peter Wong of Eagles Engineering Consultants

Rob Catchlove of Wave Consulting Australia

Benjy Lee of Benjyleeconsulting


“Jemena”
is an Aboriginal word
that means “to hear,
to listen and to think”