wda
Wimmera Development Association

spsconsulting

LOCAL COMMUNITIES AND ENERGY RELIABILITY

Executive **SUMMARY**

Taking smaller communities and farmhouses "off the grid" offers many benefits including self-sufficiency, reduced emissions and reduced reliance on the aging pole and wire infrastructure. Developing microgrids in small, isolated communities offers the opportunity to reduce energy costs, improve reliability and increase resilience for local communities including reducing bushfire risk.

Options for microgrids include isolated or standalone systems which aren't connected to the main grid and would typically be found in rural and remote areas; and grid-connected microgrids that generate their own power and sell or buy from the main grid. These can be simple without a centralised system, or more complex including centralised grid connected systems such as solar, battery and generator.

Developing microgrids for local communities is not without challenges, including investment, complexity of design, remoteness, public information, regulation, and energy storage risks.

Case studies of several community energy projects are discussed; Totally Renewable Yackandandah, Ballarat, Western Australia stand alone power systems project and GWMWater.

Stakeholder feedback indicates a need to work with energy companies, such as Mondo and Powercor, closely to understand current network challenges, concerns around economic and investment viability for small communities, as well as gaining community buy-in and ensuring appropriate community capability. There is also a recognised need to better understand the community energy options and what is appropriate for a given community.

THE IDENTIFIED NEXT STEPS ARE:

- Approach energy companies to understand where they have reliability and capacity challenges in the WSM region.
- Conduct review into which townships in WSM region have a shortage of energy, identify the towns that are most at risk and define the problem being addressed: cost, reliability, capacity or zero carbon community goal.
- Triage townships in order of regional priority.
- Work with regional leaders and energy companies to develop roadmaps for each township.
- Develop a roadmap for each community/township:
  - What makes economic sense for today?
  - What will the growth journey for each township look like?
- Approach energy companies to run a trial similar to those in Western Australia to remove farm properties from the grid. This approach is cheaper for power companies due to decreased maintenance on pole and wires, can increase reliability and affordability for landholders, decreases fire risk and increases productivity in paddock. The automation of farm equipment has increased the issue of power poles being located in the middle of paddocks. Removing power poles from paddocks will reduce the risk for farmers and for machinery.

A community energy project checklist and project planning template are provided as tools for communities ready to get started on the community energy journey.

Local communities and **ENERGY RELIABILITY**

BACKGROUND

Small and isolated regional communities are adversely affected across a range of factors due to a lack of energy reliability. Energy reliability was identified by Infrastructure Victoria as one of the key contributors to disadvantage in the region. They found households have limited access to affordable energy, with energy sector growth limited by grid capacity, regulation and poorly integrated development.

Taking smaller communities and farmhouses “off the grid” offers many benefits including self-sufficiency, reduced emissions and reduced reliance on the aging pole and wire infrastructure. Developing microgrids in small, isolated communities offers the opportunity to reduce energy costs, improve reliability and increase resilience for local communities.

EMISSIONS

The region is a major wind energy production zone and net renewable energy exporter, and renewable energy developments are continuing to grow in the region. Coupled with solar uptake and a gradual increase in electrical storage, the region will meet the majority of its own energy needs from renewables in the future, and will play a major role in enabling Victoria to reduce emissions.

Encouraging investment in regional and local energy storage solutions will support achievement of the region’s zero emissions target, including investigating local and sub-station battery storage, community-based microgrids and innovative solutions such as the City of Ballarat Hydrogen Project. Opportunities are available to switch industrial and individual users of fossil fuel energy, particularly gas, to renewable energy such as onsite solar or local wind-generated power, and for community-based microgrids to deliver reliable, affordable, off-grid power to small communities.

OPPORTUNITIES

While solar generation costs have been falling rapidly, wind is likely to retain a cost advantage for utility-scale investments for the foreseeable future. However, diverse energy generation (and storage) options improve energy security, so from that perspective, future investments should be distributed across wind generation, solar generation, storage and further network investment.

To date there have not been any utility-scale solar investments in the region. Compared to wind farms, there are fewer issues associated with solar developments, they are compatible with many other land uses, including agriculture, visual impacts are lower, and there are no noise or bird-strike impacts. It is likely that future large-scale solar farms would be targeted for the north of the region, due to more sun hours and less expensive land. However, community social licence and benefits must be well established before development can occur.

The Grampians Roadmap to Zero Technical[1] Report recommended the region engage with the state government, energy market participants, technology providers, researchers and investors to encourage investment in energy storage within the region. This may include electricity storage via batteries or larger-scale facilities, such as pumped storage hydro; and it may include innovative solutions such as hydrogen production, storage and use. The Federal Government has committed $480 million for battery initiatives and, through the Australian Renewable Energy Agency (ARENA), has allocated $50 million over six years to 2026 to support pilot project for microgrids in regional Australia.[2]

There is a growing trend toward the uptake of microgrids and mid-sized battery storage for remote towns, schools, retailers, and even greenfield housing developments. Communities have an opportunity to build energy resilience and regional development for growth and jobs.

"The average electricity bill per residential customer in Victoria is approximately $1,000, with 30% or $300 per customer going to the retailer. This is what could potentially be saved by a community energy project."
–Stakeholder feedback

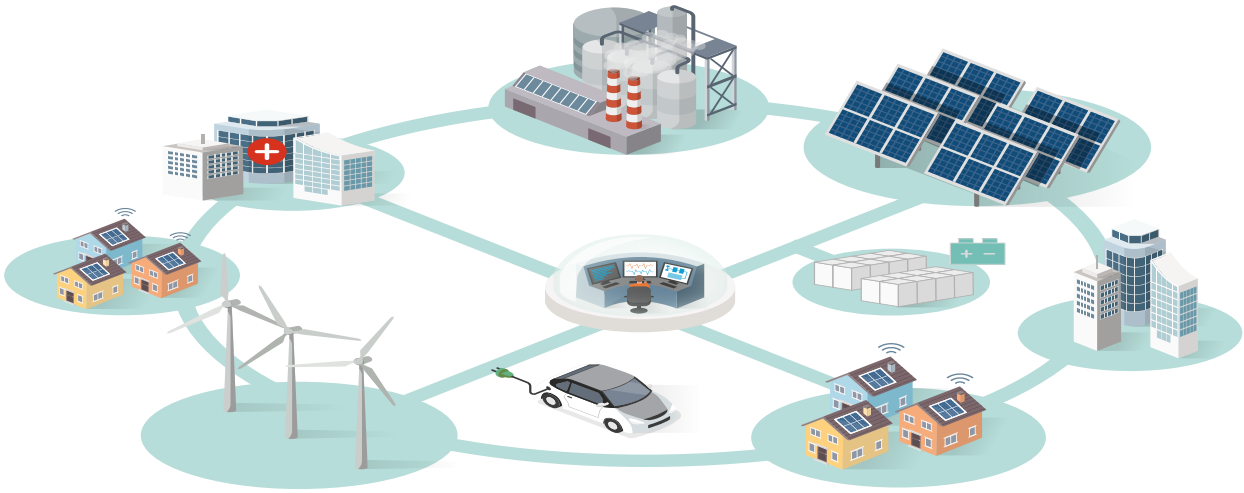
Grampians Wimmera Mallee Water, DELWP, West Wimmera Shire Council (WWSC), are working to identify and trial methods to secure reliable, affordable power in isolated 'end of line' rural areas. Areas that are particularly susceptible to physical and mental health impacts of higher temperatures due to climate change will be the focus. The town of Kaniva in WWSC has an unreliable power supply due to their location at edge of the power grid. Kaniva is an ideal location for a localised renewable energy source to be developed and for the town to be a pilot of a self-sufficient community to inform future regional development.

1 www.gnet.org.au/roadmap-to-zero-page

2 https://arena.gov.au/funding/

MICROGRIDS

Microgrids are becoming an increasingly important component of Australia's energy network because they offer a simple solution to complex energy industry challenges such as increasing electricity costs, the demands of servicing a large geographical area, and aging infrastructure. The use of renewable energy in microgrids also make them an appealing solution from a carbon emissions perspective.



BENEFITS

The benefits to local communities of renewable microgrid solutions include:

- Energy reliability
- Cost and convenience
- Renewable energy integration
- Efficiency
- Boosting local economies.[3]

Energy reliability for remote communities is a challenge, and with bushfire becoming an increasing risk, particularly for dry areas in the Wimmera Southern Mallee, it is a challenge that must be addressed. Microgrids offer a cost effective, simple solution that can be developed relatively quickly.

The Victorian Government household battery rebate program excludes most of the Grampians region, making the case for a larger communal battery as part of a microgrid more attractive.

In 2018, ARENA stated "Renewable energy resources and microgrids can help offset the need for large-scale distribution network capital investment and operating costs, thereby reducing costs for industrial, commercial and household consumers, especially in remote areas and fringe of grid situations."

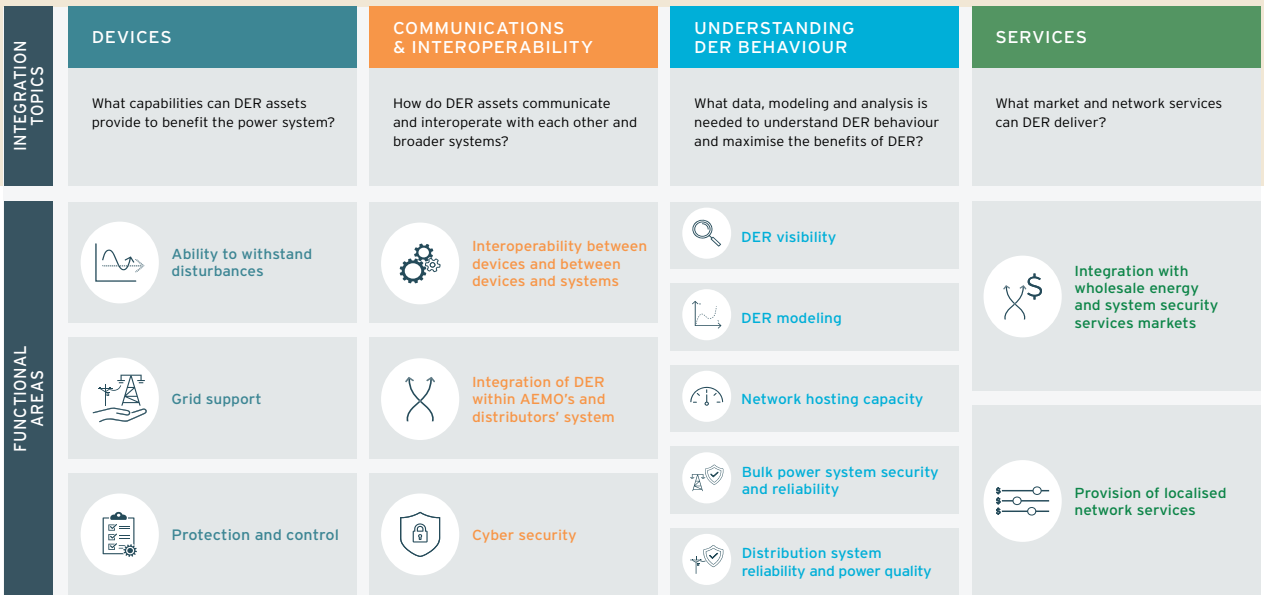
OPTIONS

Options for microgrids include:

- Isolated or standalone systems which aren't connected to the main grid and would typically be found in rural and remote areas.
- Grid-connected microgrids that generate their own power and sell or buy from the main grid. These can be simple without a centralised system, or more complex including centralised grid connected systems such as solar, battery and generator.

ARENA released the 'State of DER Technology Integration Report' in February 2021 considering existing distributed energy resources (DER) technology projects, capability, method and approach, and offering a functional framework for DER capabilities required for successful integration as follows based on their findings.

3 https://www.energymagazine.com.au/the-macro-impacts-of-australian-microgrids/



Functional framework of DER capabilities required for successful integration[4]

CHALLENGES

Developing microgrids for local communities is not without challenges, as outlined by Energy Magazine, these include:

- Financial investment – the design and construction of a microgrid requires a significant financial investment, and as microgrids are new technology ambiguity may be a deterrent for investors.
- Complexity – microgrid design and operation is inherently complex, particularly in unique location designs.
- Remoteness – it can be difficult to locate the relevant technical expertise on a local level.
- Public information – information and research about microgrids is not adequately available in the public domain.
- Regulation – standard operating procedures, quality standards and OH&S standards pertaining to microgrids are insufficient.
- Energy storage risk – with an ever-changing market, energy storage presents potential expense and risk.[5]

Transporting renewable energy from the region to the power market also remains a challenge. AEMO has limited the output potential of new energy installations in North West Victoria to overcome this challenge in the short term. Grid investment and expansion will be a key factor in enabling solar farms to be developed, particularly in more remote parts of Australia.

Large scale renewable generation and storage combined with local community microgrids, including onsite generation and storage integrated with the grid, offers local renewable power solutions to build energy resilient communities.

4 https://arena.gov.au/knowledge-bank/state-of-der-technology-integration-report/

5 https://www.energymagazine.com.au/the-macro-impacts-of-australian-microgrids/

Case Study
TOTALLY RENEWABLE YACKANDANDAH

In the northern Victorian town of Yackandandah, the community is building three microgrid networks in its bid to become 100 per cent renewable. The goal is to power the town with 100% renewable energy by 2022. In 2016 they partnered with Mondo to develop the Yackandandah Community Mini Grid project, which involves houses benefiting from integrated solar, batteries and energy management systems. The project covers 33 houses, subsidised batteries, subsidised CO2 hot water heat pumps, 12 additional Mondo Ubi's.[6] Yackandandah has recently taken delivery of the main battery energy storage for the town worth $200,000, which will store power and provide a backup power supply for the town. The Victorian Government provided $380,000 in funding for the project and the Federal Government almost $350,000 through the Regional and Remote Communities Reliability Fund.

6 https://totallyrenewableyack.org.au/

The Regional and Remote Communities Reliability Fund will provide up to $50.4 million over 5 years from 2019-20 to 2023-24. The fund supports feasibility studies looking at microgrid technologies to replace, upgrade or supplement existing electricity supply arrangements in off-grid and fringe-of grid communities located in regional and remote areas.

Case Study
BALLARAT BATTERY

In 2018, a 30 MWh battery was installed at the Ballarat terminal substation. This offers multiple benefits for the power system, including helping to maintain power quality (including frequency and voltage control), and providing short term energy storage to deal with fluctuations in consumer demand and generator output. As the electricity network moves towards more intermittent renewable generators, including solar and wind, and demand hits higher peaks due to increasing use of residential and commercial air conditioners and heating, utility-scale storage such as this will become increasingly important.

Case Study
SELF SUFFICIENT REMOTE PROPERTIES

In 2016, Western Power, the Western Australia state-owned regional electricity network operator, began trialling standalone power systems (SPS) in the Great Southern region. Each SPS includes a renewable energy supply (solar panels), battery storage, inverter and backup generator for a single property. One SPS unit can power an entire farming property. Participants enjoyed the benefit of greater reliability (including during flooding) and supply quality, with the long-term aim of removing the aging poles and wires from their property entirely. This approach is cheaper for users and the state, and delivers higher customer satisfaction. Based on the success of the trial, 52 new sites are now being rolled out as part of Round 1.

These locations are currently serviced by more than 230km of overhead distribution powerlines, four kilometres of powerline per property, all of which needs to be replaced at a significant cost in the coming year.[7]

7 https://www.westernpower.com.au/our-energy-evolution/projects-and-trials/stand-alone-power-systems-round-1/

Case Study
GWMWATER

GWMWater is investigating opportunities for greater involvement in renewable energy generation and distribution. GWMWater's renewable energy investment to date has focussed on 'behind the meter' applications, with opportunistic feeds into the grid. They have now identified 'in front of the meter' opportunities including Distributed Energy Resource (DER) and microgrids on the peripheral of towns that GWMWater services. GWMWater has identified many facilities and/or locations it owns or has responsibility for where DER's could be established as part of the overall energy solution. These have been articulated in a clean energy strategy and the broader economics canvassed for the Donald and Nhill DER's in a Preliminary Business Case. GWMWater identified an opportunity to become an energy retailer in North West Victoria in its Clean Energy Strategy, with the prerequisite of being able to generate sufficient energy capacity.

In 2019/20, construction of 1285 kW of solar power capacity was completed across 35 sites in the GWMWater operational area. They are now investing in three potential utility scale installations. The solar systems are reducing reliance on grid electricity, reducing energy costs and net carbon emissions.

Other examples include:

- Monash University is setting up their Clayton campus as a microgrid, including a large battery on the biomedical building at the centre.[8]
- In Fremantle, energy trading company Power Ledger is working on a housing development with a communal 670kWh battery.[9]

8 https://www.monash.edu/net-zero-initiative/facilities/microgrid

9 https://www.powerledger.io/media/landmark-carbon-neutral-development-to-deliver-50-saving-on-strata-levies

Stakeholder ENGAGEMENT FINDINGS

REGIONAL DISTRIBUTOR

Discussion	Recommendations and considerations
·In many cases, it makes better economic sense to remove lines in certain areas as the number of people paying for energy is so low that the cost to maintain the infrastructure is greater than the revenue. ·There are isolated farmhouses and farms in the region that are at the end of the line, some are not even in use. It may make economic sense for the distributor to support isolated farmhouses to go off-grid rather than to maintain line. ·Finding solutions for remote and rural communities is consistent with distributor's business plan.	·Work with Powercor to understand where they have reliability and capacity challenges in the WSM region and identify appropriate solutions that will address specific community energy issues. If the distributor is being penalised because of reliability in the region, they would be motivated to contribute to the solution. ·Overlay this information on to WSM region and townships and a priority list of towns will emerge.

ECONOMICS

Discussion	Recommendations and considerations
·Communities generally cannot raise the capital to kick start community energy solutions. ·Requires local leaders/leadership. ·How best to achieve community acceptance to proceed and take action? ·The opportunity exists for organisational leadership to work through this.	·Work with Councils, water boards, regional development organisations, as they are the appropriate community leaders to drive action. ·Develop a sound economic and organisational leadership model, these are critical to success. ·Understand the economics and who has capacity within the region to support community energy. ·The technologies generally exist for community energy solutions however the economics/money does not. ·Work with local distributor on identifying and developing framework for region's community energy initiatives. ·Investigate a coordinated energy and water approach – Donald is a good example of this approach.

COMMUNITY BUY-IN AND INVOLVEMENT

Discussion	Recommendations and considerations
·It is considered that generally the community don't have or want buy-in, rather they want their lights to turn on and water to run. ·How do you lift the capabilities of these communities? How to overcome this? How do we get permission to operate and take the lead for a community? How do you get the leader to drive this community solution?	·Explore organisational leadership opportunities within the region; industry leaders who have the economic knowhow and skills to develop and implement community energy initiatives. ·Have soft infrastructure in place (work with Councils and energy companies) to support communities with planning and economic development (for example, grants for the community). ·Work with local leaders who have the legitimacy in the community – for example water board. ·GWM Water (community authority and open dialogue with government) ·Bigger Councils in the region. ·Regional Development Associations.

COMMUNITY ENERGY AND SUCCESS

Discussion	Recommendations and considerations

·Does success mean that remote communities such as Kaniva go off-grid?	·Clarify what the best solution is for the town based on the problem that you are hoping to resolve.
	·Understand whether it is the cost of energy or cost of capacity that is causing energy problems.
	·Cost of energy – behind the meter solutions are easier to address, however the current network system cannot support increased two-way energy flow.
	·Reliability / capacity – requires a holistic solution. These are more expensive and greater benefit and may include;
	  ·Hub solutions - Community mini-grids, community batteries.
	  ·Islandable solutions - Community energy mini-grid (Mallacoota - $20m investment).

NEXT STEPS

01 Approach energy companies, such as Mondo and Powercor, to understand where they have reliability and capacity challenges in the WSM region.

02 Conduct review into which townships in WSM region have a shortage of energy, identify the towns that are most at risk and define the problem being addressed: cost, reliability, capacity or zero carbon community goal.

03 Triage townships in order of regional priority.

04 Work with regional leaders and energy companies to develop roadmaps for each township.

05 Develop a roadmap for each community/township:
- What makes economic sense for today?
- What will the growth journey for each township look like?

06 Approach energy companies to run a trial similar to those in Western Australia to remove farm properties from the grid. This approach is cheaper for power companies due to decreased maintenance on pole and wires, can increase reliability and affordability for landholders, decreases fire risk and increases productivity in paddock. The automation of farm equipment has increased the issue of power poles being located in the middle of paddocks. Removing power poles from paddocks will reduce the risk for farmers and for machinery.

07 Promote community energy projects and the community energy project checklist (following page).

Developing a Community Energy Project
GETTING STARTED