

An aerial photograph showing a winding road through a lush green landscape. A river flows through the scene, bordered by dense forest. The road has a few cars on it. The overall scene is vibrant and natural.

Emergent opportunities and barriers on the feasibility of microgrids



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Personal Introduction

PhD candidate in Institute of Sustainable Futures (ISF) at the University of Technology Sydney

- Research on community microgrids based on a Government-funded program of feasibility studies, including barriers, opportunities, and the complexities of community engagement in the microgrid related studies
- Recent Publication in Energy Research and Social Science titled: “Emergent Opportunities and barriers on the feasibility of microgrids: Qualitative findings from an Australian funding program”

Masters of Professional Engineering (Electrical) from University of Sydney

- Worked on Smart Home Energy Management Systems, with Raspberry pi to control the frequency of smart homes



Presentation outline

- Review of status of microgrids in Australia
- Microgrid funding in Australia and perceptions of program participants
- Drivers and barriers related to microgrids in Australia
- Recommendations to enhance the future microgrid activities at the national scale



Status of microgrids in Australia

- The Australian energy system still primarily relies on centralised, carbon-intensive non-renewable fossil fuels, with coal and gas accounting for 70% of the country's total generation in 2021.
- Australia is the 6th largest country in the world, sitting between Brazil (214 million people) and India (1.4 billion people). However, it has only 25 million inhabitants.
- The population outside the main metropolitan areas is highly dispersed, with 8.5 million people living in rural towns, villages, and remote regions.
- Challenge to deliver a resilient and reliable electricity supply across long distances and to the communities at the fringes of the grids.
- The global microgrid market is still in its infancy and Australia's community microgrids are still mainly at the pre-feasibility stage, with only some early pilots.

Microgrid Funding in Australia

Government	Grant name	Year	Amount of funding	Purpose
Federal	Regional Microgrid Program by Australian Renewable Energy Agency (ARENA)	2023 - 2025	\$125 million	To deploy microgrid technologies in regional, remote and First Nation communities.
Federal	Regional and Remote Communities Reliability Fund (RRCRF)	2019 - 2024	\$50.4 million	To support feasibility studies to enhance microgrid activity in regional and remote Australian communities
State	Victorian government Microgrid Development Initiative (MDI)	2017	\$10 million	To support and implement microgrid projects in the state
State	Queensland Microgrid Pilot Fund (QMPF)	2022	\$10 million	To support Queenslanders living in regional and First Nations communities by giving them access to more resilient electricity as part of the state's energy system transformation.

Regional and Remote Community Reliability Microgrid Fund (RRCRF)

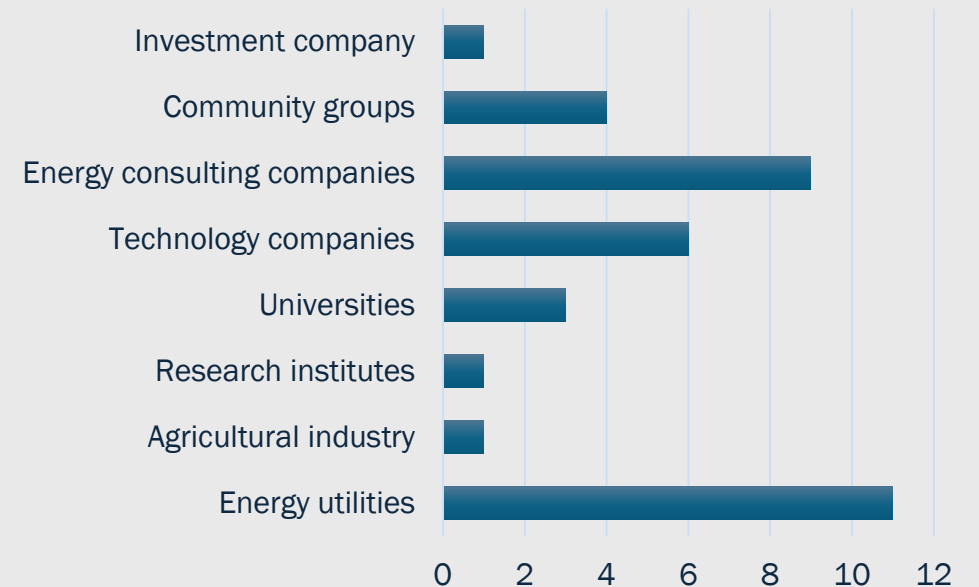
- The fund supports feasibility studies looking at microgrid technologies to replace, upgrade, or supplement existing electricity supply arrangements in off-grid and fringe-of-grid communities located in regional and remote areas
- Federal Government
- Defining microgrid as “an electricity supply arrangement that can (but may not always) function autonomously and generates and supplies electricity to multiple customers”
- 2019 – 2024: Funding runs for five years (awarded in two stages).
- \$50.4 million
- Feasibility



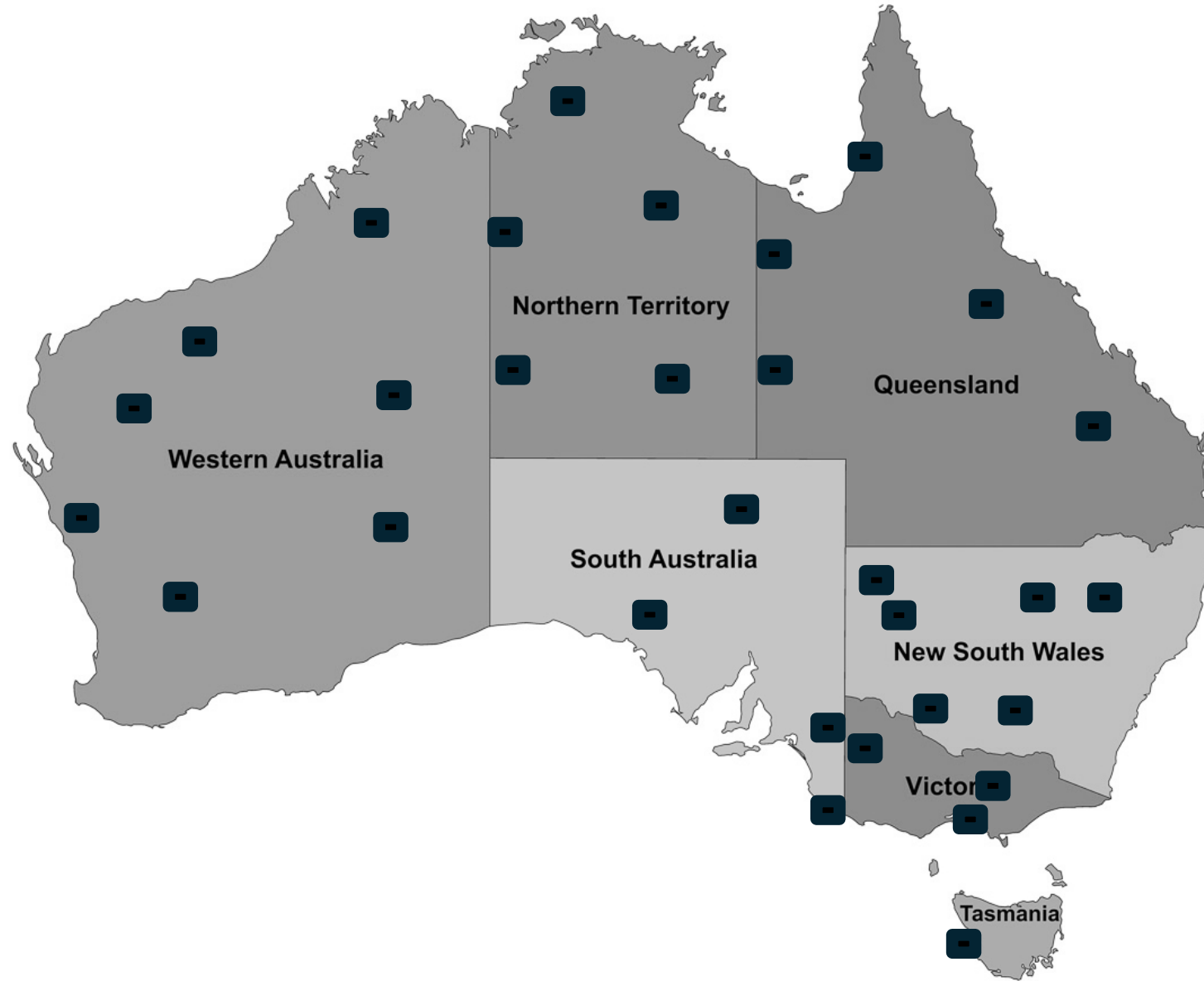
Research methods: Semi structured interviews of federal grant (RRCRF) funded projects

Total number of funded projects	36
Total number of communities involved	110
Total number of interviews conducted	19
Total number of projects covered	25 (70%)
Total number of communities covered in the interviews	70 (64%)
Role of interviewees	Project Managers Community Engagement Officers Managing Directors Senior Engineers Associate Professors Energy Experts

Types of organizations and total projects with them as major partners



Federally-funded RRCRF microgrid projects in Australia





A word cloud of terms related to microgrids, arranged in a roughly rectangular shape. The words vary in size and orientation. The largest words are 'interconnected', 'islandable', 'network', and 'generation'. Other prominent words include 'connected', 'resilience', 'power', 'intelligently', 'distributed', 'decentralised', 'battery', 'storage', 'contained', 'balance', 'isolated', 'combining', 'embedded', 'electricity', 'standalone', 'systems', 'critical', 'feeders', 'capabilities', 'sharing', 'disconnected', and 'operation'.

interconnected
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electricity
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systems
critical
feeders

DIFFERENT PERCEPTIONS OF MICROGRIDS



MICROGRID DRIVERS AND BARRIERS

Drivers



Energy Security

- *Bushfires and floods in the communities*

Energy Reliability

- *Power outages in the communities located at the fringe of the grid*
- *Lack of reliable supply of electricity in SWER lines*
- *Voltage fluctuations in the remote agricultural farms*
- *Lack of skilled personnel to clear the fault*

Economic benefits

- *Access to affordable and cheap electricity*
- *Less reliance on diesel generators*

Clean energy integration

- *Achieving net zero targets*
- *Understanding new concepts and exploring new technologies*
- *Promoting renewable energy in the local communities*

Barriers in Australian microgrid studies

Categories	Barriers from Australian microgrid studies
Political	<ul style="list-style-type: none">• Lack of appropriate regulatory framework• Restrictions due to COVID-19 Pandemic
Economic	<ul style="list-style-type: none">• Lack of clear business model and ownership structure for generating revenue• Lack of funding and financial returns
Social	<ul style="list-style-type: none">• Engagement with the community:• Lack of energy literacy in the communities• Constant changing over of people in the management role.
Technical	<ul style="list-style-type: none">• Identifying the microgrid boundary and islanding ability• Lack of access to network and customer data• Network connectivity issues in the remote communities• Local demand and supply balancing
Environmental	<ul style="list-style-type: none">• Ensuring proper reuse and recycling of technologies at the end of life
Legal	<ul style="list-style-type: none">• Legal structures that define ownership• Legal complications in site selection and land ownership• Contracting complexity for community organisations



Conclusion and Recommendation

- Multiple definitions creating confusion about the technology
- Need for the grant funded feasibility studies
- Opportunity for collaboration between various actors through funding programs
- Need of a major governmental review to examine the regulatory framework
- Grant funding for the community energy groups
- Managing the community expectations
- Need of open-source knowledge sharing tool for the communities

Thank you



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