

Cutting the Cord: The Australian Outlook for New Microgrids to 2026

A Confidential Report for Strategic Research Clients

Overview

Energeia's research has found that the global microgrid market remains nascent. However, we see declining costs for key system elements over the next five years making microgrids a viable alternative to grid supply within the next 5-10 years. In our view, Australia, with its relatively high retail electricity prices, fixed charges, distances and customer antipathy, will be fertile ground for the new technology and its associated business models to take root.

Best practice policy and regulation for microgrids is largely undeveloped. The US is leading international efforts to develop the industry through a variety of policies and regulations in order to improve resilience, reliability and increase renewables penetration. In Australia, the key regulatory and policy barriers include uniform tariff policies and uncertainty around customer protections and third party access. Australia's policy support for microgrids is also largely absent with ARENA being the only vehicle for funding through renewables integration projects, of which there have been very few involving microgrids in the last few years.

Energeia has identified four key segments for potential growth over the next ten years: existing fringe-of-grid towns, existing small, residential customers and new remotely-located business customers such as mines and farms. These customers are being driven to reject, or defect from, the grid by, for example, high connection costs, high fixed charges, the desire for increased reliability and the falling cost of energy storage and solar PV.

Analysis of the key components required to supply a customer independently of the grid has found that most are mature in their own right, however, their integration is costly and is limiting the competitiveness of microgrids. A key issue for microgrids is determining the optimal configuration of technologies. Diesel remains the cheapest option to address peak demand due to its low capital costs and flexibility. Solar PV and storage are becoming increasingly attractive for baseload supply due to falling costs, however, most customers are still likely to require diesel for backup during extended periods of low solar PV generation, and for load following.

Worldwide, most microgrid projects continue to be largely publicly funded and grid defection by households is still very much driven by social and environmental concerns, rather than economics. As a result, the microgrid industry has not progressed much beyond trials and demonstrations. Currently, multinational industrial companies dominate the market for utility scale projects whilst small, local companies satisfy the residential market.

Energeia's modelling has found that cumulative investment could be as much as \$1.58 billion over the next ten years, driven predominantly by new off-grid farms and existing small-consumption customers. Whilst a small number of early adopters will continue to defect from the grid in the short term, we see up to 86,000 small-consumption residential and business customers disconnecting by 2026 in the absence of pricing reforms to address the impact of fixed charges on these groups. Our analysis shows that for most new connections over 3 km and the smallest, most distant towns, a microgrid solution is already more cost-effective than grid supply.

The microgrid business model in Australia is unusually sensitive to policy and regulatory settings. Under such uncertainty, Energeia sees successful companies focusing on reducing their technology costs, developing load management techniques, and serving market segments least likely to evaporate overnight due to a shift in a policy or regulation.

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1.0 Introduction

Interest in grid defection has been growing in recent years in line with rapid price declines in solar PV and energy storage, as well as public discussion of the utility ‘death spiral’. In reality, however, disconnection from the grid is currently a costly alternative except for those located at the grid edge.

Unlike our report on embedded microgrids, which focused on specific network segments where above standard levels of reliability were the key driver, this report focuses on identifying the key technical and economic drivers that we expect will drive customers in the above segments to either not connect to the main grid in the first place, or to cut their existing cord to it, over the next ten years.

Importantly, since our last report was issued, Energeia’s view of the role and impact of microgrid technology has grown considerably, and we now consider microgrids to be an imminent threat and opportunity for the existing centralised power system. Effective integration of microgrid technology into the power system and incumbent business models is therefore critical to their future success.

The following sections in this chapter describe the specific scope of this report and summarises its structure.

1.1 Scope

This report is part of Energeia’s Strategic Research service, which focuses on the emerging energy technologies that will power the Customer of the Future. The report addresses the market for new (rather than existing) off-grid microgrids over the next ten years and the industry value chain that will develop, manufacture, distribute and service the various products.

This report focuses on four key emerging market segments for off-grid microgrids over the next 10 years that Energeia has identified as being the most prospective:

- New remote industrial connections, e.g. mines
- New remote commercial connections, e.g. farms
- Existing remote small community connections, e.g. townships
- Existing small customers, e.g. around 3.5 MWh per annum.

While we see significant potential opportunities for displacement of diesel generation by renewables (and storage) in existing Remote Area Power Systems (RAPS), particularly among mine sites and remote communities in WA, NT and QLD, the scope of this report has been limited to new microgrids to give greater focus to what we see as the key emerging market opportunities in Australia.

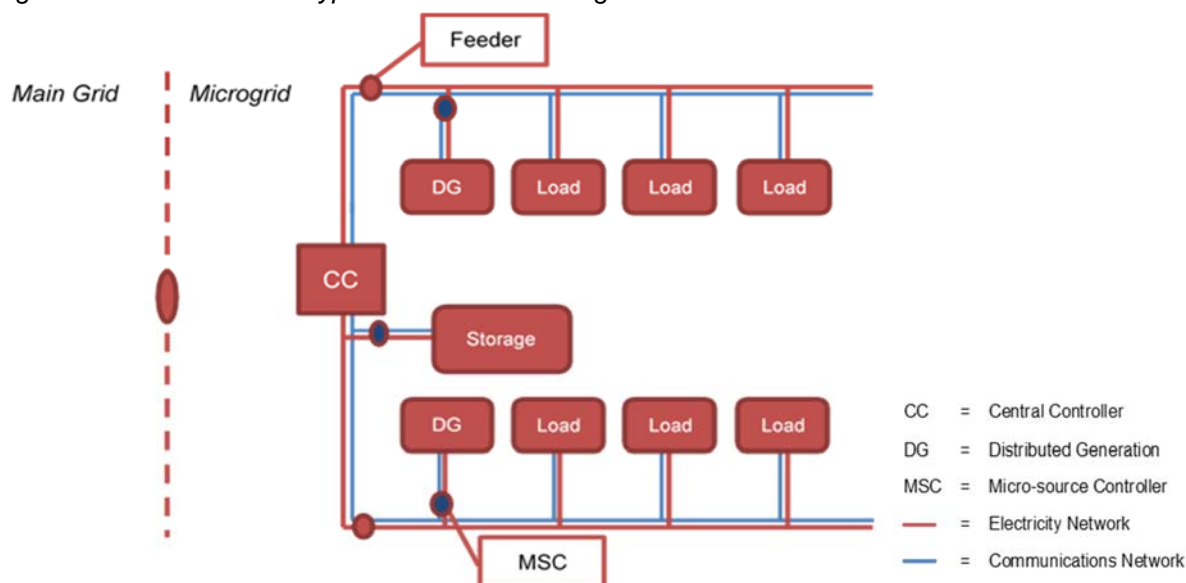
The report is also limited to consideration of solar photo-voltaic (PV) sourced energy, diesel based generation and lithium based battery storage technologies. It excludes geothermal, wind, fuel cells, cogeneration and other combustion based generation technologies.

1.2 Definitions

“Microgrid” is a broad term that encompasses a wide array of different consumption and energy supply arrangements.

For the purpose of this report, an off-grid microgrid (microgrid) is defined as a network of electrical loads and resources (see Figure 1) – ranging from a single residential customer to a large group of customers or mine, capable of operating for an indefinite period of time to a specific level of reliability, typically specified in terms of annual unserved energy (USE).

Figure 1 – Illustration of a Typical Distributed Microgrid Architecture



Source: Energeia

In the report, off-grid microgrid and microgrid are used interchangeably.

1.3 Structure

The report is structured into the following main sections:

0. **Overview** – Provides a high-level summary of the report and its key findings
1. **Introduction** – Outlines the scope and structure of the report and provides technical definitions and assumptions
2. **Policy and Regulation** – Reports on Australia’s policy and regulatory framework as it relates to microgrids at the federal and state level against international best practice
3. **Customers and Markets** – Reports on the Australian market for microgrids, including the estimated size, profile and potential of key market segments and the corresponding drivers
4. **Products and Services** – Reports on microgrid products and services, including an assessment of their functionality and performance against customer requirements
5. **Industry and Strategy** – Reports on the industry value chain by segment including key challenges and opportunities, the number and type of players, and player strategies
6. **Outlook** – Reports on Energeia’s proprietary models and outlook for policy and regulation, energy and product pricing, market demand, products and services and industry value chain.

Sections 2 through 5 provide the results of Energeia’s research and analysis of historical and contemporary information. Section 6 is forward looking, and is mostly concerned with describing the key inputs and assumptions underpinning our ten-year outlook.

7.0 Glossary

This report uses the following abbreviations:

AC	Alternating Current
ACT	Australian Capital Territory
AEMO	Australian Energy Market Operator
ARENA	Australian Renewable Energy Agency
CAGR	Compound Annual Growth Rate
Capex	Capital Expenditure
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DC	Direct Current
DNSP	Distribution Network Service Provider
ERF	Emission Reduction Fund
GHG	Greenhouse Gas
GSL	Guaranteed Service Levels
GWh	Gigawatt Hour
IEC	International Electrotechnical Commission
<i>kW</i>	<i>Kilowatt</i>
<i>kWh</i>	<i>Kilowatt Hour</i>
MW	Megawatt
MWh	Megawatt Hour
NEM	National Electricity Market
NPV	Net Present Value
NSW	New South Wales
NT	Northern Territory
NY	New York
OEM	Original Equipment Manufacturer
Opex	Operational Expenditure
PV	Photovoltaic
QLD	Queensland
Repex	Replacement Expenditure
ROI	Return On Investment
SA	South Australia
TAS	Tasmania
TWh	Terawatt hour
UK	United Kingdom
US	United States
VIC	Victoria
WA	Western Australia

Energieia

Suite 2, Level 9

171 Clarence Street, Sydney NSW 2000

T 02 8097 0070

E energeia@energeia.com.au W www.energeia.com.au