

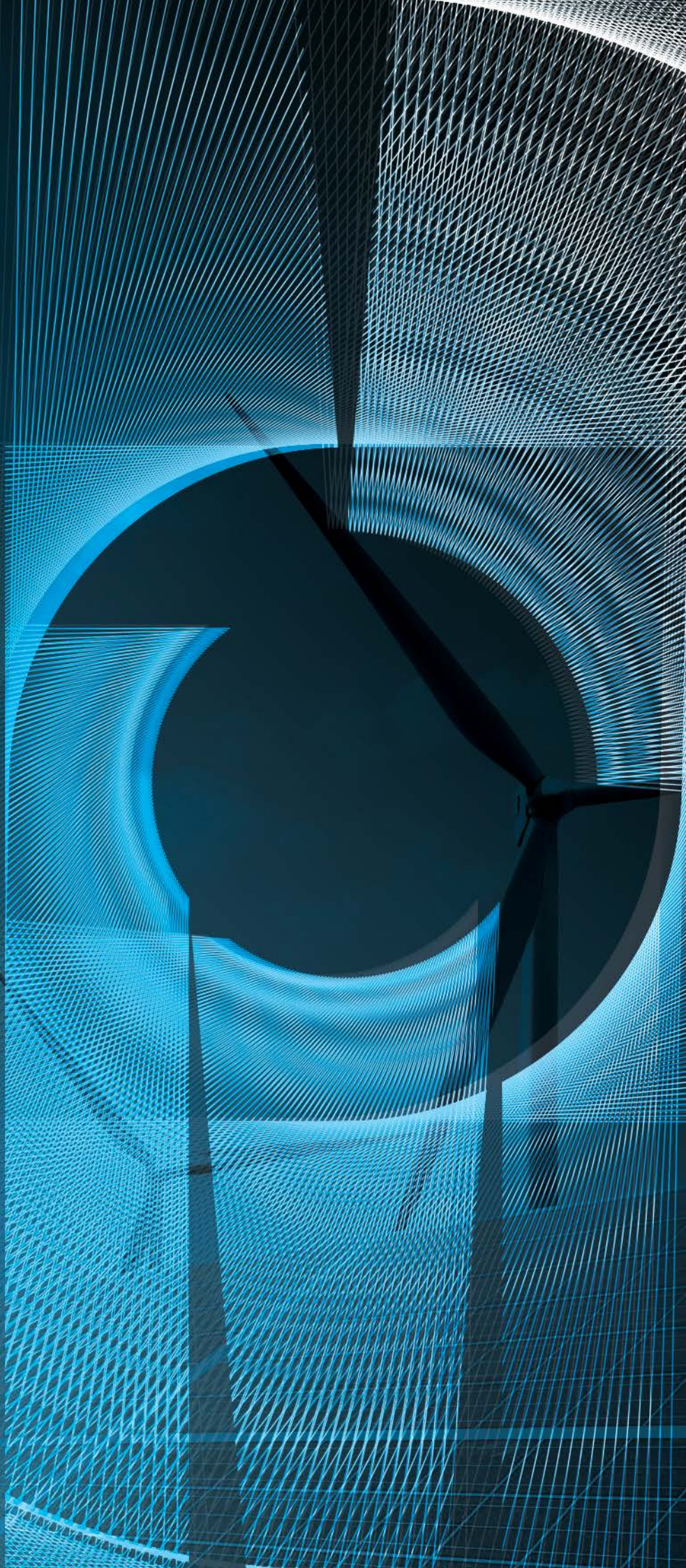


MONASH
University

MICROGRID ELECTRICITY MARKET OPERATORS

COMMERCIALISATION BROCHURE
MAY 2019

monash.edu/net-zero-initiative



THERE IS AN OPPORTUNITY FOR A NEW TYPE OF BUSINESS, A **MICROGRID OPERATOR**, TO HELP ACCELERATE THE TRANSITION TO RENEWABLE POWER. WITH MORE RENEWABLE GENERATION AND STORAGE BEING DEPLOYED BEHIND THE METER, MICROGRID OPERATORS CAN HELP TO COORDINATE CUSTOMERS' DISTRIBUTED ENERGY RESOURCES (DER) AND ENABLE CUSTOMERS TO BE REWARDED FOR PROVIDING SERVICES TO THE BROADER GRID.

Monash University is proposing the establishment of Microgrid Electricity Market Operators (MEMO) to fulfil this role and will aim to demonstrate their value at several sites in the next four years. This brochure details how MEMO would provide a sound commercial offering to customers while also reducing emissions and providing secure electricity.

WHILE CUSTOMERS' DER CAN PROVIDE IMPORTANT SERVICES TO THE GRID, THERE IS CURRENTLY LIMITED POTENTIAL FOR CUSTOMERS TO BE REWARDED FOR THIS.

Australian electricity markets are rapidly changing. DER are increasingly being deployed "behind the meter" at customers' premises. An increasing number of prosumers are seeking to mitigate rising electricity prices and reduce their greenhouse gas emissions through deploying their own onsite renewable generation and storage. This trend is challenging long-established practices for supplying and selling electricity. Currently, the connection of DER is approved by distribution network operators, because uncontrolled deployment would present challenges for the stability of the electricity network. Conversely, coordinated and controlled use of customers' DER could provide substantial benefits for the stability of the network. There are currently limited opportunities for customers to provide these additional benefits to networks, or to be rewarded for providing these benefits.

MICROGRIDS CAN HELP TO CONTROL AND COORDINATE CUSTOMERS' DISTRIBUTED ENERGY RESOURCES, AND ENABLE CUSTOMERS TO BE REWARDED FOR PROVIDING SERVICES TO THE BROADER GRID.

A microgrid is a small electricity network, composed of multiple co-located customers with their own electricity consumption needs and power generation. A microgrid has a single point of connection with the broader electricity market and a monitoring and control platform is used to coordinate the supply and demand of customers connected to the microgrid. The role of coordinating the microgrid's distributed energy resources, and interfacing with the wholesale electricity market and the ancillary services market could be undertaken by a new type of business: a microgrid operator. Through helping customers to participate in these markets and access the value from the services they provide to the grid, microgrid operators could enable customers to reduce their energy bills while also enabling increased uptake of distributed renewable generation.

WE PROPOSE THE ESTABLISHMENT OF A NEW TYPE OF BUSINESS: MICROGRID ELECTRICITY MARKET OPERATORS (MEMO).

We propose the establishment of MEMO as an entity which operates in the interest of its customers, and supporting the transition to a 100 per cent renewable electricity future. The principal objective of such an entity will be to empower its customers to reduce costs, increase the efficiency of on-site DER, and reduce emissions while maintaining a service standard equal to or better than that offered by the main grid.

MEMO could achieve these objectives by providing a simplified Microgrid as a Service package for customers and network owners. Market participants would have greater control and visibility over DER, and customers would be able to achieve shorter payback periods for DER, cost savings and access to new revenue streams. The services provided by MEMOs could also enable greater network resilience and stability.

MEMO PROVIDE A STRONG VALUE PROPOSITION FOR END USERS, EMBEDDED NETWORK OWNERS, DISTRIBUTION NETWORK SERVICE PROVIDERS AND RETAILERS.

End Users

End users currently have limited ability to be rewarded for the use of their DER on the broader grid. Customers must sell any net exports to their retailer rather than sharing with or selling to other customers, and there are limited incentives for customers to provide demand response. MEMO will address this by facilitating local supply of clean electricity at a fair price, including payments for customer-owned DER and demand response.

Embedded Network Owners

Embedded network owners face challenges in efficient electricity supply of their network. As electricity supply is rarely the core business of embedded network owners, this role is often outsourced to a company with specialist skills. However, these companies do not normally provide sophisticated control of DER or demand response. In contrast, MEMO will improve the operation of embedded networks by providing incentives and control systems for demand response and DER within the network.

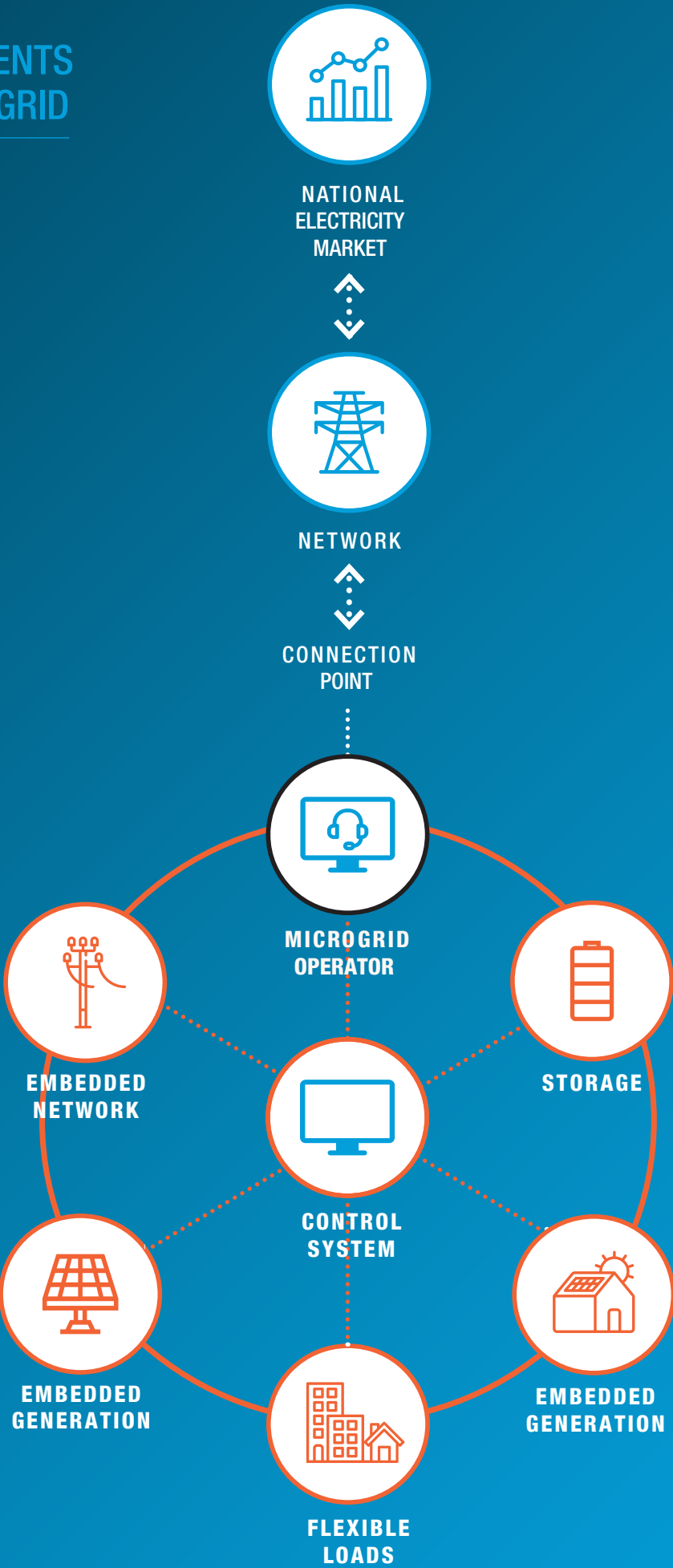
Distribution Network Service Providers

Distribution Network Service Providers are often reluctant to rely on DER or demand response to meet network service standards, due to lack of certainty and control over the technology. The control systems owned and operated by MEMO overcome these constraints. This will allow MEMO to provide distribution network service providers with a lower cost and reliable alternative to network augmentation.

Retailers

Retailers must balance their aggregate supply and demand at the lowest possible cost, with wholesale electricity price volatility presenting a key risk. Instead of participating in the wholesale market itself, MEMO could offer retailers a form of wholesale price risk management, using its demand flexibility and export capability.

CORE ELEMENTS OF A MICROGRID



THE VALUE PROPOSITION FOR A MICROGRID WILL DEPEND UPON ITS LOCATION, AND THE CHARACTERISTICS OF THAT LOCATION.

Microgrids can be “grid-connected”, located in regions connected to the National Electricity Market that have existing brownfield or greenfield embedded networks. Microgrids can also be “fringe-of-grid” located in regions connected to the National Electricity Market that are remote or require significant network augmentation and experience a relatively high likelihood of supply reliability and power issues.

For both of these types of microgrid, the value proposition will be highest in locations with:



HIGH PENETRATION
OF RENEWABLES



INTERNAL NETWORK CAPACITY
CONSTRAINTS
EXTERNAL NETWORK
CONSTRAINTS



MULTIPLE CUSTOMERS
WITH DIVERSE ACTIVITIES



THERMAL STORAGE
BATTERY STORAGE



RETIREMENT OF THERMAL POWER
PLANT IN THE VICINITY OF THE
MICROGRID NETWORK

Different types of end users and embedded network owners could benefit from the services of a microgrid operator. Typical settings for a microgrid include:



AIRPORTS



COMMERCIAL AND INDUSTRIAL
PRECINCTS



RETIREMENT VILLAGES



CARAVAN PARKS



SHOPPING CENTRES



UNIVERSITY CAMPUSES



GOVERNMENT

TO DELIVER ON THE VALUE PROPOSITION, MEMO WILL PROVIDE A RANGE OF SERVICES.



MICROGRID CONTROL SERVICES

- Microgrid control system technical design
- Microgrid control system installation (hardware, IT communications, metering)
- Microgrid operations and maintenance
- Microgrid power quality analytics
- Network connections



MARKET SERVICES

- Microgrid and energy market analytics
- Energy trading
- Market settlements (ancillary services, demand response)
- Regulations and compliance



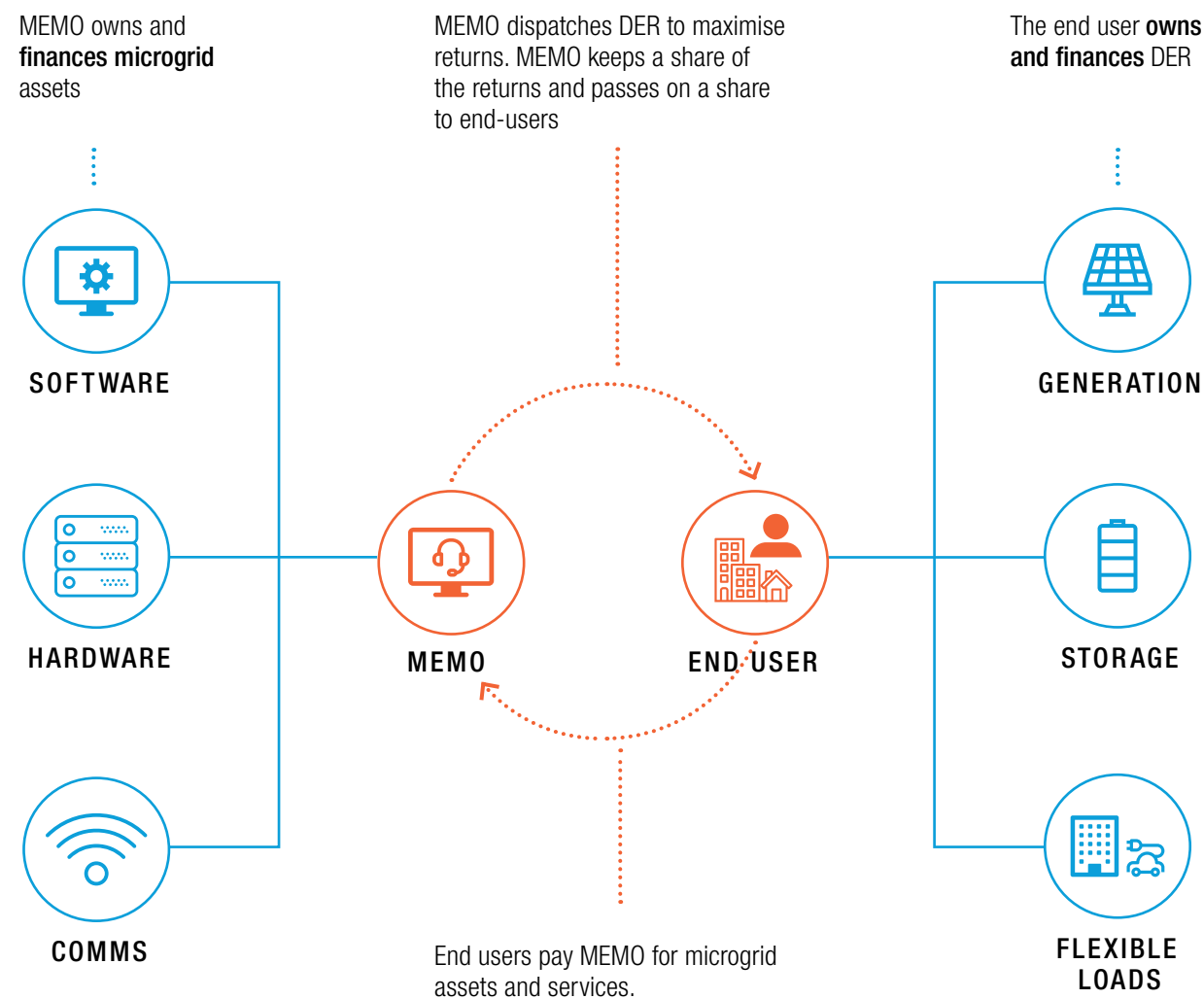
MICROGRID CUSTOMER SERVICES

- Contract, billing and collections
- Microgrid tariff/product design
- Progressive electricity procurement
- Engaging customer interface

MEMO WILL PROVIDE THE CONTROL, MARKET AND CUSTOMER SERVICES TO MAXIMISE THE VALUE OF ITS CUSTOMERS' DER.

We propose an ownership model for MEMO, under which end users would own and finance their DER, while MEMO would own and finance the microgrid assets, such as software, hardware and communications. MEMO would dispatch customers' DER to maximise returns for the end users and themselves, while end users would pay MEMO for providing this service.

MEMO RELATIONSHIP WITH END USER



MEMO WILL BE ABLE TO ACCESS A RANGE OF REVENUE STREAMS THAT CAN BE SHARED WITH THE END USER

There are a range of revenue streams arising from microgrid control and market participation that are already accessible for microgrid operators. These are:

- Demand side response for network load control;
- Peak demand management (including charge reduction, price arbitrage and wholesale hedge avoidance); and
- Provision of frequency control ancillary services.

There are also a number of additional revenue streams that could be accessed if there were changes to market design, policies and regulations. These include:

- Sale of electricity into wholesale and retail markets;
- Sale of voltage control services to the local network as a network ancillary service;
- Value from reduced loss factors from shifting load from high load to lower load periods; and
- Value from deferred investment in the distribution network.

MONASH HAS A PLAN TO TEST MEMO'S BUSINESS CASE AND REPLICATE THE MODEL OVER THE NEXT FOUR YEARS

OBJECTIVES

TO ESTABLISH A WORKING PROTOTYPE UTILISING THE MONASH MICROGRID ASSETS AND INVESTIGATE THE COMMERCIAL VIABILITY OF THE MODEL AT A NETWORK CONSTRAINED GRID-CONNECTED HYPOTHETICAL SITE.

TO IDENTIFY THE TECHNICAL, REGULATORY, POLICY, MARKET DESIGN AND BEHAVIOURAL ISSUES SUCH A BUSINESS WOULD FACE AND PROVIDE RECOMMENDATIONS TO ADDRESS THEM.

TO OUTLINE AND TEST THE BUSINESS CASE FOR SUCH MICROGRID OPERATOR ENTITIES IN VICTORIA.

TO CONDUCT STAKEHOLDER CONSULTATION WITH POTENTIAL PARTNERS AND CUSTOMERS TO TEST THE MODEL.

TO DEVELOP A COMPLETE SERVICE PACKAGE (OPERATIONAL TOOLBOX).

TO ACCESS NEW REVENUE STREAMS FOR END USERS.

GROWTH PLAN

2019
2020
2021
2022
2023

2019-2020

- Establish mechanics for MEMO based on Monash Microgrid model.
- Help inform regulators and policy makers by testing energy trials at Monash.
- Refine MEMO model.
- Formalise strategic partnering relationships in contract.
- Identify potential sites for further roll-out of MEMO.
- Market the MEMO model with the aim if contracting the next microgrid project.
- Begin feasibility assessment and commercial negotiations for MEMO next microgrid projects.

IF BUSINESS CASE POSITIVE:

establish appropriate MEMO entity/
partnership arrangements.

IF BUSINESS CASE NEGATIVE:

review approach and refine model,
or cease project and share learnings.

2020-2021

- Finalise business case for MEMO target markets.
- Formalise offer to channel partners and end users in Victoria.
- Further refine partner relationships.
- Formalise channel partner relationships.
- Consider regulatory reforms to further enable MEMO's expansion in Victoria.
- Obtain expansion capital.
- Contract MEMO next microgrid project(s).
- Contract MEMO's second microgrid.
- Scale up and recruit key resources.

2021-2022

- Expand offer to microgrids throughout Australia.
- Further refine MEMO model.
- Begin considering Monash exit strategy.

FOR MORE INFO, PLEASE VISIT OUR WEBSITE:
monash.edu/net-zero-initiative



Environment,
Land, Water
and Planning

Monash University acknowledges the support
of the Victorian Government's Microgrid
Demonstration Initiative