Demand Management Innovation Allowance (DMIA) Report 2021-2022

Submission to AER

Endeavour Energy

Table of Contents

1.0 Executive Summary

Endeavour Energy currently have four Demand Management Innovation Allowance (DMIA) projects:

1. *Power*Savers
2. Dynamic Operating Envelopes
3. E-Bus Depot Energy Management
4. Bawley Point & Kioloa Community Microgrid

The total DMIA claim for 2021-22 is $651,123.50

Project	Operating Expenditure ($ nominal)	Capital Expenditure ($ nominal)	Total Expenditure ($ nominal)	New or Continuing
***Power*Savers**	$10,660.00	$0	$10,660.00	New
Dynamic Operating Envelopes	$0	$77,677.34	$77,677.34	New
E-Bus Depot Energy Management	$0	$54,720.79	$54,720.79	New
Bawley Point & Kioloa Community Microgrid	$0	$508,065.41	$508,065.41	New
Total	**$10,660.00**	**$640,463.54**	**$651,123.54**	

2.0 Background

This report has been prepared in accordance with the AER's Regulatory Information Notice in response to paragraph 6 of Schedule 1. The information provided will constitute the provision of an annual report for the purposes of paragraph 3.1.4.1 of the Demand Management Incentive Scheme (DMIS) applying to Endeavour Energy (as set out in the 2019-2024 Distribution Determination).

As per paragraph 6 of the AER's Regulatory Information Notice Schedule 1, Endeavour Energy is requested to provide responses describing its expenditure and the nature of its demand management activities for review by the AER. The annual reporting requirements are outlined below.

Endeavour Energy's response on the Demand Management Incentive Allowance must include:

1. *Identify each demand management project or program for which Endeavour Energy seeks approval.*

2. *For each demand management project or program identified in the response to paragraph 1:*

    - *explain:*
        - *how it complies with the Demand Management Innovation Allowance criteria detailed at section 3.1.3 of the demand management incentive scheme;*
        - *its nature and scope;*
        - *its aims and expected outcomes;*
        - *the process by which it was selected, including its business case and consideration of any alternatives;*
        - *how it was/is to be implemented;*
        - *its implementation costs; and*
        - *any identifiable benefits that have arisen from it, including any off peak or peak demand reductions;*

    - *confirm that its associated costs are not:*
        - *recoverable under any other jurisdictional incentive scheme;*
        - *recoverable under any other Commonwealth or State Government scheme; and*
        - *included in the forecast capital or operating expenditure approved in the 2019-24 Distribution Determination or recoverable under any other incentive scheme in that determination; and:*

    - *state the total amount of the Demand Management Innovation Allowance spent in the Relevant Regulatory Year and how this amount has been calculated.*

3. *Provide an overview of developments in relation to projects or programs completed in previous years of the regulatory control period, and of any results to date.*

3.0 New Projects for Approval

3.1 *Power*Savers

The *Power*Savers program, designed and implemented by Endeavour Energy, is a comprehensive suite of customer technology applications and services to manage demand and other network constraints.

The *Power*Savers program for residential customers has been established to manage a range of smart load devices including air-conditioning units, water heaters, EV chargers and assets comprising solar and battery unit combinations.

3.1.1 Nature and Scope

The purpose of this specific program is to provide customers with maximum choice by including an expanded list of devices compared to those included in earlier programs.

One of the outcomes of earlier demand management programs was the need for a more comprehensive and complete product which comprises full integration of a customer engagement application, software applications to fully manage the customers' end devices and configurable customer notifications to provide customer flexibility to opt out of Event days or join more programs with a wide range of customer incentives.

The scope of the project also comprises comprehensive data reporting functionality to measure the customer and network benefits progressively through the trial and at completion.

3.1.2 Aims and Expectations

The aims of the *Power*Savers program are as follows:

- Efficiently manage the demand management programs for residential customer smart load devices including air-conditioning units, electric water heaters, EV chargers and assets comprising solar and battery unit combinations.
- Provide analysis:
  - To understand customer behaviour and anticipate the impact of demand management programs to incentives; and
  - On the impact of demand management programs to the distribution network to support the efficient deployment of non-network solutions.

The expected outcomes include:

- Well-developed understanding of participants' interest in the program and the penetration of controllable devices across the Endeavour Energy network;
- Capturing actual/estimated energy reduction per customer and the prevailing weather conditions during Event days;
- Confirming average and total energy reduction for all participants;
- Identifying any issues captured during the Event period including those who discontinued their participation and archiving of all raw data collected; and
- Suitability of the application to be applied more widely across the Endeavour Energy network to manage system demand efficiently with our existing network support resources and services.

3.1.3 Project Justification

The *Power*Savers program is an opportunity for Endeavour Energy to accelerate a transition to a modern grid and deliver a suite of solutions to make energy more efficient for customers while harnessing the rapid uptake of renewables.

We are enabling our customers' evolving energy choices with the expanded list of devices that customers can connect to the program.

Through controlling many types of these distributed energy resources (DERs), we are not only increasing the total amount of flexibility available but can actively manage both peak and minimum demand.

3.1.4 Implementation Plan

The demand management system is delivered by a prime vendor who has assembled a consortium of suppliers charged with designing and implementing the various demand management programs around a core platform.

3.1.5 Implementation Costs

Expenditure claim in FY22 is $10,660.00 in OPEX covering advertising and promotion costs associated with the project. All expenses are accounted in work orders linked to the project.

3.1.6 Results

The trial went live on 31 March 2022 and will operate over a number of seasons. The results of this trial will be captured in a report and made publicly available.

3.2 Dynamic Operating Envelopes

The Evolve project which commenced in February 2019, is a collaboration between industry, academia and government to develop software applications to integrate with distribution network operational technologies (and systems used by aggregators) to manage Distributed Energy Resources (DER) under their control.

The project comprises multiple trials and demonstrations to eventually calculate and publish operating envelopes for all DER connected to the distribution network.

3.2.1 Nature and Scope

Endeavour Energy implemented and tested the Evolve operating envelope platform in July 2021. The costs associated with Endeavour Energy's demonstration of the Evolve platform are captured within this report. Endeavour Energy intends to set real-time operating envelopes for its customer DERs by deploying the software applications and associated services developed as part of the Evolve project.

3.2.2 Aims and Expectations

The aim of the Evolve program is to efficiently manage residential customer smart load devices and generation devices by applying operating envelopes to protect the security of the distribution network.

The expected outcomes, including reporting on:

- The applications and services developed and supported by the trial vendor, Zepben;
- The potential to embed the applications and services in the Endeavour Energy Operational Technology environment to support the publishing of operating envelopes for the range and extent of DER across the Endeavour Energy network; and
- Common methods to communicate with owners and service providers of virtual power plants (VPP) as they enter the Endeavour Energy franchise area.

3.2.3 Project Justification

The Evolve project aims to demonstrate a Distributed System Operator (DSO) model where the project will implement systems and capabilities that calculate and publish (via a software API) the operating envelopes for individual and aggregate DER in the distribution network, enabling DER systems to participate in energy, ancillary and network services markets, while staying within safe operating limits.

In the absence of the mechanisms proposed in the project, it is likely that Endeavour Energy would have to:

a. limit customer DER connection approvals due to uncertainty of the output of DER systems at any point in time,
b. reduce or prevent energy export from DER assets as a component of new connection standards, and

c. limit or remove the rights of DER assets to participate in the delivery of services that support energy reliability and security.

3.2.4 Implementation Plan

The implementation of the Evolve project was conducted by Zeppelin Bend Pty Ltd. Endeavour Energy was a trial participant. As a participant, Endeavour Energy supplied information to the Evolve vendor with data about its distribution network. Zeppelin Bend Pty Ltd provided feedback on the quality of Endeavour Energy supplied data as part of the trial feedback.

The trial commenced in FY19/20 and concluded on 30 June 2022.

3.2.5 Implementation Costs

Expenditure claim in FY22 is $77,677.34 in CAPEX included effort involved in supplying network data and attendance at briefings, progress report and final report presentations. All expenses are accounted in work orders linked to the project.

3.2.6 Results

The extent and nature of the product should realise both off peak and peak demand reductions if and when it is deployed and fully integrated into the Endeavour Energy Operational Technology environment. The trial has recently issued its final report, including the Endeavour Energy network.

3.3 E-Bus Depot Energy Management

3.3.1 Nature and Scope

Endeavour Energy is collaborating with Busways and Evenergi on an innovative trial to integrate electric bus charging with demand signals on the energy grid. As more electric vehicles join the road, demand for electricity increases, putting added pressure on the grid.

Without smart charging, there is an increased risk of peak demand worsening, requiring costly upgrades to grid infrastructure. The joint trial in Penrith aims to avoid this issue and alleviate the added pressure on the grid by feeding real-time demand data into control algorithms that help determine the optimal time to charge.

Endeavour Energy has committed to installing 17 distribution transformer monitors on relevant distribution transformers to gain full real-time visibility on the upstream low voltage and high voltage network the bus depot is connected to. By collaborating with Evenergi, this live data can be used to inform and optimise the control systems that are used to charge the buses. When demand is low or there is a surplus of solar power on the network, buses can charge without adding to peak demand, better utilising the existing grid.

3.3.2 Aims and Expectations

This project aims to explore the possibility of dynamically allocating load limits to customers (also known as dynamic operating envelopes), a capability that is only possible with real-time visibility of the network.

The bus depot Vehicle Energy Management and Optimisation (VEMO) software will receive live network data from Endeavour Energy monitoring devices via an API and they perform the calculation of the dynamic operating envelope within the control system.

By implementing smart charging algorithms, the grid can be better utilised to avoid costly upgrades, which will help keep downward pressure on the price of electricity for our customers.

Whilst exploring this use case, it is also essential to ensure bus operational and charging needs are always met to serve the transport schedule needs, as this is a fully operational bus depot serving the community of Penrith daily.

If successful, this project has the potential to avoid or defer stage 2 network upgrades for the Penrith bus depot, as more buses come online in the coming years.

3.3.3 Project Justification

As part of the Transport for NSW Zero Emissions Bus Depot EOI, Endeavour Energy, Evenergi and Busways worked together to identify potential sites. Busways had selected the Penrith bus depot as the site to receive the first batch of electric buses. As part of the scoping study, it was determined that this site would require up to 4.5MVA of additional capacity to supply the bus depot, and the electrical upgrades would be delivered in multiple stages.

This staged approach provided an opportunity to test this demand management approach in the initial stage when loading constraints were not critical, with the learnings then informing the investments required for the later stages.

This depot, being the first of approximately 20 bus depots in Endeavour Energy's network to receive electric buses, presents an opportunity for the learnings to then be scaled to multiple other sites as they also begin to electrify.

3.3.4 Implementation Plan

The trial was implemented as follows:

Load Monitoring Devices

The HV feeder that supplies the bus depot has a total of 17 distribution substations connected along it.

Load monitoring devices have been purchased and are being installed on all 17 distribution substations. This includes the transformer located on the bus depot property directly supplying the bus chargers.

The load monitors will provide all loading and voltage measurement data at 1-minute intervals. The key interface between monitoring devices and the computation block is through API.

DNSP Controller

The control algorithm will receive 2 separate API feeds. The first being a direct feed of the local transformer supplying the bus depot. The second being a summated view of all 17 units providing the overall loading of the HV feeder.

A mathematical model is proposed to effectively compute the dynamic grid limit for a particular feeder without overloading the electrical network.

VEMO

The dynamic grid limit is then passed into the VEMO control system to integrate this into the logic decision making of the charging rates for each vehicle.

The chargers will then have the capability to dynamically respond to the network loading and assessment can be made on the feasibility of this system in other locations throughout the network.

3.3.5 Implementation Costs

Expenditure claim in FY22 is $54,720.79 in CAPEX covering equipment purchase, installations, engineering development and testing costs associated with the project. All expenses are accounted in work orders linked to the project.

3.3.6 Results

The system is currently in deployment and is expected to be live by the end of 2022. We plan to have the system in operation for approximately 6 months from this date in order to assess the benefits the system can deliver.

A report summarising the results of this pilot will be prepared following this 6-month period.

3.4 Bawley Point & Kioloa Community Microgrid

3.4.1 Nature and Scope

The Bawley Point, Kioloa and Termeil communities are located at the extreme southern end of Endeavour Energy's franchise area. The area is a popular tourist destination, and this means that energy demand can increase four to five-fold during peak holiday periods. Being at the very end of the Endeavour Energy network, electricity services at Bawley Point and Kioloa experience relatively high SAIDI and SAIFI values. Load has also increased to near capacity with regional permanent population movements, in part due to COVID-19. Additionally, the network is voltage constrained – facing low voltage during peak periods, and high voltage during the low demand periods, which will in the longer-term result in poor power quality and curtailment of customers' DER.

To assist in addressing emerging network needs, Endeavour Energy had previously installed a 1MVA diesel generator between Bawley Point and Kioloa to supplement the existing network, but this solution

faces ongoing operational costs and is aging. The largest customer in the network is Willinga Park, who have privately installed a considerable amount of behind the meter generation assets (including solar PV/battery/diesel generators) to allow for standalone operation. Currently only the PV system exports into the network, with the remaining assets only providing a back-up supply for the facilities (or zero export peak demand reduction).

The increasing capabilities and viability of DER - both at a residential and community level - have since made an alternative new technology solution credible when compared to a traditional network solution. This alternative solution would involve the development of a microgrid, with elements co-funded and co-designed with the community.

The major features of the project involve:

- Community co-design, and integration of community owned assets;
- Turnkey supply and installation of a new ~3MVA/3MWh Battery Energy Storage System (BESS);
- Roll out of residential batteries and solar (funded through the NSW Government's Bushfire Livelihoods Economic Recovery program);
- A Distributed Energy Resources Management System (DERMS) to enable control of local generation and storage; and
- Demand management programs (smart streetlights, smart metering and Off-Peak Plus), and the integration of larger customer assets to assist in supporting the network.

3.4.2 Aims and Expectations

The aims of the program include:

1. Address the vulnerability of the Bawley Point and Kioloa communities' network reliability and resilience, and to address the growing demand requirements
2. Demonstrate new planning approaches, including how we can partner and work closely with our customers and communities, and utilise participatory design processes
3. Accelerate decarbonisation, through accessing and incentivising sustainable and renewable energy in our network
4. Establish the first microgrid in Endeavour Energy's network as a new technology solution for edge-of-grid customers, and apply learnings to opportunities in diverse and metropolitan environments
5. Develop a cornerstone project that combines multiple Future Grid technologies such as DERMS, VPPs and community-scale grid batteries

3.4.3 Project Justification

The project was justified as there was emerging network need through load growth and increasing reliance on the aging diesel generator. The project was economically justified when compared to a traditional network solution, with the alternative being construction of a new zone substation at Termeil. This would have meant service to Bawley Point and Kioloa still relied on power lines running through significant areas of bushland. NSW government funding was secured and planned to be used solely to enable the rollout of behind the meter resources. This will leverage significant co-contribution from customers who will own the eventual assets.

3.4.4 Implementation Plan

Endeavour Energy has commenced a number of parallel work streams to progress the project for complete commissioning in mid-2023:

- Community workshops for consultation and behind the meter asset participation design (March 2022 – Ongoing).
- Expressions of interest for subsidised battery or solar systems will close end of August 2022. Installation is expected to start in December 2022.
- Procurement and supply of the grid scale BESS (~3MW/3MWh) to be commissioned early 2023.
- DERMS, Off-Peak Plus and energy efficiency program expecting implementation early 2023.

3.4.5 Implementation Costs

The DMIA components will be used to support the innovative aspects of the project including the participatory community engagement and co-design approach as well as contribution toward supply, network integration and commissioning of the islandable grid-forming battery. Expenditure claim in FY22 is $508,065.41 in CAPEX. All expenses are accounted in work orders linked to the project.

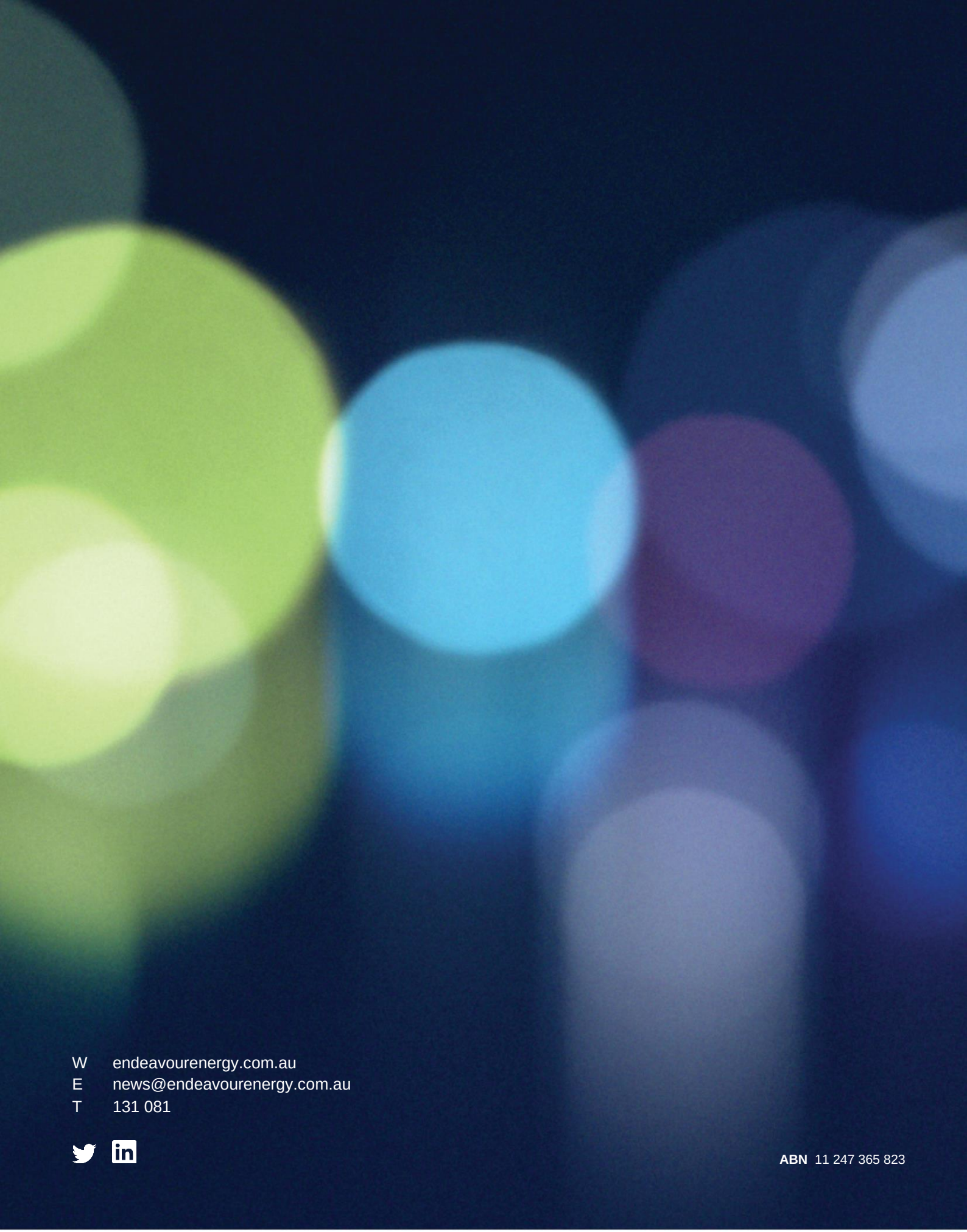
3.4.6 Results

The project is still in the final stages of the design and procurement phases, preliminary results have shown high community interest in the program and a willingness to co-contribute to battery and solar rollout from community members.

4.0 Background

Endeavour Energy confirms the funding of the projects contained in this report are not:

a. recoverable under any other jurisdictional incentive scheme;
b. recoverable under any other state or Commonwealth government scheme; and
   included in the forecast CAPEX or OPEX approved in the AER's distribution determination for the next regulatory control period, or under any other incentive scheme in that determination (such as the D-factor scheme for NSW).



W endeavourenergy.com.au
E news@endeavourenergy.com.au
T 131 081

ABN 11 247 365 823

Endeavour Energy