Demand Management Plan

April 2023

START ›

ERGON ENERGY NETWORK | energex

Part of Energy Queensland

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Message from our Executive

Demand Management (DM) has been active in Queensland for decades, providing significant capability to the way we manage our network. It involves using non-network solutions to balance demand by reducing demand during peak periods and shifting demand into troughs – keeping a downward pressure on capital expenditure and customers' electricity bills.

Our DM Program includes the well established Broad Based initiative which rewards hundreds of thousands of customers across the network for their demand flexibility. It provides customers with simple set and forget solutions using load control tariffs and the PeakSmart air conditioning program. Through our ongoing Targeted initiative we have entered into network support agreements to address emerging network constraints and defer or reduce network costs. Not only have these initiatives been used for load shaping but for emergency events - helping to "keep the lights on".

Our DM program is continually evolving to respond to changes occurring in customers' demand – from the take up of air conditioners to the installation of solar PV systems and growing numbers of electric vehicles (EVs).

While traditionally DM has focused on lopping peaks in demand, the program is expanding to address lower and negative troughs (minimum demand) that are arising on our networks due to high levels of solar. In the future, localised negative peaks (minimum) or maximum peaks in demand could arise from large numbers of customers dispatching their energy resources (CER) in response to very high or low energy market costs. We are exploring opportunities for both our Broad Based and Targeted initiatives to respond to these changes and deliver cost effective solutions. We will continue to advance our DM Strategy and plan to keep a step ahead of these changes.

DM is a key capability in the once-in-a-century transition of our energy system. We will grow our program in line with the Government's Queensland Energy and Jobs Plan (QEJP) targets by:

- beating the target of 50% renewable energy by 2030, and moving to 70% renewable energy by 2032, and 80% by 2035-36; and
- delivering zero net electricity emissions across our isolated systems.

Electricity networks are an essential platform for the transition to net zero. It's clear that there is no solution without distribution.

With all this change, our focus on our customers and affordability remains a priority. Through partnerships with our customers and DM providers, we continue to deliver non-network solutions at a lower cost than traditional network. Thereby minimising capital expenditure and keeping downward pressure on electricity prices for customers.

Our DM Program works alongside dynamic connections, cost reflective tariffs and battery energy storage to ensure we can effectively integrate renewables and enable the electrification of transport, while also continuing to ensure safe and reliable operation of our networks.

We expect both network connected and customer battery storage to be integral to new DM opportunities to enable CER. In response, this year we have established a new Network Connected Batteries initiative. This initiative will put in place localised network storage in areas of Queensland with large amounts of rooftop solar PV, providing greater network stability and reliability.

New energy technologies, smart meters and digital solutions will enable customers with flexible demand to participate in emerging energy markets. Our DM Program will respond to these changes by providing customers with more choices and more options to unlock benefits associated with flexible, efficient and affordable energy use - whether this is shifting load of a hot water system or an electric vehicle (EV).

We are looking to the future and advancing our networks to empower customer choice in their energy supply solutions. 2023-24 will see us build on our established and long-standing DM Program: making the most of our network owned and controlled DM solutions while evolving the program to pursue complementary market-based partnerships. Our new capabilities will also enable dynamic operating envelopes (DOE) as a mechanism for managing the levels of electricity a customer can export to the grid from their rooftop solar systems and batteries.

These opportunities will be realised through our new Distributed Energy Resource Management System (DERMs). Our DERMs will enable greater DM customer offerings by interacting with market participants' systems to aggregate customer loads for emergency and load shaping responses. The DERMs will optimise the utilisation of flexible CER, with consideration of our network constraints and customer preferences. Our new capabilities will also enable dynamic operating envelopes (DOE) as a mechanism for managing the levels of electricity a customer can export to the grid from their rooftop solar systems and batteries.

It's critical we make the most of what exists today while new solutions and technologies evolve. The repurposing of our existing load control system over the last year to tackle both maximum peak and negative peak (minimum) demand, saw the development of new schedules for hot water systems on load control tariffs. These schedules are ready for implementation in autumn and spring when solar generation is at its peak. This will ensure hot water systems are off during evening peak and wanting to heat during the middle of the day. Hundreds of thousands of customer's hot water systems will act as solar sponges soaking up some of the excess solar being generated and exported to the grid, helping the network while still ensuring customers have hot water when they need it.

We will continue to provide set and forget simple solutions via our traditional DM platforms while also enabling greater choice to customers with new solutions enabled through our DERMS, DOE and new market platforms.

Our DM Program will play a pivotal role in matching customers' consumption of electricity with renewable generation to enable a smooth low-cost decarbonisation journey of the energy system. The shift to clean energy generation alone will not achieve net zero emissions. We need efficient energy consumption to cost effectively accommodate the increasing total energy needs of customers through electrification of transport and changes in domestic and commercial heating, cooling and cooking needs. We know from experience that when customers' demand is flexible, we can put downward pressure on augmentation while also providing benefits in managing the inherent fluctuations of supply associated with renewable generation.

The QEJP outlines a transformation of Queensland's electricity system and the pathway to the continued delivery of clean, reliable and affordable energy. This year will see the expansion of our DM Plan to cover all of Queensland by including our 33 isolated power stations which form part of the transformation and decarbonisation of the energy system. Our DM initiative for remote and isolated systems will see a plan developed in consultation with individuals, businesses, and organisations in these areas to reduce the long-term cost to decarbonise these communities and provide customers options to reduce their electricity bill. Delivering outcomes that see and define clear benefit sharing that includes a cleaner energy system, reduced environmental risk and improved energy security.

We will collaborate with Ergon Energy Retail to support the March Cost of Living announcement to provide benefits to customers, network and generation services and ensure lower cost and better use of renewable resources.

This DM Plan forms part of our stakeholder engagemen to ensure our DM Program continues to deliver rea benefits to our communities, and that our planned activities have the social licence to operate.

We look forward to working with our customers and DM providers during 2023–24 and beyond.

Peter Price
Executive General Manager, Engineering

Introduction

Each year, Energex and Ergon Energy Network (Ergon Energy) publish a DM Plan to:

- describe our long-term DM Strategy (see Our Strategy)
- outline the principles we'll use to achieve the strategy (see Our Principles)
- provide information about existing and planned DM initiatives (see Our Initiatives)
- identify opportunities and challenges that may influence our strategy (see Challenges and Opportunities)
- describe initiatives for the coming financial year, including forecast costs and performance targets (see DM Initiative Budget and Targets)
- meet our regulatory requirements under section 127C of the *Queensland Electricity Regulation 2006*.

For the first time, we have expanded our DM Plan to also cover the 33 power stations that supply 39 communities too remote to connect to the national electricity market. While this isn't a regulatory requirement, it means the DM Plan now provides a whole of Queensland snapshot and is designed to support the Queensland Energy and Jobs Plan (QEJP) objectives in relation to Action 3.5, Clean energy for remote and First Nations communities. The Remote and Isolated Communities initiative will help lower the long-term cost to decarbonise these communities and provide customers options to reduce their electricity bill.

To find out more about Energex and Ergon Energy and our service area see Appendix One: About Us and Appendix Two: Our Service Area.

The Context

Queensland has one of the highest penetrations of rooftop solar in the world. The forecast ongoing strong adoption of this and other technologies by our customers requires us to continue transforming the Queensland distribution networks to improve resilience and grow the interconnected platform enabling this renewable future.

The Queensland Government's QEJP target of 70% by 2032, and 80% by 2035-36 will accelerate the connection of renewables. The Government has also extended this commitment to decarbonisation of remote and First Nations communities connected to our isolated systems. Renewable energy targets, along with a growing customer desire to adopt "greener" technologies, will see an even greater take up of a variety of CER such as EVs, rooftop PV, energy storage and smart home appliances.

Renewable energy by its very nature fluctuates depending on the weather and the time-of-day – this variability, can lead to challenges of managing security, quality of supply and reliability on the network. As we connect more renewable generation to the network, the increasing reverse power flows, greater variability, along with higher peaks and deeper troughs are all creating challenges for managing loading and voltage on the distribution network, and more broadly, system-wide stability.

Under this scenario, we will see more negative minimum demand occurrences, new and different peaks (minimums and maximums) arising from dispatchable CER (generation and load). DM initiatives will play a pivotal role in matching customers consumption of electricity with its generation to enable a smooth transition at lowest cost to net zero energy system.

On top of this, the 'electrification of everything' adds another element as we strive to create a net zero emissions economy. Electricity will be a critical fuel for the future of Australia, with EVs gaining momentum and its use to power emerging energy industries, such as hydrogen production. Fundamentally, our networks need to move electricity between generators and users, from when and where it is made and stored, to when and where it is used. What's changed is generation (from roof top solar and batteries) is now embedded throughout our distribution network. New regulatory obligations require Distribution Network Service Providers (DNSPs) to enable export services from these CER.

New technologies are providing customers in remote and isolated areas with more choices to manage and supply their electricity. By engaging with customers in our remote and isolated networks on renewables, energy usage, energy efficiency and DM opportunities, we will ensure that we can continue to provide a safe and reliable supply. By implementing efficiency measures now we can reduce the longer term costs of decarbonisation and deliver benefits for customers now. These activities will help us meet the growing electrification needs and zero net electricity emissions targets for our isolated power systems. This will include partnering with Ergon Energy Retail who will be rolling out an energy efficiency program in Ergon Energy Network's isolated First Nation communities.

Our Response

It's clear that there is no one solution to meeting the challenges of net zero emissions. The full capabilities of a smart distribution network must be harnessed to accommodate more decarbonised energy.

Our distribution networks enabled by new technology are the platform for sharing PV, stored energy (batteries) and enabling the electrification of transport.

Our DM Strategy is part of a suite of strategies outlined in Our Future Grid Roadmap, which communicate our approach to transform Queensland's distribution networks and deliver safe, affordable, secure and sustainable energy solutions. (see figure 1). These support the delivery of the QEJP. We are currently developing our Tariff Structure Statement and Regulatory Proposal 2025-30. More information can be found on our Talking Energy website.

A successful DM program will lead to lower network augmentation expenditure, optimised investment in CER, and a greater match between customer demand and renewable generation. Our DM Program will play a pivotal role in delivering a low-cost transition to a net zero future. DM is core to managing the network efficiently to support the delivery of affordable, smart, reliable and clean energy for the people of Queensland.

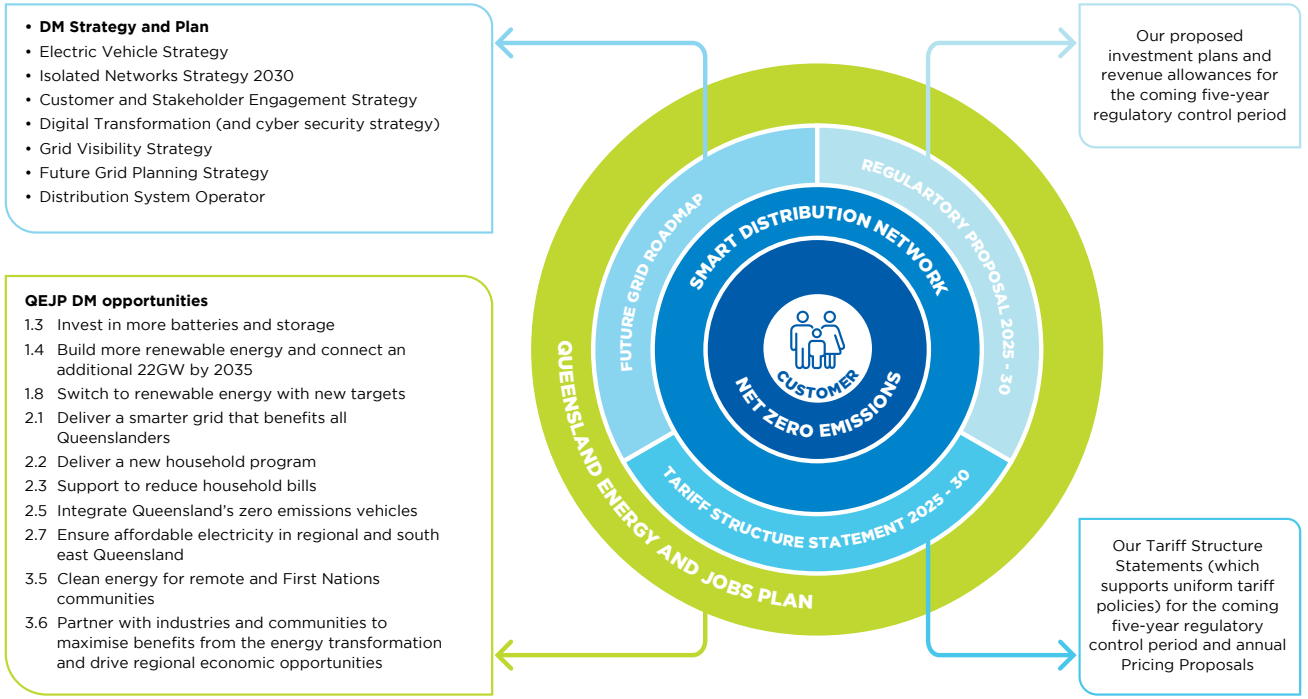

Figure 1: DM Plan part of the response

Our DM Strategy and Plan delivers on affordable, smart, reliable and clean outcomes for our communities and customers:

Affordable

- Delivering DM solutions that are more cost effective than traditional network infrastructure
- Enabling customer choice and participation in demand flexibility
- Supporting tariff reform, including new flexible-load tariffs
- Providing options for customers seeking to reduce energy costs while supporting reduced cost of supply in Isolated communities
- Optimising the use of our legacy platforms (AFLC) to provide set and forget solutions

Smart

- Utilising our DERMS and dynamic operating envelopes to flex load and generation on the network
- Partnering with DM providers and working with emerging markets
- Innovating for a smart grid using our DMIA funds

Reliable

- Using DM capabilities to help 'right size' the network
- Enhancing DM capabilities to manage both maximum peak and negative peak (minimum) demand
- Locating network connected batteries in areas with high solar PV generation to provide a localised solution to negative peak (minimum) demand

Clean

- Using DM to match renewable generation with customers' energy consumption.
- Supporting greater penetration of renewables on the grid
- Supporting electrification of transport, homes and businesses
- Enabling decarbonisation of isolated and remote communities

See Figure 2 on how our DM initiatives and activities support these outcomes.

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Targeted initiative
- Deliver DM solutions that are more cost effective than traditional network infrastructure

Broad Based initiative
- Enable customer choice and participation in demand flexibility
- Maintain AFLC control of customer appliances on load control tariffs

Network Connected Batteries initiative
- Desktop studies to support real world experience to inform a sustainable economically efficient model

DM Development initiative
- Develop a roadmap to 2032 to guide our DM strategy, plan and program
- Develop targets to right size Broad Based initiative
- Supporting development of new flexible load control tariffs
- Lead and manage our Tariff Trial project

Remote and Isolated Communities initiative
- Develop DM strategy and plan for remote and isolated areas
- Deliver Thursday Island pilot and collating learnings
- Expand our Industry Engagement Strategy to include our approach for engagement for non-network solutions in remote and Fringe of Grid areas

Broad Based initiative
- Continue to deliver PeakSmart air conditioning program
- Partner with DM providers and work with emerging markets

DM Development initiative
- Support rollout of load control system functionality of DERMs
- Trial and explore demand flexibility of hot water load via new technologies

Innovation Initiative
- Develop a DM innovation strategy
- Manage and govern our DMIA funds and projects

Remote and Isolated Communities initiative
- Develop DM strategy and plan for remote and isolated areas

Broad Based Initiative
- Enable customer choice and participation in demand flexibility
- Maintain near ubiquitous AFLC capability to support customer choice through load control tariffs

Network Connected Batteries initiative
- Manage the market engagement and commercial arrangements for our fleet of batteries

DM Development initiative
- Develop a roadmap to 2032 to guide our DM strategy, plan and program
- Develop targets to right size Broad Based initiative
- Support development of new flexible load control tariffs
- Lead and manage our Tariff Trial project

Innovation initiative
- Develop a DM innovation strategy

Remote and Isolated Communities initiative
- Develop DM strategy and plan for remote and isolated areas
- Deliver Thursday Island pilot and collating learnings

Targeted initiative
- Negotiate and execute contracts to deliver non-network options

Network Connected Batteries Initiative
- Integrate network batteries into the DM Portfolio

Broad Based initiative
- Maintain AFLC control of customer appliances on load control tariffs

Remote and Isolated Communities initiative
- Expand our Industry Engagement Strategy to include our approach for engagement for non-network solutions in remote FOG areas

Figure 2: DM managing the network efficiently to support the delivery of affordable, smart, reliable and clean energy

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What is Demand Management?

DM is the active management of energy to match the consumption of electricity with its generation. This means using energy efficiently; using less or generating more in peak demand times and shifting energy consumption to low demand periods (e.g. into the middle of the day when there is plentiful renewable generation). DM is implemented by customers or DM providers, either in exchange for financial incentives or as a required part of a connection agreement.

For a more detailed explanation of DM see Appendix 3 DM.

What is demand flexibility?

Australian Renewable Energy Agency (ARENA) defines 'demand flexibility' as the capability of customers to vary their demand in response to generation, network, or market signals. Demand flexibility can operate in real time and can be incorporated into long-term investment decisions.

Customers generally have essential resources (the primary source of electricity to a customer's home or business) and flexible resources (such as solar PV, batteries, hot water systems, EVs, pool pumps and water pumping/irrigation equipment).

Flexible resources can have their energy use modified while still meeting the needs of the customer. They can vary their energy demand or operating times, and/or provide energy storage.

When it comes to flexible energy use, customers have different circumstances and motivations. Participating in DM is not an 'all or nothing' for customers - they can choose which appliances and how often they are flexed. The key to our successful approach to DM is ensuring our programs match customer needs, provide choice, have social licence, and are trusted by our customers.

Our principles guide the design of our DM Initiatives by working with customers to provide effective incentives and simple solutions to help them change their energy use and embed the behaviour. For example, we may encourage people to move their electricity use to a different time of day, switch appliances off or on, or modify the energy use of flexible appliances (or loads). This can allow us to reduce or delay network expenditure in an area where there is a network constraint. We currently offer a variety of DM incentives and rewards programs across Queensland - see Energex cashbacks and Ergon Energy cashbacks.

Expanding our capability and reach

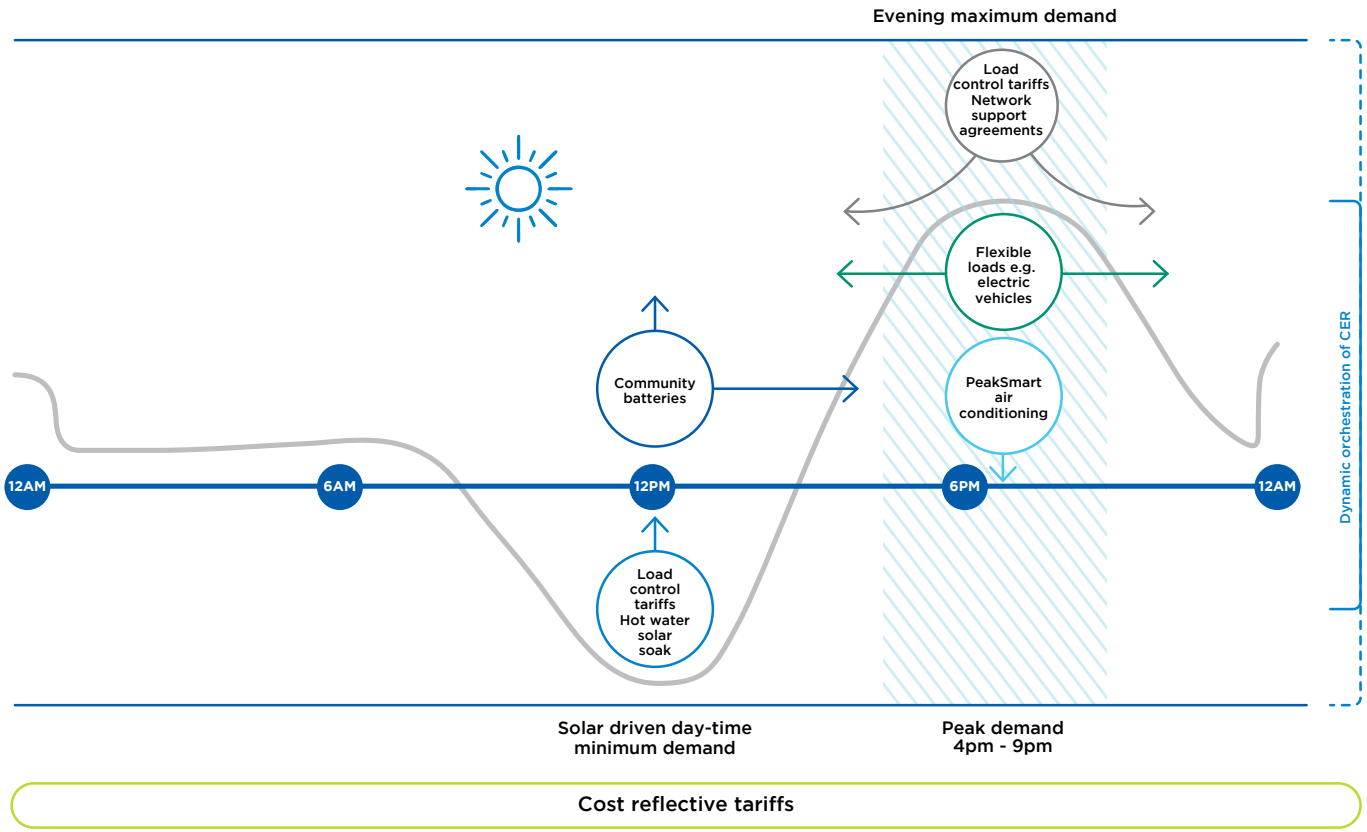
Customer demand flexibility has been enabled by Audio Frequency Load Control (AFLC) in Queensland since the 1950s. We continue to seek ways to complement this load control capability. We are already working on new technologies and systems that can provide more targeted and responsive control. In addition, the regulations relating to energy services are also continuing to evolve, changing the way in which the service is provided or procured by a Distribution Network Service Provider (DNSP)

Our DERMs platform, which commenced being built in late 2022, will enable dynamic network constraint management and efficient coordination of CER. DERMS will allow Energex and Ergon Energy to dynamically manage network constraints and facilitate the communication of DOEs. The DERMs will build on our existing capabilities for communicating DOEs to customers through our Dynamic Customer Connections using our utility server. DERMs enables direct interaction with CERs, gateway devices and relevant market participants (e.g., Virtual Power Plants and aggregators). At the same time, it provides additional capability to our load control system to more dynamically switch loads using AFLC in response to network needs.

Demand Management Enables CER integration

We are implementing a suite of actions to maximise the potential of our network to support changing behaviours, technologies, customers, and seasons. These actions seek to provide balance – giving customers choice about connecting the energy resources they want, without putting excessive pressure on the network.

DM alongside cost reflective tariffs, network battery storage and dynamic connections aim to increase the hosting capacity of our network. The active management of two-way energy flows optimises the use of the network and the value of CER, ensuring prudent investment and downward pressure on electricity prices.



Load control tariffs

These tariffs are designed to reward customers for using flexible loads outside of peak demand times (usually 4-9pm). Hot water systems on control load tariffs can be turned on during the middle of the day to soak up excess solar PV being generated and exported onto the network.

Network connected batteries

Network batteries can charge during time of high solar PV export and discharge during periods of maximum peak demand. Delivering DM to address negative peak (minimum) demand and enable even higher levels of rooftop PV on our networks.

PeakSmart air conditioning

Customers and installers are rewarded for installing demand responsive air conditioners. During periods of extreme demand on the network, these air conditioners can be signalled by network to reduce their consumption.

Network support agreements

These agreements reward customers, aggregators or other DM providers for implementing energy efficiency or demand flexibility (shift, shed or shape load) in areas of constraint on the network.

Cost reflective tariffs

Network tariffs that encourage and reward customer behaviour and flexibility through demand or time of use charging. Supporting uniform tariff policies.

Dynamic connections

Set the limits that a customer can export to the network. These limits will vary over time and will allow higher export limits when there is capacity on the local network.

Our Demand Management Portfolio

Since 2019, we have reported our DM capability to the Australian Energy Market Operator (AEMO) via the Demand Side Participation Information Portal. Our Broad Based, Targeted and Network Connected Batteries initiatives give us a DM portfolio capable of:

- providing network support during system-wide and localised issues,
- enabling a growing number of CER to connect to our network,
- supporting the transition to a net zero emissions future, and
- supporting system-wide issues when called upon by AEMO.

Our total DM capability for Energex and Ergon Energy is shown in figures 3 and 4.

Energex: Portfolio Summary

(as reported to AEMO's Demand Side Participation Portal)

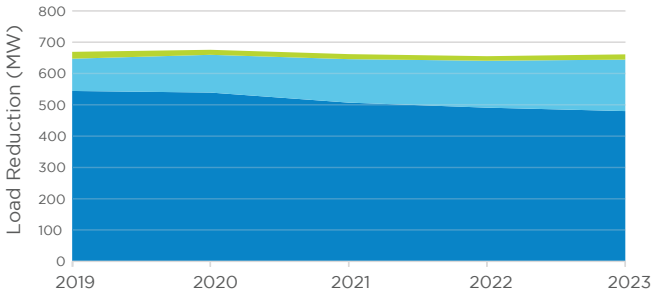


Figure 3: Energex DM portfolio

Ergon Energy: Portfolio Summary

(as reported to AEMO's Demand Side Participation Portal)

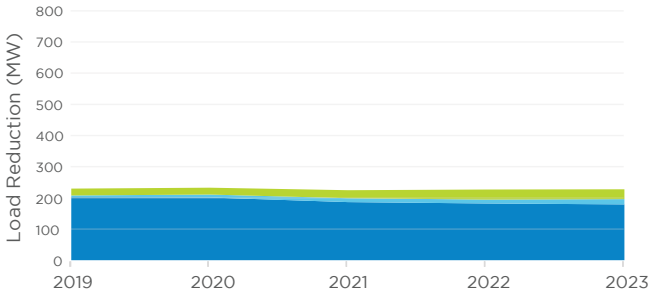


Figure 4: Ergon Energy Network portfolio

Broad Based load control tariffs (peak)
Broad Based PeakSmart (DRM1)
Targeted Network Support Agreements

Size of our Portfolio

Our DM Portfolio is made up of load we can flex from our Targeted and Broad Based initiatives, and as of this year, load we can flex by storing and releasing from our Network Connected Batteries initiative.

Determining the size of our Targeted initiative is straightforward. This portion of the portfolio is the sum of all loads (MW) available to flex under our network support agreements. When our Network Planning team identifies a constraint on our network, we engage with the market to see if our customers or DM providers can deliver a solution that solves the problem. If a suitable solution is found, then we enter into an agreement for an amount of network support at the location and times required. See our Industry Engagement Strategy. These targeted solutions address local network limitations to defer and/or avoid traditional network investments.

In comparison, our Broad Based initiative has been built up over many years. It consists of appliances such as hot water systems and pool pumps that are connected to load control tariffs, along with PeakSmart air conditioners. All which are flexed using our network owned and operated load control system and AFLC technology. As the name suggests, these products are available to customers across the network and do not target specific areas with network limitations. The Broad Based segment of our portfolio delivers load shaping of demand by lowering peaks and filling troughs. Our Broad Based initiative is well placed to deal with wide scale take up of new customer energy needs, for example from air conditioning, roof top solar and the electrification of water heating and transport.

The pace of change happening across our network is driving the review of our Broad Based initiative to ensure that it is equipped to deliver a sustainable service and the load shaping required. In support, we have committed to developing targets for peak demand and load flexibility that ensure our portfolio is right sized to handle future challenges, is cost efficient and customer centric. It will also ensure we are providing the necessary support to the QEJP.

Network Connected Batteries – taking energy generated locally and using it locally

Batteries are a key part of our approach to enabling a smart distribution network and supporting the QEJP renewable targets. The increased numbers of CER connecting to our network has seen the expansion of our DM Portfolio to include Australian Energy Regulator (AER) waiver approved network connected batteries. These batteries are energy storage systems connected at the distribution level to store the excess electricity generated by CER in the area for later use and can also provide network and market services. They are a key new product to manage future energy demands - both traditional load peaks and new emerging negative peaks (minimum demand). They provide a local demand solution - balancing storage and supply.

Over the course of the next 12 to 18 months, Energex intends to deploy three and Ergon Energy intends to deploy nine 4MW/8MWh batteries, to complement the five existing 4MW/8MWh batteries in regional centres across Ergon Energy. These new government funded batteries will be spread across Queensland near communities that have significant rooftop solar generation. The batteries will support the security and reliability of energy supply by charging during times of high solar PV export and offsetting minimum demand. They will also provide other network services such as voltage management to AEMO and third-party energy trading.

Additional opportunities are also being scoped:

- via the partnership between Energex and retailer Origin Energy for 35 neighbourhood batteries across Ipswich under the QEJP. This is a jointly funded battery project which will inform future business opportunities.
- for community batteries under the Australian Government's Community Batteries for Household Solar Program.

The lessons learnt and information gained from all the distribution connected batteries (above) will inform:

- the extent to which these batteries can provide support during maximum peak and negative peak (minimum) demand events, defer augmentation and provide upstream support.
- price signals for HV connections, to encourage the import and export of electricity at times that mitigate network impacts and ensure that these types of customers make an efficient and equitable contribution to the recovery of the residual (fixed) costs of owning and operating the electricity network (see High Voltage Battery Tariff Trial).
- business models that leverage the opportunities to support the energy transition, complement large scale battery storage and manage negative peak (minimum) demand at substations with high levels of rooftop solar.
- how connection policies, connection standards and processes can be improved to integrate energy storage more efficiently and expeditiously into the distribution network in a safe and commercially viable manner.

Our energy storage strategic ambition will comprise a small percentage of the minimum storage required in Queensland as identified by AEMO's step change forecast in the 2022 Integrated System.

For further information see our Talking Energy website here.

High Voltage Battery Tariff Trial

Over the last few years, we have been approached by proponents of large-scale batteries wanting to connect to the high voltage (HV) part of our network. They have advocated that standard Connection Asset Customer (CAC) network tariffs are not suitable for these situations – mainly because they were not designed with the usage profile of a large battery in mind.

Our Network Pricing team have listened to the feedback and a trial of tariffs that are more suited to daily import and export cycles that support network and market outcomes will commence in 2023-24.

Ergon Energy Network and Energex have received approval from the AER to trial new tariffs for our HV connected customers. The network trial tariffs feature a three-part import and three-part export structure. The trial will assess the ability of battery energy storage customers to respond to cost reflective price signals to support the electricity network in periods of low system demand and peak periods when the electricity network is more likely to be constrained.

The trial will also identify if other large customer segments may respond to time of use windows linked with export services. The trial is expected to commence from 1 July 2023 to operate for 12 months, with the possibility of extension for up to a further 12 months. The focus of the tariff trial is (CAC) connected at 11kV up to 66kV.

For further information see AER website here.

Our Demand Management Strategy

In this time of transformation, our DM Strategy responds to the challenges and opportunities faced by our network. It supports the delivery of the QEJP and is guided by our principles.

Our Strategy sets out our approach for partnering with our customers and DM providers to enable flexible loads and generation to improve network utilisation, make use of existing capabilities and deliver a smooth lower cost transition to a low carbon future. It aims to unlock opportunities for more control, choice and flexibility in how consumers use energy to deliver on affordable, reliable, smart and clean energy outcomes. The Strategy delivers on Our Future Grid Roadmap and will be implemented via our six initiatives (see Figure 5). Our strategy is aligned with the QEJP and our target setting will be done in coordination with the Queensland Government.

Our Strategy recognises that active participation in DM is not suitable for, nor wanted by, all customers. Demand flexibility does not have to mean all customers, all of the time, for all of their load or generation. Rather, it is some customers, some of the time, for some of their load or generation, who deliver sufficient flexibility for system-wide benefits that flow to both participants and non-participants. Our DM Strategy builds on our existing simple set and forget solutions such as PeakSmart air conditioning and load control of hot water, while also evolving in response to new technologies and market solutions.

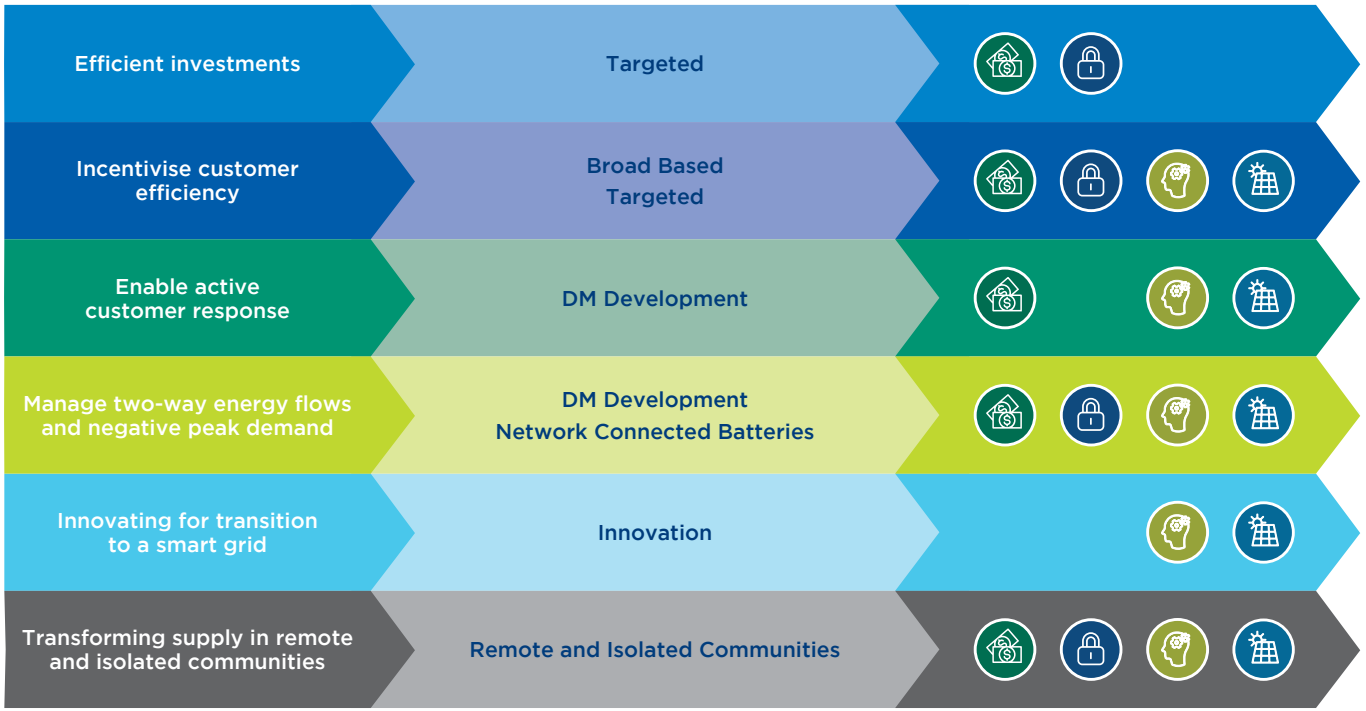


Figure 5: Our DM Strategy delivering on affordable, reliable, smart and clean outcomes for customers

Efficient investments

We will continue to engage with customers and DM providers to seek DM solutions that provide cost effective alternatives to infrastructure options.

Our Targeted initiative will be underpinned by our Industry Engagement Strategy – where we engage and work with customers and DM providers to develop and implement demand side, non network solutions to address distribution system limitations and provide lower costs for customers.

As the energy services market matures, our Strategy is to pursue both individual and aggregated demand solutions for network constraints. Business models will evolve to create a more efficient process for rewarding support from both customers and aggregators. Contracts will transition over time from paper based to automated contracts; dispatched, measured and verified by our DERMs. This will be supported by our customer self-service portals, improved business-to-business processes and increasingly automated CER.

Incentivise customer efficiency

We will continue to provide opportunities through our Broad Based and Targeted initiatives for customers to be rewarded for changing their demand to provide support to the market and address network limitations – either directly or via a third-party aggregator.

By incentivising customers and DM providers we will encourage DM solutions that promote long-term efficient network utilisation through load shaping. We will support the design of cost reflective and load control tariffs that will facilitate take-up and encourage customer behaviours that support more efficient use of the network and save customers money.

Our Broad Based initiative will focus on appliances that are widely recognised to be the largest and/or most flexible loads used by residential and small business customers:

1. Electric hot water systems
2. Air conditioners
3. EVs

We will incentivise customers to shift loads out of peak times and in some cases shift to the middle of the day to make the best use of renewable energy. This puts downward pressure on network augmentation and saves customers money.

Our Broad Based strategic approach is to establish targets for load (MW) required under control each year for peak demand and load flexibility. Depending on the size of these targets (refer to Size of our portfolio), opportunities may be pursued in future years to explore unlocking demand flexibility in other customer segments such as large customers.

Our Targeted approach is guided by our planning process which identifies forecast network limitations and network augmentation and replacement project options. Refer to our Distribution Annual Planning Reports (Energex and Ergon Energy).

Enable active customer response

Where customers choose to participate, we will continue the direct control of loads using our existing AFLC capability. We will maintain and make the most of our existing load control system and AFLC technology by:

- Utilising existing capabilities to shift loads in response to both maximum peak and negative peak (minimum) demand.
- Increasing capabilities through smart technologies and automation possible via our DERMs.

We will complement this capability by procuring and dispatching cost-efficient demand response via our DERMs platform. Our DERMs capabilities will enable us to:

- form market partnerships with customers and DM providers. This is a no-regrets action to engage with the market to deliver optimal outcomes for both network and customers from demand flexibility.
- orchestrate flexible load and generation through DM and dynamic operating envelopes (DOEs).

As our DERMS and DOE capabilities mature, new opportunities to flex EV loads will arise. Additional options will be pursued then to provide greater customer choice on EV charging. For the 2023-24 year the focus will be on activities to support the development of DERMS and DOE to unlock these additional opportunities.

It is vital we bring our customers and DM providers with us on the transition. Our customers have an opportunity to be active participants on the network through advanced, 'smart' digital meters, 'smart' inverters, new dynamic connections, load control and cost reflective tariffs. Our smart grid capabilities such as our DERMs will enable more DM solutions. By working in partnership with our DM providers we can unlock opportunities for customers through new and emerging energy services, markets, and widespread availability of digitally tailored solutions.

At the same time, we acknowledge that automation and smart appliances don't appeal to all customers. Some customers may only have simple appliances and reduced access to CER and enabling technologies. Other customers may have low motivation or ability to actively participate in demand flexibility. In line with our principle of being inclusive and equitable, we will aim to provide options and choices for our customers to participate in DM - that enable those who want to participate, without negatively impacting those customers who do not wish or cannot participate.

Our enablement approach will incentivise flexibility, support and empower customers to increase their capacity to flex their demand for their own and network's benefit. It will be about giving customers information about the benefits of flexing demand and the choice on whether to participate in DM programs. We will raise customer's awareness and education of our DM Program, load control and cost reflective tariffs.

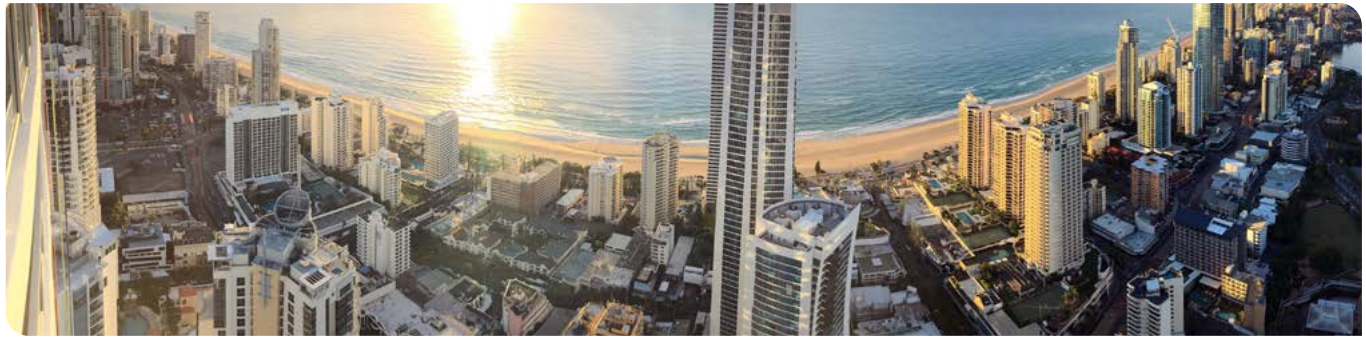
Manage two-way energy flows and negative peak (minimum) demand

We will continue to provide DM solutions that improve utilisation and deliver a smooth lower cost transition to a low carbon future, while maintaining reliability and security. This means implementing DM solutions to manage both maximum peak and negative peak (minimum) demand events occurring on our distribution networks. We will leverage our Broad Based DM capability to manage whole of system security for both maximum peak and negative peak (minimum) demand events.

Our Network Connected Batteries initiative is a key element to our strategic approach to managing impacts of whole of system negative peak demand and facilitating decarbonisation of the electricity system.

The large-scale network connected batteries, in areas with high solar penetration across Queensland, store the excess renewable energy generated by Queenslanders for sustainable use and distribution into the market in the high-use peak periods. Energy storage located in areas with high solar PV generation provide a localised solution to negative peak (minimum) demand on zone and bulk supply substations. The closer the storage is located to renewable generation, the greater the benefits through reduced costs and greenhouse gas emissions.

Our Network Connected Batteries will complement transmission level storage, Low Voltage connected storage and third-party battery based solutions arising from the Regulatory Investment Test for Distribution (RIT-D) process.



Innovating for the transition to a smart grid

To stay ahead of the transition to net zero emission, our DM Development and Innovation initiatives will drive continuous improvement and innovation of our DM Program. Our focus will be on evolving the capabilities and services required as we transition to a smart grid. We will help unlock multiple benefits for our customers and market participants and drive more value from our network assets. Through the formation of the Distribution Service Operator (DSO) we will support new markets that enable customers with CER to extract new value. Our work on DERMS and DOE will see us well placed to deliver for our customers.

We will develop a DM innovation strategy to drive a proactive and directed approach to using our Demand Management Innovation Allowance Mechanism (DMIAM).

Transforming supply in remote and isolated communities

We will continue to seek opportunities for DM to improve efficiency of electricity supply to remote (Fringe of Grid) and isolated areas and to support their transition to a cleaner decarbonised energy system with reduced environmental risk and improved energy security. Acknowledging the unique challenges faced by these communities (such as their distance from major centres, weather, environmental conditions and access to trades, efficient and smart energy appliances), our strategy will take a long-term growth approach.

Our strategy will support our Isolated Networks Strategy 2030 and the QEJP objectives in relation to Action 3.5, Clean energy for remote and First Nations communities. It will help lower the long-term cost to decarbonise these communities and provide customers options to reduce their electricity bill.

We will support our Fringe of Grid program through our Remote and Isolated Communities initiative. Our expanded Industry Engagement Strategy will set out our approach to engaging and working with remote customers and non-network providers interested in proposing, or tendering for solutions, where these provide an efficient alternative to traditional poles and wires investment.

Our strategy will be developed in line with our principles of cocreation and collaboration with our remote and isolated community stakeholders – including First Nations people.

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A Living Strategy

Given the amount and rate of change in the energy sector and DM environment we must remain agile and responsive. To do this we have a living strategy that evolves with new knowledge and capabilities, to meet the varying challenges and opportunities that present as we transition our grid. A strategy that embraces this customer-driven change and aims to maximise the opportunities and value for and from CER – from hot water systems to batteries.

The design and structure of our DM Program ensures our initiatives are driving a process of innovating, producing, adopting and adapting to support the delivery an affordable, reliable, smart and clean network. Refer to figure 6. The size and make up of Our DM Portfolio will also change in response to system and local network needs and as innovations are implemented in the coming years.

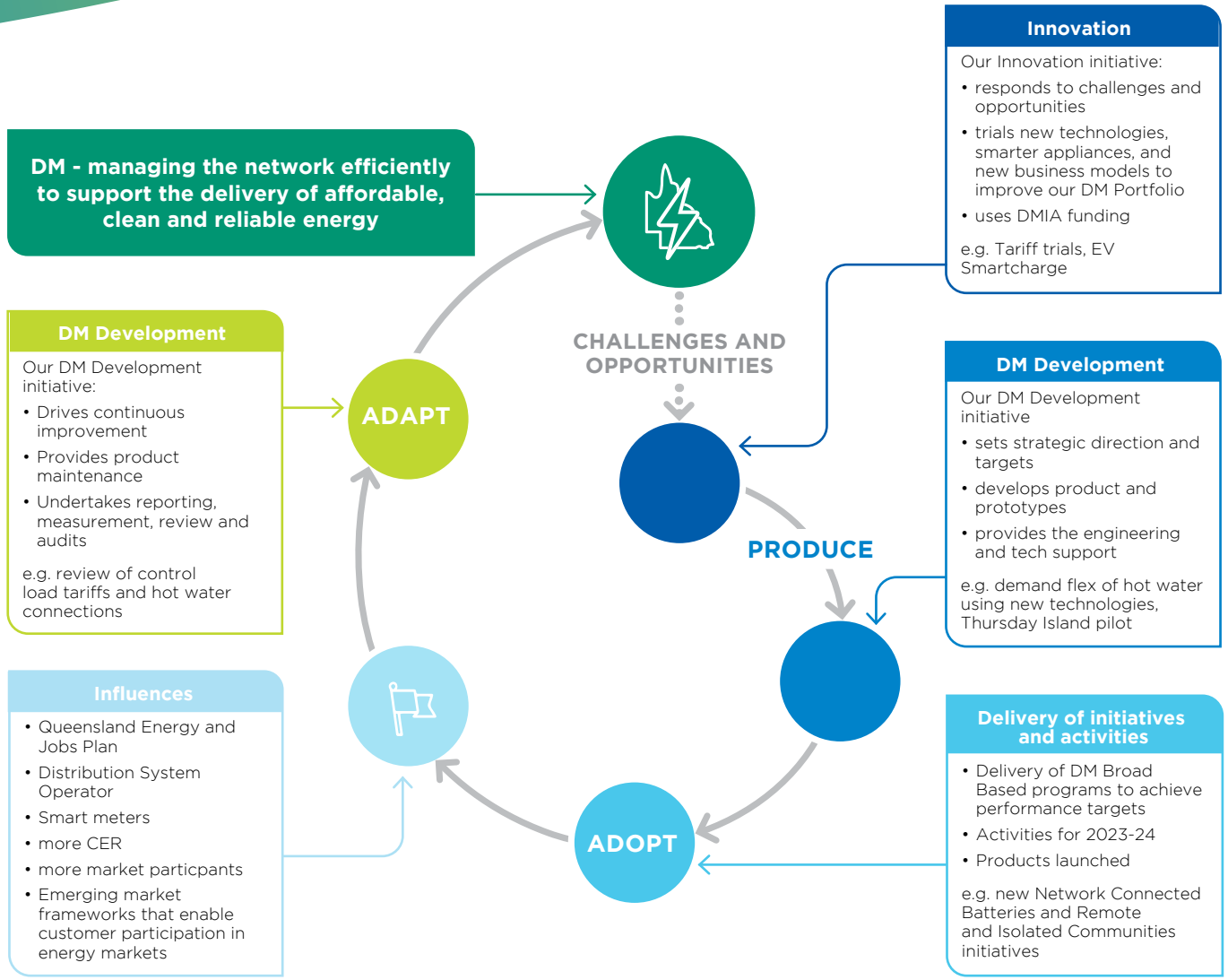


Figure 6: Our approach to DM strategy and delivery

Our Initiatives

Our DM Strategy sets our strategic direction for our DM Program which is implemented by six initiatives. See figure 7. All initiatives ultimately connect to our Future Grid Roadmap. They also support Energex and Ergon Energy's commitment to the QEJP.

Four of these have been in place for several years, with the Network Connected Batteries and Isolated and Remote Communities initiatives commencing in 2023-24. As per our 'living strategy approach' (refer Figure 6), the launch of these two new initiatives is in response to:

- a recognition that the DM Program needs a greater focus on solutions to tackle negative peaks (minimum) demand on our distribution networks
- learnings from the Thursday Island pilot, acknowledgement of the greater role DM can play in supporting our Isolated Networks Strategy 2030 and the announcement of the QEJP action 3.5 Clean energy for remote and First Nations communities.

Our 2023-24 activities for each initiative are also in response to key issues identified in the 'innovation', 'produce' and 'adapt' phases of our DM strategy and approach (refer Figure 6). Those being the need to:

- develop targets for peak demand and load flexibility that ensure our portfolio is right sized to handle future challenges, is cost efficient and customer centric
- address the decline in customers connecting their hot water systems to control load tariffs (see case study Hot Water Flexible Load Options)
- support the development of cost reflective tariffs – load control, flexible load and tariff trials
- support the development of our DERMs to enable greater DM customer offerings
- drive the direction of DM innovation and our DMIA investments.

Each year, we publish a DMIA report. For more information, see our latest Energex and Ergon Energy DMIA report

Broad Based initiative

This initiative rewards customers for demand flexibility, which provides us with a proven DM Portfolio to address system peak demand, address system negative peak (minimum) demand.

This initiative is available to residential and small business customers across the networks. It provides us with direct control of PeakSmart air conditioners along with appliances connected to load control tariffs.

We provide incentives to customers who enrol their PeakSmart air conditioners. We also provide incentives to industry partners who install PeakSmart air conditioners.

We offer load control tariffs that provide a cheaper electricity rate for connected appliances.

For information about our incentives, see our web pages about South East Queensland rewards and Regional Queensland rewards.

Current number of [1]	Energex	Ergon Energy
Active load control tariffs	629,630	363,738
PeakSmart air conditioners	140,498	12,542

Targeted initiative

This initiative provides incentives to customers and DM providers who can deliver DM in specific areas of the network identified as having future network constraints. This demand-side initiative helps us to defer and/or reduce network costs.

More information about our demand-side engagement strategy and register are available on the websites for Energex and Ergon Energy.

For more information, read about our South East Queensland Energex target areas and current consultations and our regional Queensland Ergon Energy target areas and current consultations.

Current number of [2]	Energex	Ergon Energy
Network support agreements	1	5

NEW Network Connected Batteries

This is a new initiative focuses on providing localised network storage in areas of Queensland with large amounts of rooftop solar PV to provide greater network stability and reliability.

This initiative delivers Broad Based DM to address negative peak (minimum) demand and enable even higher levels of rooftop PV on our networks.

The batteries store excess energy generated by rooftop solar systems during the day providing a localised solution to negative peak (minimum) demand on zone and bulk supply substations.

The batteries will be a mix of network connected and owned large-scale, neighbourhood and community batteries.

We will manage the market engagement and commercial arrangements with the sourcing and operation of our fleet of batteries for network support.

NEW Remote and isolated communities initiative

This initiative has a demand flexibility, energy efficiency and energy literacy focus across all our remote and isolated communities. It is a new initiative which is in its pilot phase.

Our pilot provides incentives to the highest consuming electricity customers on Thursday Island (TI) to implement energy efficiency initiatives, reduce electricity usage and greenhouse gas emissions. See TI case study.

As the initiative evolves further DM activities will be developed and delivered across our remote and isolated communities, including controllable loads and efficient energy use. This will be done collaboratively and cocreated with our remote and isolated communities including First Nations people

The initiative will complement the Powersavvy program led by Ergon Energy Retail.

The initiative supports our Isolated Networks Strategy 2030 and the decarbonisation of these communities as per the QEJP.

DM Development

This initiative drives continuous improvement of our DM capability. It ensures our DM activities respond to and provide the DM capability required to meet the challenges and opportunities facing our network (strategy and target setting).

Under this initiative we lead and manage our Tariff Development and Tariff Trial projects to develop, trial and evaluate potential network tariff options for inclusion in the Tariff Structure Statement (TSS).

The initiative delivers DM reporting and regulatory reviews (including annual DM Plan and DM Performance reports).

DM Innovation

This initiative trials innovative DM capabilities and technologies that reduce long-term network costs.

Funding for trials under this initiative is available through the national DMIA. Case studies on our DMIA trials are available on our Energex and Ergon Energy websites.

Figure 7: Our initiatives

[1] As at 31 March 2023 for AEMO Demand Side Participation Portal
[2] As at 31 March 2023 for AEMO Demand Side Participation Portal

Our Activities for 2023-24

Broad Based initiative

Continue to deliver PeakSmart air conditioning program.

Maintain AFLC capability to support customer choice through load control tariffs.

Targeted initiative

Seek efficient non-network options and defer network expenditure using requests for proposals and RIT-D consultations.

Negotiate and execute contracts to deliver non-network options and track deferral benefits.

Network Connected Batteries initiative

Manage the market engagement and commercial arrangements for the sourcing of retail trading partners and the operation of our fleet of batteries.

Integrate network batteries into the DM Portfolio and develop a framework for reporting.

Desktop studies to support be real world experience from our Network Connected Batteries to inform a sustainable economically efficient model that includes value stacking via relationships with retailers to trade battery capacity.

Remote and Isolated Communities initiative

Continue to deliver Thursday Island pilot and collate learnings.

Develop DM strategy and plan for remote and isolated areas in support of our Isolated Networks Strategy 2030 and the decarbonisation of these communities as per action 3.5 in the QEJP.

Expand our Industry Engagement Strategy to include our approach for engagement for non-network solutions in remote Fringe of Grid areas.

DM Development

Develop a roadmap to 2032 to guide our DM strategy, plan and program.

Investigate a peak demand target for the Broad Based initiative to ensure it is right sized for future network needs.

Trial and explore demand flexibility of hot water load via new technologies.

Investigate a Broad Based load flexibility target for negative peak (minimum) demand which informs the Network Connected Batteries initiative.

Support rollout of load control system functionality of DERMs (for managing electricity demand on the network) to enable demand flexibility of AFLC connected and market partners' devices.

Support development of new flexible load control tariffs.

Lead and manage our Tariff Trial project to develop, trial and evaluate potential network tariff options. Prepare for tariff deployment through education and awareness in partnership with retailers.

Innovation Initiative

Develop a DM innovation strategy to drive the direction of our DMIA investments.

Manage and govern our DMIA funds and projects.

Demand Management Initiative Budget and Targets for 2023-24

Our DM Strategy guides our portfolio and initiatives to ensure they respond to network and customer needs both now and in the future. This section summarises our budget and targets for the 2023–24 financial year.

Our expenditure for the year has been impacted by the significant increase in CPI. The rise has substantially impacted the cost to deliver our contracts for network support and the procurement of materials and services. This is consistent with cost escalations being experienced in the wider economic environment.

Energex forecast expenditure and targets

Energex's forecast expenditure to implement DM initiatives in 2023–24 is $6.32 million. Table 1 provides a breakdown of expenditure for each initiative within the overall DM Program and an estimate of demand reduction. Future year MVA demand reductions may vary, based on our developing program focus and customer uptake of new technologies.

Initiative	Total Expenditure ($,000)	Demand Management (MVA)	$/kVA
Broad Based	3,618	13.82	262
Targeted	1,015	18.40	55
DM Development	1,693	n/a	n/a
Total for DM program	6,325	32.22	n/a
Network Connected Batteries		**MW/MWh total**	
		13.5/27	
DM Innovation			
DMIA	1,100	n/a	n/a

Table 1: Energex direct costs for DM initiatives (excludes overheads)

Ergon Energy Network forecast expenditure and targets

Ergon Energy's forecast expenditure to implement DM initiatives in 2023–24 is $4.93 million. Table 2 provides a breakdown of expenditure for each initiative within the overall DM Program and an estimate of demand reduction. Future year MVA demand reductions may vary, based on our developing program focus and customer uptake of new technologies.

Initiative	Total Expenditure ($,000)	Demand Management (MVA)	$/kVA
Broad Based	738	2.39	309
Targeted	2,838	30.20	94
DM Development	1,362	n/a	n/a
Total for DM program	4,937	32.59	n/a
Network Connected Batteries		**MW/MWh total**	
		56/112	
Remote and Isolated Communities[1]	250		
DM Innovation			
DMIA	1,100	n/a	n/a

Table 2: Ergon Energy Network direct costs for DM initiatives (excludes

[1] Funded outside of DM opex budget

Appendix 1: About Us

Ergon Energy and Energex are part of Energy Queensland, Australia's largest, wholly government-owned electricity company. Ergon Energy and Energex are the poles and wires businesses that deliver electricity to homes and businesses across Queensland.

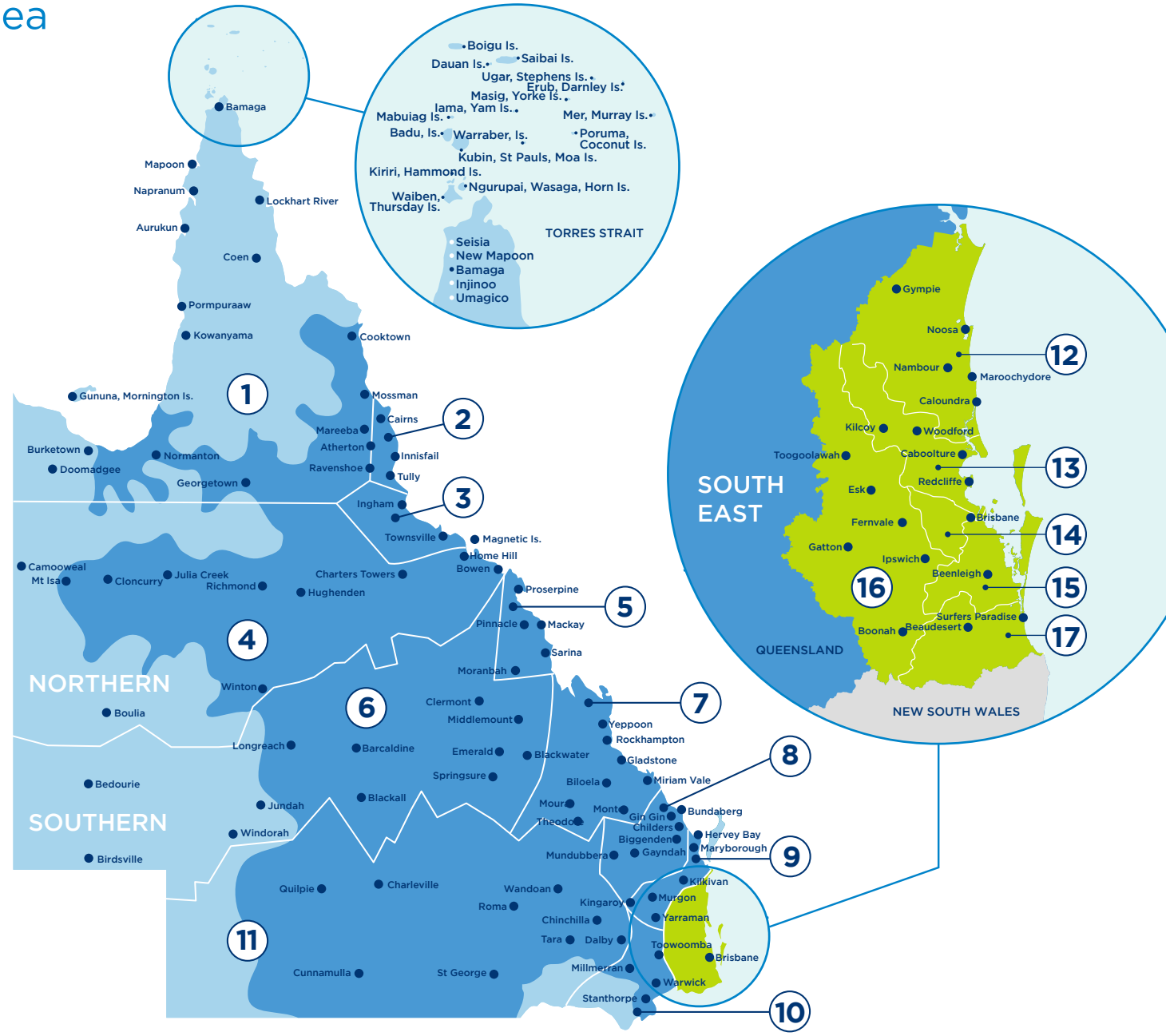
Ergon Energy's distribution network supplies North, Central and Southern Queensland. Around 70% of Ergon Energy runs through rural Queensland, across a vast service area, by far the largest in the National Electricity Market (NEM), with the second lowest customer density per network kilometre. It has a proportionately high investment in sub-transmission assets, compared to the more urban networks, and one of the largest Single Wire Earth Return networks in the world.

Energex's distribution network supplies electricity to Southeast Queensland, servicing high density population areas, including Brisbane Central Business District, the Gold Coast and Sunshine Coast areas, as well as the South East's extensive urban and rural areas.

Appendix 2: Our Service Area

1 Far North
2 Tropical Coast
3 Herbert
4 Flinders
5 Pioneer
6 Central West
7 Capricornia
8 Bundaberg Burnett
9 Fraser Burnett
10 Darling Downs
11 South West
12 Sunshine Coast
13 Brisbane North
14 Brisbane Central
15 Brisbane South
16 Ipswich Lockyer
17 Gold Coast

Regional network - Ergon Energy Network
Isolated supply - Ergon Energy Network
Ergon Energy Retail
South East Network - Energex
Depot locations



Our Network

The Energex and Ergon Energy distribution networks form part of the NEM. The NEM is made up of interconnected power systems stretching from Port Douglas in Queensland to Port Lincoln in South Australia and across to Tasmania. The NEM enables the exchange of electricity across the five interconnected States, to match power supply with demand. To understand more about how the NEM works see the AEMO fact sheet, National Electricity Market.

Isolated Systems

Ergon Energy has 33 isolated power stations and 34 isolated networks that collectively form our isolated systems. They supply 39 communities with approx. 8,300 connections supporting 21,000 people. These isolated systems support a diverse range of communities in the Torres Strait, Gulf of Carpentaria, Cape York, Palm Island and western Queensland. They are autonomous systems that are not connected to the NEM.

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Our Network

7,679 employees

1.7 million power poles

2.3 million connected customers

3 network control centres

2,693MW (7pm 16 Dec 2019)
Ergon Energy network-wide peak demand

862MW (12.30pm 20 Aug 2022)
Ergon Energy network-wide negative peak (minimum) demand

5,289MW (2.30pm 2 Feb 2022)
Energex network-wide peak demand

399MW (12pm 18 Sept 2022)
Energex network-wide negative peak (minimum) demand

4,129MVA
capacity of small-scale solar PV systems

851MVA
Total large-scale solar PV systems connected

763,231
customers connected with small-scale solar PV systems

16,637
Electric vehicles registered

13,267
Battery installations

35,194GWh
electricity delivered a year

Our Network data as at November 2022

Our Isolated Network

39 isolated communities

33 isolated systems

RENEWABLE ENERGY SUPPLY

1MW
Ergon Energy owned

4MW
customer owned

Annual energy demand
425MWh
Stephen's Island
3.1GWh
Thursday Island

Maximum demand
68kW
Stephen's Island
4.2MW
Thursday Island

21,000
connected customers

46MW
installed capacity

Our Isolated Network as at March 2021

Appendix 3: Demand Management

DM uses non-network solutions to match customer demand and electricity supply: it provides alternative and complementary solutions to network centric infrastructure. DM often involves providing incentives to customers and DM providers to modify demand and/or energy use so we can reduce or delay network expenditure.

DM can be used to remove or delay network constraints due to:

- maximum peak demand and associated issues with network capacity
- negative peak (minimum) demand and associated issues with voltage, system frequency and power quality management
- retirement or replacement of an ageing asset
- redundancy support during equipment failure, managing diverse power flows and other system security issues

The elements of the electricity network are designed to operate safely at all times. This is particularly important during periods of very high demand (known as peak demand), when we seek to ensure these elements do not become overloaded and fail. Reducing peak demand can reduce the amount of network required and, therefore, reduce the cost of our network by avoiding building infrastructure needed for only a few hours a year. In addition to meeting peak demand, our network needs capacity to respond to emergencies.

DM is also used to shift energy into demand troughs. With the take up of rooftop solar, these lower and negative troughs are increasingly experienced during minimum daytime demand periods. Shifting energy to the trough helps to improve stability during times when a lot of solar energy is coming into the network and increases the amount of solar that can be generated. Customers are encouraged to solar soak as that is the most efficient use of their solar energy.

In response to the growing levels of CER on the network, our DM Strategy considers our customers' energy resource assets and the need to optimise investment. DM can also be particularly helpful when there is uncertainty in demand growth forecasts, as it does not lock in long-term infrastructure investment. In these situations, DM can provide considerable value by keeping options open and encouraging flexibility.

The successful implementation of DM must deliver demand flexibility at the right:

- time –at the time of the constraint on the network,
- place – where the constraint is occurring on the network,
- quantity – to meet the network need,
- cost – cost of delivery must be efficient to keep downward pressure on electricity prices for customers,
- customer outcome – to minimise customer impact and maintain customer amenity.

	Examples	DM activity
Demand flexibility The capability of customers to vary their demand in response to generation, network, or market signals. Demand flexibility can operate in real time and can be incorporated into long-term investment decisions		
Shape A permanent/regular change in the time-of-day electricity is used (e.g. using timers)	Daily rescheduled equipment (e.g., water heating) and production.	Load control tariffs Cost reflective tariffs Behavioural campaigns
Shift Periodic changes to the time-of-day electricity is used (e.g., based on price signals) – not cutting load but getting customers to move their energy consumption from periods of peak demand to times when there is surplus renewable generation.	Batteries, EVs, pre-cooling/heating, production changes in response to high wholesale electricity market prices or network peak demand capacity constraints. Mitigates peaks in demand and soaks surplus renewable generation.	Cost reflective tariffs Network connected batteries
Shave Reducing demand during peak periods - cutting load, using onsite energy storage or alternative energy sources. Occurs in response to a critical demand peak events .	Batteries, reduced cooling/heating, diesel generators	PeakSmart Network support agreements Network connected batteries
Shed Switching off equipment. Loads are curtailed during periods of peak demand without increasing energy use at other times to compensate. Occurs in response to a critical demand peak event.	Curtailment of equipment or production in response to network peak demand or system emergency events.	Network support agreements PeakSmart
Shimmy Moving demand over very short timescales in responses to an external signal (e.g., Frequency Control Ancillary Services) Occurs continuously or multiple times per day.	Short term supply and demand balancing – dynamic loads that can adjust quickly to smooth load and support frequency	N/A
Surge Flexible demand sources take advantage of excess renewable power generation by ramping up operations, turning on load.	Desalination, hydrogen production industrial processes, water heating solar soaking. TOU tariffs	Future Cost reflective tariffs
Energy efficiency Permanent reduction of demand by using less energy to perform the same task.		
	Energy efficient appliances, equipment and buildings	Network support agreements
Strategic flexible load growth associated with electrification Permanent increase of demand (where network capacity allows)		
Encouraging new electric loads	Electrification of industrial processes and transportation	Future

Table 3: DM approaches

Appendix 4: Challenges and Opportunities

Our Demand Management Plan is designed to address a range of challenges while taking advantage of emerging opportunities.

Increasing climate variability

Could increase the frequency of heat waves, create higher peak demand and require load management capabilities for an emergency response.

Electrification of everything

New loads could enter the network (e.g. hot water), increasing demand at peak times and consuming excess solar generation during the day.

Hydrogen energy

Hydrogen could provide a clean, flexible, storable, safe fuel that will assist with integrating and expanding renewables.

Regulatory reform

The network and national electricity market are transforming to enable greater integration of consumer energy resources (e.g. domestic solar), flexible demand and customer choice.

Electric vehicles

Managed charging of EVs can offer opportunities for customers, the environment and for power system support. Whereas mass adoption of unmanaged charging of EVs could significantly increase peak demand, risking power reliability and security.

Net zero emission targets

Government and business targets are driving more renewable energy into the network.

2032 Olympics

The Brisbane Olympics is likely to stimulate significant infrastructure and economic growth.

Future network capabilities

We're developing and implementing new capabilities to complement our existing load control assets and systems.

Decreasing daytime negative peak (minimum) demand

The current trend towards high penetration of renewable, decentralised, asynchronous generation has the potential to cause network reliability and security issues and require additional investment to address them.

Demand outlook

Localised demand growth driven by a growing population may require additional investment to maintain enough capacity and voltage stability.

Energy affordability and value

Affordability remains a core concern for customers.

Battery use

Customer and network batteries are used to store excess solar generation for use during evening peak demand periods.

Advanced digital meters

Customer uptake of meters with two-way communication capabilities will provide opportunities for network visibility and enable demand response.

Internet of things

Customer uptake of smart energy management devices will increasingly optimise electricity use and facilitate greater control of individual appliances.

Innovative tariffs

Varied tariffs (e.g. time-based, load-based and load control tariffs) can help to minimise demand during peak times and encourage use when solar input is at its highest.

For further information on what's shaping our plans and our approach to finding the best solutions, please refer to the summaries of our latest Energex and Ergon Energy Network Distribution Annual Planning Reports 2022 for our customers, communities and other stakeholders.

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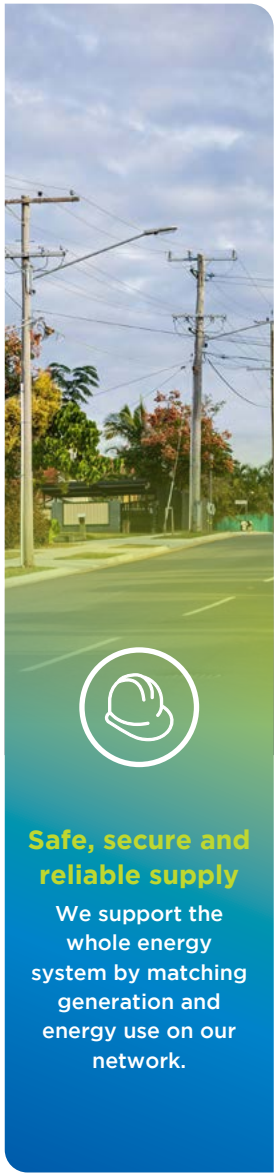
Appendix 5: Our Principles



Safe, secure and reliable supply

We support the whole energy system by matching generation and energy use on our network.

Customer centric

We make it easy and rewarding for customers to be efficient and flex their energy use when and how they choose to.

Cost efficient

We incentivise our customers' flexible and efficient energy use to optimise network utilisation and avoid costly or unnecessary network upgrades.

Clean

We enable customers' flexible and efficient energy use to boost grid capacity for more energy from cleaner sources.

Inclusive and equitable

We provide our Queensland customers with choice and benefits with flexible, efficient and affordable energy use.

Collaborative

We will partner with DM providers on cost efficient market-based DM products and services to complement current and future network owned solutions.

Cocreate

We will work with community members and First Nations peoples to cocreate and implement remote and isolated communities' DM energy activities.

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Case Study: Electric Vehicles

EVs can offer opportunities for customers, the environment and for power system support. While uptake in Queensland has been slow, there is potential for rapid adoption as we have seen in other parts of the world. This has the capacity to have a greater impact on the electricity supply industry than that of air-conditioning and solar photo-voltaic (PV) systems.

As of November 2022, there were 16,637 EVs (excluding motorcycles) registered in Queensland, and our forecasts show this rapidly accelerating by 2030 and 2035 (see figure 8 below).

Summary of CER Forecasts

Electric vehicles	2025	2030	2035
Actuals September 2022 - 13,717			
Fast uptake scenario	124,000	1 million	2.2 million
Medium uptake scenario	25,000	268,000	1.3 million
Slow uptake scenario	14,000	34,000	278,000

Figure 8: EV Forecasts

We are working to ensure the benefits to customers and networks are maximised as uptake increases. Commencing in May 2020, Ergon Energy and Energex embarked on research to:

- better understand the charging profiles during the innovation phase of the adoption lifecycle and
- understand how this may change and impact the network in the future.

We also engage with our customers annually through the Queensland Household Energy Survey to understand, among other things, EV ownership and charging behaviours.

Currently, at home (or private) charging options for EV owners are either by using an electric vehicle supply equipment (EVSE) on a load control tariff for fast charging or at a slower rate of charge by plugging into a standard power point on either a flat rate or network flexible load tariff.

The challenge of unmanaged charging

Our research revealed that when there was no access to solar/renewable generation or discounted tariff rates (such as a load control tariff), convenience charging predominated into the evening with the potential to occur during historical network peak hours – possibly impacting negatively on the network.

With mass adoption of EVs unmanaged charging could therefore significantly increase peak demand, risking power reliability and security, as well as increasing costs for customers.

Transitioning to meet customer needs and choices

Importantly our research has shown that EV charging is very suitable for flexible charging. Customers have shown us they are already accessing EV charging options for their benefit:

- whether by accessing advantageous pricing,
- using the solar generation they may have at their home,
- actively controlling themselves (by timers or when they plug in to charge), or
- having others manage the charging on their behalf e.g., load control tariffs.

Research tells us that when customers take advantage of renewable solar generation or a flexible load tariff, the charging profile is favourable to both the EV owner and our network.

With this knowledge we are focusing our investigations for enabling customer EV charging by:

- developing more innovative tariffs that reward flexibility (TSS 2025-30)
- improving EVSE charging outcomes when on load control tariffs
- exploring options for future standard load control technologies utilising our DERMS
  - flexible threshold control of load management (only used when needed)
  - partnering with the EV industry to deliver smart charging solutions that enable customers and networks to collaborate in best practice EV charging.

Our DM Program aims to help customers reduce their household energy bills, lower emissions and support the electricity grid by soaking up excess solar production. We will continue to engage with our customers to develop suitable tariffs that will facilitate these goals, and in doing so we avoid expenditure on infrastructure upgrades and keep our costs to customers low. As we move to dynamic connections and utilising our DERMS, customers will be able to access additional EV charging opportunities available from market parties, such as aggregators or EV charging companies.

Now	Partner and prepare	Engage and flex
Load control	**Manage the transition**	**Flexible load management**
Audio freqency load control (AFLC) of EVSEs on load control tariffs.	Implement Distributed Energy Resources Management System (DERMS) and explore innovation in load flexibility.	DERMS coordination of flexible loads with load control and network flexible load tariffs. Dynamic connections for EVSE loads

Case Study: Hot Water Flexible Load Options

Since the 1950s we've been connecting hot water systems to load control tariffs. Under this arrangement customers have benefited from a discounted rate of supply while the network has benefited from ensuring hot water load isn't on during evening peak demand periods. A large portion of the existing DM load control portfolio is provided by control of appliances (including hot water systems and pool pumps) using AFLC technology (refer to Our Portfolio).

Water heating is the second largest segment of household energy use (after appliances), making up 28% of the average Queensland home energy use. Electric storage hot water systems are the most common hot water systems in Queensland. With transition to the electrification of everything we expect to see electric hot water systems having a greater share of the market, as customers switch from gas to electric.

Load control tariffs are a cost-effective tool to reduce peak demand and most DNSPs have large numbers of customers with load control tariffs. Load control tariffs[3] are one of many pathways to household flexibility and are an option we will continue to offer to customers. Load control tariffs also provide capability in filling the troughs of negative peak (minimum) demand. Recently, Ergon Energy and Energex developed and tested new schedules designed to maximise solar soak, whilst maintaining customer amenity. These switching schedules will be used during autumn and spring when negative peak (minimum) demand issues typically occur, or otherwise as required.

Challenge

Currently 41% of Energex customers and 50% of Ergon Energy customers have their hot water systems on load control tariffs. The number of hot water systems connected to load control tariffs in existing homes has been declining at a rate of 2-3% per year. During 2022, the number of customers with active[4] load control tariffs reduced by around 20,000 in the Energex network area and around 9,000 in the Ergon Energy network area. Over this same period, around 50,470 solar PV systems were installed on residential premises.

This loss is not being mitigated by new connections with only 527 new load control tariff connections in Energex and 2,588 in Ergon Energy during 2022. The impact of this is an ongoing reduction of Energex and Ergon Energy's flexibility capability.

The reasons driving this decline in load control tariffs include:

- inability to solar soak across both primary and secondary tariffs. This means a customer could be exporting solar PV and receiving a Feed-in Tariff (FiT) on their primary tariff, while at the same time purchasing electricity at the load control tariff (primary reason)
- small price difference between primary tariff and load control tariff retail prices;[5] and
- additional upfront costs for load control tariff due to metering and relay requirements.

When customers are connecting solar PV, the majority are removing their hot water from load control tariffs and installing a simple timer or similar so they can self-consume their solar generation. This allows them to lower bills by using their own solar to heat water.

Now	Partner and prepare	Engage and flex
Load control	**Manage the transition**	**Flexible load management**
Audio freqency load control (AFLC) of appliances on load control tariffs.	Implement Distributed Energy Resources Management System (DERMS) and explore innovation in load flexibility.	DERMS coordination of flexible loads with load control and network flexible load tariffs.

Transitioning to meet customer needs and choices

With the ongoing penetration of solar PV as well as electrification of transport, the need for flexible load management is increasing. We will engage with our stakeholders as part of the development of the 2025-30 TSS, to review our load control tariffs with a view to

- reduce the loss of customers with load control tariffs.

The QEJP and the market regulators have set a target of 100% penetration of smart meters by 2030. Smart meters have in-built load control capability. During the TSS engagement, the opportunities provided by smart meters will be explored in relation to load control tariffs.

[3] Report 2021 Residential Baseline Study for Australia and New Zealand for 2000-2040, available on line here
[4] Has had consumption over the last 12 months
[5] The previous approach to setting the price relativity does not adequately reflect LRMC and this is a key element of our tariff strategies for 2025-30.

Case Study: Helping Decarbonise Isolated Systems and Enabling Local Communities

Pilot | **Enable** | **Establish** | **Evolve**

Queensland has 33 stand-alone power stations that form our isolated system and have traditionally been powered by centralised diesel power stations. However, these networks are rapidly transitioning to increase renewable energy supply. Our Isolated Networks Strategy 2030 outlines our ambition:

To support community development and participation in renewable energy supply while providing safe, sustainable, cost effective and reliable networks.

In support of this strategy to actively enable customer or community owned and operated renewable generation, our DM Program is working with customers directly to flex and reduce their electricity usage. By encouraging sustainable energy behaviours aligned to maximise the value of their CER, particularly solar PV, we are reducing diesel consumption now and preparing the isolated systems to transition to a carbon neutral energy delivery system.

Pilot

In 2022 a pilot program was launched in a target area to incentivise the highest consuming electricity customers on Thursday Island (TI) to implement energy efficiency initiatives and reduce electricity usage. Key stakeholders were consulted on the scope and approach of the program, including local and non-TI based stakeholders.

A no regret action was taken to help customers reduce their electricity bills, reduce diesel consumption and embed good energy practices on the island.

The top 40 energy users were invited to participate in the pilot program and offered an incentive to install more energy efficient appliances and equipment to reduce energy demand. Incentive payments were calculated based on estimated annual savings and paid upfront on receipt of proof of installation.

As a result of this pilot, there is an improved knowledge and acceptance of DM principles in isolated communities.

Enable

Based on the learnings and engagement insights from this pilot, we are developing a plan for further energy efficiency practices to be implemented on the island and expanded to other remote and isolated communities. This plan will be designed in collaboration with key stakeholders and First Nations peoples. With the strong take-up and ongoing interest in customer-owned roof-top solar energy systems, the plan will focus on enabling higher penetration levels, and will be complemented with tools and products to assist all customers to manage their usage and bills.

How DM facilitates the transition to net zero communities:

- improving energy performance through energy efficiency to reduce the amount of renewable energy required to replace diesel generation.
- shifting load away from times of potentially higher emissions (for example at night-time when there is greater reliance on energy generation from diesel generators)
- enabling cost efficient electrification of new loads by shifting consumption away from peak demand periods and into daytime troughs
- reducing the curtailment or renewables by shifting customers' consumption to hours of peak generation to 'solar soak'

Establish

Communities can become more engaged and involved in a local energy market, as technologies such as renewable generation, storage and connectivity evolve and become more commonly available in these regions. We will continue to provide employment opportunities for the local community both directly and indirectly to facilitate local community and business growth.

Evolve

Embedding energy efficiency practices and increasing demand flexibility will continue to evolve as network and customer needs change and we support the Queensland Government's plan (QEJP) to transition to net zero emissions. Furthermore, providing customers with opportunities to reduce demand and mitigate further growth in peak demand will support load growth and future electrification such as increased EV uptake.

Definitions

Audio Frequency Load Control (AFLC)

We have AFLC transmitters at various bulk supply and zone substations across our network. When required, these units send a signal over the power lines to all downstream connected homes. The signal is used to open or close a switch on the circuit these appliances are connected to. When the switch is closed, the appliances can draw the electricity they need; when the switch is open, no electricity is available.

Consumer energy resources (CERs)

is the name given to a wide range of technologies commonly located at houses or businesses – such as rooftop solar PV, battery storage, thermal energy storage, electric vehicles and chargers, and home energy management technologies.

Demand Management Innovation Allowance Mechanism (DMIA)

The Australian Energy Regulator (AER) provides distributors such as Energex and Ergon Energy Network with an allowance, which is a research and development fund. With this funding we are able to implement innovative research and development projects with a focus on demand management, that if successful, help to reduce long term network costs. Energex and Ergon receive an allowance of around $1.1 million each per year. For more information on DMIA see the Australian Energy Regulator Demand Management Scheme and Innovation Allowance.

Dynamic operating envelope (DOE)

Dynamic operating envelopes vary export limits over time and location based on the available capacity of the local network or power system as a whole. For more information on DOE see the Australian Renewable Energy Agency Dynamic Operating Envelopes Workstream

Energy efficiency

is using technology that requires less energy to perform the same function or any behaviour that results in the use of less energy

Flex

The capability of customers to vary their demand in response to generation, network, or market signals. Demand flexibility can operate in real time and can be incorporated into long-term investment decisions.

Hosting capacity

Is the ability of the low voltage network to accommodative the growing penetration of CER while maintaining power quality and safe supply.

Load control (economy) tariffs

provide cheaper electricity for appliances that don't need to be on all day (for example, hot water systems and pool pumps). Electricity is available to connected appliances for a minimum of 18 hours a day (for Tariff 33) or a minimum of 8 hours (for Tariff 31). These network tariffs are designed to reward customers for using electricity outside daily peak demand times (around 4pm - 8pm). Load control tariffs are cheaper than the flat electricity rate and require installation of a meter with a second element and a load control relay.

Minimum daytime demand

Negative peak demand or minimum demand happens when energy flows away from customers are greater than energy flowing towards them. This is typically caused when rooftop solar and storage matches or exceeds demand on the network.This usually happens between 10am and 2pm on clear, sunny days during spring and autumn, particularly on weekends or public holidays. For further information see AEMO factsheet.

Peak demand

Peak demand occurs when the community's electricity use is at its highest. This usually happens between 4pm – 8pm on our hottest, summer days. For further information see our webpage.

Regulatory Investment Test for Distribution (RIT-D)

Regulatory investment tests are used to seek non-network options (or DM solutions) for network projects with an expenditure of more than $6 million. For more information see our Industry Engagement Strategy.

Social licence

is the informal permissions granted by stakeholders for another party to make decisions on their behalf about the operation of their CER.

Abbreviations

AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
AFLC	Audio Frequency Load Control
ARENA	Australian Renewable Energy Agency
CER	Consumer Energy Resource
CPI	Consumer price index
DERMS	Distributed Energy Resource Management System
DM	Demand Management
DMIAM	Demand Management Innovation Allowance Mechanism
DNSP	Distribution Network Service Provider
DSO	Distribution System Operator
EV	Electric Vehicle
HV	High voltage
NEM	National Electricity Market
PV	Photo-voltaic
QEJP	Queensland Energy and Jobs Plan
RIT-D	Regulatory Investment Test - Distribution
TI	Thursday Island
TSS	Tariff Structure Statement