Demand Management Plan

April 2022

START >

ERGON ENERGY NETWORK | energex

Part of Energy Queensland

Message from our Executive

Energex and Ergon Energy Networks are proud of their industry-leading work in demand and energy management.

For a long time, demand management has been a significant part of the way we manage our network. It involves using non-network strategies to balance demand – including reducing demand during peak periods and balancing demand during troughs. In 2022–23, new programs will stretch our ability to further improve our capability and manage emerging influences on network demand.

Demand management (DM) has traditionally been about 'chopping off the peak' – that is, reducing demand on the network at peak times to avoid building additional network that is only used for short periods. DM also provides direct load control during emergency events. Our DM program includes load control tariffs, the PeakSmart air conditioner program and network support agreements with customers. But, as the energy market changes, we need to adapt and consider different approaches in partnering with our customers.

Queensland's energy needs are changing in four important ways:

1. Customers are changing how they use and control their energy. Major influences include Queensland's rapidly expanding solar capabilities, the uptake of electric vehicles, battery energy storage systems, the 'electrification of everything' and our journey to net zero emissions.
2. Customer demand is changing, with higher peaks and lower troughs in demand. In October 2021, we experienced a record daytime network minimum demand and, only a few months later, in February 2022, we saw a record peak in demand. Minimum demand is an increasing challenge to the design of the power system and shaping energy use to fill the troughs is an effective way to manage it.
3. Our energy network flows are changing. Customers are continuing to connect small-scale renewable energy sources to the distribution network (such as rooftop solar) along with large-scale renewable generators (such as solar and wind farms) in addition to the existing bagasse generation already in place. Also, various forms of energy storage are being investigated and installed[1]. The aggregated customer owned solar on our network is now more than three times the size of Queensland's largest coal generator and may double again by 2030.
4. The electricity market and regulatory environment are transforming. Significant changes include smart solar reforms[2] that enable distributors to support two-way energy flows and stand-alone power systems to serve customers in remote areas.

At Energex and Ergon Energy Network, we're embracing these changes. We recognise that we have an important role in helping Queensland to achieve its target of 50 per cent renewables by 2030 and net zero emissions by 2050.

Demand management is an important part of our response to the changing energy environment and is fundamental to a low carbon energy future. In the past year, our DM capabilities helped keep the lights on following the Callide Power Station outage, managed demand during summer heatwave conditions, responded to local peak demands on our network and demonstrated (through trials) our ability to shift energy on load control tariffs to the middle of the day during times of minimum demand.

Most of our Demand management capability is from direct control of simple appliances, such as hot water systems, pool pumps and air conditioners, using audio frequency load control (AFLC) technology. During 2022–23, we will continue to use and explore the uses of AFLC, while also trialling direct load control options and aggregated demand response from home energy management systems (HEMS) to complement AFLC and build the capabilities we need for the next decade.

This Demand Management Plan sets out our five-year strategy during this time of change. It is part of our response in preparing now for the electricity grid of the future. We look forward to continuing to work with our existing and new customers during 2022–23 and beyond, as we energise our communities and enable customer choices.

Peter Price
Executive General Manager, Engineering

[1] See the March 2021 Queensland Government announcement about network-connected battery storage being installed in Queensland.
[2] See the August 2021 AEMC announcement about smart solar reforms.

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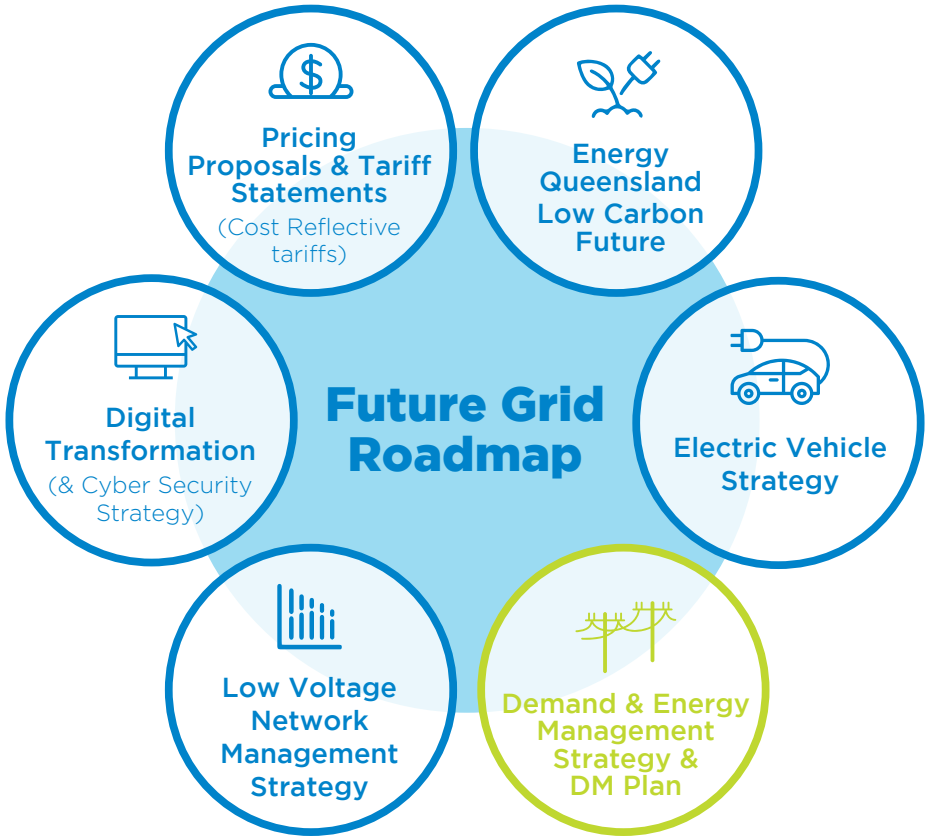
Introduction

Each year, Energex and Ergon Energy Network publish a Demand Management (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 for the next five financial years (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*.

Our DM strategy is part of a suite of strategies outlined in *Our Future Grid Roadmap*, which describes our plans to transform Queensland's energy sector and deliver safe, affordable, secure and sustainable energy solutions. A customer view of the future grid is presented here.



Our Network

7,526 employees

33 isolated systems

1.7 million power poles

834MVA
Total large-scale[3] solar PV systems connected

723,160
customers connected with small-scale solar PV systems

3,937MVA
capacity of small-scale solar PV systems

3 network control centres

2.3 million
connected customers

34,600GWh
electricity delivered a year

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

593MW
(7.55am 17 Oct 2021)
Energex network-wide minimum demand

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

959MW
(12pm 22 Sep 2021)
Ergon Energy network-wide minimum demand

9,341
Electric vehicles registered[#]

8,966 Battery installations

Figure 1: Our network and service area (figures as at 14 February 2022)

See Appendix 1 for information on our service area and Appendix 2 for more about Energy Queensland.

[3] Large-scale solar PV systems are those larger than 5MW.
[#] Excluding electric motorcycles.

What is Demand Management?

Demand management (DM) is a way of making sure our network capacity can always meet demand. Our electricity networks are designed and built to be:

- safe – to deliver electricity safely to our customers
- reliable – to deliver electricity in the quantity and quality required by our customers
- secure – to quickly respond and remain stable when unexpected events occur
- cost effective – to efficiently distribute electricity to our customers.

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 some spare capacity available for emergencies.

DM is used to 'right-size' the network, while ensuring the network remains safe, reliable, secure and cost effective. We use DM to reduce peak demand. In turn, this reduces network costs and improves reliability.

DM is also used to shift energy into demand troughs. With the take up of rooftop solar, these 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.

DM is a non-network solution to managing energy demand. It provides a cost-effective alternative to investing in traditional network infrastructure. For a more detailed explanation of DM, see Appendix 3.

Our DM program uses a mix of initiatives. The key to success in community-wide approaches to DM is ensuring our programs match customer needs. We design 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 in South East and regional Queensland.

What is 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.

What is minimum daytime demand?

Minimum daytime demand occurs when, simultaneously, the community's electricity use is low and the export of energy into the grid from rooftop solar is high. This usually happens between 10am and 2pm on clear, sunny days during spring and autumn, particularly on weekends or public holidays.

What are flexible appliances or loads?

Flexible appliances (often called 'flexible loads') can have their energy use modified while still meeting the needs of the customer. Flexible appliances may have the ability to vary their energy demand, an ability to vary their operating times, and/or provide energy storage. Examples include hot water systems, pool pumps, air conditioners, electric vehicle chargers, batteries and water pumping/irrigation equipment.

Our Demand Management Strategy

Our long-term strategy for demand management (DM) is one of the suite of strategies described in *Our Future Grid Roadmap*. We are working to transform Queensland's energy sector; deliver safe, affordable, secure and sustainable energy solutions; and respond to the challenges and opportunities facing our network. To achieve our long-term strategy, we are guided by our principles, which ensure our DM initiatives meet our customer, safety, cost efficiency and environmental objectives. Table 1 describes our broad DM strategies and DM initiatives.

Strategy	DM Initiatives	Customer Outcomes (2025)[4]
Efficient investments We will continue to engage with customers and DM providers to seek DM solutions that provide cost-effective alternatives to infrastructure options. We will invest in the electricity supply chain to deliver efficient, well-planned network expenditure and reduce network prices over the long term.	Broad Based Targeted	Network prices that support customer choice as customer energy resources and electric vehicles continue to increase.
Enable active customer response We will maintain direct control of customer loads using our existing audio frequency load control (AFLC) capability. We will complement this capability by procuring and dispatching cost-efficient demand response. We will invest in intelligent network technologies and digital platforms to procure and dispatch demand response. This will be part of our broader future grid investment. Enhanced capability will reduce network augmentation requirements and increase our capacity to host customer energy resources.	DM Development	Increased opportunities for customers to be rewarded for using their energy resources to support the network, either directly or through an aggregator. Best practice connection standards for customer energy resources that enable greater customer choice and balance cost and risk.
Incentivise customer efficiency We will continue to provide incentives to customers and DM providers to encourage DM solutions as part of our approach to deliver efficient, non-network options that defer, avoid or complement network investment.	Broad Based Targeted	Local DM programs and network tariffs that offer customers incentives for more efficient network use. Customer experience improved through online interactions.
Manage two-way energy flows and minimum demand We will trial and test DM solutions that increase our hosting capacity of customer energy resources while maintaining reliability and power quality performance at statutory levels. This is in line with our customer expectations and the Queensland Government's target of achieving 50% renewable energy by 2030.	DM Development	Allow more customer energy resources to be connected to the grid, while maintaining reliability and power quality performance at current statutory levels.
Transforming supply in remote areas We will continue seek opportunities for DM to reduce the cost to supply electricity in remote areas. DM can help to ensure that customer energy resources are optimised with stand-alone power systems to form part of an integrated, cost-effective alternative to traditional network solutions.	DM Development	Customers and communities benefit from the cost efficient and reliable supply of power from stand-alone power systems and microgrids in regional and remote Queensland.
Invest in innovation We will continue to invest in innovative trials and projects to test and validate DM solutions. These trials will be supported by funding from the Demand Management Innovation Allowance Mechanism (DMIA).	Innovation	Trials and projects result in improved, contemporary, cost-effective network services for customers. (For more information, see the *Energex DMIA Report 2019–20* and the *Ergon Energy Network DMIA Report 2019–20*.) We will continue to seek ideas for trials from our customers and industry partners (see information about demand management innovation on the Energex website and Ergon Energy Network website).

[4] These customer outcomes are drawn from *Our Future Grid Roadmap*, which describes our internal overarching strategic direction.

Our Initiatives

Our long-term demand management (DM) strategy is delivered by four initiatives:

Broad Based | **Targeted** | **DM Development** | **Innovation**

These initiatives have been in place for several years and will continue for the foreseeable future.

Through our Broad Based and Targeted initiatives, we reward customers for demand flexibility, which provides us with a proven DM portfolio to address system peak demand, address system minimum demand and provide network support in local areas (see Our DM Portfolio). Our DM Development initiative drives continuous improvement and ensures we complement the initiatives in *Our Future Grid Roadmap* – including dynamic connections (refer to the case study) and national initiatives (such as the likely evolution of the role of distributed network service providers (DNSPs) from network asset managers and operators to distribution system operators (DSOs)[5]. Our Innovation initiative trials ways to take advantage of new communication technology and smarter appliances to improve our DM portfolio.

Our DM portfolio will change in response to system and local network needs and as innovations are implemented in the coming years. Our focus areas for 2022–23 are set out below.

[5] For more information on the future proposed role of DNSPs see page 70 of Energy Security Board's 2021 publication *Post-2025 Market Design*.

Broad Based Initiative

This initiative is available to residential and small business customers across the entire network.

It provides us with direct control of PeakSmart air conditioners along with appliances connected to load control tariffs. During periods of extreme demand or emergency response, this initiative helps to prevent area problems and network outages.

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 [6]	Energex	Ergon Energy
Active load control tariffs	643,647	371,148
PeakSmart air conditioners	132,722	11,285

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 Network.

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

Current number of [7]	Energex	Ergon Energy
Network support agreements	1	5

DM Development Initiative

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.

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

Innovation Initiative

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 Demand Management Innovation Allowance Mechanism (DMIA). Case studies on our DMIA trials are available on our Energex and Ergon Energy Network websites.

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

Our focus areas for 2022–23 are described in more detail here.

[6] As at 31 March 2022 for AEMO Demand Side Participation Portal
[7] As at 31 March 2022 for AEMO Demand Side Participation Portal

Our DM portfolio

Since 2019, we have reported our DM capability to the Australian Energy Market Operator (AEMO) via the Demand Side Participation Information Portal (DSPIP) (see figure 2 and 3). As outlined, our Broad Based and Targeted initiatives give us with a proven DM portfolio to provide network support during system-wide and localised issues. Support for system-wide issues is coordinated by AEMO, which calls on distributors and other market participants to assist. A recent example of our DM capability in action is provided in the case study: Keeping the lights on during the Callide Power Station outage.

Energex: Portfolio Summary

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

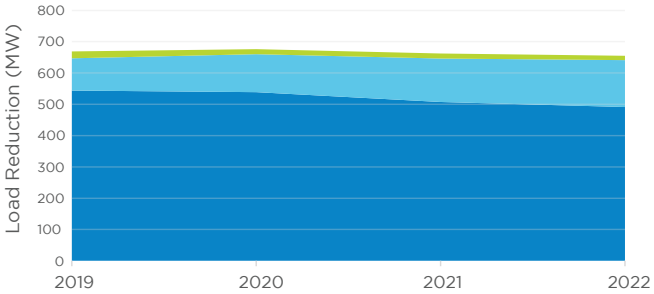


Figure 2: Energex DM portfolio

Ergon Energy: Portfolio Summary

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

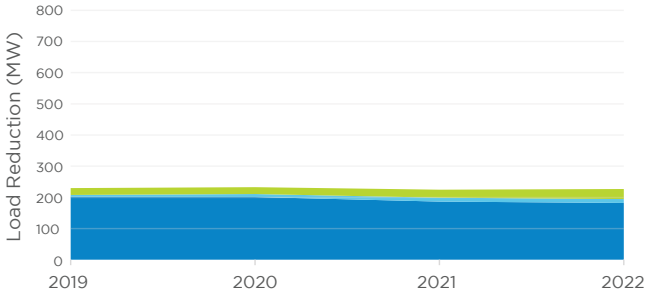


Figure 3: Ergon Energy Network portfolio

- Broad Based load control tariffs (peak)[8]
- Broad Based PeakSmart (DRM1)[9]
- Targeted Network Support Agreements

[8] This is the maximum anytime load under control.

[9] This is DM capability under a demand response mode 1 (DRM1) (compressor off) as per *AS/NZ4755 3.1*. However, we usually use DRM2 during heat wave events, which requires the air conditioner to reduce its power draw to 50% of what it was using before the event.

Load control tariffs

A large portion of our Demand Management (DM) portfolio is provided by direct control of appliances such as hot water systems and pool pumps that are connected to load control tariffs using audio frequency load control (AFLC) technology. The number of customers with load control tariffs is decreasing. Given this decline, during 2022–23 we will review solutions that maintain our DM capability (including tariff design) and further promote load control tariffs. More information on load control tariffs is available on the Energex and Ergon Energy Network websites.

Why is the number of customers with load control tariffs decreasing?

The number of active load control tariffs reduced from 1,044,564 in 2021 to 1,014,795 in 2022. Load control tariffs are declining because customers move their appliances off load control tariffs when they install solar energy and set timer controls for these appliances. Timers can be a good way to run appliances while solar energy is being generated (called solar soaking). A risk for customers is that timers can be set incorrectly or can fail to operate, resulting in higher costs. For example, if an incorrect or failed timer leads to hot water heating outside of daylight hours, the customer will pay for grid energy to heat their hot water and receive no benefit from their 'free' solar energy. More information about solar soaking is available on the Energex and Ergon Energy Network websites.

What is audio frequency load control (AFLC)?

Using AFLC, we can shape the energy use of over one million appliances, including those connected to load control tariffs and PeakSmart air conditioners that have a demand response enabled device (DRED) installed. 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.

For appliances on load control tariffs, the AFLC 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.

For PeakSmart air conditioners, the AFLC signal is used to carry operating instructions (OIs) to the DRED installed in the air conditioner. The air conditioner then translates these OIs into demand response modes (DRMs), as defined in the Australian Standard *AS/NZS 4755.3.1*. DRM1 switches the unit off; DRM2 limits energy demand to 50 per cent; DRM3 limits energy demand to 75 per cent. Typically, we use DRM2 during heat wave events. When an airconditioner is in DRM2 or DRM3 mode it will still provide cool air to a room but may take longer to cool the room the desired temperature. Customer feedback suggests that DRM2 causes very little inconvenience to customers. However, DRM2 makes a meaningful impact on our network. DRM1 is rarely, if ever, used. For more information see our PeakSmart events.

What are load control tariffs?

Load control tariffs (or 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.

In 2020, we introduced three new load control tariff options for business customers. These network tariffs provide businesses who can manage supply interruptions with an alternative tariff option. Take up under these new load control tariffs for business customers is low. While it is ultimately Retailers responsibility to offer or promote these tariffs to their customers, we will continue to promote them where appropriate.

Our Focus Areas for 2022–23

Efficient investment

Targeted initiative

- Seek efficient non-network options and defer network expenditure using requests for proposals (RFP) and Regulatory investment test for distribution (RIT-D)
- Negotiate and execute contracts to deliver non-network options and track deferral benefits

Enable active customer responses

DM Development initiative

- Continue to support the DM portfolio, including PeakSmart air conditioners, load control tariffs and network support agreements
- Support finalisation of Australian Standard *AS/NZS 4755.2*, which provides a framework for demand response from customer appliances (including air conditioners, electric vehicles, hot water systems and pool pumps). This framework can be used with all communication methods (i.e. AFLC and non-AFLC)
- Investigate DM solutions (in addition to load control tariffs) for electric vehicle connections

Innovation initiative

- Undertake a vehicle to grid (V2G) functionality trial (related to *Our Future Grid Roadmap*)

Incentivise customer efficiency

Broad Based initiative

- Continue to deliver PeakSmart air conditioning and load control tariffs

DM Development initiative

- Engage with customers, DER installers, retailers and industry partners to improve understanding of:
  - peak and minimum demand
  - benefits of load control tariffs
  - benefits of shifting more energy use to the middle of the day
  - EV home charging options and optimal charging behaviours
  - home energy management systems
  - new load control and cost reflective tariffs (time of use tariffs and demand tariffs)
- Given the decline in customers connected to load control tariffs, review solutions (including tariff design) to maintain DM capability
- Implement a trial of proposed new residential tariff(s)

Innovation initiative

- Continue to release customer insights from the EV SmartCharge trial
- Conduct customer research on flexible loads

Manage two-way energy flows and minimum demand

Broad Based initiative

- Investigate a new program to support changing energy demands

DM Development initiative

- Implement solar soak configuration for load control systems to move hot water heating into the middle of the day

Innovation initiative

- Increase network DER hosting capacity through improved network visibility and dynamic operating envelopes (related to *Our Future Grid Roadmap*)

Transforming supply in remote areas

DM Development initiative

- Support DM Plan for Thursday Island to complement Isolated Network Strategy 2030

Innovation initiative

- Conduct stand-alone power system (SAPS) customer pilots (related to *Our Future Grid Roadmap*)
- Trial batteries with customers in remote areas (related to Our Future Grid Roadmap)
- Conduct the Clairview microgrid trial (related to *Our Future Grid Roadmap* and co-funded by Regional & Remote Communities Reliability fund)

DM Initiative Budget and Targets for 2022–23

Our Demand Management (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 2022–23 financial year.

Energex forecast expenditure and targets

Energex's forecast expenditure to implement DM initiatives in 2022–23 is $5.61 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	3,415	13.71	249
Targeted	1,075	16.60	65
DM Development	1,123	n/a	n/a
Total for DM program	**5,612**	**30.31**	**n/a**
DMIA	1,100	n/a	n/a

Table 2: Energex direct costs for DM initiatives (excludes overheads)

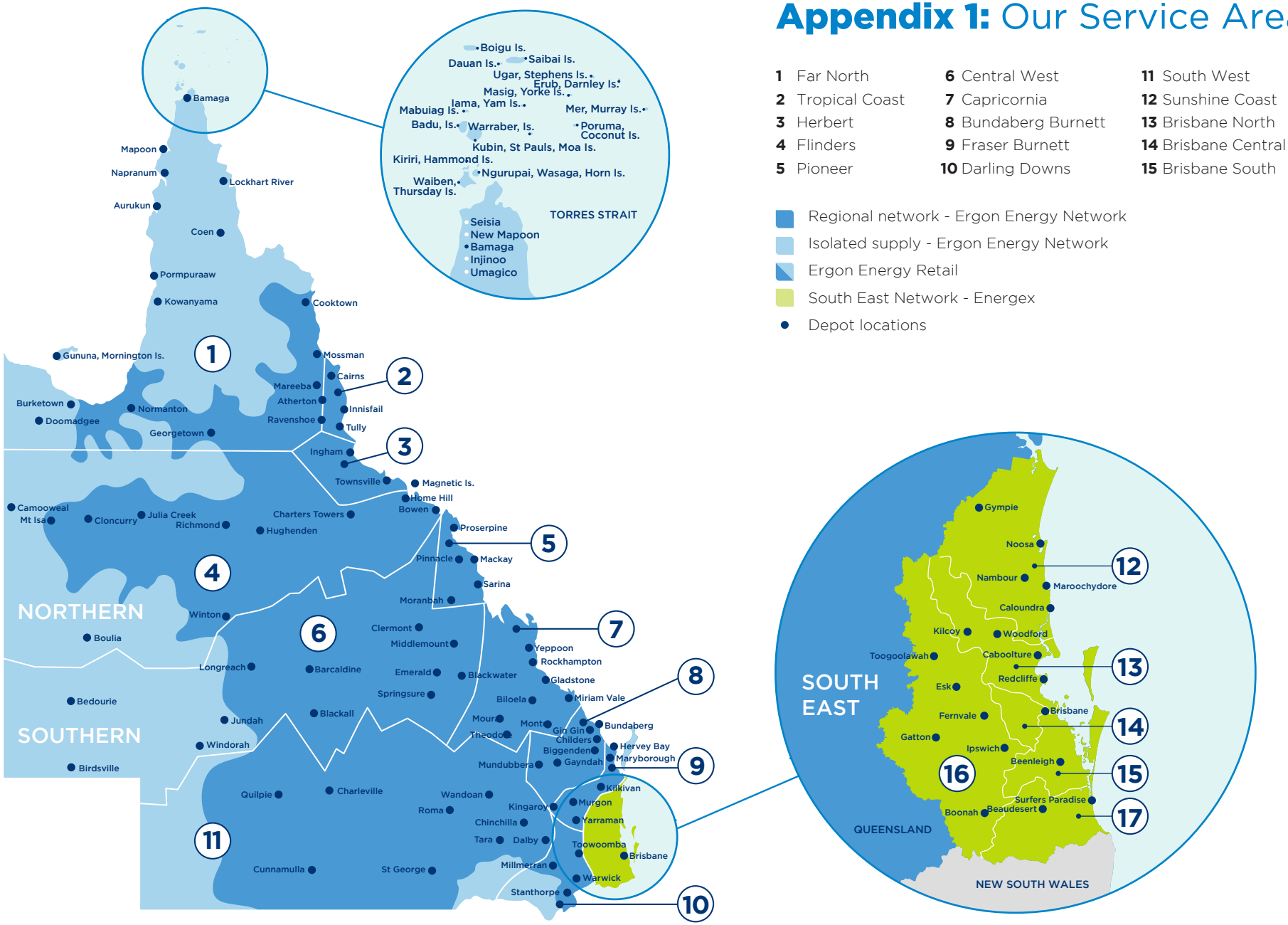
Ergon Energy Network forecast expenditure and targets

Ergon Energy Network's forecast expenditure to implement DM initiatives in 2022–23 is $4.59 million. Table 3 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	575	2.05	280
Targeted	2,758	31.80	87
DM Development	1,259	n/a	n/a
Total for DM program	**4,592**	**33.85**	**n/a**
DMIA	1,100	n/a	n/a

Table 3: Ergon Energy Network direct costs for DM initiatives (excludes overheads)

Appendix 1: 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

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Appendix 2: About Us

Energex and Ergon Energy Network are proudly part of the Energy Queensland Group, which is a Queensland Government Owned Corporation. We strive to deliver our vision to energise Queensland communities and support our customers' 'electric lives'.

Energex and Ergon Energy Network operate the electricity distribution networks across Queensland, which cover 1.7million km^2. Ergon Energy Network supplies electricity to homes and businesses over a vast area that covers around 97 per cent of the state – from coastal and rural centres to the remote communities of outback Queensland and the Torres Strait. Energex's network supplies electricity to homes and businesses in the South East region of the state. The South East Queensland region includes the major urban areas of Brisbane, Gold Coast, Sunshine Coast, Logan, Ipswich, Redlands and Moreton Bay.

Appendix 3: Demand Management

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:

- peak demand and associated issues with network capacity
- 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.

In response to the growing levels of customer energy resources 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.

DM must be deployed to match network constraints in two ways:

- temporal – frequency and duration
- spatial – network level and location, and number of customers affected.

Types of DM

There are several types of DM, including: demand response, which is used when required; energy efficiency, which can permanently reduce demand; and strategic load growth, which can permanently increase demand beyond 'trough filling' (see Table 1). DM strategies are implemented by customers or DM providers, either in exchange for financial incentives (Table 4) or as a required part of a connection agreement.

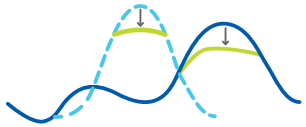
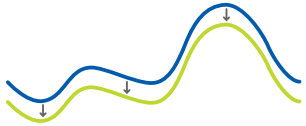
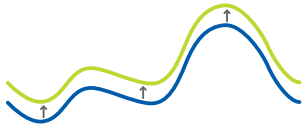
Description	
Demand Response (DR): Temporary modification of load or generation as required (e.g. in response to signal from network or price signal). There are different types of DR used for wholesale, emergency, network and ancillary services.	
Peak shaving – reducing demand during peak period (e.g. using onsite generation or battery storage). PeakSmart air conditioning is an example of emergency DR aimed at 'peak shaving'.	
Load shifting – shifting demand outside of peak demand periods. Load control tariffs are an example of network DR aimed at 'load shifting'. They can also be used for emergency DR. **Valley filling** – shifting demand into periods of low demand. Time of Use (TOU) tariffs and load control tariffs are examples of network and wholesale DR aimed at 'valley filling'.	
Flexible load and generation – modifying load and generation according to DR signals, published technical constraint envelopes and energy market prices (e.g. batteries could be charged during times of low demand). The Dynamic Customer Connection consultation, Dynamic Operating Envelopes (DOE), Vehicle to Grid (V2G) trials and AEMO's recent Wholesale Demand Response Mechanism consultation are potential future examples of wholesale and/or network DR platforms, strategies and approach.	
Energy Efficiency: Permanent reduction of demand, at peak times and non-peak times.	
Energy efficiency – using less electricity to perform the same task.	
Strategic flexible load growth: permanent increase of demand (where network capacity allows), beyond 'valley filling'.	
Strategic flexible load growth – encouraging new loads (where network capacity allows), beyond valley filling. For example, growth in EVs and other modes of electric transport and electrification of industrial processes.	

Table 4: DM approaches

Typical residential customer load profile
Load or generation after demand management measure
Typical solar generation profile

Appendix 4: Challenges and Opportunities

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

National

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. electric vehicles), 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 customer energy resources (e.g. domestic solar), flexible demand and customer choice.

State

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 minimum demand

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

Demand outlook

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

Customer

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

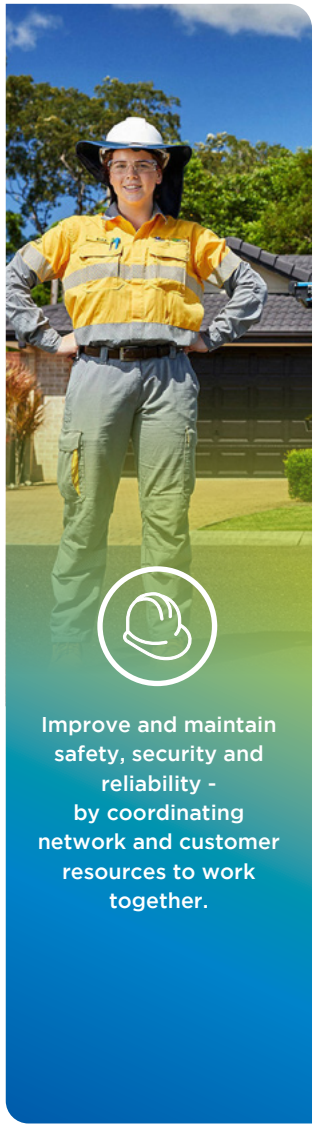
Innovative tariffs

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 2021 for our customers, communities and other stakeholders.

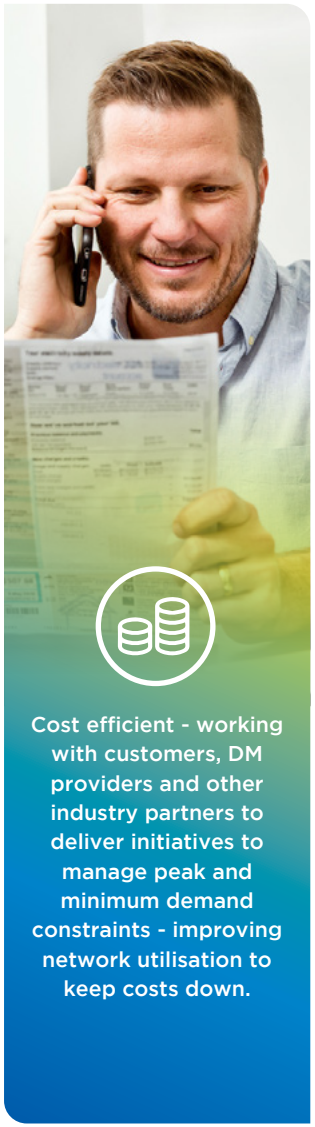
Appendix 5: Our Principles

To guide the achievement of our long-term strategy for DM, we are guided by the following principles.



Improve and maintain safety, security and reliability - by coordinating network and customer resources to work together.

Customer focused - supporting and enabling customers in their energy choices.



Cost efficient - working with customers, DM providers and other industry partners to deliver initiatives to manage peak and minimum demand constraints - improving network utilisation to keep costs down.

Activate the market and transition - by procuring DM services where they provide value and responding to regulartory and market changes.

Help achieve the Queensland renewable energy target - by enabling connection of customer energy resources - integrating renewables into the network and leveraging all market participants to manage the technical challenges in achieving the target of Net Zero by 2050.

Fair and equitable - by unlocking the value of DM services to achieve cost-efficient outcomes for all, not just those with direct access to customer energy resources.

Case Study: Keeping the Lights on During the Callide Power Station Outage

On 25 May 2021 at 1.33 pm, one of the turbine halls at Callide Power Station caught fire. The three units generating electricity at the time went offline. The sudden loss of 3,100MW of generation immediately affected other generators in Queensland and Powerlink's transmission network. This created flow-on effects to our distribution network. At the peak of the crisis, the outage affected 470,000 customers (or about 1 in 5 customers) – about 380,000 in South East Queensland and 90,000 in regional Queensland.

Our demand management response, combined with other responses coordinated by AEMO, prevented the need for involuntary load shedding. Our capability in events such as this is two-fold – first, we can reduce demand during the peak demand period, and second, we can restore flexible demand gradually, over a long period. Both capabilities are invaluable.

Queensland experienced a shortfall in available generation heading into the evening peak demand period (4pm – 9pm). In response, the Australian Energy Market Operator (AEMO) issued a Lack of Reserve 2 (LOR2) notice at 4.45pm. It then issued a forecast Lack of Reserve 3 (LOR3) notice at 5.07pm, identifying the potential for electricity demand in Queensland to exceed the available supply. (For more information about Lack of Reserve notices and forecasts, see AEMO's Factsheet – Lack of Reserve notices.)

Energex and Ergon Energy Network responded to AEMO's request to reduce electricity demand by turning off hot water systems and pool pumps connected to load control tariffs. We took this step to mitigate the risk of involuntary load shedding (AEMO controlled reduction in supply) on the network during the peak demand period. (For more information about load shedding, see AEMO's Factsheet – Explaining load shedding.)

During the Callide Power Station outage, we were still able to meet customers' hot water and pool pumping needs and achieve a total demand reduction of 400MW over the peak demand period. A key benefit from our response was holding off the return of controlled load until after the LOR subsided. For Energex, 777MW of hot water and pool pump load was restored in small increments from 8pm to 9.40pm. In the Ergon Energy Network, 470MW of hot water and pool pump load was restored in small increments from 8.30pm to 9.40pm. Our response, combined with other responses led by AEMO, prevented the need for involuntary load shedding. For more information, read AEMO's report on the event.

Case Study: Home Energy Management Systems Prove their Worth

As customer energy resources become more commonplace in homes, we need to better understand the value and opportunities they present for customers and our networks. In 2019, Energex established a two-year home energy management system (HEMS) market trial to consider:

- how HEMS providers attract customers
- the value of HEMS solutions for customers and the network
- the attractiveness of set-and-forget 'smart' solutions
- how HEMS technology will integrate and communicate with the electricity network.

Five HEMS providers (or aggregators) participated in the trial, seeking to attract a total of 500 customers. Energex provided a financial incentive to each provider (of up to $400 per participant). Providers offered various incentives to customers, ranging from free HEMS with the purchase of a solar PV system, battery or smart hot water system, to a negotiated price for a full HEMS.

While there was strong customer interest in HEMS, converting it into customer participation was difficult due to market immaturity and a reluctance to adopt new technologies. Ultimately, 28 customers participated through one HEMS provider.

Customers chose to try a home energy management system to reduce their energy consumption, track their energy use, reduce their bills, try new technology, and control and monitor their appliances.

Between February and June 2021, Energex sent 17 demand response and demand management (DM) signals to the HEMS supplier to test (both individually and together) peak demand and minimum demand (peak solar generation) management situations. The technical delivery proved successful, with (near real-time) management of two-way energy flows in both situations.

Value to customers and the network

HEMS event outcomes (diversified demand per household from the whole cohort of customers) were:

Peak demand events	
Peak reduction range (5pm – 7pm weekdays)	Between 0.90 and 1.2kW
Minimum demand events	
Solar export reduction (direct inverter management)	1.7kW (3.1kW by signal respondents)
Solar export reduction (load increase)	2.3kW (3.3kW by signal respondents[10])
Solar generation stop	4kW
Solar generation stop/ maximum load increase	5.79kW

Image of G Switch by Intelligent Automation

The HEMS trial showed that directly coordinating solar generation was effective. Increasing loads to 'solar soak' was also effective, but less reliable for addressing minimum demand.

Customer energy and bill impacts from having HEMS	Reduced evening peaks by approximately 30% (potentially greater for actual peak demand days, but not tested in the trial)
	Reduced overall grid-supplied kWh by approximately 14%
	Customer electricity bill optimisation resulted in material savings of 19%[11] on average

The trial proved HEMS is a powerful set-and-forget solution for customers, enabling them to:

- easily manage complex retail tariffs (cost-reflective)
- optimise energy use (and demand) to periods of the day when grid-supplied energy may be cheaper
- encourage self-consumption of renewable generation, providing even greater value to customers each day.

For more information on the HEMS trial see our full case study, published in January 2022.

[10] Not all households were signalled to respond to the events. The lower number reflects the diversified value across the cohort; the larger number reflects the diversified response of those households that did respond.
[11] All primary tariff grid-supplied energy was rated at Ergon Energy Retail Tariff 11 gazetted rates.

Case Study: Dynamic Customer Connections

Queensland is working towards a target of 50 per cent renewable energy by 2030. At Energex and Ergon Energy Network, we're supporting this change by preparing for increased connections of customer energy resources (such as solar PV, batteries and rotating machines). Network distributors across Australia are exploring new ways of operating and connecting with customer energy resources (also known as distributed energy resources (DERs)).

From 2022, customers in Queensland who connect an energy resource to the low voltage network will be able to choose a dynamic connection agreement as an alternative to a traditional fixed connection agreement. Initially, dynamic connections will be offered via negotiated connection offers. By late 2023, we expect dynamic connections to be the norm for all new customer energy resource connections in Queensland, with connections via model standing offers or basic connection offers.

Dynamic connections allow more customer energy resources to be connected to the network than the current connection standards. In addition, they include variable export limits, rather than the current standard of a fixed export limit.

Dynamic connections seek to provide balance for the network – giving customers choice about connecting the energy resources they want, while minimising impacts to the grid by communicating varying import and export limits to the customers' energy resources. These varying limits will be calculated by Energex and Ergon Energy Network using near real-time network data and communicated every five minutes to customers' energy resources. Importantly, these limits will apply at the connection point, giving customers flexibility in how they use their renewable energy.

An example of dynamic connections in practice

A customer has an 8kVA rooftop solar PV system and wants to install a 5kVA/14kWh battery to store their excess solar for use later in the evening. The customer has a single-phase power supply to their home.

Traditional connection

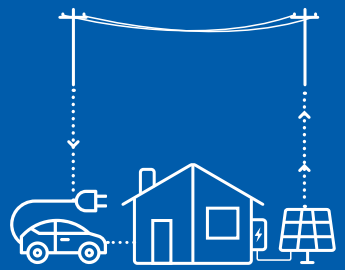
Under the traditional connection standard, the maximum aggregate inverter capacity of energy resources that can be connected to each phase is 10kVA. To connect the battery, the customer would need to upgrade their household power supply and PV system to three-phase power and ensure the energy resource capacity installed is balanced across all three phases. This work would increase the cost of the battery installation. Under the traditional connection standard, the maximum export allowed is fixed at 5kW per phase.

Dynamic connection

With a dynamic connection, the customer can connect up to 10kVA of solar PV and up to 10kVA of batteries on a single phase. In this situation, the customer will not need to upgrade their single-phase household power supply to three-phase supply. A dynamic connection offers dynamic export limits, which will vary between 1.5 and 10kW depending on local network conditions. For the customer to take up this option, the solar and battery systems must be connected to the home's internet and equipped with compatible communication technology[12], as specified in the connection standard (STNW3510 and STNW1174). Most modern inverters will have this communication capability, however, some older inverters may require software and/or hardware upgrades. In this example, the customer will enter into a negotiated contract with Energex or Ergon Energy Network for a dynamic connection. For more information, see our Dynamic Customer Standards FAQS and our engagement website Talking Energy

[12] Connection to the public internet and compliance with IEEE 2030.5 Standard for Smart Energy Profile Application Protocol (SEP2) using a common smart inverter profile (CSIP).

As a customer I can

	Home with load control tariff and PeakSmart air-conditioner	Home with solar PV	Home with solar PV and battery	Home with EV and other customer energy resources (or DER)	Home that has agreed to provide DR to Retailer/Aggregator
					
NOW	Through my distributor, I provide network services and am rewarded with a lower electricity rate or incentive. **DER Type** Simple **Export Limit** N/A	I can use what I generate and export excess energy to the grid for payments. The maximum amount I can export to the grid is a fixed limit. My inverter settings automatically support the network. **DER Type** Smart **Export Limit** Fixed	I can use what I generate and store excess energy at home for later use and export excess energy to the grid for payments. The maximum amount I can export to the grid is a fixed limit. My inverter setting automatically support the network. **DER Type** Smart **Export Limit** Fixed	I charge my Electric Vehicle (EV) either from the grid or using my solar PV or a combination of both. **DER Type** Smart **Export Limit** Fixed	Through my retailer/aggregator, I actively provide wholesale energy market services and am rewarded with an incentive. **DER Type** Smart **Export Limit** Fixed
NOW TO 2030	Through my distributor I provide network services and am rewarded with a lower electricity rate or incentive. **DER Type** Simple **Export Limit** N/A	I can use what I generate and export excess energy to the grid for payments. The maximum amount I can export will vary depending on network conditions. **DER Type** Smart **Export Limit** Dynamic	I can use what I generate and store excess energy at home for later use and export excess energy to the grid for payments. The maximum amount I can export will vary depending on network conditions. **DER Type** Smart **Export Limit** Dynamic	I charge my EV either from the grid or using my solar PV or a combination of both. The maximum amount I can export or import will vary depending on network conditions **DER Type** Smart **Export Limit** Dynamic **Import Limit** Dynamic	Through my retailer/aggregator I actively provide wholesale energy market and/or distribution market services and am rewarded with an incentive. The maximum amount I can import and export will vary depending on network conditions. **DER Type** Simple and smart **Export Limit** Dynamic **Import Limit** Dynamic

Definitions

Customer energy resources (or distributed energy resources)

Customer energy resources or distributed energy resources (DERs) 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, smart meters, and home energy management technologies.

For more information on DERs see the Australian Energy Market Commission's Distributed energy resources.

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 import and 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.

Load control tariffs (also known as economy tariffs, volume controlled tariffs, tariff 33 and tariff 31)

The electricity supply on load control tariffs is interruptible and is suitable for appliances like hot water systems, pool pumps and electric vehicle chargers that don't need a constant supply of power. Appliances have to be wired and connected through a dedicated circuit back to the meter. Energex or Ergon Energy Network control the times when power is available. Electricity is provided for up to 18 hours a day at a discounted rate compared to the general usage tariff.

Regulatory investment test (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 page 9 of our Demand Side Engagement Strategy.

Request for proposal (RFP)

A request for proposal is used to seek non-network options (or DM solutions) for network projects with an expenditure of less than $6 million. For more information see page 9 of our Demand Side Engagement Strategy.

Solar soak

Solar soak is when customers use energy as it is being generated by solar PV systems (usually from 8am to 4pm in summer or 9am to 3pm in winter). Solar soaking allows customers to get the best value from their solar PV system and maximise their use of renewable energy.

For more information on solar soaking see our Solar soak.

Three-phase power

Most homes in Queensland have single-phase power. Single-phase power has two wires (one active and one neutral). In contrast, three-phase power has four wires (three active and one neutral). Three-phase power is used in larger homes and businesses, as it can cope with the electricity demands of larger and more powerful appliances being used simultaneously. Three-phase power distributes loads across the three active phases. We distribute electricity in three phases, which is why there are multiple cables on our poles.

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Forward ›

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