

emPOWERing You trial

Final Report Summary

August 2019



Introduction

A message from TasNetworks' CEO

The emPOWERing You trial has been a ground-breaking trial of cost reflective network tariffs, conducted on a scale previously unseen in Australia. The trial involved thousands of hours of work by TasNetworks employees over a much longer period than the two years of the trial itself, from the staff who planned and managed the project to the people who responded to the questions and requests for help from participants throughout the trial. emPOWERing You would not have been such a success if it were not for their dedication and professionalism and I sincerely thank everybody involved for their hard work.

I have long said that our customers are central to everything we do at TasNetworks and the emPOWERing You trial could not have happened at all without the willing participation of our customers. Some 600 households in and around the Brighton Municipality volunteered to be part of our experiment and between them spent hundreds of hours completing surveys, participating in focus groups and attending engagement sessions. Some even invited us into their homes to share with us what they'd been doing differently in order to shift, stagger or save their use of electricity in response to the time of use electricity pricing being tested as part of the trial.

One of the messages that came out of the qualitative research component of the trial was that many participants valued the potential benefits to the wider community of reducing electricity use at peak times, possibly even ahead of the personal financial gain they might achieve through taking advantage of time of use tariffs. One of the trial's participants captured that sense of the greater good when they summed up their own involvement in the emPOWERing you trial by saying "It makes you feel a bit privileged to be a part of the trial, knowing it's going to be helping others. I sort of feel special that what TasNetworks gets from me is helping a lot of other people."

So, to the more than 1,500 people who participated in the trial, on behalf of TasNetworks and the wider community that we serve, thank you for being prepared to be involved in the emPOWERing You trial and for your desire to make a positive difference in the lives of your fellow Tasmanians. You have provided us with information and insights that we could never have gained otherwise.

As time goes by and time of use electricity pricing gradually becomes the norm, I hope that both the TasNetworks employees that worked on the emPOWERing You trial and the people who participated in it will be able to look back and know that they were there at the start, and that their involvement in the trial will have helped thousands of Tasmanian households.

Lance Balcombe
Chief Executive Officer

Background and Objectives

Background

Flat, consumption based network charges are widely acknowledged as no longer fit for purpose because they give rise to cross subsidies and encourage inefficient use of the network through unchecked growth in peak demand. Electricity distributors are required to transition to cost reflective network tariffs that signal the different cost of providing electricity to customers with different patterns of consumption. TasNetworks' aim is to shift the residential customer base in Tasmania to more cost reflective network pricing over successive regulatory periods.

Cost reflective pricing represents a significant change in the way distributors charge for the delivery of energy to retail customers. It is also a complex topic and the effects of cost reflective network prices on consumers' bills are still uncertain.

There is little evidence relating to consumers' ability to understand cost reflective network tariffs and how they might respond to cost reflective network pricing signals. Aspects of the Tasmanian residential market also make it difficult to draw reliable inferences about the behaviour of Tasmanian consumers from research conducted in other markets.

The emPOWERing You trial was envisaged as the means by which TasNetworks might gain a better understanding of these and other matters relating to the reform of network tariffs, such as how best to explain cost reflective pricing to customers and help them compare network tariffs, so they can take advantage of cost reflective tariffs in ways that reduce their power bills without adversely affecting their lifestyle.

Objectives

The research objectives spanned both phases of the trial and included:

- ① amassing a database of time of use electricity demand and consumption representative of the trial participant population;
- ① testing and quantifying the reaction of residential customers to a demand based time of use tariff structure;
- ① testing customer understanding of the tariff used in the trial;
- ① understanding the motivations behind behaviour change;
- ① understanding barriers to behavioural change, including why trial participants may not have responded to price signals;
- ① identifying electricity use during peak times that customers are either unwilling or unable to shift to off-peak times;
- ① understanding behaviours that are likely to be maintained beyond the trial and those that are not;
- ① capturing customer stories about behaviour change and cost reflective pricing that can be shared with a wider audience;
- ① collecting demographic and socio-economic information about trial participants, plus information about the appliances in their homes and attributes of their dwellings that might influence energy use;
- ① identifying the communication methods and messages that were most useful in fostering an improved understanding of energy usage and management amongst trial participants; and
- ① understanding how to help vulnerable customers make informed decisions about their energy use.

Methodology

Quantitative

The experimental design of the trial was developed with the University of Tasmania's School of Social Sciences and included a range of features designed to ensure the validity of the trial.

The trial centred around the deployment of off-market advanced meters in 600 households located in the Brighton municipality in southern Tasmania.



emPOWERing You involved 600 households (n=600)

Phase One centred around the collection of 12 months of interval data to provide a base-line against which participants' responses to the cost reflective network pricing introduced in Phase Two could be compared.

Phase Two saw participants exposed to virtual demand based time of use network tariffs and a further 12 months' of interval data collected for comparison with the base-line data gathered in Phase One.

During the second phase, participants were sent monthly reports comparing the network tariffs which would be notionally charged to their retailer (based on the current flat, consumption based network tariffs applying to the participant's dwelling) with the network charges that would have applied under the virtual network tariff being used as part of the trial. Because the trial was off-market, the network tariff used to provide the counter-factual network charges had no impact on the electricity bills trial participants received from their retailer during the trial.

Instead, participants received a financial incentive from TasNetworks at the conclusion of the trial, based on their response to cost reflective network pricing during Phase Two.

Energy sector consulting firm Energeia was engaged to undertake statistical clustering analysis, utilising both the qualitative and quantitative data outputs from the trial.

Qualitative

Qualitative social research was undertaken to help TasNetworks identify the role it can play in the transition towards more cost reflective network pricing and how it might best go about explaining cost reflective network tariffs to customers. Detailed qualitative analysis was undertaken with the help of brand and insight agency The Lab, through a series of focus groups and in depth customer interviews.

Qualitative research elements included:



18 x 1 hour interviews in participant's homes



12 x 1½ hour focus groups involving 80 participants



6 surveys, with over 2,600 responses



5 x 1–2 hour interviews with participants about their experience as part of the trial

Methodology

Experimental cost reflective tariff design

Developing cost reflective network tariffs is a complex process and there are a range of views about what constitutes the most cost reflective network tariff structure. This is reflected in the variety of tariff designs put forward by Australian DNSPs since the changes made to the National Electricity Rules in 2014 requiring the use of cost reflective network pricing.

In practice, network tariffs are also required to strike a balance between cost-reflectivity and a range of competing tensions, such as equity, simplicity and technological neutrality, which can mean that some design elements that might increase cost reflectivity may not be met with customer or stakeholder support.

Well-designed demand tariffs are considered by many to better reflect the demands that individual customers place on networks, and to allocate costs more equitably between customers than consumption tariffs. However, the concept of demand is arguably a more difficult concept for most residential customers to understand than consumption.

The experimental tariff used in the emPOWERing You trial mirrored TasNetworks' Residential time of use demand network tariff (known as TAS87), which was introduced in 2017-18 but at the time of the trial was yet to be taken up by a retailer.

As such, the network tariff tested in the trial was a two-part demand based time of use tariff featuring a daily service charge and two daily demand charges. The tariff featured peak and off-peak periods, with no shoulder periods and no seasonal variation.

One demand charge was applied to the maximum demand recorded during peak periods in any given month (itself an average of the four highest peaks recorded in any 30 minute interval falling within a peak period).

A similar arrangement was applied to demand in off-peak periods. The maximum demand figures for peak and off-peak periods were then multiplied by the number of days in the month and the relevant price per kW to determine the demand charges applying to that month.

While this methodology introduced an additional degree of complexity for customers, the use of peak demand averaging eliminated the potential for trial participants to incur higher network charges in any given month of the trial because of a single, unusually high level of demand.

The off-peak demand charge used in the trial to reward participants who could minimise their use of electricity at peak times and/or shift their use of electricity away from peak periods was 83.6 per cent lower than the demand charge applied to peak periods (5.009 ¢/kW versus 30.086 ¢/kW).

The following illustration shows the time of use periods applying during Phase Two of the trial.



Executive Summary

Key findings – Qualitative

TasNetworks' positioning and ongoing relationship with the Tasmanian community

- Some customers had never heard of TasNetworks prior to the trial.
- TasNetworks profile amongst participants was generally one of a simplistic, optimistic personality – 'the innocent' – both positive and benign in intent.
- TasNetworks had an opportunity to transition to the persona of 'the helper', and play the role of an active facilitator of choice by advising, educating, and informing customers about their electricity options.
- The willingness of participants to permit TasNetworks to play the role of a facilitator of choice reflects the level of trust that participants had in TasNetworks.
- Messages about safety did not resonate with participants, with many feeling they raised issues many people don't have and aren't concerned about, and that safety is simply something TasNetworks should do, rather than a special benefit.

Electricity prices

- Trial participants demonstrated relatively low levels of understanding of what makes up people's electricity bills, in terms of the electricity supply chain.
- There was a sense amongst trial participants that electricity prices are continuously going up, and consumers have very little control over it.
- While frustrated by a perceived lack of choice in the Tasmanian electricity industry, most participants had a set and forget mindset and were minimally engaged with the trial and the electricity industry more widely.

Executive Summary

Key findings – Qualitative

Network tariff reform

- Most participants were aware of the term ‘time of use’ and understood it at a conceptual level.
- There was low awareness of the availability of ‘time of use’ tariffs and a mixed understanding around how they work.
- There was a sense that ‘time of use’ tariffs won’t change much for customers in terms of their electricity costs unless they are willing to accept significant disruption to their lifestyle. Off-peak usage was seen as involving a significant amount of sacrifice and inconvenience.
- Lower electricity rates were not considered enough of an incentive to use electricity at ‘inconvenient times’ (particularly not for those people with dependents).
- Giving people (simple) tools and information to empower them, and realistic promises about the results customers might expect, were messages that were well received by trial participants in relation to network tariff reform.
- The benefits to the wider community of reducing electricity use resonated universally across trial participants (unlike personal financial gain as a result of taking advantage of time of use tariffs).

Executive Summary

Key findings – Quantitative

Demand response to ToU pricing

- Involvement in the trial had an observable impact on participants' aggregated maximum demand, once time of use demand based network pricing signals were introduced in Phase Two of the trial.
- Collectively the response was muted, however, with a combined reduction in maximum demand of just over 2.5 per cent in peak periods and just under 2.5 per cent in off-peak periods. Larger reductions in demand – of approximately 3.5 per cent – were observed in the shoulder seasons of Autumn and Spring.
- Despite the apparently weak response amongst trial participants to cost reflective network pricing signals, there was still a clear difference in the behaviour of trial participants when compared to households in the trial municipality which didn't participate in the trial (effectively a control group). As a group, trial participants reduced their consumption of electricity during Phase Two of the trial while the non-trial households increased their consumption over the same 12 month period.
- Participants exhibited a range of behaviours in terms of their responsiveness to time of use network pricing, with the majority of participants showing no measurable change in their usage and some even increasing their maximum demand at peak times.
- In terms of peak periods in winter, 65 per cent of trial participants recorded no change in their maximum demand compared to Phase One of the trial, while 19 per cent actually increased their maximum demand.
- Despite the low overall response to time-of-use pricing, there were some small sub-groups of participants which responded strongly to the time of use network pricing being tested in the trial.
- 4.1 per cent of participants achieved significant reductions (of just over 15 per cent) in their demand during peak time periods, and reduced their demand across all four seasons. These participants were identified as Strong Responders.
- A further 16.2 per cent of participants reduced their maximum demand during peak periods in winter, which is the season in which the Tasmanian distribution network typically experiences its annual peak in demand.

Executive Summary

Key findings – Quantitative

Consumption as a driver of demand

- There was a strong correlation between consumption and demand. For example, for the majority of participants (73 per cent) the direction of the change in their maximum demand recorded during winter aligned with changes in their consumption.
- Even though trial participants were receiving a ToU demand price signal, participants who reduced their demand found it easier to reduce consumption than to implement measures specifically aimed at reducing demand, an observation which is supported by the more pronounced reductions recorded in consumption than demand. Whilst anecdotally there was evidence that some participants were shifting consumption between peak and off-peak periods, this was not observable from metering data.
- The correlation between changes in consumption and demand suggests that if customers are willing and have the capacity to respond to time of use pricing signals, rather than relying on demand based price signals, changes in network peak demand could be achieved using a consumption based time of use tariff, which has the advantage of being better understood by customers.
- The overall decrease in demand was driven by changes in the behaviour of a small subset of trial participants. However, relying on a small number of customers who are highly responsive to cost reflective network pricing is unlikely to deliver meaningful demand reductions or limit future demand growth at a feeder or network level.
- TasNetworks will need to use the lessons learned from “strong responders” to engender more widespread changes in consumer behaviour if the transition to cost reflective network tariffs is to increase the utilisation of the network.

Winter responders and Strong responders

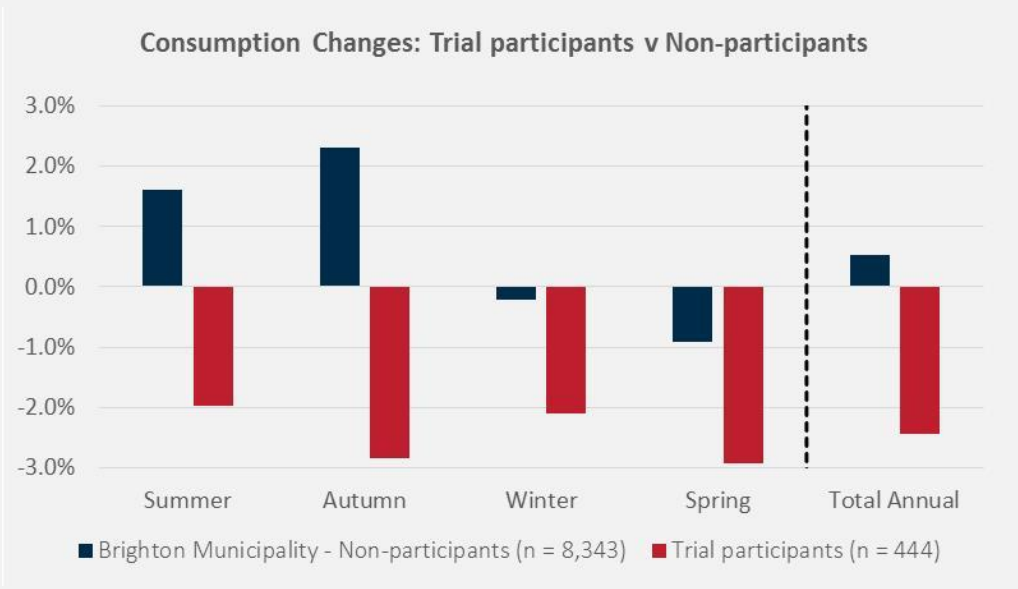
- 16 per cent of trial participants did reduce their winter load, most notably in the morning peak period.
- On average, those customers were able to reduce their maximum demand in winter peak periods by nearly 10 per cent, and their consumption in peak periods over winter by just under 20 percent.
- A smaller group of 18 participants (4.1 per cent of the sample) reduced their maximum demand across all four seasons. These participants were identified as “Strong Responders”.
- In winter, on average Strong Responders decreased their maximum demand in peak periods by 17.8 per cent (and 16.2 per cent in off-peak periods).
- During the course of the year, on average Strong Responders decreased their consumption of electricity in peak periods during Phase Two by 31.8 per cent and in off-peak periods by 23.6 per cent, compared to Phase One of the trial.
- In terms of demand, the Strong Responders reduced their maximum demand in peak periods by 15.5 per cent and in off-peak times during Phase Two by 12.5 per cent.

Findings

Definitive behavioural change

Overall, the trial resulted in an observable reduction in participants’ maximum demand, as well as their consumption.

Even though the response amongst trial participants was muted, this chart highlights the clear difference in the behavioural outcomes of trial participants (collectively) compared to other households in the Brighton municipality which didn’t participate in the trial (effectively a control group).



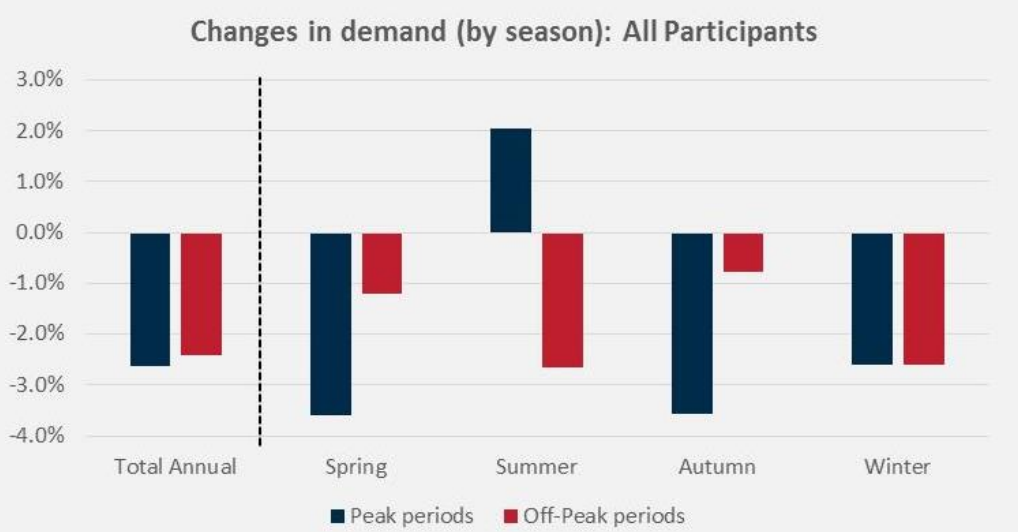
Note: Even though the trial was testing consumer responses to a demand based price signal, this comparison is necessarily based on consumption data because demand data is not available for non-trial participants, whose usage of electricity is metered using accumulation meters.

Collectively, trial participants reduced their consumption of electricity during Phase Two of the trial while non-trial households within the trial area increased their consumption over the same 12 month period.

This indicates that there was a definite response to the time of use price signals introduced during Phase Two of the trial.

Overall demand response amongst participants

Collectively the response to time of use demand based network pricing was muted amongst trial participants. The combined reduction in maximum demand was just over 2.5% in peak periods and just under 2.5% in off-peak periods. Larger reductions in demand – of approximately 3.5 per cent – were observed in the shoulder seasons of Autumn and Spring.



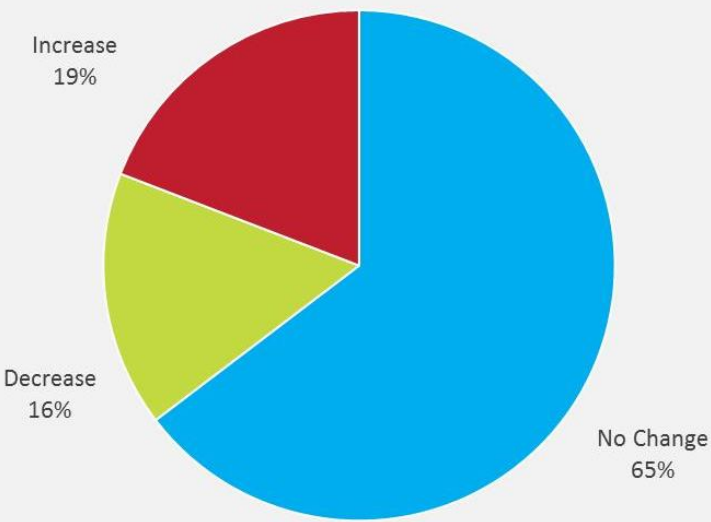
Note: For this and many other metrics in this report, n=444, rather than 600, which was the total number of participants in the trial. This is because 24 months of interval metering data was not available for all trial participants.

Findings

A range of responsiveness

Participants exhibited a range of behaviours in terms of their responsiveness to time of use network pricing, with the majority of participants showing no measurable change in their usage and some even increasing their maximum demand at peak times.

Variations in winter peak demand changes



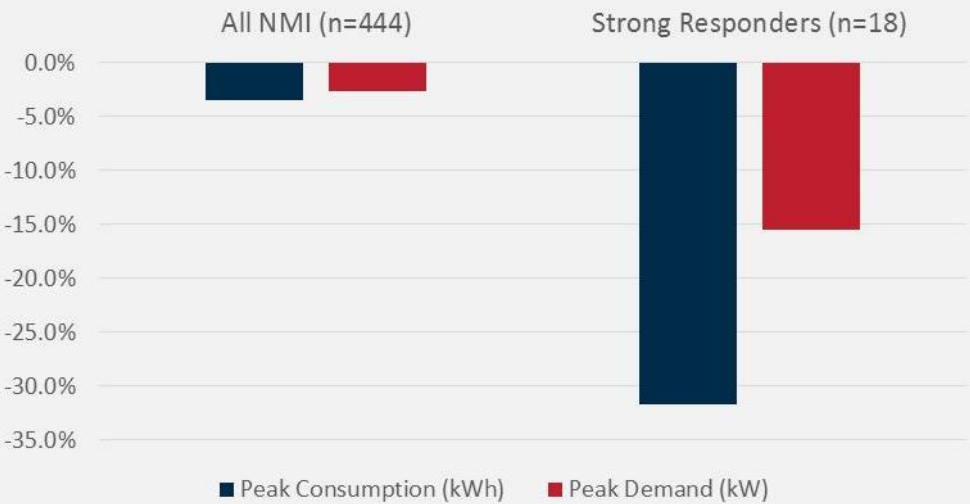
In terms of peak periods in winter, the season in which the Tasmanian distribution network experiences its system peak, 65 per cent of trial participants recorded no change in their maximum demand compared to Phase One of the trial, while 19 per cent actually increased their maximum demand.

Strong responders

Despite the low overall response to time-of-use pricing, there were some small sub-groups of participants which responded strongly to the time of use network pricing being tested in the trial. A small sub-group of 18 trial participants consistently reduced their maximum demand in all four seasons. This group mostly consisted of larger-than-average users whose reductions in consumption also resulted in significant reductions in demand during Phase 2 of the Trial. These customers were identified as “Strong responders”

This chart compares the magnitude of the behavioural change amongst strong responders with the average behavioural change across all trial participants (including Strong Responders).

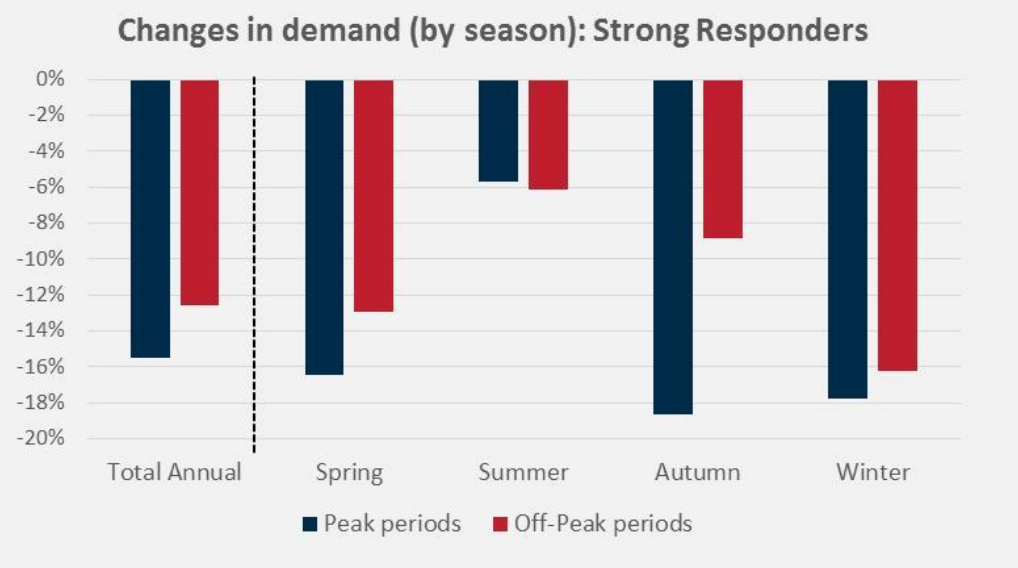
Behavioural change during peak periods in Phase 2



Findings

Strong responders

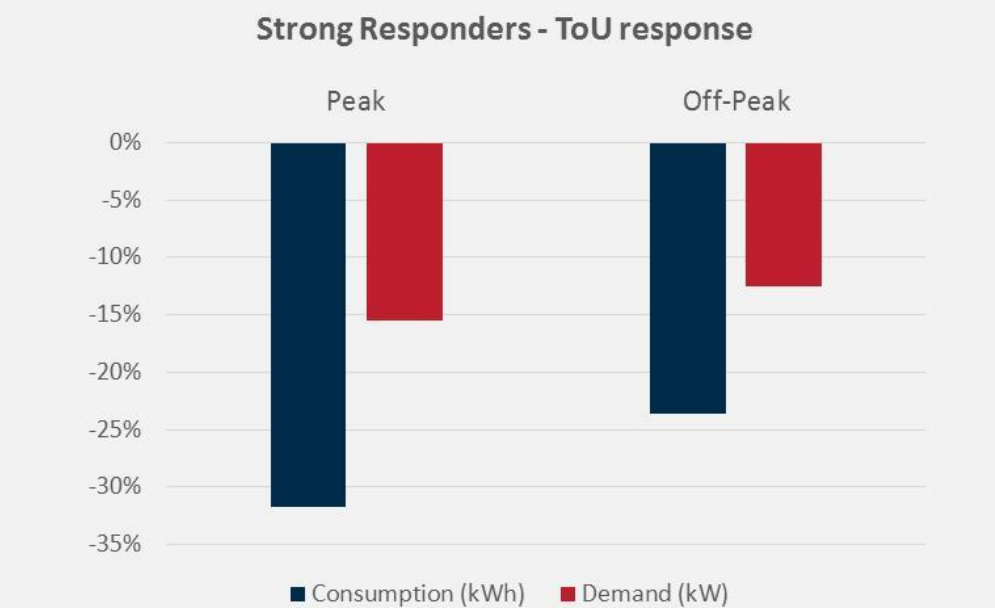
Strong responders were able to reduce their maximum demand across all four seasons. The following chart shows that Strong responders made significant reductions in their maximum demand, both in peak and off-peak periods which, if replicated at a network level, might potentially have a significant impact on the need for augmentation expenditure in the future, as well as on asset replacement expenditure.



Another group of 72 participants (16 per cent) was also identified who reduced their maximum demand in winter peak periods. This group showed reductions in their level of demand throughout the day, but with the biggest reductions occurring during morning peak times.

On average, those customers were able to reduce their maximum demand in winter peak periods by nearly 10 per cent, and their consumption in peak periods over winter by just under 20 percent.

The reduction in consumption (and demand) by Strong Responders was appreciably stronger in peak periods than off-peak periods – although as the following chart shows the difference in the reduction in consumption between peak and off-peak periods was less pronounced than was the case with demand. But the fact that demand and consumption both decreased in off-peak periods suggests that the reductions in peak periods were more driven more by outright reductions in consumption than shifting consumption from peak into off-peak periods.



Like 85 per cent of the wider residential customer base, Strong responders – and trial participants more generally – rely on electric heating as either their primary or major source of heating. Strong responders reduced both their heating load and the electricity they used for the purposes of general power and lighting by similar degrees. This suggests that they were not targeting a particular use of electricity as part of their efforts to respond to time of use network pricing, but pursued reductions across the board.

Findings

Strong responders

What did these Strong responders look like and what distinguished them from other households participating in the trial? Strong responder households were characterised by:



Significantly above average users of electricity



Larger households than the trial average



More likely to include people in paid employment



Above average household income amongst trial participants

A further small group of 17 Large Non-Responders showed similar Phase One consumption and demand patterns to the 18 Strong Responders, as well as similar household characteristics, but made no significant behavioural changes during Phase Two.

Characteristics of strong responders

	Winter Responders	Strong Responders	Large non-Responders	Trial Average
Solar panels	15%	11%	6%	20%
Educated beyond Year 12	50%	56%	47%	48%
Home most of the day	47%	39%	33%	57%
Household Income	\$56,550	\$66,733	\$65,459	\$47,365
Annual consumption	11,544 kWh	14,340 kWh	15,649 kWh	8,995 kWh
Retired	19%	11%	12%	26%
Employed	47%	56%	65%	36%
People in household	3.2	3.6	3.6	2.7

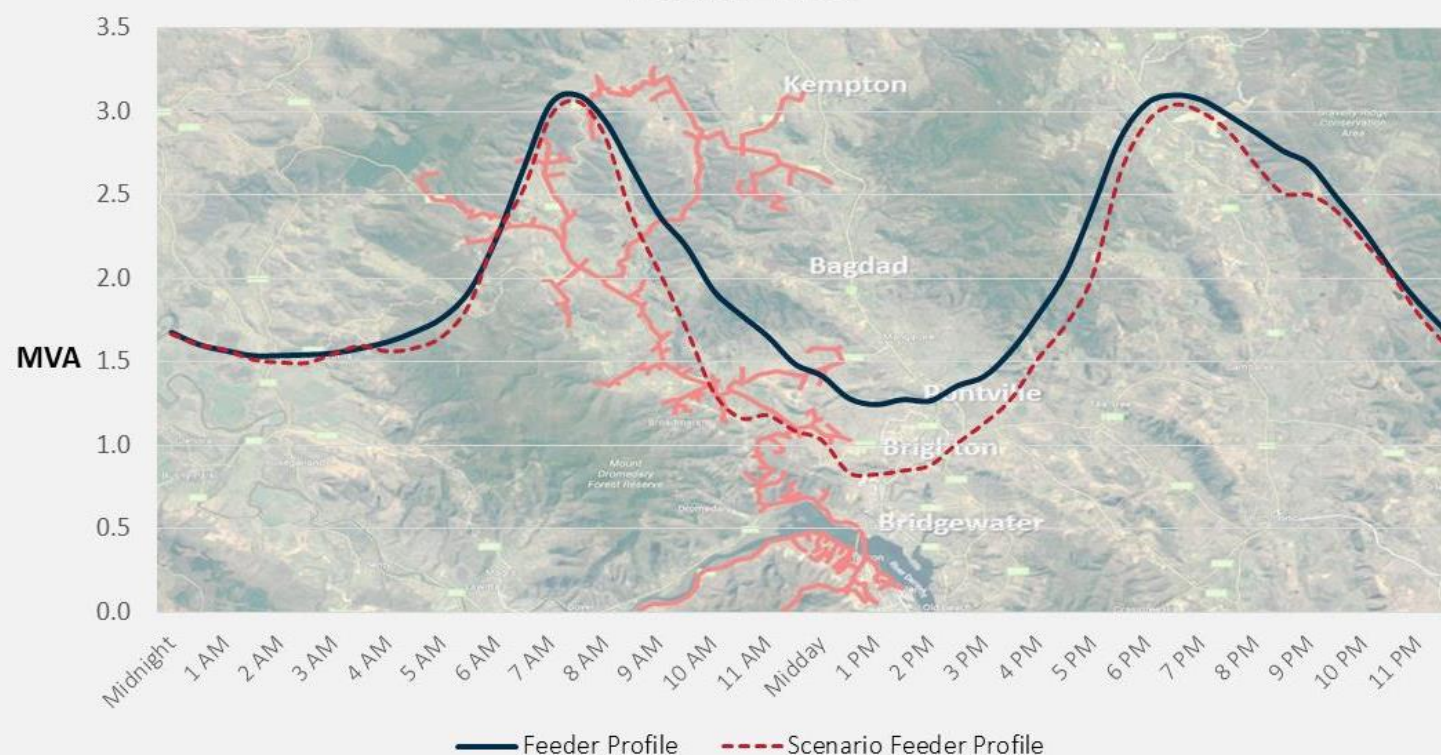
Findings

Network implications

Minimal impact on demand at peak times

When looking at maximum demand at a network or feeder level, the trial had minimal impact. The following chart shows the impact that trial participants' behaviour would have collectively had on demand for an individual feeder within the Brighton Municipality, based on aggregated responses from similar household profiles. Feeder 48185

Feeder 48185



predominantly services residential customers, with 78% of the load coming from residential customers. The feeder supplies 28 tariff trial participants and the usage patterns of those customers were supplemented with the usage patterns of customers supplied by a similar feeder, meaning the demand reduction scenario in this chart draws on the response to cost reflective network pricing of about 130 tariff trial participants.

As the chart shows, unless a behavioural response more akin to that of the Strong responders who participated in the trial could be fostered amongst households more widely, the introduction of cost reflective network pricing is likely to yield only a minimal reduction in the maximum demand being supplied by the feeder during the early morning and early evening peak periods. The more significant reductions projected during the daytime off-peak period, are unlikely to deliver substantial savings for customers, or facilitate more efficient use of the network's capacity.

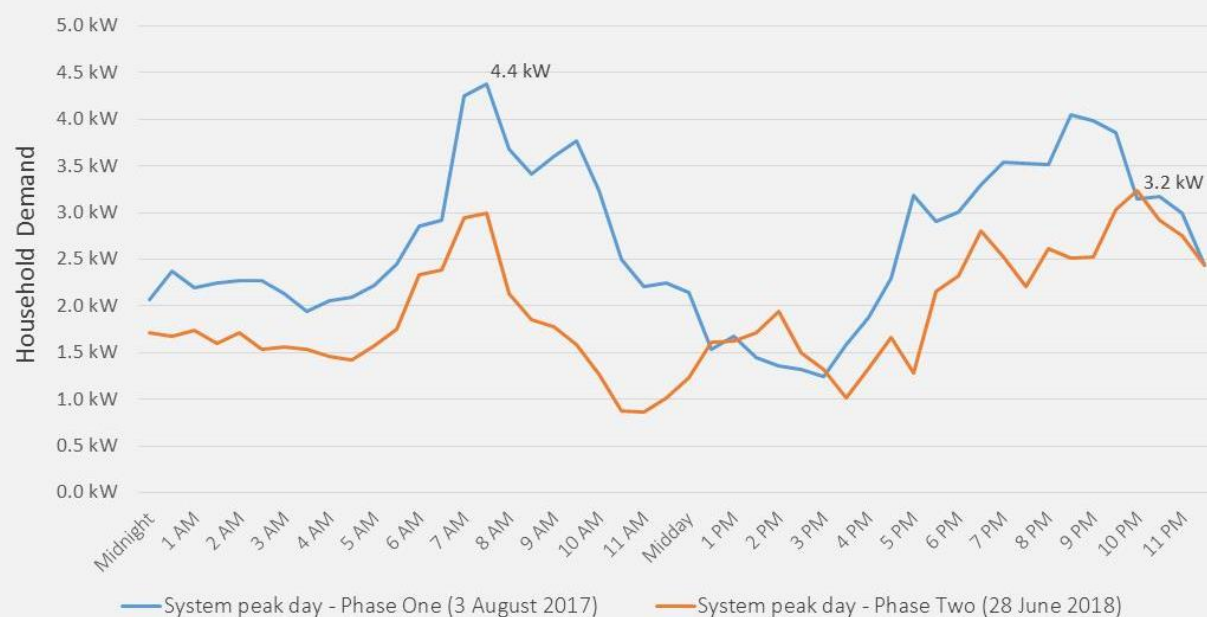
Findings

Network implications

Demand response based on Strong responders

As was the case with the trial, there will always be a range of responses to time of use electricity pricing in any form, ranging from no behavioural response through to customers who behave in ways which run counter to pricing signals. However, analysis of network peak days in Phase One and Phase Two of the trial showed a pronounced reduction in demand amongst the Strong responder group of trial participants.

Demand response by Strong Responders



This suggests that there are potential network efficiency benefits to be realised if TasNetworks can identify what influences a Strong responder to behave in this way and help other customers (particularly those that look like Strong responders) to behave similarly in response to cost reflective time of use network pricing.

The chart on this page illustrates the average reduction achieved by Strong responders in their demand for electricity at an individual household level, by averaging their demand profiles on the network peak days that occurred during Phase One and Two of the trial.

Noting that in comparing these two days the maximum demand of Strong responder households in peak periods shifted from the early morning peak period in Phase One to an early evening peak in Phase Two, the maximum demand reading recorded during peak periods on system peak days fell from 4.4kW to 3.2kW, a reduction of just over a quarter (27.3 per cent).

Note: Temperature correction is often used in an attempt to isolate underlying trends in energy use, by producing time series which remove the effect of changes in ambient temperature. The metering data that informed the above comparison of Strong Responders' demand profiles on network peak days has not, however, been temperature corrected. This is because, on a day-to-day basis, analysis of the weather during the emPOWERing You trial showed temperature to have little influence on trial participants' energy use during winter, the season in which the distribution network in Tasmania experiences its system peak demand. A lagged response to variations in temperature was observed in other seasons, in that a succession of colder (or warmer) days had an observable effect on participants' energy use. But this effect was not observed during the winter months. Further, while the overnight minimum temperature in Hobart on the system peak day in 2017 was lower than the system peak day in 2018 (1.0° C v 3.0° C), the Strong Responders recorded consistently lower levels of demand on the system peak day in 2018, despite that day recording a significantly lower maximum (12.3° C v 9.9° C) and slightly lower mean temperature (6.7° C v 6.4° C).

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