TasNetworks
Delivering your power

Policy and Regulatory Working Group

Consultation Paper 3

June 2021

Contents

Glossary and commonly used phrases

Australian Energy Market Operator (**AEMO**)	The National Energy Market Operator and planner.
Australian Energy Regulator (**AER**)	The economic regulator and enforcer of the energy rules.
Cost reflective tariff	A tariff that charges the user based on underlying drivers of future investment.
Customer group	A way of aggregating customers that share similar characteristics, such as usage and behaviour patterns.
Distributed Energy Resources (**DER**)	Refers to smaller generation or storage units such as solar panels, batteries or electric vehicles.
Default assignment	Refers to customers being automatically assigned to a specific tariff when either connecting to the network or when their characteristics change (please note: default assignment may occur at different times depending on the distribution network service provider's tariff strategy).
Electric Vehicles (**EVs**)	A vehicle that derives all or part of their power from electricity supplied by the electric grid.
Embedded Network	Private networks which serve multiple premises and are located within, and connected to, our distribution network through a single connection point.
Embedded Network Customer	The end use customers within an embedded network. These customers are offered connection services and may purchase energy from within the embedded network.
Embedded Network Operator	The person or person(s) appointed to take care of procurement, billing, collection and customer service. The Embedded Network Operator is typically either the building owner or appointed by the building owner.
Flat rate tariff	A single fixed price for the use of the network, which does not vary with time of use.
High Voltage (**HV**)	High voltage means anything greater than low voltage, i.e. >= 1,000 volts. For the purpose of this document, high voltage commonly refers to electricity usage by large business customers.
Low Voltage (**LV**)	The National Electric Code considers voltages <1,000 volts to be low voltage. For the purpose of this document, low voltage commonly refers to electricity usage of small business or residential customers.
Mandatory assignment	Refers to a type of prescribed tariff assignment where customers must remain on the default network tariff the distributor assigns to them.
Minimum demand on the minimum demand day	The "minimum demand day" identified the day where there was the lowest amount of demand on the network over the financial year. The minimum

	demand is then the lowest amount of demand at a given point in time on that minimum demand day.
Network Tariff	A charge, or a combination of charges, applied to the provision of network services, specifically, the provision of a customer's connection to the shared electricity network and the delivery of the electricity used by that customer via that network.
Obsolete	Obsolete network tariffs are no longer available to new installations or able to be applied to an existing installation not already assigned to the obsolete tariff.
Opt in	A type of tariff assignment that occurs when a customer notifies their retailer of their desire to opt into a particular network tariff.
Opt out	A type of tariff assignment that occurs when a customer notifies their retailer of their desire to opt out of a particular network tariff.
Substation	Part of an electrical generation, transmission, and distribution system. Among other important functions, substations connect the high voltage transmission network and the low voltage distribution network – from which our residential customers and the majority of our business customers connect.
Tariff Class	A class of retail customers with similar characteristics that are grouped together so that similar customers pay similar prices.
Tariff Structure	Refers to the shape, form or design of a tariff, including its different components (or charges), as well as, in some cases, how they interact. Network tariff structures determine how a network operator calculates how much an individual customer is charged for using its network.
Time of use	A type of cost reflective tariff that applies different prices for electricity at different times of the day, week or year.

Glossary for Vehicles

Battery electric vehicle (**BEV**)[1]	Vehicles that are solely powered by electricity and do not have petrol, diesel or LPG engine, fuel tank or exhaust. They are also known as plug-in EVs as they use an external electrical charging outlet to charge the battery.
Electric vehicle (**EV**)	A vehicle that derives all or part of their power from electricity supplied by the electric grid. They are powered by electricity rather than liquid fuels.
Internal combustion engine (**ICE**)	An engine which generates power by the burning of petrol, oil, or other fuel with air inside the engine.
Hybrid electric vehicle (**HEV**)	Hybrid vehicles that do not plug-in are not considered an EV

[1] https://arena.gov.au/renewable-energy/electric-vehicles/

Long range electric vehicle (**LREV**)[2]	CSIRO defined the LREV to include larger articulated trucks which perform the bulk of long distance road freight and has > 500+km range.
Short range electric vehicle (**SREV**)[3]	CSIRO defined the short range EV to be <500km and are assumed to fall into the following five vehicle classes: light, medium and large cars, rigid trucks and buses.
Plug-in hybrid electric vehicle (**PHEV**)[4]	Plug-in hybrid electric vehicles are powered by a combination of liquid fuel and electricity. They can be charged with electricity using a plug but also contain an internal combustion engine that uses liquid fuel

[2] CSIRO Report June 2020, Projections for small-scale embedded technologies, Paul Graham and Lisa Havas
[3] CSIRO Report June 2020, Projections for small-scale embedded technologies, Paul Graham and Lisa Havas
[4] https://arena.gov.au/renewable-energy/electric-vehicles/

1. Introduction

1.1. Purpose of this document

The purpose of this paper is to:

- Develop a collective understanding of distributed energy resources (**DER**) and embedded networks (**EN**),
- Understand the impacts currently being observed on TasNetworks' network,
- Identify the opportunities in the Tasmanian networks now and into the future, and
- Determine the TasNetworks' approach towards investigating and potentially implementing tariffs to support innovation and fair use of the network

1.2. Objective of the workshop

The objective of the Policy and Regulatory Working Group (**PRWG**) in July 2021 is to demonstrate the trends TasNetworks is seeing on the network and understand our customer preferences of adapting network pricing to facilitate increasing levels of DER technology and embedded networks.

1.3. The Policy and Regulatory Working Group

The Policy and Regulatory Working Group will support the development and submission of TasNetworks' 2024-29 Regulatory and Revenue Proposal by providing advice on regulatory framework, forecasts and pricing strategy development.

Forums are currently forecast to continue on a quarterly basis, and we will monitor and review the frequency and length of the workshops during the later stages of engagement.

2. Executive summary

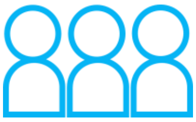
Customers are adopting DER technologies in response to environmental changes and advances in new technology. It is forecast that Tasmanians will increase their investment in these technologies in the future.

However, the impact of these technologies on the distribution network needs to be understood to enable an appropriate response to change. The below table summarises the observed changes in TasNetworks' distribution network as a result of the uptake of solar PV and it seeks to understand the potential impact of new technologies such as batteries and electric vehicles (**EVs**). Embedded networks are included in this discussion due their impact on the distribution network and their ability to install embedded generation within the embedded network.

- Since 2016, following the end of the transitional feed-in-tariff (**FiT**) rates, **solar PV installations** in Tasmania have **increased 38.3 per cent.**
- Electric vehicle growth is projected to increase – however the rate of increased sales is dependent on a number of factors. Evidence collected from overseas and with existing EV owners is showing that most owners tend to **recharge their vehicles at the end of the day** on their return home – this has been termed as **convenience charging**. It is likely that an increase in the uptake of EVs will see higher evening peaks.
- TasNetworks is currently participating in an **EV trial** with ARENA, the result of this trial will be available **quarter 4, 2022**.
- The uptake of TasNetworks' **demand and distributed energy resources tariffs** have been low despite the high uptake of solar PV by both residential and business customers.
- The majority of customers export less than **5,000 kWh per annum** – 76.7 per cent of residential customers and 56.1 per cent of small business customers. A large proportion of residential customers with solar PV have remained on the general light and power, and heating and hot water tariffs (TAS31/TAS41).
- **Embedded networks for business customers** show different profiles which often reflects the profile of the dominant stores e.g. supermarkets, discount retail stores. Using existing consumption patterns, these embedded networks would **generate higher annual savings** on one of TasNetworks' network **demand tariffs**. The majority of savings are generated from the variable charges.

3. Pricing principles

At our June 2020 forum, members of the PRWG helped develop TasNetworks' pricing principles. These principles continue to guide our discussion regarding tariff reform and development.

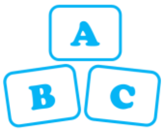


Affordable

We offer an essential service and recognise that customers want affordability in the delivered cost of electricity. To support this we will ensure sustainable network investment and that particularly vulnerable customers will not be exposed to hardship as a result of our pricing or network tariff reforms.

Fair

We will provide transparent and cost reflective pricing signals so that all customers contribute to their portion of total network costs.



Simple

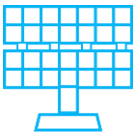
Our network pricing will be both cost reflective and easy for our customers, retailers and stakeholders to understand.

Consistent

We will avoid creating price shocks for customers and minimise upward pressure on the delivered cost of electricity.

Innovative

We will investigate innovative solutions that meet the changing needs of our customers and changes in technology.



Choice

We will not stand as a barrier for customers who invest in distributed energy resources, such as solar generation and battery storage. Our pricing will provide choice to our customers to best meet their energy needs, while not imposing on the needs of others or the network.

4. Distributed Energy Resources

Distributed energy resources (**DER**) encompasses renewable energy systems that are located at residential properties or businesses to provide them power. These systems refer to energy that is generated and used "behind" the electricity meter.

Examples of DER include rooftop solar PV, batteries, electric vehicles and chargers, advanced meters and home energy management technologies.

The network impact over the last decade as a result of DER being implemented is having a significant impact on the NEM. Rather than large centralised power stations generating power, electricity is now coming from many homes and businesses transforming the way in which customers interact with the electricity system. This transformation is changing customer behaviours and expectations on both the consumption and generation of electricity requiring DNSPs to facilitate a two-way energy flow.

4.1. Solar photovoltaic generation

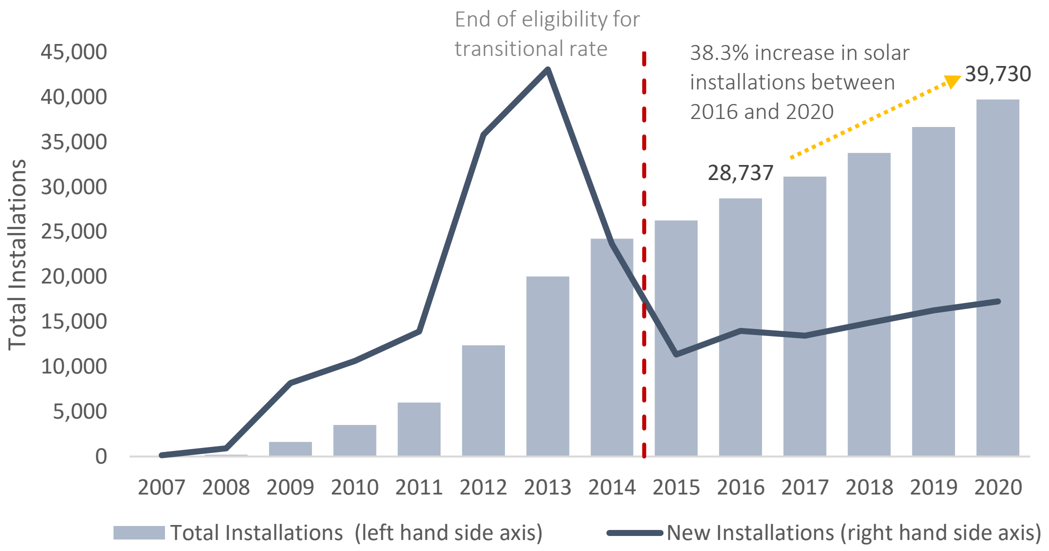
In Tasmania, solar PV uptake has steadily grown over time. During the period 2012 to 2014 solar PV uptake was at its peak, this was primarily a result of the attractive transitional feed in tariff (**FiT**) rates available at the time[5]. However, new installations reduced midway through 2014 and returned to the 2010 levels during 2015. Since then solar PV installations have stabilised, although in the last 12 months an average 248 customers have installed solar PV each month, this is an increase of the average 203 installations in the prior 12 months.

As at the end of March 2021, solar penetration in Tasmania was 12.4 per cent, 95 per cent of solar installations are for residential customers and solar penetration for residential customers around 13 per cent.

[5] A grandfathered (transitional) rate was available to customers who had qualifying solar systems installed or had an approved application prior to 31/08/2013. Customers who had an open and approved application at that time had another 12 months to install their system to qualify for the grandfathered rate

This compares with penetration rates of approximately 30 per cent in other jurisdictions, and where in South Australia a third of residential customers have solar PVs.

Figure 1 - Solar PV uptake for residential and business customers in Tasmania



Source: Clean Energy Council (accessed April 2021)

4.1.1. Minimum Demand

Minimum demand is an emerging issue across the NEM and some markets – particularly South Australia – the amount of energy being produced by customers with solar panels is exceeding the demand for electricity creating issues or stability in the network.

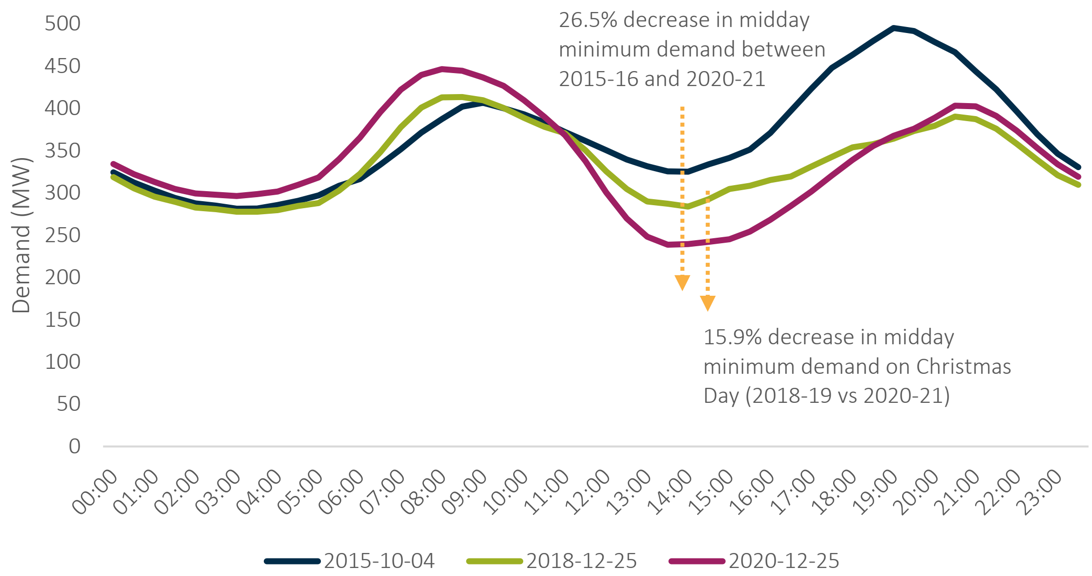
In South Australia, solar PV penetration sits at approximately 30 per cent. This high level of solar generation is, on some days, exceeding demand requiring both the DNSP and AEMO to implement strategies mitigating adverse network outcomes[6].

Although solar exports are not currently impacting TasNetworks' distribution network to the same extent, our network minimum day time demand (Figure 2) between 2015-16 and 2020-21 has revealed that on TasNetworks' minimum demand day:

- The minimum demand is 15.1 per cent lower in 2021-21 (which occurred in the early afternoon) compared to the minimum demand in 2015-16 (which occurred in the early morning).
- In 2015-16, the day time minimum demand occurred between 2:00pm and 2:30pm and was 15.5 per cent higher than the 24-hour minimum demand (325 MW).
- The day time minimum demand between 2015-16 and 2020-21 shows an average decrease of 26.5 per cent in the midday minimum between the hours of 1:30pm and 2:30pm.
- Since 2018-19 the midday minimum has occurred on Christmas Day and has declined 15.9 per cent.

[6] Refer to Section 6.3 of the October 2020 PRWG Additional Information pack.

Figure 2 - Network minimum demand

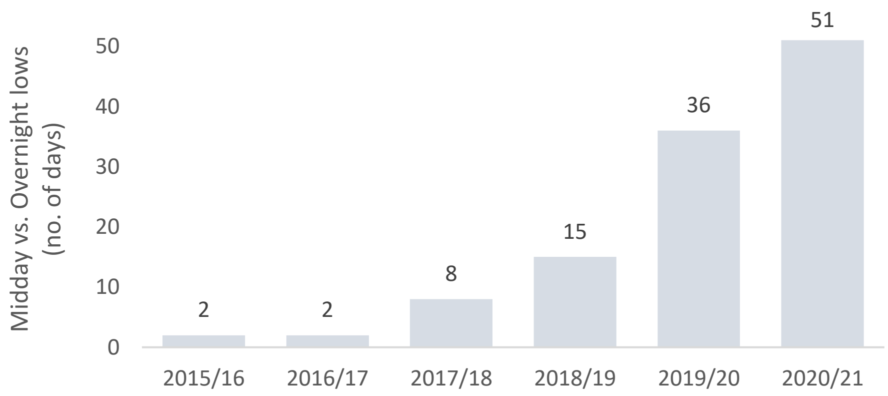


Source: TasNetworks

4.1.2. Locational minimum demand

Launceston and outer Hobart have shown the strongest growth in export generation in recent years predominantly driven by existing housing stock. In areas with higher solar penetration the number of days where the midday minimum is lower than the overnight minimum is increasing from zero in 2015-16 to 46 days in 2020-21 (Figure 3).

Figure 3 - Number of days where the midday minimum demand was below the overnight minimum demand from 2015-16 to 2020-21 in regions where there is high solar PV growth (number of substations = 5)



Source: TasNetworks

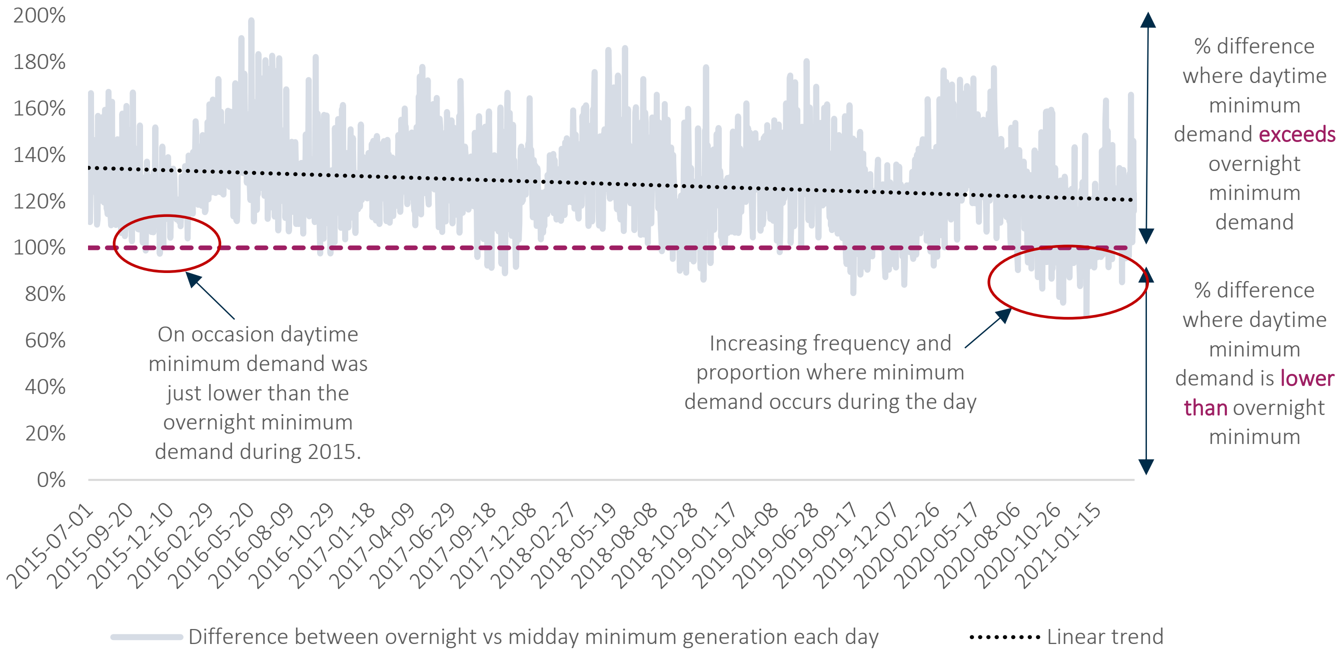
Figure 4 shows both the increase in frequency of daytime minimum generation exceeding the overnight minimum and the proportion by which the difference between the minimum daytime and overnight generation has increased, for example:

- On the 06-03-2021 the overnight minimum was 57,441 kWh compared the daytime minimum of 49,976 kWh – this represents an 87 per cent difference between the daytime and overnight minimum and is represented below the red line.

- Conversely, on the 24-03-2021 the overnight minimum was 49,576 kWh compared to the daytime minimum of 82,432 kWh – this represents a 66 per cent difference between the daytime and overnight minimum and is represented above the red line.

Over the time period, we can observe that the trend is on a downwards trajectory where the proportional difference between the overnight and daytime minimum demand differs.

Figure 4 - Percentage difference in minimum overnight and daytime generation between 01-07-2015 and 31-03-2021 in regions where there is high solar PV growth (number of substations = 5)



Source: TasNetworks

4.1.3. What did we learn from the Consort Bruny Island Battery Trial[7]?

The Consort Bruny Island Trial was undertaken to investigate how the implementation of household battery storage can increase the penetration of renewable energy to co-ordinate desired technical outcomes and to reward prosumers for the services their battery provides. The study included the use of household batteries, network-aware coordination (**NAC**), the reward for battery services and understanding household acceptance.

NAC is the key technical innovation at the heart of the trial which sought to coordinate the flow of energy from residential solar and batteries (residential DER) to the network ensuring that the network and electricity grid operates efficiently and reliably. In coordinating energy flows, NAC is able to manage network constraints at the lowest overall cost for the network service provider and ultimately for customers.

Reward structures were investigated during the trial and an *Energy Use payment* – where actual use from the NAC was computed and communicated to participants after the peak event – was preferred[8].

Figure 5 demonstrates the difference in network utilisation when batteries are optimised for use during peak period compared to those customers who didn't have DER technologies installed:

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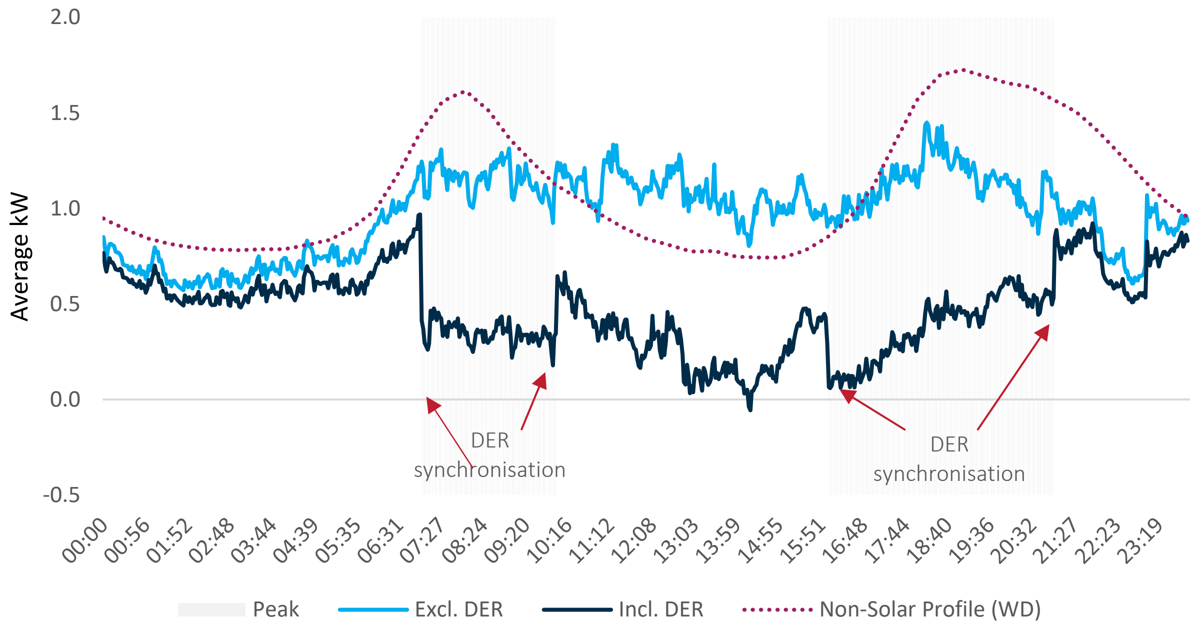
[7] https://arena.gov.au/assets/2019/06/consort-project-results-lessons-learnt.pdf
[8] other reward structures can be found in the *Consort Bruny Island Battery Trial* report

- The "non-solar profile" shows energy consumption among customers who don't have any solar installed. This profile shows the morning and evening peak periods during a winter week day.
- The profile that "excludes DER" represents the consumption profile of the Consort Bruny Island participants as if they did not have DER installed. The day-time consumption profile for this group of customers is flatter than the non-solar profile but does show a small evening peak.
- The grid profile "including DER" are those customers who have DER installed and the batteries were optimised to utilise the network during off-peak, i.e. customers were able to use the energy stored in their batteries during periods off-peak. This profile demonstrates that at the points of DER synchronisation at the:
    - start of the peak period e.g. 7:00am and 4:00pm, customers almost immediately stop drawing from the network and use their batteries
    - end of the peak period e.g. 10.00am and 9:00pm, customers' use of the network increases.
- It is observed that during the afternoon/evening peak time, grid utilisation increases slowly.

Figure 5 – Bruny Island trial grid profiles for a winter weekday demonstrating the use of integrated DER technologies.



Key findings of the Trial were:

- Average solar self-consumption was approximately 41 per cent without a battery, this increased to 68 per cent with a battery. The benefit was significant for customers, with energy costs being reduced to close to or below $0 (for customers using less than 16 kWh per day on average).
- For customers participating in the trial:
    - Total energy savings averaged $1,100 per year – the lowest saving was $630 per year with the highest saving being $1,550 per year.
    - Average annual savings attributable for solar only generation was $750 and for the battery system was $200.
- Using batteries, participants were able to shift an average of 4 kWh of load per day.

Further reports on the *Consort Bruny Island Battery Trial* can be found at https://arena.gov.au/knowledge-bank/consort-project-results-and-lessons-learnt/.

4.1.4. Summary of solar PV generation

Analysis has shown solar PV installations have increased approximately 38 per cent across Tasmania's distribution network since 2015-16. Over the same period, the minimum demand on the minimum demand day has dropped by 36 per cent and the number of midday minimum demand days has been increasing.

There are some locational challenges emerging where we observe that solar PV uptake is growing faster in some regions across Tasmania and the number of daytime minimum demand days in these locations is increasing since approximately 2016[9]. However even in areas where solar PV uptake is slower, we are observing a downward trend in daytime minimum demand compared to the overnight minimum demand.

The Consort Bruny Island Battery Trial offers some interesting insights into what we need to consider when engaging with our customers on DER technologies to allow customers the ability to access the network as a trading platform and to ensure that there is equity in charging for network utilisation.

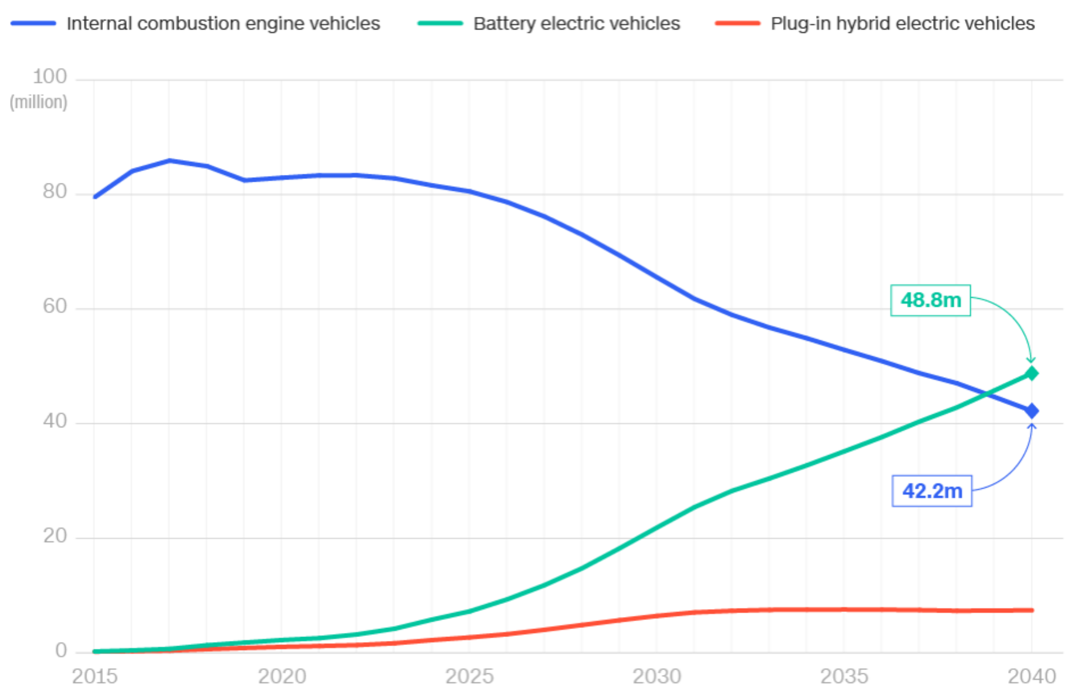
4.2. Electric vehicles

4.2.1. Introduction

There are two main types of Electric Vehicles (**EVs**) – Battery Electric Vehicles (**BEV**) and Plug-in Hybrid Electric Vehicles (**PHEV**).

Worldwide it is expected that electric cars could outsell internal combustion engine (**ICE**) vehicles by 2040 (Figure 6), this is predominantly being driven by stricter regulation in Europe and China, falling battery costs and government subsidies to encourage manufacturers to adopt new technology.

Figure 6 - By 2040, electric cars could outsell internal combustion engine vehicles



Source: Bloomberg New Energy Finance [10]

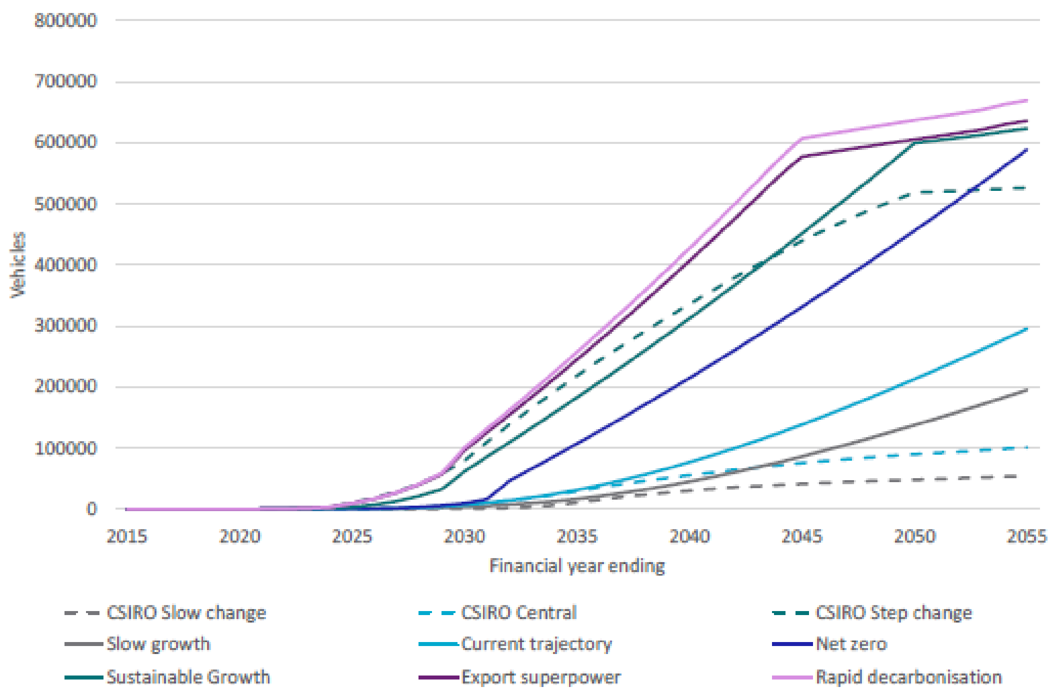
[9] TasNetworks has implemented policies and guidelines within our connections process to assess the location and size of embedded generation.
[10] https://edition.cnn.com/interactive/2019/08/business/electric-cars-audi-volkswagen-tesla/

4.2.2. Electric vehicles in Tasmania

Currently the entry costs into the EV market are still high, however investments from the automotive industry to mass-produce EVs in the future, along with decreasing costs of batteries and EV components will make the EV market more competitive.

Australia, as a nation that imports vehicles, will not be immune to the international changes in the market. The CSIRO has recently updated its projections on the uptake and consumption profiles of EVs. They provided several scenarios to predict the uptake (Figure 7).

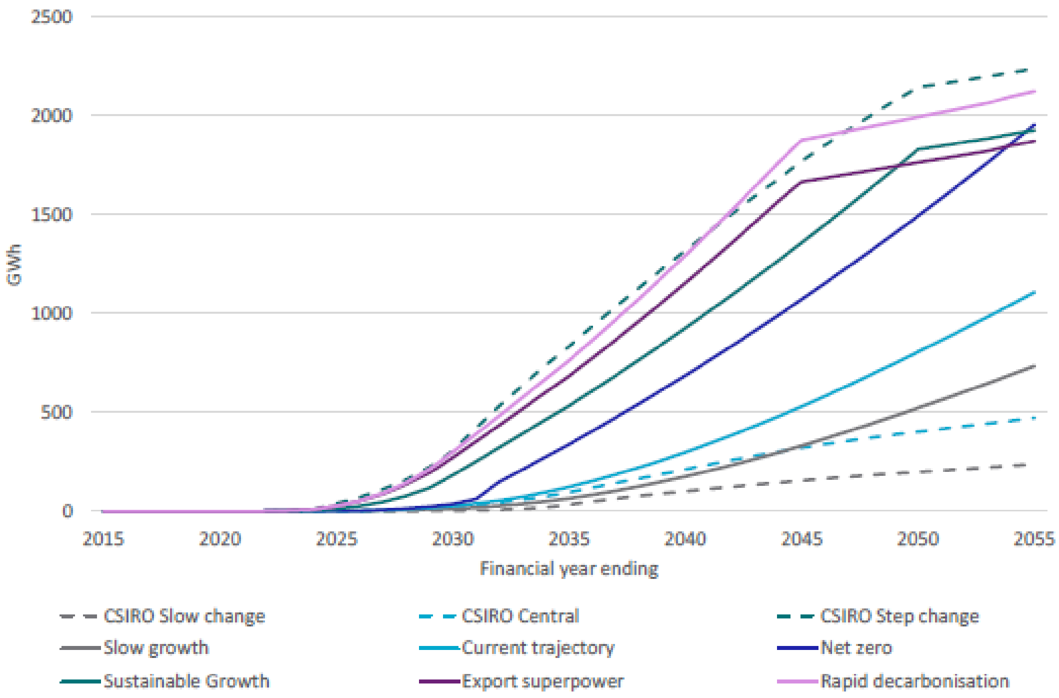
Figure 7 – Number of battery electric vehicles (BEV) in Tasmania by 2055



Source: CSIRO

Based on the current trajectory (light blue solid line), Tasmania will start to see an uplift in EVs by approximately 2032. However, there are scenarios that would result in a much quicker transition where approximately 300,000 EVs would be on Tasmanian roads before 2040 – sustainable growth (green solid line), rapid decarbonisation (pink solid line), and export super power (dark pink solid line). Figure 8 shows the consumption of EVs under the same scenarios

Figure 8 – Consumption (GWh) of battery electric vehicles (BEV) in Tasmania by 2055



Source: CSIRO

4.2.3. EV impacts on the network

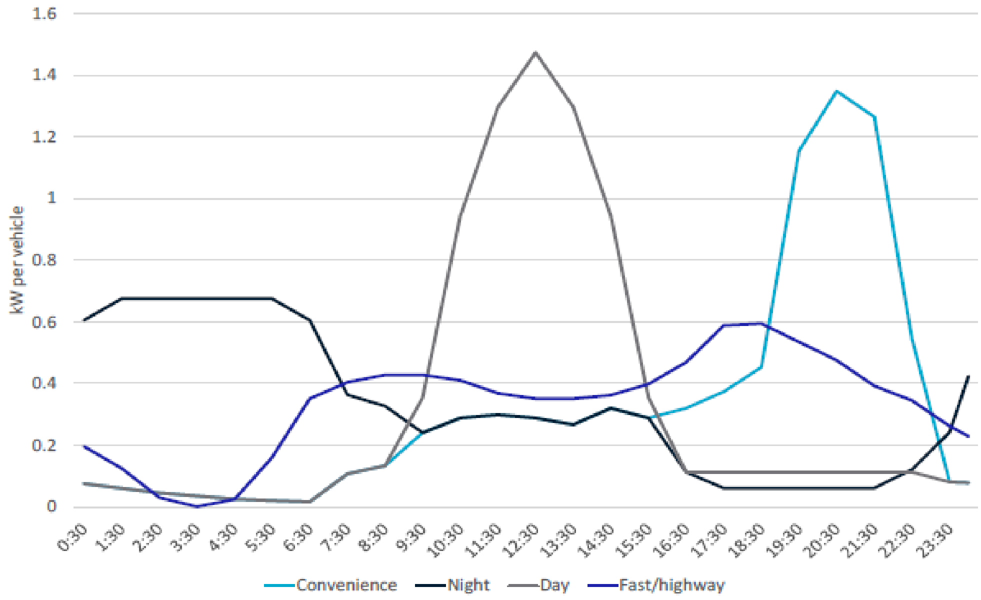
The predominant growth in EVs is predicted to be the passenger vehicle, which has the potential to contribute to maximum demand. The distribution network was not initially designed for EV charging, and the impact on the network is dependent on the behaviour of customers' charging habits and the pace of EV up-take e.g. households that currently own two ICE vehicles may replace these with two EVs.

As EV penetration rates increase and where most residential customers pay a flat rate for electricity, there is no incentive for customers to move their consumption. Without appropriate price signals or technological advancements (such as smart charging), there could be significant investment required in the network to support EV charging.

The challenge is to provide price signals to encourage EV owners to charge their vehicles during off-peak periods.

The CSIRO analysis reflects different consumer behaviours and demonstrates an average Australian daily profile. The four customer profiles that were created are convenience, night, day and fast/highway charging (Figure 9). The convenience profile highlights that the distribution network is likely to experience changes in peak maximum demand in the evenings as a result of uncontrolled EV charging.

Figure 9 – Average charging profile for a medium sized passenger vehicle (Australia)



By 2050, the modelling shows a strong preference for convenience charging by 2050 (Table 3) irrespective of the speed at which Australia transitions to EVs.

The median household consumption in Tasmania is 7,400 kWh per year, assuming that the average EV will used approximately 1,860 kWh[11], this equates to an approximate increase of 25 per cent in annual household consumption.

Currently peak energy demand in Tasmania occurs during a cold weekday winter morning and the evening peak in winter is around 3% lower than the morning peak. If we were to see customers charging their vehicles in the evening when returning from work, we could see the peak shifting from the morning to the evening.

4.2.4. Current EV trial

TasNetworks is participating in a trial with the Australian Renewable Energy Agency (ARENA) and five other participating DNSPs. The *EVGrid* Trial is available for both renters and home owners that can install wall-mounted chargers. The purpose of the trial is to enable participating DNSPs to test demand response capability using EV charging infrastructure. The trial will provide data from behind-the-meter to enable us to assess the impact of EVs on the electricity network from residential premises and determine the willingness of customers to have their EV charging managed. Participants have been being recruited and information has been passed on to the installation partner for assessment and installation of EV chargers. It is anticipated that information will become available in quarter 4, 2022.

5. Embedded Networks

5.1. Introduction to Embedded Networks

Embedded networks are private networks which serve multiple premises and are located within, and connected to, our distribution network through a single connection point. In addition, micro grids can also

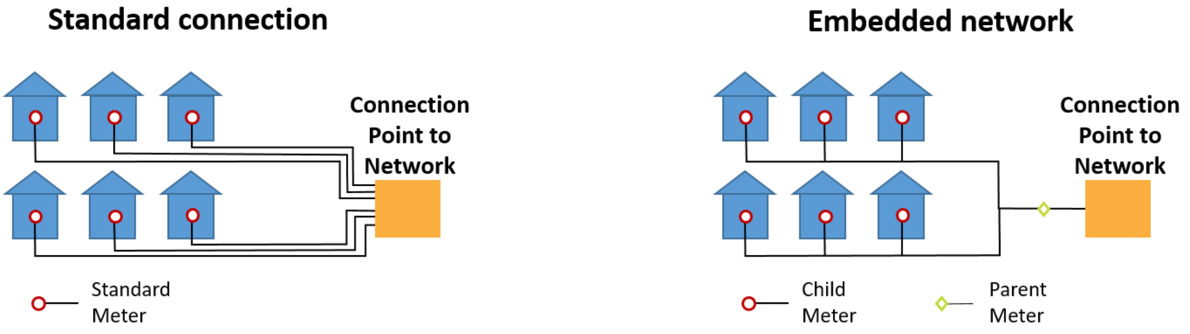
[11] The UK National Travel Survey concluded that the average EV would consume 1,860 kWh per year. Using the 40kWh Nissan Leaf, it is assumed that the average mileage per car was 7,800 miles per year, and the 2018 Nissan Leaf has a range of 168 miles. Therefore 1kWh equates to 4.2 miles (168/40). If a typical vehicle covers the national average of 7,800 miles per year, the vehicle would use approximately 1,860 kWh (7800/4.2).

exist within the embedded network, that is, DER technologies such as rooftop solar PV may exist to generate electricity within the embedded network to seek to save money for residents, create new revenue streams for the building owners, improve the environmental credentials of the embedded networks and/or improve the security of energy supply.

The embedded network operator is typically either the building owner or appointed by the building owner to oversee the procurement, billing, collection and customer service within an embedded network. Customers within the embedded network are known as 'embedded network customers'.

Embedded networks are usually commercial ventures. These ventures seek to aggregate multiple customers into a single network connection (Figure 10).

Figure 10 - Embedded network example



Sites that might lend themselves to being set up as embedded networks include shopping centres, retirement villages, apartment complexes and caravan parks. In the case of a shopping centre set up as an embedded network, the shopping centre owner or managing agent would be the embedded network manager and the individual shops within the shopping centre the members of the embedded network.

5.2. 2019-24 Embedded Network Tariff Proposal

TasNetworks has previously investigated implementing and have proposed embedded network tariffs. The engagement was largely principle-based and there were no substantive concerns of the embedded network approach from stakeholders. However, due to the limited available data at the time, TasNetworks was unable to proceed.

5.2.1. Independent living villages as embedded networks

This modelling has initially been based on independent living villages ('**villages**') and consideration is given (where possible) to embedded generation within these villages.

Numerous villages throughout the state were researched, however only one customer had sufficient interval data from the individual residential units.

It is acknowledged that independent living villages differ in size and composition, but most have numerous residences with an ancillary building with shared facilities, e.g. exercise facilities, café, kitchen, community centre, and administration areas. The total annual consumption for the nine research independent living villages range from approximately 35 MWh (for a small seven unit village) to over 1.7 GWh, with average consumption being approximately 433 MWh. Combined load profiles tend to be morning peaking, however there are differences between individual customers.

Following research of nine different independent living villages, Figure 11 shows the profile of:

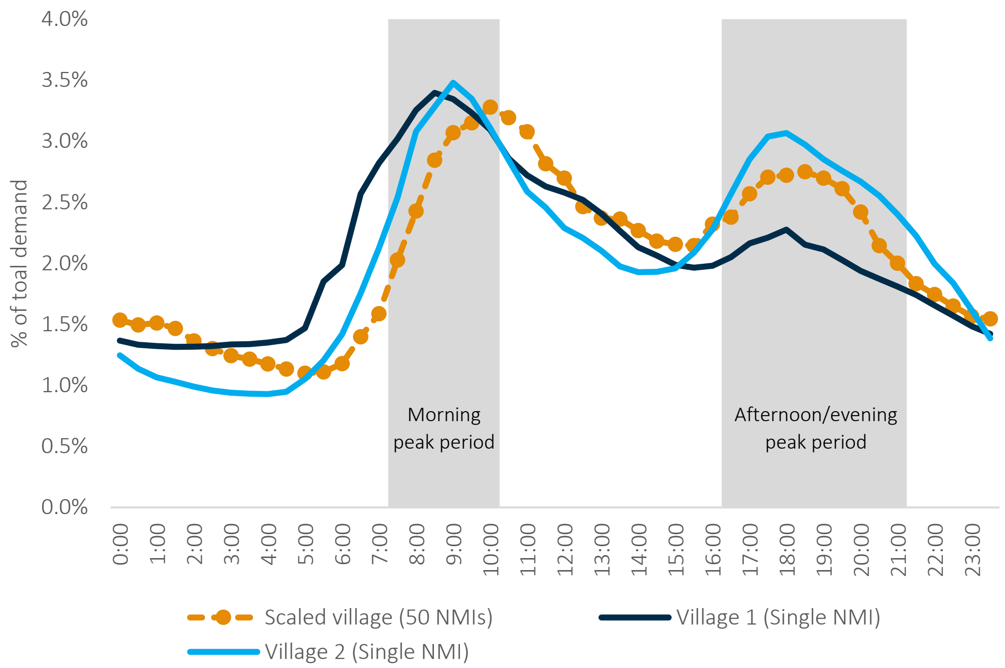
- 2 villages that are connected with a single NMI.
- 1 independent living village with sufficient interval data for the individual residences and ancillary building and were connected directly to the distribution network. Using this data enabled us to form the basis for a scaled village of 49 residential NMIs and 1 non-residential NMI.

Village 1 was registered as an embedded network in November 2020 and had the highest consumption (1.7 GWh per annum).

Figure 11 shows that for the villages investigated, the peak is in the morning with a secondary hump in the afternoon. These profiles are very similar to residential customers and mirrors the network peaks. However, the morning peak is later in the morning for the scaled village and the evening peak drops away much earlier, this early decline in the peak is also reflected in village 1, which is much lower than village 2.

Although the usage profile of a village may be similar to that of a residential profile, the size of these villages and the commercial status requires that, for the purpose of tariff class eligibility, villages are deemed a 'business' and are not eligible for the residential tariff class and therefore residential tariffs. The analysis below however compares the usage profile.

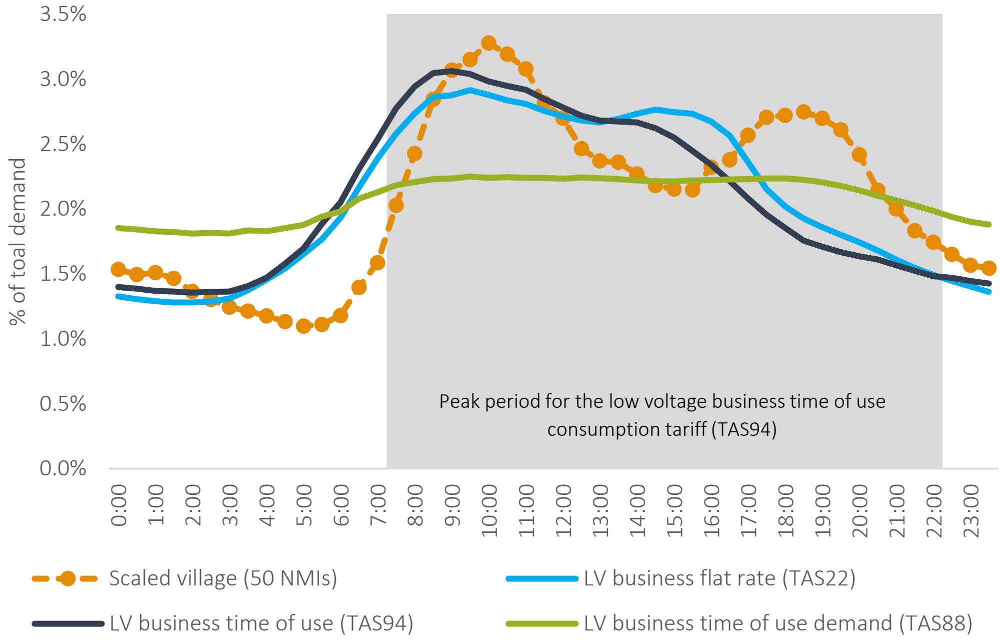
Figure 11 – Independent living village comparison



5.2.1.1. Comparison of the scaled village against business tariffs

Figure 12 compares the village against the low voltage business time of use tariff (TAS94) and the low voltage business flat rate tariff (TAS22).

Figure 12 - Comparison against low voltage business time of use (TAS94)



In determining an appropriate charging mechanism for embedded networks, we will need to consider the size of electricity supply between the TasNetworks and the connection point. A capacity-style charging mechanism may provide flexibility for the embedded network's access, recognise the value of remaining connected to the distribution network providing reliability of electricity supply, and the ability for embedded network customers to utilise the network as a trading platform. The capacity charge could be linked to network connection point, that is a distinction between the low voltage and high voltage network which enable cost reflection of services and asset utilisation.

5.2.2. Shopping centres as embedded networks

A number of shopping centres operating in other jurisdictions have registered as embedded networks, however there are no Tasmanian shopping centres currently listed[12] as an embedded network. Various shopping centres around Tasmania were investigated as candidates for embedded networks, however there were only a small number of centres where there was sufficient data to undertake analysis.

Most Tasmanian shopping centres are smaller neighbourhood centres with approximately 20-30 smaller stores and one or two dominant 'anchor' stores, e.g. supermarkets, discount retail stores. There is a small number of larger centres in the State with up to 100 stores with approximately four anchor stores.

There are also specialised complexes, such as the Home Improvement Centres, where stores are typically warehouse-sized and usually don't have any supermarkets or discount retail stores. They may include petrol stations and 24/7 fast food outlets.

The combined load patterns of the shopping centre often reflect the profile of the anchor store. However, the nature and opening hours of connected stores can result in distinctly different profiles between centres.

[12] AERs Public Register of Network Exemptions

The consumption and demand levels of shopping centres resemble those of existing high voltage business customers. The annual consumption of researched centres range between 1.5 GWh to over 8 GWh (for a larger multi-storey complex).

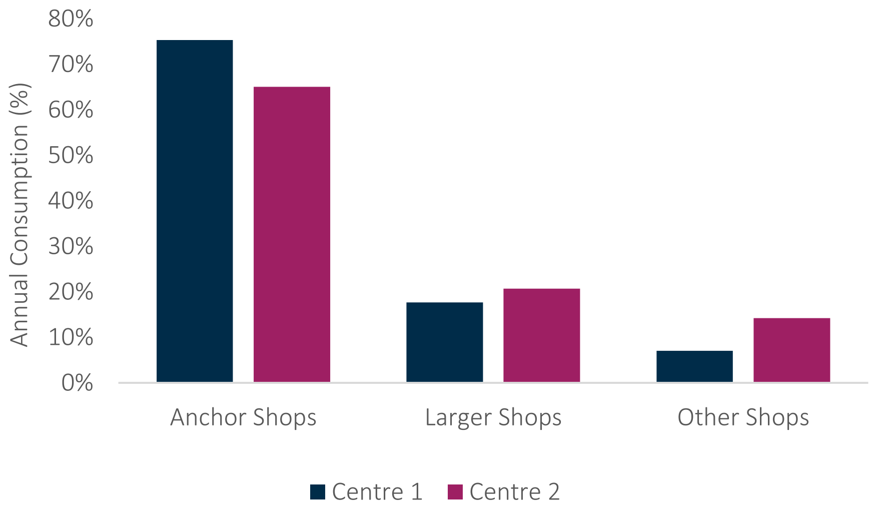
The analysis represents two different types of shopping centres with their own distinctive consumption patterns that reflect the businesses within the centre.

Table 1 – Shopping centres researched

	Centre 1	Centre 2
Description	Neighbourhood shopping centre (12 NMI)	Home improvement centre (12 NMI)
Anchor shops	Supermarket and 24/7 discount department store	Two warehouses and 24/7 fast food restaurant
Other larger shops	Bakeries, bottle shop	Petrol station, leisure and outdoor goods retailer
Consumption range	8 MWh to 2.2 GWh Total = 3.0 GWh Standard deviation 641 MWh	23MWh to 646 MWh Total = 2.6 GWh Standard deviation 216 MWh

The annual consumption proportion of stores within each centre is shown on Figure 13.

Figure 13 - Annual consumption of stores within selected shopping centres

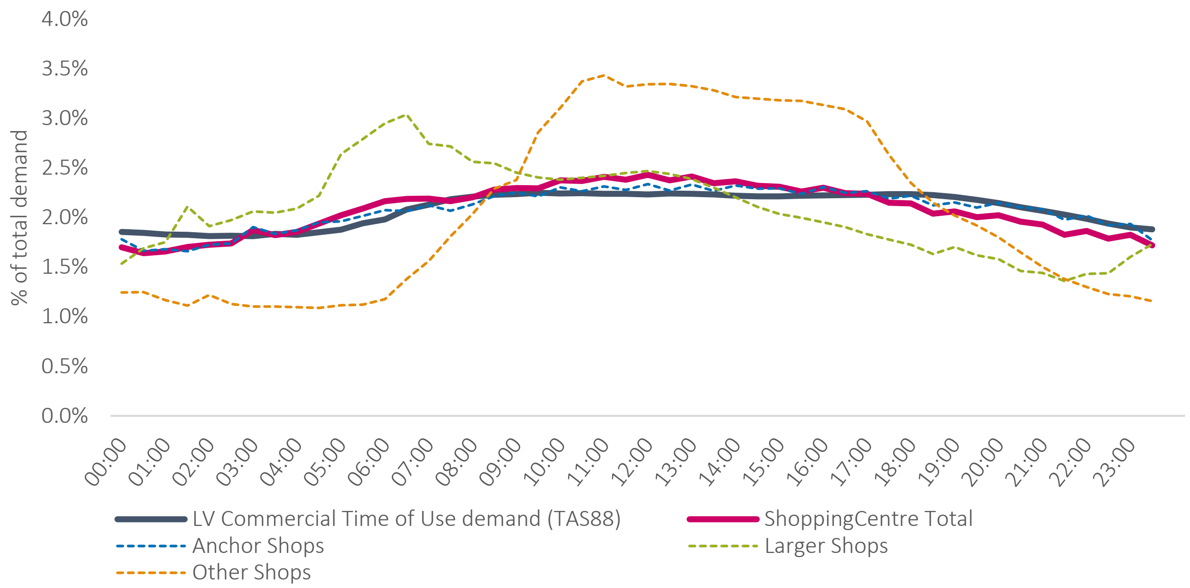


5.2.2.1. Centre 1 – Neighbourhood shopping centre with a supermarket and 24/7 discount retail store

Figure 14 shows shopping centre profile (red line) against the profile of customers who typically use the low voltage commercial time of use demand tariff (TAS88) (blue line). These customers generally have a flat demand profile over a 24-hour timeframe. This chart shows that the anchor stores (dotted aqua line) dominate the profile of the entire centre – this most likely reflects the 24/7 nature of the discount retail store, plus the continuous running of fridges, freezers and air conditioning units within the supermarket.

Other stores (orange dotted line) – which consume approximately seven per cent electricity in the centre – reflect the profile of 9-5 businesses that would usually use the low voltage general tariff (TAS22) or the low voltage commercial time of use consumption tariff (TAS94).

Figure 14 - Centre 1 profile compared against the LV commercial time of use demand tariff (TAS88)

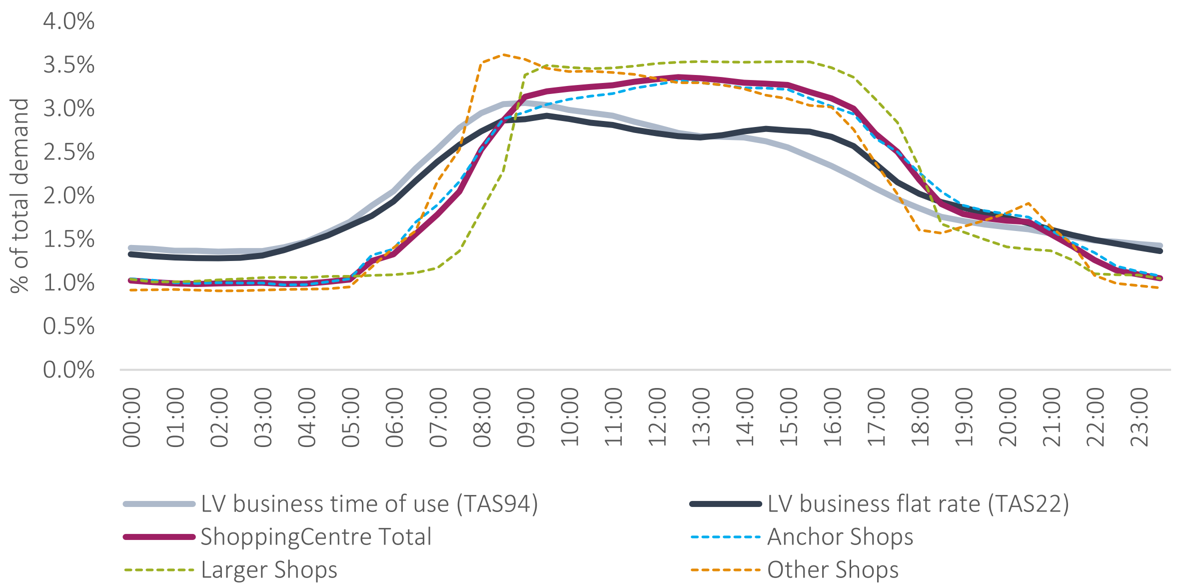


5.2.2.2. Centre 2 – Home improvement centre with two warehouses supermarket and 24/7 fast food restaurant

Figure 15 shows shopping centre profile (red line) against the profile of customers who typically use the low voltage commercial time of use consumption tariff (TAS94) (grey line) and the low voltage business general tariff (TAS22) (blue line). These customers usually follow the 9am-5pm business opening hours over a 24-hour timeframe.

This chart shows that all stores, as represented by the dotted lines (anchor, larger shops and other shops) are essentially following day-time trading hours. It is noted that the other shops (orange dotted line) sees a small increase in the evening between 6:30pm and 9:00pm which would be representative of the fast food restaurant.

Figure 15 - Centre 2 profile compared against the LV business time of use consumption tariff (TAS94) and the LV business general tariff (TAS22)



6. Next steps

The information presented in this paper will be used to inform the engagement and discussion at the PRWG workshop in July 2021. We encourage you to share your feedback at this workshop, however if you cannot attend, please send any comments, observations or questions to regulation@tasnetworks.com.au.

The outcomes of this workshop will be published on TasNetworks' website.