SOUTH AUSTRALIAN WINE INDUSTRY
ASSOCIATION INCORPORATED

Winery Network Charges & Demand Management Guide

Prepared by 2XE

Supported by Government of South Australia Green Industries SA

The ***Winery Network Charges & Demand Management Guide*** is an initiative of the South Australian Wine Industry Association (SAWIA) in partnership with Green Industries SA (GISA) and prepared by 2XE Pty Ltd.

Funding to develop this guide was awarded to SAWIA through GISA's Business Sustainability Program in November 2018. The purpose of the project is to support the SA wine industry and address knowledge gaps regarding electricity pricing and energy demand management strategies as a means of reducing costs and improving efficiency.

This Guide builds upon the *Winery Energy Saving Toolkit (WEST)* which assists wineries with developing the business case for upgrades to energy-intensive equipment.

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Established in 1840, the South Australian Wine Industry Association is the peak body representing the viticultural and winemaking interests of the state.

The association's core functions are to provide leadership and strategy, to represent the industry and lobby on its behalf, and to provide advisory services to members which underpin the sustainability and competitiveness of our members' wine business.

The association provides practical information and advice to members on a wide range of topics - industrial relations, WHS, environment, viticulture and export, to name a few.

www.winesa.asn.au

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2XE works with businesses to become more resource efficient by improving their use of energy, water, material and time.

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Glossary

Term	Definition
AEMO	Australian Energy Market Operator
AER	Australian Energy Regulator
Additional Demand	Is the amount that the Agreed Anytime Demand exceeds the Agreed Annual Demand. If the Agreed Anytime Demand is less than Agreed Annual Demand, then the Agreed Additional Demand is zero.
Annual Demand	Is the highest demand measured for a 30min period in the period 12:00 to 21:00 on working days between November and March.
Anytime Demand	Is the highest demand measured for a 30min period outside of the times that the Agreed Annual Demand applies. There is no charge for anytime demand provided it is below the Agreed Annual Demand.
DLF (Distribution Loss Factor)	The measure of percentage of energy lost through line losses on the distribution network between the transmission connection point and the customer connection point.
Excess kVAr charge	If the customer installation is not power factor compliant at time of the monthly peak demand, then an annual charge is applied. The charge aligns to the amount of kVAr's required to make the site compliant.
High Voltage (HV)	Electrical supply more then 1,100Volts
kVA	The measure of the total electrical power at any point in time (also known as apparent power). This includes both components of active power and reactive power (see KW and kVAr) and gives a better indication of demand load on an electrical supply system.
kVAr	The unit used for the measurement of reactive power.
kW	Watts are the unit of electrical power, 1kW = 1,000 Watts. Watts are a measure of demand, however this unit only includes the electrical properties that actually perform electrical work (Also known as Active or Real power).
kWh	The unit used for electrical energy consumed, e.g. 1kW of load used for 1-hour equals 1kWh.
Low Voltage (LV)	Electrical supply less than 1,100Volts
MLF (Marginal Loss Factor)	The percentage of energy lost through line losses in the Transmission system compared to that lost in supplying the Reference Node.
Peak Demand	The maximum demand reached on a week day in the between Nov - Mar in the peak demand period 4pm to 9pm. This demand is reset each month and public holidays are excluded.
Shoulder Demand	The maximum demand reached on a week day each month in the shoulder demand period 12 mid-day to 4pm. This demand is reset each month.
Off-Peak Demand	This is the maximum demand reached in a 30min period outside of the Monthly Shoulder Demand and the Monthly Peak Demand periods.
NMI (National Metering Identifier)	A unique number for each of a customer's metered connection points.
PF (Power Factor)	Power Factor is a type of efficiency measure and is the ratio of Active and Apparent power i.e. PF = kW/kVA

Contents

Introduction

The South Australian wine industry is currently under pressure due to increasing energy prices. Given that energy costs on average account for 15 percent of total winery operational costs, energy cost savings are critical to the future competitiveness of every winery. Many wineries have already begun to reduce their energy use by implementing strategies outlined in the Winery Energy Saver Toolkit (WEST) developed by the SA Wine Industry Association (SAWIA) and Green Industries SA. However, feedback from the SAWIA Environmental Committee and broader industry stakeholders has identified a gap in the WEST offering, namely guidance and advice regarding electricity pricing and electricity demand management as a means of reducing electricity costs.

In wineries electricity demand costs account for 42 percent of total electricity expenditure. Many wineries are unaware that they can actively manage their demand charges and often assume these costs are “fixed”. This guide aims to improve the wine industries understanding of the South Australian electricity market, electricity network charges, the future trends of both tariffs and electricity charges, and wineries level of exposure to the energy market. The outcome of this guide is to allow wineries to make informed decisions about their electricity tariff now and into the future, and to help wineries manage their own demand.

The guide is split into two sections. The first section is designed to educate wineries about the energy market and their exposure to this market. The second section outlines demand management strategies, technologies and how they can be applied. Understanding the market and applying strategies can reduce network charges by up to 35 percent. Such technologies can also help the industry take advantage of a growing range of demand-response incentives offered by energy retailers.

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Section 1 – Energy trends and the SA Wine Industry

This section aims to investigate electricity tariff structures currently in place in South Australia and their impact on the wine industry. This section will examine trends in the energy market (such as electricity price forecasts, and availability of demand response incentives) to assist wineries to determine their level of exposure and help wineries make informed energy efficiency decisions.

This will include:

- Exploring and collating the range of tariff structures currently impacting the wine industry
- Exploring wineries tariff / bill / cost structures
- Understand the retailers and distributors needs to understand the future of energy pricing and tariff structures
- Determining trends in the energy market both relating to changes in tariff structures and costs charged to end users
- Determining when wineries will incur changes to tariff structures
- Measuring the impact of the changes to tariff structures.

Understanding South Australia's Electricity Market

Electricity Generation and Transportation

To understand the electricity market and how you are charged for electricity, it is important to first understand how electricity makes its way from the power station to your winery. Figure 1 below outlines how electricity is delivered to your winery. Whenever you turn on a light, you create a demand for electricity. That demand needs to be met by generators and so a cascade of transmission occurs from generators, high voltage transmission lines, distribution transformers all the way to your light.

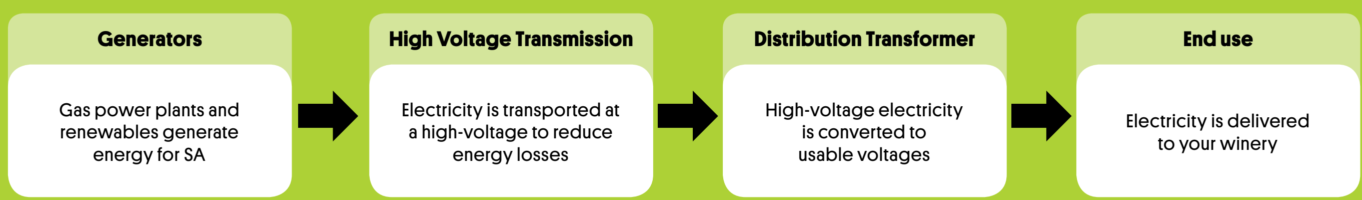


Figure 1: *Electricity Generation and Transportation*

Demand and Consumption

In wineries, electricity is used by refrigeration systems, motors, pumps, compressors, lights and all other electrical equipment. There are two key measurements used to describe how your site uses electricity, **demand** and **consumption**.

Demand (kW or kVA)

Every piece of electrical winery equipment requires electrical power to work. Demand is the total electrical power used by equipment at any one time on site and is measured by your electricity retailer in kVA (kilo-volt-amps).

Consumption (kWh)

As equipment uses electrical power, it consumes electrical energy. Electricity consumption is the amount of electrical energy used by equipment. Consumption is measured in kWh (kilo-watt-hours) and is equivalent to 1kW of power operating for 1 hour.

Most wineries are now charged for both electricity **demand** and **consumption**. This means that electricity costs are dependent not only on the amount of electricity you consume (**consumption**) but also the **intensity** it is consumed (**demand**). Figure 2 shows an example of demand profile of two wineries. Both wineries use 500kWh of energy per day. Winery 1 has a flat demand of ~21kVA and pays **$2,000** per annum in network charges. Winery 2 has a lower demand than Winery 1 for most of the day but has a 100kVA spike in demand and pays **$10,000** per annum in network charges.

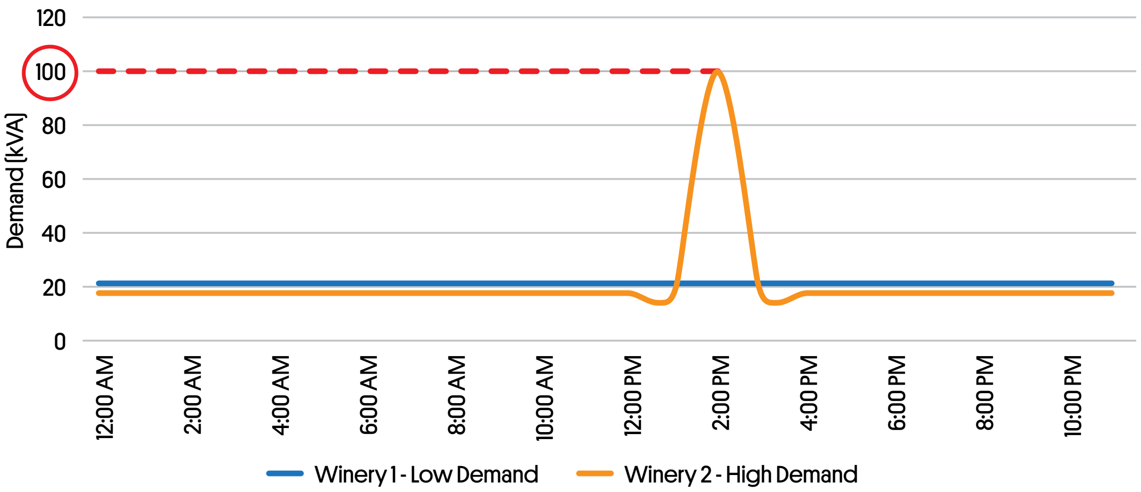


***Figure 2:** Demand vs Consumption*

Electricity Supply and Demand

Both the **supply** and **demand** of electricity in South Australia is changing every second of every day. As people get up in the morning, they turn on appliances which increases electricity **demand**, this increase in demand is met with an increase in **supply** by generators. The Australian Energy Market Operator (AEMO) ensures that supply and demand is kept in balance by maintaining the wholesale electricity market. Generators sell electricity to the wholesale market which is bought by electricity retailers who sell it on to you. This process creates an ever fluctuating "**spot price**". The spot price changes due to the amount of generation capacity available, the type of generator and many other factors. Figure 3 below, was taken from the AEMO website and shows how much the spot price of electricity varies each day. The spot price tends to be highest when electricity demand is highest. This frequently occurs in the afternoon when South Australians get home from work and turn on air conditioners.

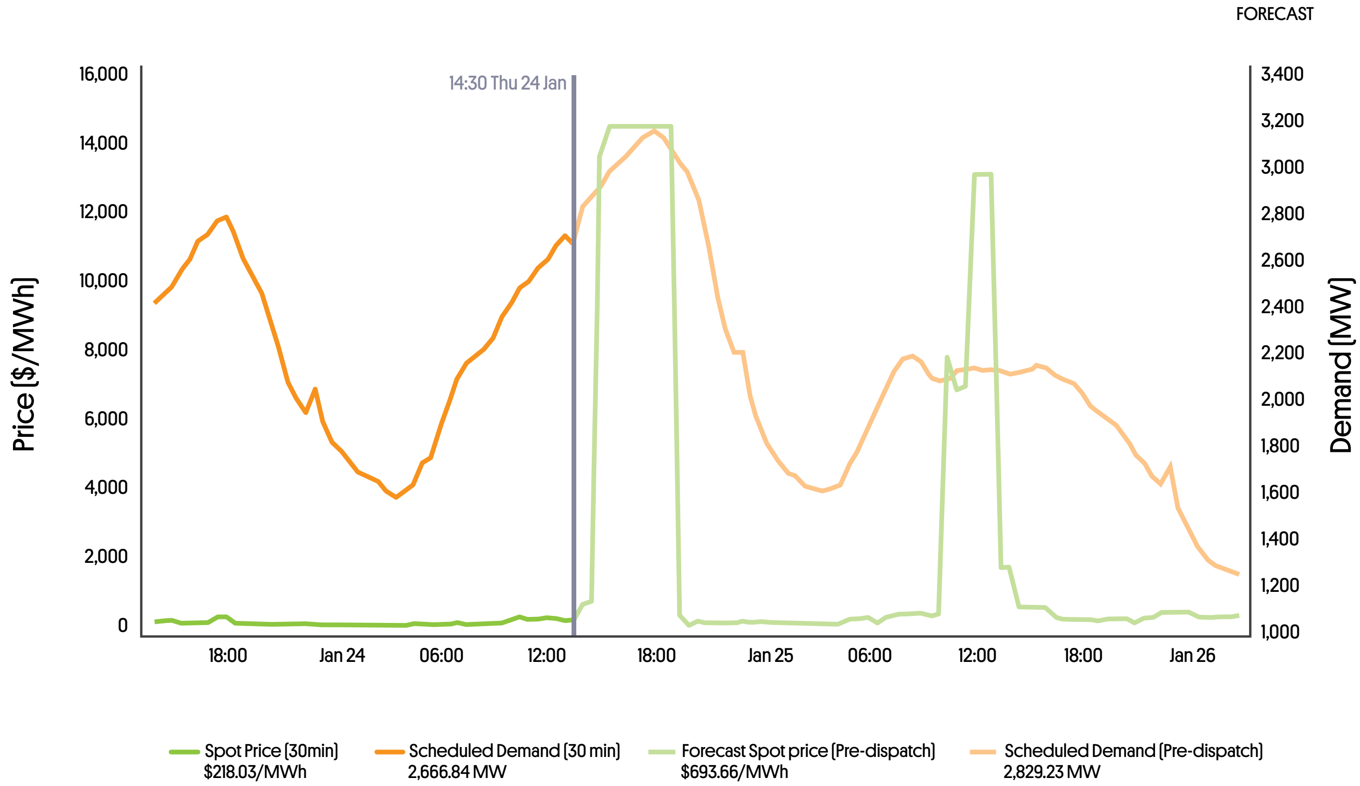


***Figure 3:** The Wholesale Electricity Market*

Electricity retailers, such as AGL, Origin and Energy Australia, are the **middleman** between the customer and the electricity supply chain. They are continuously purchasing electricity from the **spot market** and the price they pay changes throughout the day. After purchasing this electricity, retailers sell it to the consumer. The price that consumers are charged is based on the average spot market price at the time of **contract renewal.** You purchase electricity from your retailer either at a single rate in **$/kWh**, or multiple rates based on **Time-of-Use (ToU)** periods (e.g. **peak and off-peak**). Retailers bill you for the cost of energy, including their mark up, and pass on all other charges related to your energy use, such as network, environmental and market charges.

So, what is happening to the average wholesale electricity price?

Wholesale Electricity Prices

Historical costs

The electricity market goes through cycles and is influenced by **external factors**. The 2007/8 drought[1] caused the first major price volatility[2] in the wholesale market. A significant portion of the National Energy Market (NEM) generation capacity is provided by hydropower and coal fired power stations which require **water** for their cooling processes. During this drought, prices increased by over 40% on average.

Over the last two years the wholesale market price volatility is predominately linked to relatively **concentrated generator ownership**, generator bidding behaviour, thermal plant withdrawals and limited import/export potential between states. There have also been significant closures of coal-fired power across Australia in the last three years, greatly contributing to reduced generation capacity and hence **higher spot-prices** for electricity.

Figure 4 illustrates the historic average retail price per State from August 2006 to November 2018. South Australian electricity prices rose the most during this period, with the average[3] retail price exceeding 18c/kWh in 2017. Most wineries that needed to re-contract their electricity purchasing between 2016 and 2017 experienced at a minimum a 50% increase in retailer consumption rates.

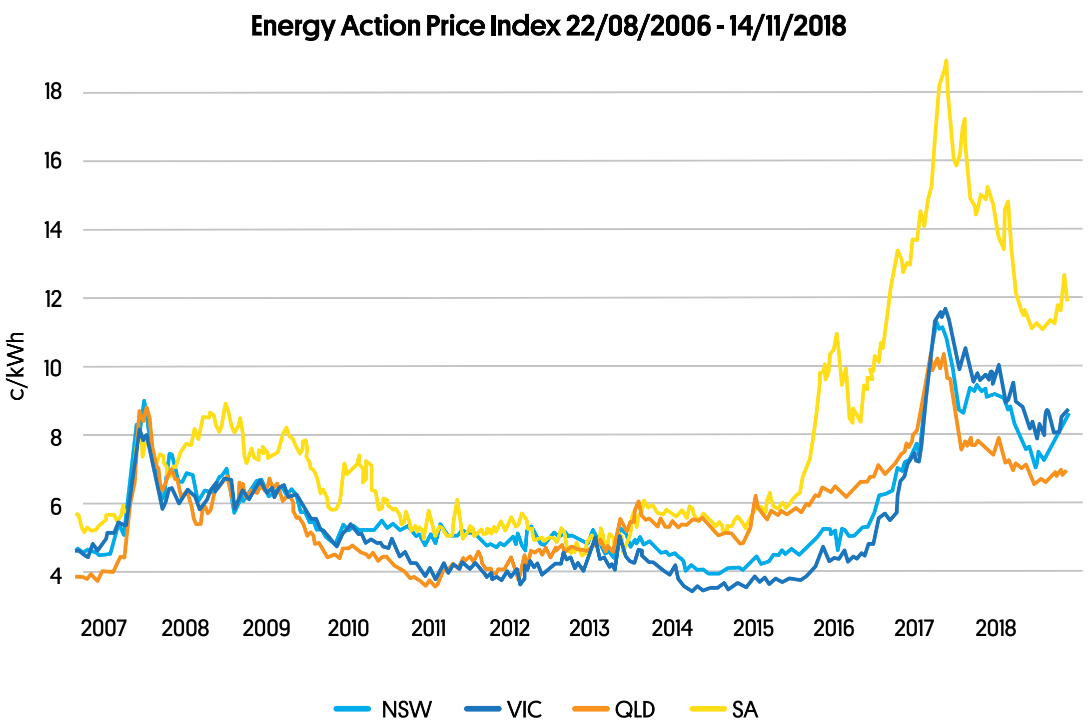


Figure 4: Average retail rates by State[4]

1 Reference: http://www.wattclarity.com.au/articles/2010/10/how-the-drought-of-2007-affected-specific-power-stations/
2 Reference: https://www.aer.gov.au/news-release/drought-national-electricity-financial-markets-first-major-shock
3 Average refers to the average rate between peak and off-peak
4 Reference: Energy Action Price Index, http://www.energyaction.com.au/energy-procurement/aex-reverse-auction/energy-action-price-index

Current costs

Since the start of 2018 there has been a minor correction in the retail markets, however average prices are still considerably higher than pre-2016 prices. These prices are anticipated to be the new normal moving forward and it is unlikely that the market will see pre-2016 pricing again unless there is a dramatic shift in generation capacity.

Expected future costs

There is still uncertainty about how the market will behave over the next few years. Accurately forecasting the future price of wholesale electricity is not a straightforward process and depends on several factors, including:

1. Installation of **new generation capacity**: At a national level there are no immediate plans for the construction of new electricity generation plants. The federal Government's proposed National Energy Guarantee (NEG) may incentivise investment in new baseload generation capacity in an effort to reduce electricity prices, however the details of the NEG have not yet been provided.

2. Federal Government policy: NEG contains two new obligations for the associated energy market;

    i. Ensure enough electricity generation is available to meet Australians needs (the Reliability Guarantee)

    ii. Drive down the sector's Greenhouse Gas Emissions (the Emissions Guarantee)

3. The uptake of **small and large-scale renewable energy**: Electricity generated from solar has increased from <1% to 3% of total electricity generated in Australia in the past 5-years. The AEMO forecasts rooftop installations will increase by 350% over the next two decades and contribute around 11% of the National Energy Markets (NEM's) energy requirement by 2035-36. This uptake will continue to reduce the demand for grid-supplied electricity, and hence reduce the price of wholesale electricity.

4. Forecasted residential, commercial and industrial electricity demand: Australia's electricity demands are forecasted to be relatively **flat over the next 5-10years**, this forecast will change upwards or downwards (with flow-on impacts to wholesale electricity prices) depending on variables such as economic growth (or recession), environmental/climatic changes and uptake of electric vehicles and rooftop solar.

Despite this uncertainty, it is likely prices will continue to rise slightly over the coming years, though not as dramatically as the 2016/17 prices. For this reason, wineries should continue to manage electricity **demand** and **consumption** to reduce their exposure to future price hikes.

Electricity Charges

Your electricity bill can be difficult to understand at first, but it's easier to think of your bill as 4 bills on the one page. Once you understand your electricity bill you can understand what you can do to change your bill and your exposure level to energy tariff structures and trends. Figure 5 illustrates a sample invoice with an explanation of each charge on the following page.

Your account in detail

Account Number:

Supply address

Supply period: 1 May 2017 to 31 May 2017 (31 days)

	Quantity	Rate	Rate (incl. energy losses)	Charge
Energy charges				
Peak	19111.256 kWh	$0.161341 /kWh	$.174813 /kWh	$3,340.90
Off Peak	15243.576 kWh	$0.084463 /kWh	$0.091515 /kWh	$1,395.02
Sub-total				**$4,735.92**
Network charges				
Network Peak	34354.832 kWh	$0.050500 /kWh		$1,734.92
Shoulder Demand Charge	137 kVA	$4.55160 /kVA		$1,034.57
Off Peak Demand Charge	139 kVA			$0.00
Network Access Charge	31 days	$0.000000 /day		$0.00
Sub-total				**$2,769.49**
Renewable Energy Charges				
E&REC – LRET Flexi Renewable	34354.832 kWh	$0.013097 /kWh	$0.014191 /kWh	$487.53
E&REC – SRES	34354.832 kWh	$.002804 /kWh	$0.003038 /kWh	$104.37
Sub-total				**$591.90**
Other charges				
AEMO Pool Fees	34354.832 kWh	$0.000350 /kWh	$0.000377 /kWh	$12.95
AEMO Ancillary Charges	34354.832 kWh	$0.00500 /kWh	$0.000539 /kWh	$18.52
Metering Charges	1	$2.60273 /day		$80.68
Retail Service Fee	1	$50.63000/month		$50.63
Sub-total				**$162.78**
Total GST				**$826.01**
Total current charges (incl. GST)				**$9,086.10**

Your meter and tariff information

Meter type: Interval

NMI:

Meter usage: X = 19111.256 kWh, Y = 15243.576 kWh

Total Usage this period = 34354.832 kWh

DLF = 1.078 X MLF = 1.0051 = Total Loss Factor

Highest actual metered demand period is 139kVA, recorded on 02/05/2017 at 11:00

Legend:

- Retailer energy charges
- Network charges
- Environmental & market charges
- Metering & supply charges

Figure 5: *Sample invoice with labelled components*

- **Retailer energy charges**: this is normally the most expensive part of your bill and is based on the total electricity used, measured in kilo-Watt hours (kWh) The rate is determined by your retail contract and is influenced by the market spot price at the time of contract renewal. You can decrease these costs by negotiating your retail energy charge with your retailer or decreasing your electricity consumption.
- **Network charges**: this is the second most expensive item and is based on two factors:
  - Total electricity consumption, measured in kWh and charged on a $/kWh basis.
  - Maximum demand, measured in kilo-Volt Amps (kVA).

  This price is set by and paid to the distributor (SAPN) and regulated by the Australian Energy Regulator (AER). You can decrease this charge by decreasing your demand.
- **Environment & market charges**: based on the total electricity used, measured in kWh and charged on a $/kWh basis. These charges are pass-through costs from the environmental scheme and the operating fees of the Australian Energy Market Operator (AEMO) to run the National Energy Market (NEM). These costs are regulated by the AER and can be decreased by reducing your electricity consumption.
- **Metering & supply charges**: fixed charges for the supply and management of meters, charged regardless of total electricity used. These costs cannot be decreased.

The pie chart below (Figure 6) illustrates the average cost contribution of each component to your bill.

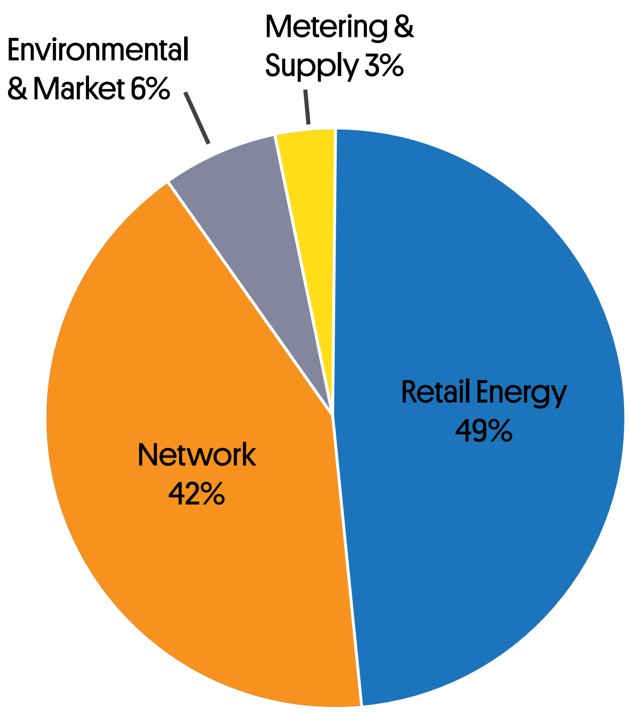


Figure 6: *Average Winery Electricity Bill Cost Breakdown*

Retail and network charges make up the bulk of your electricity bill. Strategies to decrease energy use and demand can lower your exposure to fluctuating prices and demand charges.

The Shift Towards Demand-Based Tariffs

Over the past 5-years Australia has been going through a Tariff Reform. The reform came about due to an increase in demand on the Distribution network because of changes in customer behaviour. It was recognised that network tariff structures based on energy consumption pricing ($/kWh) alone do not reflect the cost of operating the network to meet the changing needs of customers. Investment in the network has and continues to be driven largely by building and maintaining infrastructure to meet the **peak demand** requirements of Australians, rather than **average** energy use.

The South Australian climate has led to an extraordinary demand for both commercial and residential **air conditioning**. Over 90% of homes are currently air conditioned with the total air-conditioned floor space increasing each year. Air conditioners have a high **electricity demand** and on high temperature days, when most households are using their air conditioner, the electricity grid is met with a high **peak network demand**. Energy intensive weather conditions such as heat waves require the network assets and generation capacity to be **over-sized** to accommodate this demand, which for the remainder of the year is **under-utilised**, driving distribution costs up.

Figure 7: *Air conditioner bank*

The intention of the reform is for pricing to reflect the **cost of operating** the distribution network and to change customer behaviour by rewarding customers who shift their consumption / demand outside of peak usage periods with lower prices.

The first wave of reforms came into effect in July 2015 when SA Power Networks made tariffs based on agreed maximum demand **mandatory** for large business customers (defined as a business premise that consumes more than **160MWh** per annum). During the transition of large business customers to this more cost-reflective tariff, SA Power Networks also introduced a new large business tariff structure. This new tariff structure was based on the **maximum recorded demand** for each month, e.g. customers were no longer locked into one level of demand for the entire year. This proved to be a more cost-effective structure for customers with peak seasonal loads.

The second wave of reforms began in 2017 and will continue through to 2020 targeting small business customers (less than **160MWh** per annum). These businesses will be moved onto the same tariff structures as large businesses but will be allowed a transition period. This transition period allows businesses to become familiar with the structure and to change operations to mitigate cost impacts where possible.

What does this mean for your winery?

If you're not already on a demand based tariff, you soon will be

You need to understand the new rules and implement strategies to manage demand charges

Network Charges Explained

Demand Based Tariff Structures

There are two main categories for business network tariffs, and two structures beneath each category. This is explained by Figure 7.

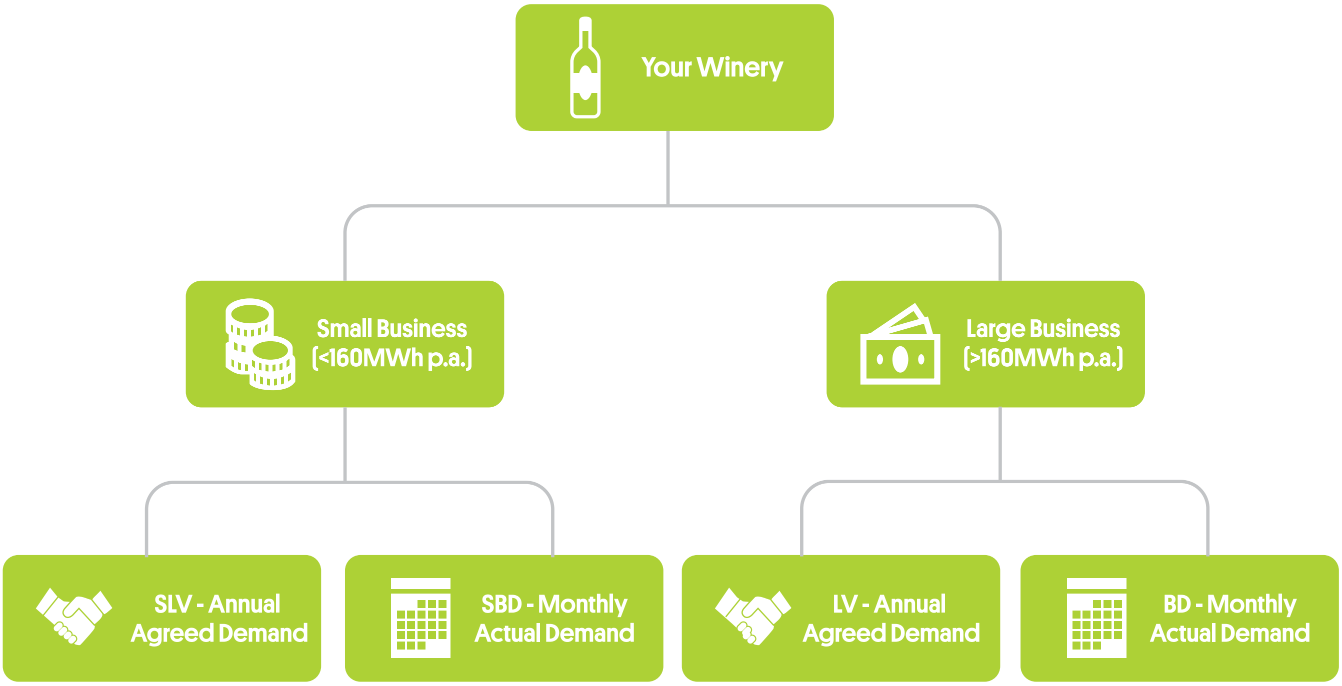


Figure 8: *Network Tariff Options*

The categorisation of small and large businesses is based on a business's annual electricity consumption.

- Small Business is any business premises consuming less than 160MWh per annum (~<500T crush per vintage)
- Large Business is any business premises consuming more than 160MWh per annum (~>500T crush per vintage)

While wineries cannot select which business category they fall under, they can select their tariff structure. The choice of tariff structure only affects the network charges section of your electricity bill.

Annual Agreed Demand Tariff

Summary: Low Voltage Annual Agreed kVA Demand

Demand costs for the **entire year** are based on the maximum kVA demand measured over a 30-minute period during the annual demand period, and is fixed for 12-months. You pay for the maximum electricity demand your winery requires during the year.

	Mon	Tue	Wed	Thu	Fri	Sat	Sun
1:00AM							
2:00AM							
3:00AM							
4:00AM	**Off-Peak Demand period**						
5:00AM	(all year round, local time)						
6:00AM							
7:00AM							
8:00AM							
9:00AM							
10:00AM							
11:00AM							
12:00PM							
1:00PM	**Shoulder Demand Period**						
2:00PM	(all year round, local time)						
3:00PM							
4:00PM							
5:00PM							
6:00PM	**Peak Demand period**						
7:00PM	(November-March, local time)						
8:00PM							
9:00PM							
10:00PM							
11:00PM							
12:00AM							

Agreed demand will only be changed if:

- Site demand exceeds the agreed demand over any **average 30-minute** period during the Agreed Annual Demand Period. This will increase your agreed demand.
- You request to reduce your agreed demand to reduce costs (you must provide 12-months of data as evidence).If you request to reduce your agreed demand and you exceed the new level within 12-months you will be back-billed for the additional demand.

More details regarding change of agreed demand is provided in Appendix A.

Bill Example – Annual Agreed Demand Tariff

An example electricity bill for a winery on an agreed tariff is shown in Figure 8 below. There are three key pieces of information relating to electricity demand charges on this bill which are highlighted in red and explained below:

1. Highest actual metered demand during the billing period:

   This is the maximum demand that the winery reached during the billing period. Note: It also includes the date and time that the maximum demand was reached. This can be used to identify what processes were driving maximum demand at the time.

2. Annual agreed demand (kVA):

   This is the agreed annual demand for this winery. If this value is exceeded during the peak demand period it will be set at the new highest value for another 12 months. If this value is exceeded outside of the peak demand period, the annual agreed demand does not change but an additional demand charge is incurred.

3. Demand cost ($/kVA):

   The rate per kVA per month. This rate is set by the tariff type and this rate cannot be negotiated. This value can be used to calculate the potential savings of electricity demand management.

Detailed Charges

Page 2 of 2

Service Address — National Meter Identifier

Distribution Loss Factor 6.31% — Marginal Loss Factor 0.82% — Total Loss Factor 7.18%

Highest actual metered demand this period is 365.44 kVA (Recorded on 06/03/2016 at 11:30:00) 1

Meter: — Usage 120636.25kWh

Period 01/03/2016 - 31/03/2016 — Days 31

	Quantity	Unit	Rate	/Unit	Amount	Sub Total (incl. GST)
1. Energy Charges						
Peak	53674.53	kWh	12.3763	c/kWh	$6,642.92	
Off Peak	66961.72	kWh	7.7546	c/kWh	$5,192.61	
GST					$1,183.55	
Sub Total						$13,019.08
2. Network						
Peak	120780.04	kWh	3.2900	c/kWh	$3,973.66	
Additional Demand	0.00	kVA	4.104400	$/kVA	$0.00	
Annual Block 1 Demand Rate	2 390.87	kVA	10.620600	$/kVA 3	$4,151.27	
Supply Rate	31	Days	11.486000	$/Day	$356.07	
GST					$848.11	
Sub Total						$9,329.11
3. Other						
LREC Charge	120636.25	kWh	1.0287	c/kWh	$1,240.99	
SREC Charge	120636.25	kWh	0.4116	c/kWh	$496.54	
AEMO Ancillary	120636.25	kWh	0.0133	c/kWh	$16.04	
AEMO Charge	120636.25	kWh	0.0335	c/kWh	$40.41	
Service Charge			40.000000	$/Bill	$40.00	
VIP Metering Charge			100.000000	$/Bill	$100.00	
GST					$193.39	
Sub Total						$2,127.37
					Total New Charges	$24,475.56
					Total GST (for this invoice)	$2,225.05

Figure 9: Winery Electricity Bill - Agreed Tariff

Example – Changing Your Annual Agreed Demand

The annual electricity profile for a winery is outlined below in Figure 9. This winery is on an LV annual agreed kVA demand tariff, with an annual agreed demand of 656kVA.

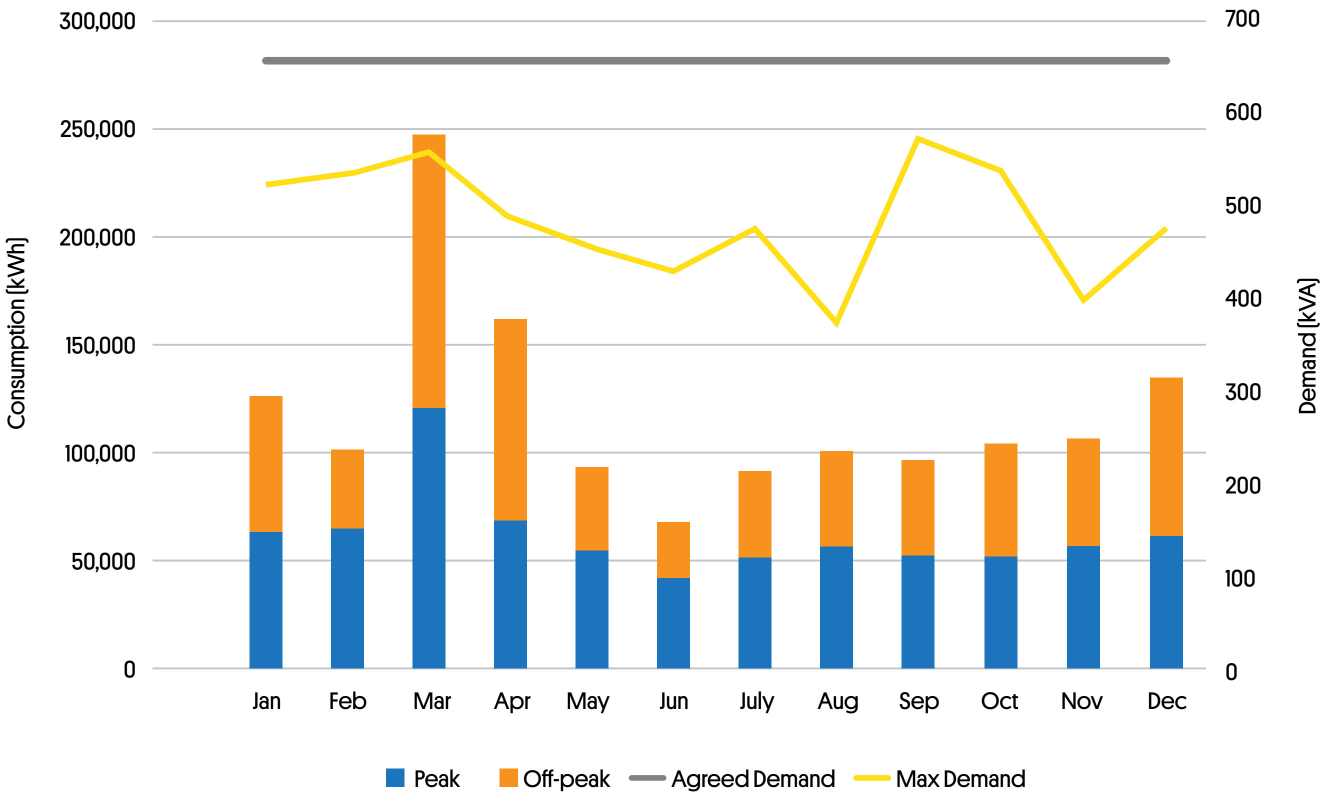


Figure 10: Example annual consumption & demand profile

Over the last few years the winery made several efficiency upgrades (e.g. complete lighting retrofit, refrigeration and air compressor staging and power factor correction). These changes resulted in a reduction in the maximum demand of the winery. For the year outlined above, the maximum demand achieved during the annual agreed monitoring period was 556kVA. This is 100kVA lower than the current agreed demand. The winery can make a request to decrease agreed demand to 556kVA. The reduction in demand would provide a cost saving of ~$9,000[5] per annum.

Appendix A outlines the risks in requesting to decrease agreed demand. These risks should be considered prior to making a request. For example; it is best not to request a decrease in agreed demand if production volumes were lower due to a poor vintage as higher volumes next year may increase maximum demand above the agreed value.

5 Cost based on SA Power Networks Pricing Proposal 2018-19.

Monthly Actual Demand Tariff

Summary: Low Voltage Monthly Actual kVA Demand

Demand costs are based on the actual monthly maximum kVA demand measured over a 30-minute period during Shoulder and Peak Time-of-Use periods, as illustrated below, and **resets every month**. Wineries are not charged for demand during the off-peak period. Essentially, your winery is charged based on the maximum electricity demand reached each month.

This tariff structure charges more per kVA of demand but provides more flexibility than an annual agreed demand tariff. This structure is good for businesses who have high electricity demand for only a few months per year.

Bill Example – Monthly Actual Demand Tariff

An example electricity bill for a winery on a monthly actual demand tariff is shown in Figure 10. There are three key pieces of information relating to electricity demand charges on this bill which are highlighted in red and explained below:

1. Peak, shoulder and off-peak maximum demand (kVA):

   This area of the bill details the maximum demand reached during peak, shoulder and off-peak periods. You are charged for demand based on these values.

2. Demand cost ($/kVA):

   The price per kVA of demand per month. This rate is set by the tariff type and this rate cannot be negotiated. This can be used to calculate the potential savings of electricity demand management projects.

3. Highest actual metered demand during the billing period:

   This is the maximum demand that the winery reached during the billing period. Note: It also includes the date and time that the maximum demand was reached. This can be used to identify what processes were driving maximum demand at the time.

Your account in detail

Account Number:

Supply address

Supply period: **1 Dec 2016 to 31 Dec 2016 (31 days)**

	Quantity	Rate	Rate (incl. energy losses)	Charge
Energy charges				
Peak	15466.479 kWh	$.075022 /kWh	$.081286 /kWh	$1,257.21
Off Peak	10470.465	$.043118 /kWh	$.046718 /kWh	$489.16
Sub-total				**$1,746.37**
Network charges				
Network Peak	25936.944 kWh	$0.0505[illegible]Wh		$1,309.82
Shoulder Demand Charge	136 kVA	$7.55160 /kVA		$1,027.02
Off Peak Demand Charge	138 kVA			$0.00
Network Access Charge	31 days	$0.000000 /day		$0.00
Summer Peak Demand Charge	120 kVA	$15.22410 /kVA		$1,826.89
Sub-total				**$4,163.71**
Renewable Energy Charges				
E&REC – LRET Flexi Renewable	25936.944 kWh	$0.005015 /kWh	$0.005434 /kWh	$140.94
E&REC – SRES	25936.944 kWh	$0.003780 /kWh	$0.004096 /kWh	$106.24
Sub-total				**$247.18**
Other charges				
AEMO Pool Fees	25936.944 kWh	$0.000350 /kWh	$0.000377 /kWh	$9.78
AEMO Ancillary Charges	25936.944 kWh	$0.00500 /kWh	$0.000539 /kWh	$13.98
Metering Charges	1	$2.60273 /day		$80.68
Retail Service Fee	1	$12.66000 /month		$12.66
Sub-total				**$117.10**
Total GST				**$627.44**
Total current charges (incl. GST)				**$6,901.82**

Your meter and tariff information

Meter type: Interval

NMI: DLF = 1.078 X MLF = 1.0051 = Total Loss Factor

Meter usage: X = 15466.479 kWh, Y = 10470.465 kW Highest actual metered demand period is 138kVA, recorded on 13/12/2016 at 9:30

Total Usage this period = 25936.944 kWh

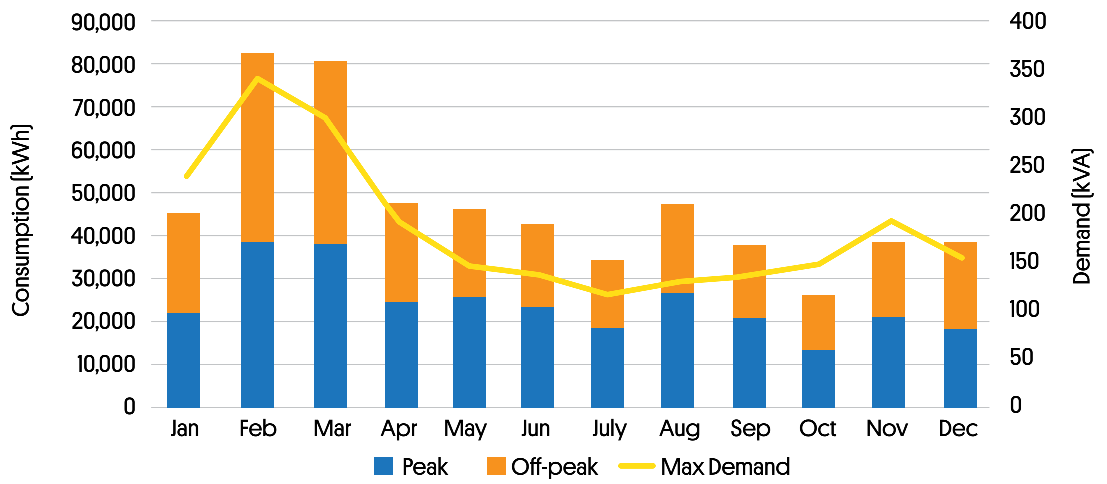
Figure 11: *Winery Electricity Bill – Actual Tariff*

Which Structure Should You Use?

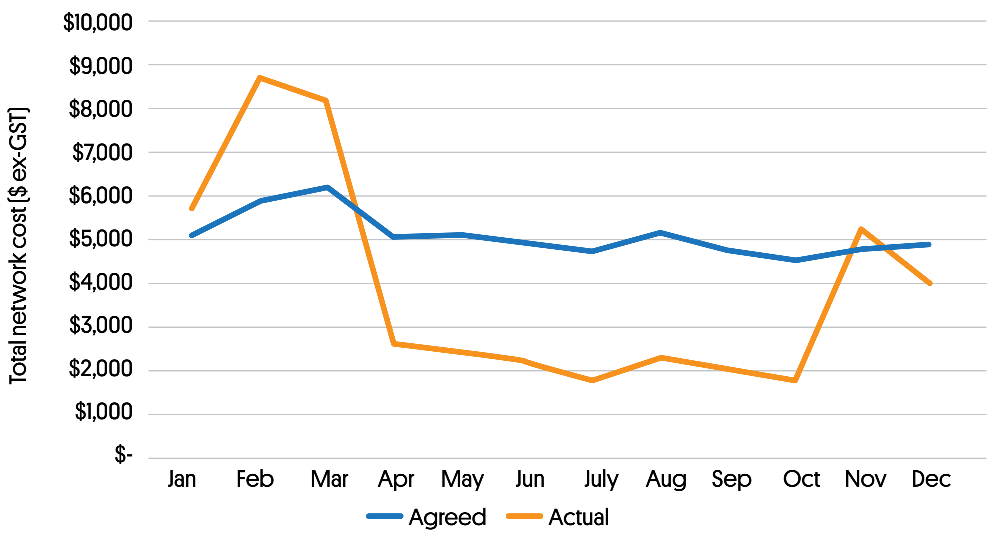
There are two tariff structures available to businesses, either annual agreed demand or monthly actual demand, so which one is best for your winery? The answer is that it will depend on the operations occurring on site. This is demonstrated in the following two case studies.

Case Study 1: Winery A

The annual electricity profile for Winery A is presented below. The winery has a distinct peak in both consumption and demand during vintage (February and March). The vintage period accounts for 30% of total annual consumption and demand is on average 50% higher than the remainder of the year.

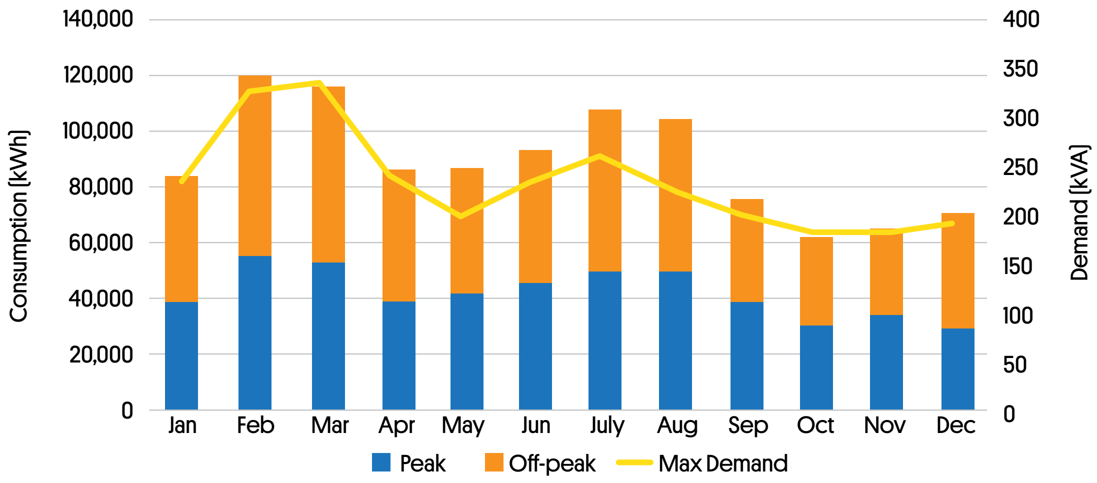


The impact that the demand profile has on total cost is illustrated below. As can be seen, the network cost over vintage on the monthly actual tariff is ~$5,000 higher than the annual agreed, however for the remainder of the year cost is on average $2,500 per month lower than the agreed tariff. Overall the actual tariff is more cost effective for Winery 1 with an annual cost difference of $14,000 between the two tariffs.

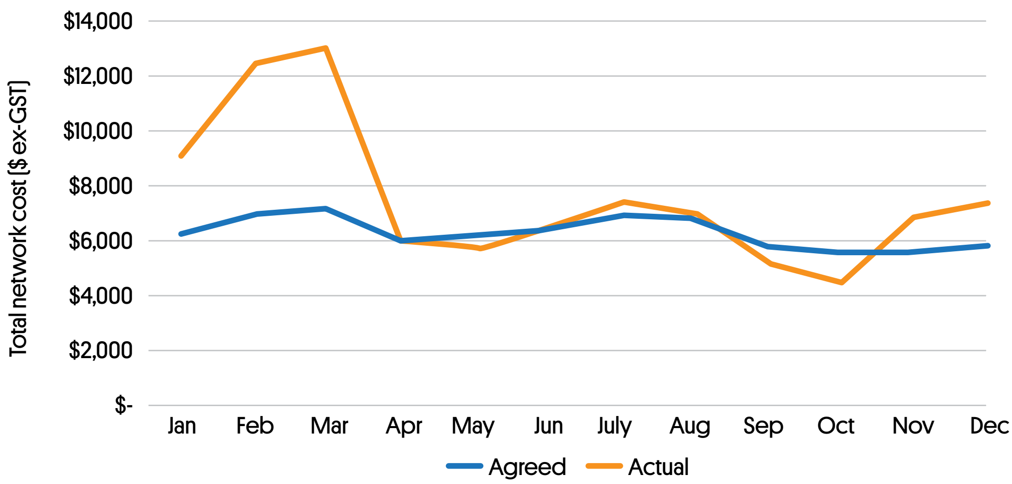


Case Study 2: Winery B

The annual electricity profile for Winery B is outlined in the figure below. The winery has a peak in both consumption and demand during vintage (February and March). The vintage period accounts for 20% of total annual consumption and demand is on average 36% higher than the remainder of the year.



The impact that the demand profile has on total cost is illustrated below. As can be seen, the network cost over vintage on the monthly actual tariff is ~$14,000 higher than the annual agreed by and for the remainder of the year the cost on both tariffs is relatively similar. Overall the agreed tariff is the more cost-effective for Winery 2, with an annual cost difference of $16,000 between the two tariffs.



Note that a monthly actual tariff provides greater price volatility from month-to-month. This may impact cashflow and should be considered when selecting tariffs. To ensure your winery is on the most cost-effective tariff, get in touch with an energy expert or SA Power Networks. These case studies are covered in further detail in Appendix A at the end of this guide.

Change of Structure

The process for requesting either a tariff change or agreed demand decrease is relatively simple and can be made through your retailer who will be directed to SA Power Networks online request form.

The Future of Network Charges

In 2018 SA Power Networks began developing the 2020-2025 Tariff Structure Statement (TSS). The focus of the TSS is to continue the shift to cost-reflective tariffs. From early public consultation a number of changes are proposed for small and large business tariff structures. However, the full extent of these changes will not be understood until late 2019 on completion of an extensive review and public consultation process. The AER draft decision is scheduled to be released in September 2019.

Small business agreed/actual demand tariffs

- Changes in 'Peak' demand period to become the highest average demand for a 4-hour period between 5:30pm and 9:30pm from November to March
- Shoulder demand measure becomes anytime demand
- Customer can specify agreed demands for peak average demand and anytime maximum demand, however the customer will pay a higher price for demand above the nominated agreed.
- Agreed demand is unaffected, only changes at customer/retailer request

These proposed changes mean that the monthly actual tariff ToU periods will be very similar to the annual agreed monitoring period.

The changes are designed to share demand cost recovery between anytime maximum (during peak business hours) and peak average demand (which drives co-incident peak network demand). All small business customers concerned about how these changes may impact them should get in touch with SA Power Networks during their public consultation process in 2019.

Large business agreed/actual demand tariffs

- Combine Agreed and Actual demand into a combination tariff, agreed set by customer/retailer
- Peak window becomes 5:30pm to 9:30pm work days and non-workdays, November to March with average demand for 4-hours.
- Anytime demand applies every month for highest 30-min window
- Actual demand charges apply when actual demand exceeds agreed
- Proposed changes to usage prices due to solar trough

All large business customers concerned about how these changes may impact them should get in touch with SA Power Networks during their public consultation process in 2019.

Both changes to large and small tariffs will benefit wineries who can manage and reduce demand in the late afternoon. (E.g. undertake most chilling operations prior to the end of the day working, and resume chilling at midnight).

SA Power Networks have acknowledged that the changes make the tariff structure increasingly complex and it is possible that it may be simplified through further industry consultation.

Section 2 – Demand management strategies and technologies

This section aims to examine strategies for managing peak electricity demand. Most wineries do not have a high degree of automation or control to ramp up and ramp-down electricity-intensive processes to vary their demand. This results in the winery production process creating high peak demand which greatly increases winery electricity costs. Given the cyclical nature of wineries, peak loads are high during vintage and considerably lower for the rest of the year. Implementing demand management strategies to reduce peak demand during vintage is an effective way to reduce winery electricity costs.

This section aims to examine pathways for demand management including:

- Energy monitoring equipment at both a site and process level
- Visual monitoring tools for understanding energy use
- Alert systems for peak demand
- Automation to reduce energy use when approaching peak energy demand
- Demand management technologies, techniques, and modifications for existing operations
- Alternative / supporting energy generation methods including:
    - » solar
    - » backup gensets
    - » off-peak energy storage
    - » on site generations

Get Informed, Get the Right Electricity Data

The first step in demand management is to understand electricity use on site and identify what is causing high electricity demand charges. To do this, you need to get the right data. There are three main types of data that you can access; electricity bills, interval meter data and sub-metering data.

Electricity Bills

Electricity bills show which billing components contribute the most to overall electricity spend, where to focus efficiency improvements and the business case for change.

Figure 11 shows the cost of each energy component for the past 12 months. This graph helps to identify which components of a business's electricity use contribute the most to your business's total energy spend.

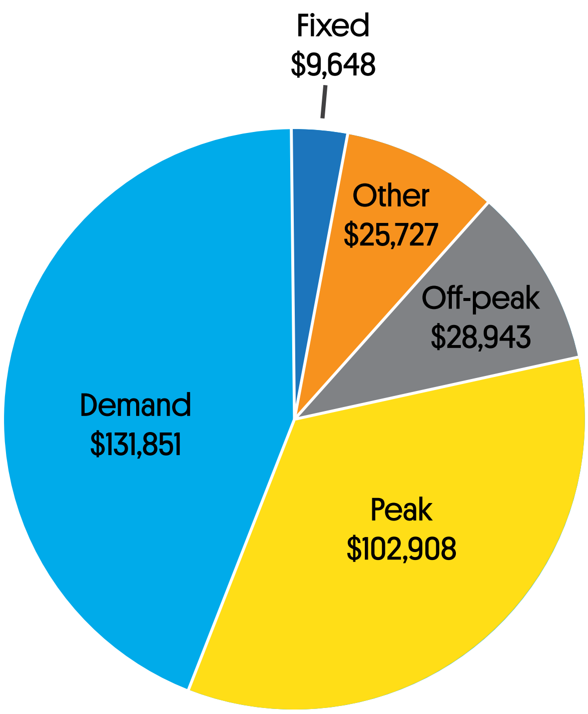


***Figure 12**: Annual breakdown of electricity charges*

This simple breakdown of costs can be used to identify which areas should be focused on when developing energy management strategies. In this example, demand accounts for the largest annual cost (~42%) and any projects which reduce peak demand will likely provide the best cost-savings. Peak electricity use is the second highest energy spend and as such, this should be a high priority when looking to reduce electricity costs.

To confirm that electricity demand management is applicable to your winery, compile an annual breakdown of electricity charges to verify how much demand contributes to your total bill and how much you could save. If demand charges are costing you $100,000 per annum, a 10% reduction in site demand during monitoring periods will save you $10,000 a year. As previously mentioned however, for a winery on an annual agreed tariff, a cost reduction will not occur unless SAPN are contacted and 12-months evidence of a lower demand is provided.

While electricity bills present a useful monthly summary of electricity use, they don't provide detail about how you use electricity throughout the day.

Interval Meter Data

Interval meter data is the data collected by your site(s) electricity meter at the point where your site connects to the grid. This data provides lots of information about your electricity use. Accessing interval meter data is a critical step for conducting a thorough analysis of your electricity use, however it can often be hard to get in a useful format. Furthermore, data is only collected at half-hourly intervals and cannot be accessed in real-time.

SA Power Networks now have an online portal to make accessing your interval meter data easier, but it is impossible to interpret this raw data without first using a tool to convert it into a useful format. As such, it may be best to get in touch with an energy expert and ask them about analysing your interval meter data.

Head to the following link to access your interval meter data:

https://www.sapowernetworks.com.au/your-power/manage-your-power-use/your-meter-data/

Figure 12 below is an example of interval meter data which has been analysed and presented in a useful way. Interval meter data, when presented in this way, can provide you with:

- When you are using electricity
- When you can load shed
- Your peak demand
- Your power factor
- Which tariff is best for you
- Your demand frequency

Energy experts will use this data when assessing demand management strategies.

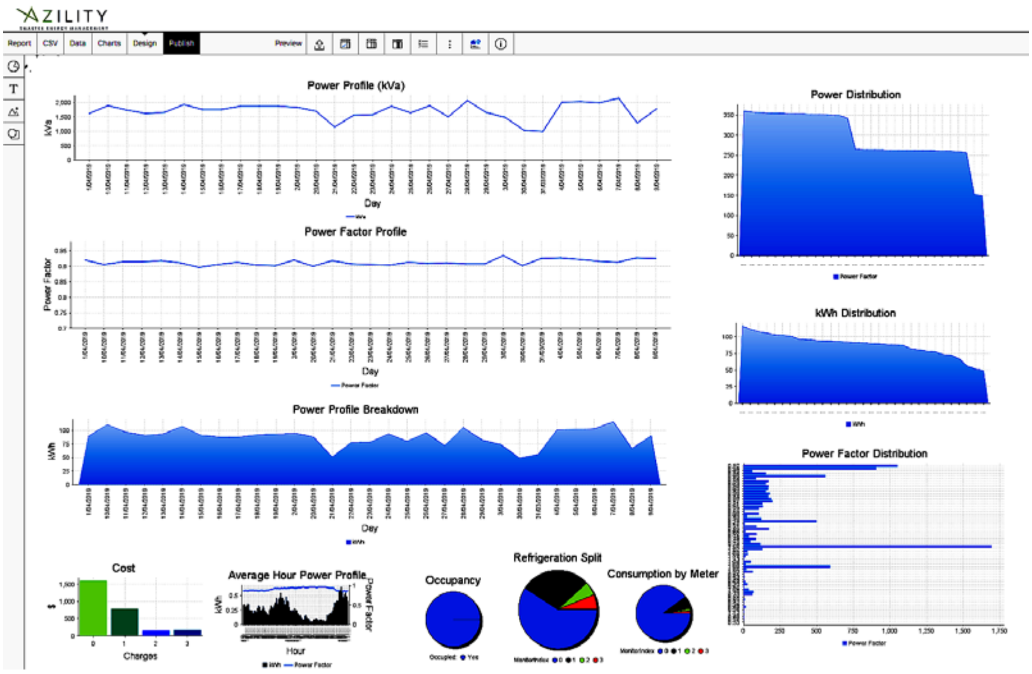


Figure 13: Example of well-presented interval meter data

Submetering

Energy monitoring technology has advanced significantly in the past few years with many businesses installing energy monitoring systems to understand how electricity is used on-site in real-time. While interval meters provide data every half an hour, electricity sub-metering can take measurements from every second through to every hour, it is determined by the user. Furthermore, while interval meter data collects information about the total power usage across your entire site, submetering can be placed on sub-systems to show you exactly how a certain piece of equipment or area is using electricity. Figure 13 below shows the potential systems and process areas that could be monitored in real-time using electricity submetering. In this case, the winery would have a detailed insight into how their refrigeration system is performing and how much electricity their processing area and warehouse area are currently using.

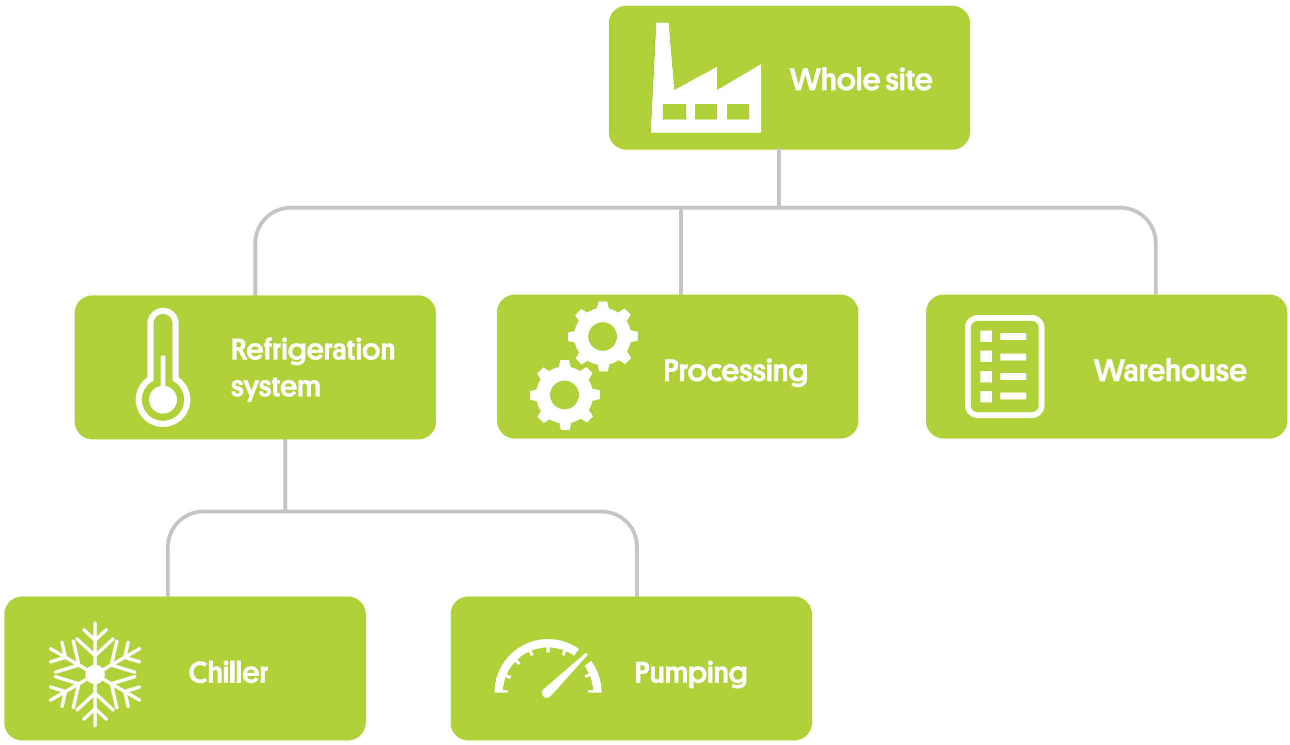


Figure 14: *Potential sub-metering installation points*

Monitoring demand provides information about when the site is nearing peak demand and therefore, when action should be taken to mitigate costs.

There are a large range of energy monitoring devices on the market, most of which can be installed by a general electrician, starting at approximately $3,000 for both hardware and basic software solutions.

As sub-metering technology can accurately track the power use of a single piece of equipment, it can be used to monitor equipment performance. For example, by installing sub-metering on a refrigeration compressor, you can track how that compressor is performing and whether it may be faulty or needs maintenance. If the compressor is randomly spiking in power usage, this may indicate that it is nearing end of life and that a replacement compressor should be ordered.

Demand Management Opportunities

Due to the large thermal loads associated with stored wine, wineries are one of the few industries that can effectively manage their demand by modifying refrigeration use.

What is Driving Your High Demand?

To effectively implement electricity demand management opportunities, it is important to understand your winery's electricity demand. Figure 14 is an example of a winery's average electricity demand during vintage. Winery electricity demand generally peaks in the afternoon during the monitored demand period, highlighted in red. The red area is when maximum demand is monitored and impacts your electricity cost. Efforts should be made to maintain demand as low as possible during this time.

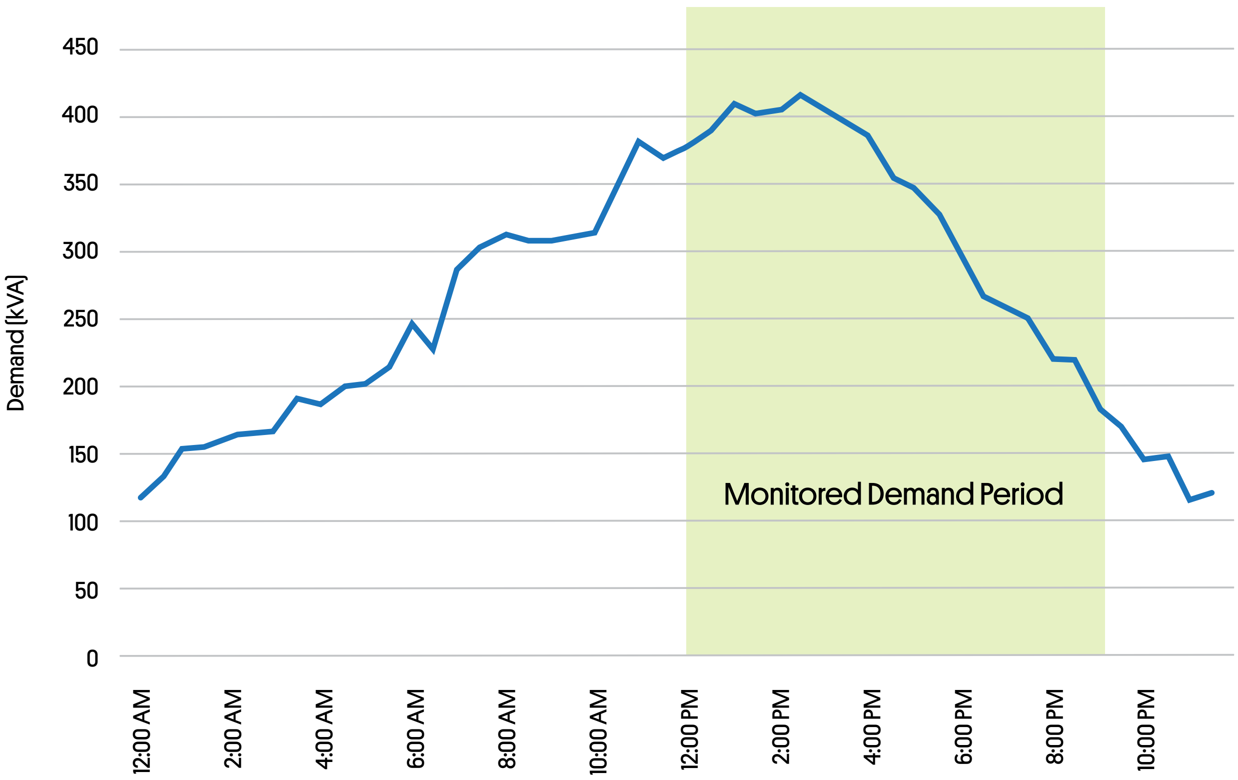


Figure 15: *Winery Average Electricity Demand During Vintage*

Electricity demand ramps up throughout the day as more activities occur. The activities are usually related to the winery refrigeration system, such as must chilling, ferment cooling and tank farm cooling. Refrigeration can often account for up to 70% of a winery's total electricity use, as shown in Figure 15 below.

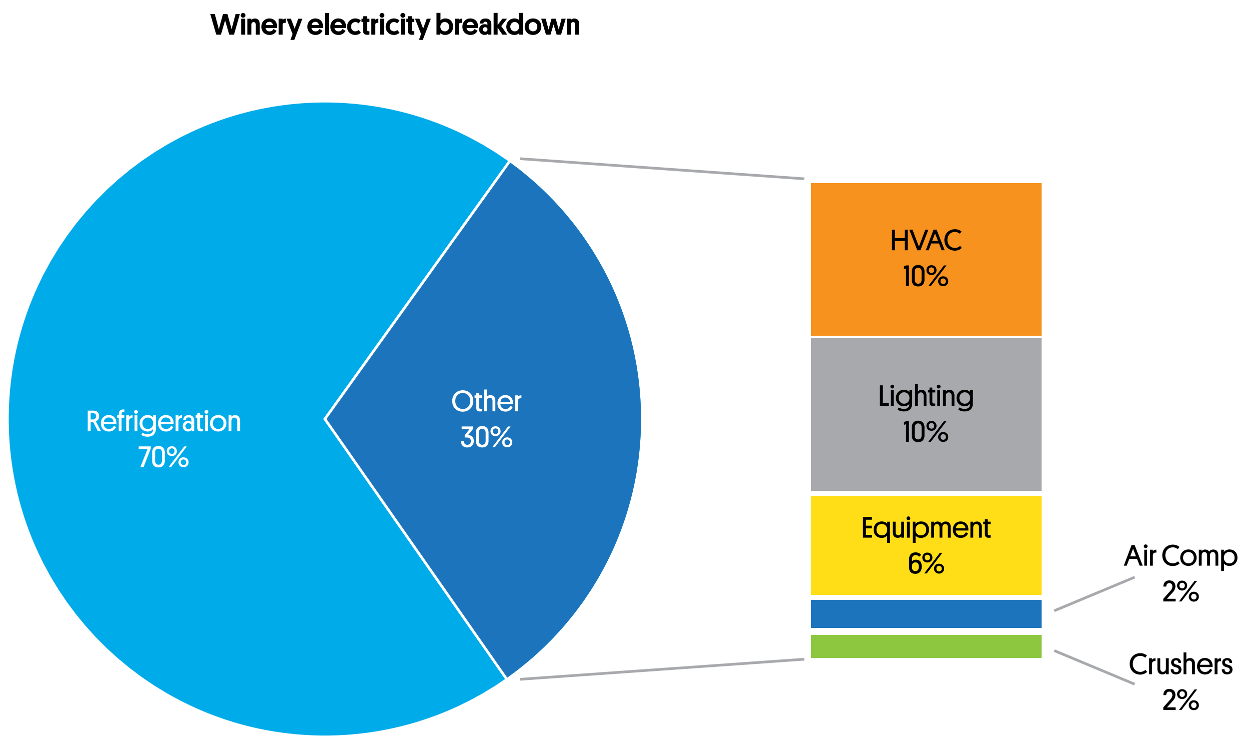


Figure 16: Winery Electricity Use Breakdown

High refrigeration system energy consumption always corresponds with a high electricity demand due to the large compressors and pumps in the systems. This means that refrigeration systems generally contribute the most to electricity demand costs on site. As such, refrigeration systems are the main area of opportunity when attempting to reduce demand charges.

Fortunately, while refrigeration accounts for the vast majority of winery electricity use and demand, it is one of the key systems which can have its electricity demand costs managed.

Opportunity 1 - Load Shifting

Summary

Peak demand is caused by energy intensive operations and processes. Load shifting involves moving these operations and processes outside of the monitored demand period to reduce electricity demand costs. An example of this is illustrated in Figure 16 below. Refrigeration is the most energy intensive process in a winery and this section investigates how to effectively shift refrigeration loading to outside of monitored demand periods.

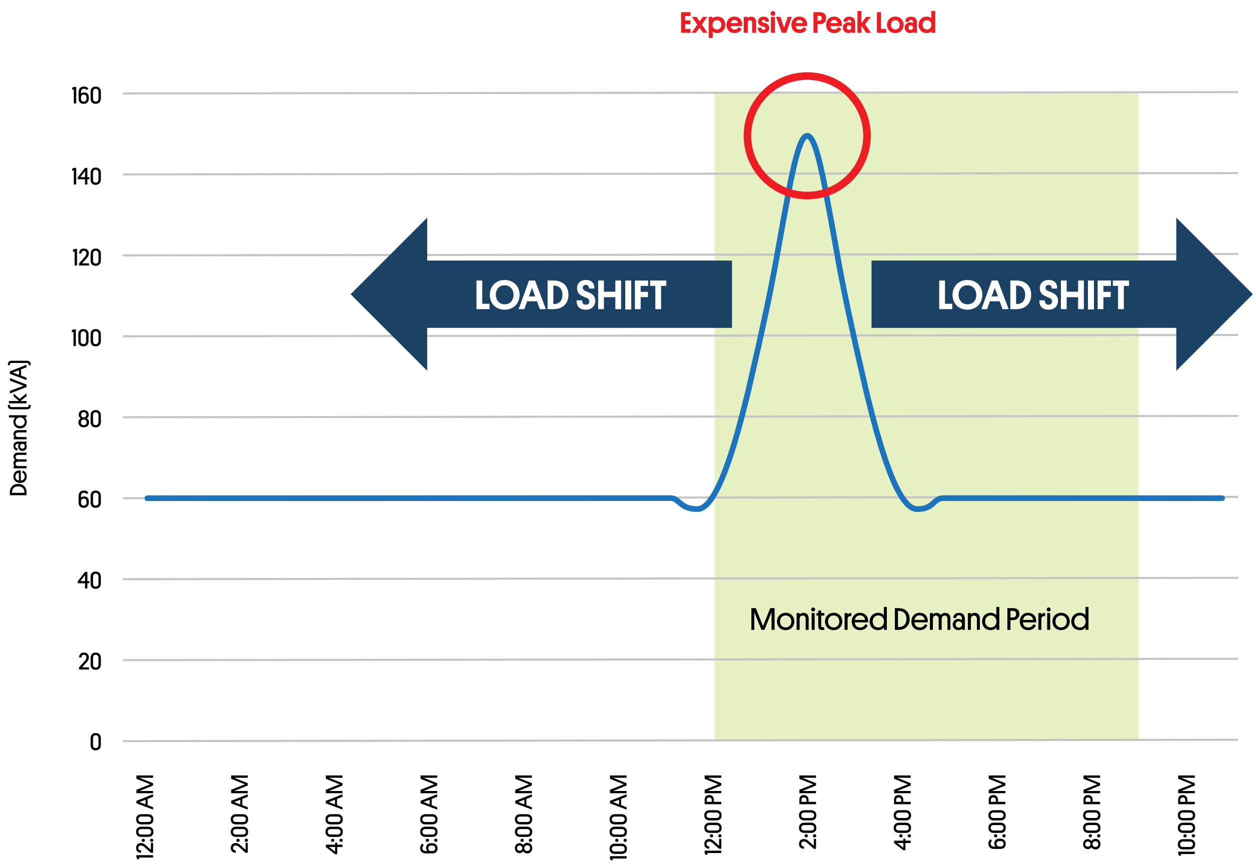


Figure 17: *Load shifting*

For cost savings to be made, load shifting practices must ensure consistent reduction of either monthly or annual maximum monitored demand. For example, if a winery on an annual agreed tariff fails to correctly load shift a peak in demand during the annual agreed demand period, their agreed demand will be reset to the higher value and higher costs will be incurred.

Strategy Principle

Regardless of whether wine tanks are insulated or uninsulated, indoors or outside, shaded or un-shaded, wine inside a tank takes time to warm up. Figure 17 shows the wine temperature of an insulated, partly shaded outdoor 24kL tank on a 40°C day. The tank is fitted with an automated cooling system to keep wine between 4.9°C and 5.5°C. The wine took approximately 1 hour to cool from 5.5°C to 4.9°C and took 10 hours to warm back from 4.9°C to 5.5°C during the hottest part of the day.

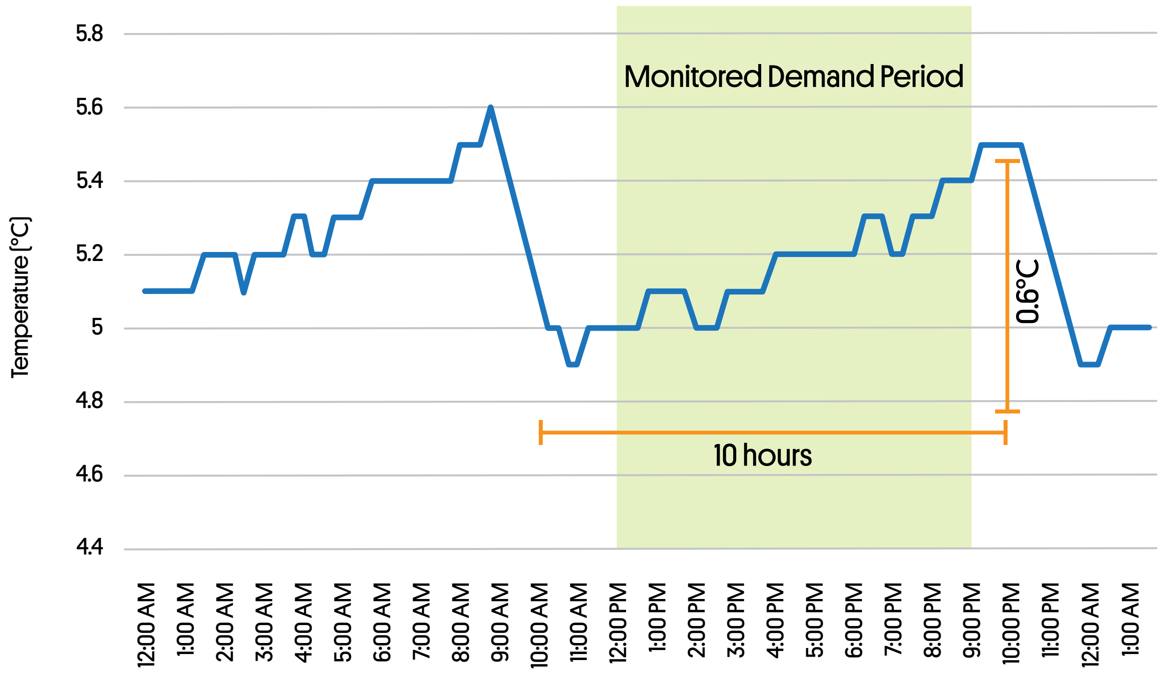


Figure 18: *Wine temperature graph*

In this example, if the temperature band was changed to 4°C and 6°C, active cooling would be required once every 24 to 48 hours. This means, if the wine is cooled overnight, no additional cooling would be required until the following night and active tank cooling could be scheduled outside of the monitored demand period (12pm – 9pm).

Winery staff often have the perception that their refrigeration system operates at full capacity 24 hours a day, 7 days a week during vintage and that there is no available capacity. However, based on refrigeration logs there is often refrigeration capacity available in the early hours of the morning, when electricity is cheap due to off-peak retail rates, and the cooler ambient temperature means that refrigeration systems run at maximum efficiency.

Demand Management Opportunities

Refrigeration load shifting involves moving as much tank refrigeration to outside of peak monitored periods as possible. This reduces maximum electricity demand as it lowers the power usage of your refrigeration system during the day. It also improves the efficiency of your refrigeration system due to lower ambient temperatures at night. Furthermore, shifting electricity consumption to between 9pm and 7am will allow your winery to take advantage of off-peak electricity rates. Refrigeration load shifting is the most important step in winery electricity demand management and can provide substantial cost savings.

Case Study – Load Shifting

A winery located in the Barossa Valley implemented an electricity demand strategy focusing on load scheduling of their refrigeration systems. Prior to implementing this strategy, the winery was reaching a maximum peak demand of 500kVA. Load scheduling allowed the winery to shift power consumption from the hot day hours to the cooler evening hours. This resulted in a 50% reduction in maximum peak demand. The 250kVA reduction in peak demand saved the winery approximately $30,000 per annum. In addition to demand savings, operating the system at night increased refrigeration efficiency to provide a 25-35% reduction in refrigeration electricity consumption. Finally, this system allowed the winery to utilise cheap off-peak electricity, reducing costs even further.

Load shifting in automated systems:

Configuring an automatic refrigeration system to cool wine at night can be relatively simple and is an extremely effective way to reduce refrigeration costs. There are a number of ways to implement refrigeration load shifting in an automatic system, one of which is outlined in Appendix B, and it is best to get in touch with your automation contractor to learn more.

Load shifting in manual systems:

Using a manually controlled system can be more challenging as it requires staff to be present after 9pm. Load shifting of a manually controlled system involves turning on tank refrigeration after 9pm and turning it off in the morning once the wine is adequately cooled. Due to the nature of electricity demand charges, if maximum demand is exceeded even once for more than 30 minutes during the monitored demand period then demand charges for either the month or year (depending on your tariff structure) will increase.

Balance cooling load

In addition to shifting refrigeration loading to evening hours, wineries can further increase cooling efficiency by cooling tank farms in zones rather than chilling all tanks simultaneously. This has two benefits as it decreases the maximum refrigeration electricity demand and maximises tank cooling efficiency by ensuring brine temperature remains low and the refrigeration system is not overloaded. An example of a winery tank farm zoning system is shown overleaf in Figure 18. Spreading refrigeration load equally over off-peak hours is important as wineries on an agreed tariff will be charged if the off-peak electricity demand exceeds the annual agreed demand.

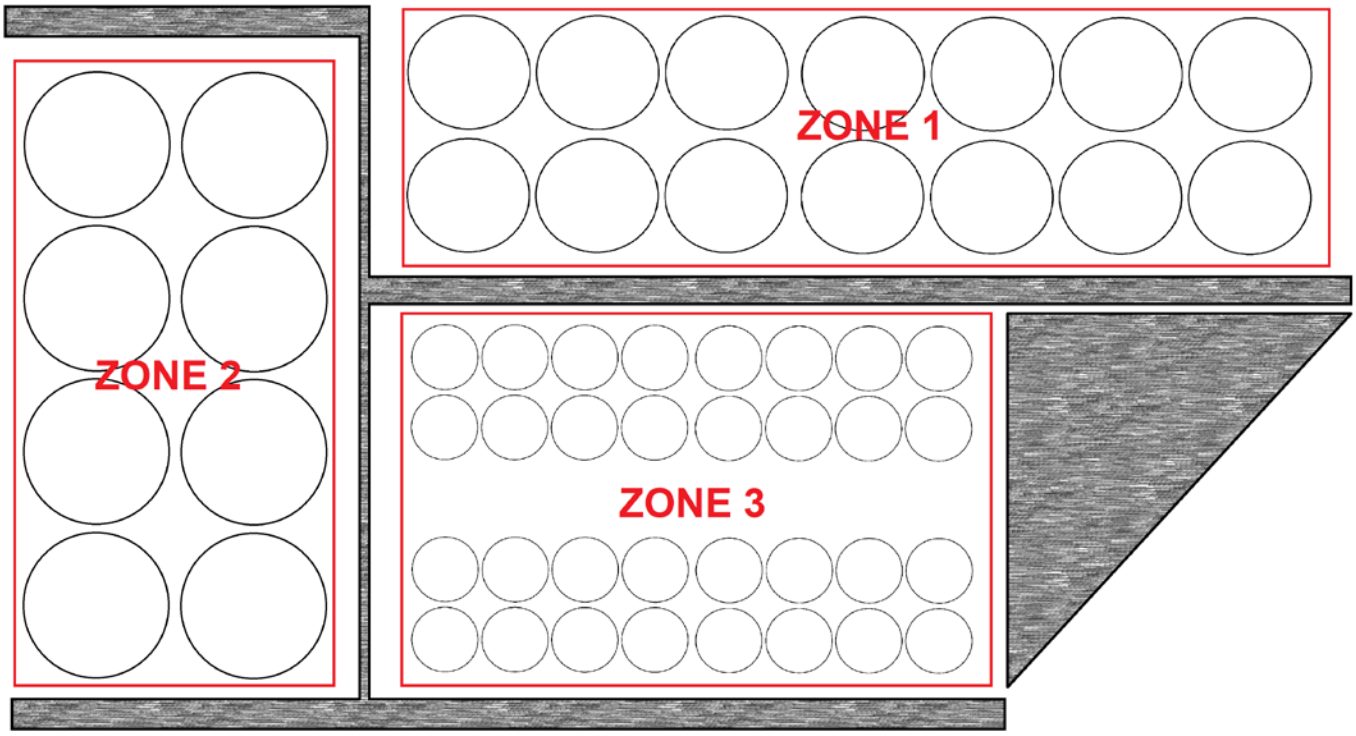
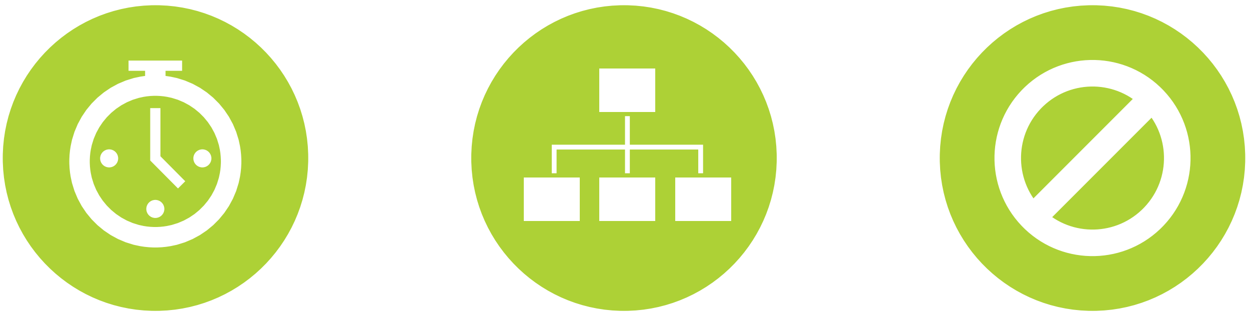


Figure 19: Winery tank farm zoning

Undertaking these steps will ensure the refrigeration system has capacity during the day for time critical tasks such as must chilling. Dedicating the refrigeration system to must chilling during daily receival has two main benefits:

- Keeping refrigeration demand low
- Maximising the chilling of must on receival

A summary of the key actions for load shifting is included in Figure 19.



Complete the bulk of refrigeration during off-peak periods

Refrigerate tank farm in zones to reduce peak refrigeration loading

Don't cool tank farm while chilling must or ferments

Figure 20: Summary of load shifting actions

Opportunity 2 - Load Shedding

Summary

Load shedding is the principle of ramping down or turning off energy intensive equipment to prevent your electricity demand from exceeding a pre-defined demand value. For example, wineries on an annual agreed tariff can load shed to ensure that their agreed demand is not exceeded at any time. Wineries on a monthly actual tariff can use load shedding to reduce demand during monitored periods thereby reducing monthly demand charges. An example of this is provided in Figure 20.

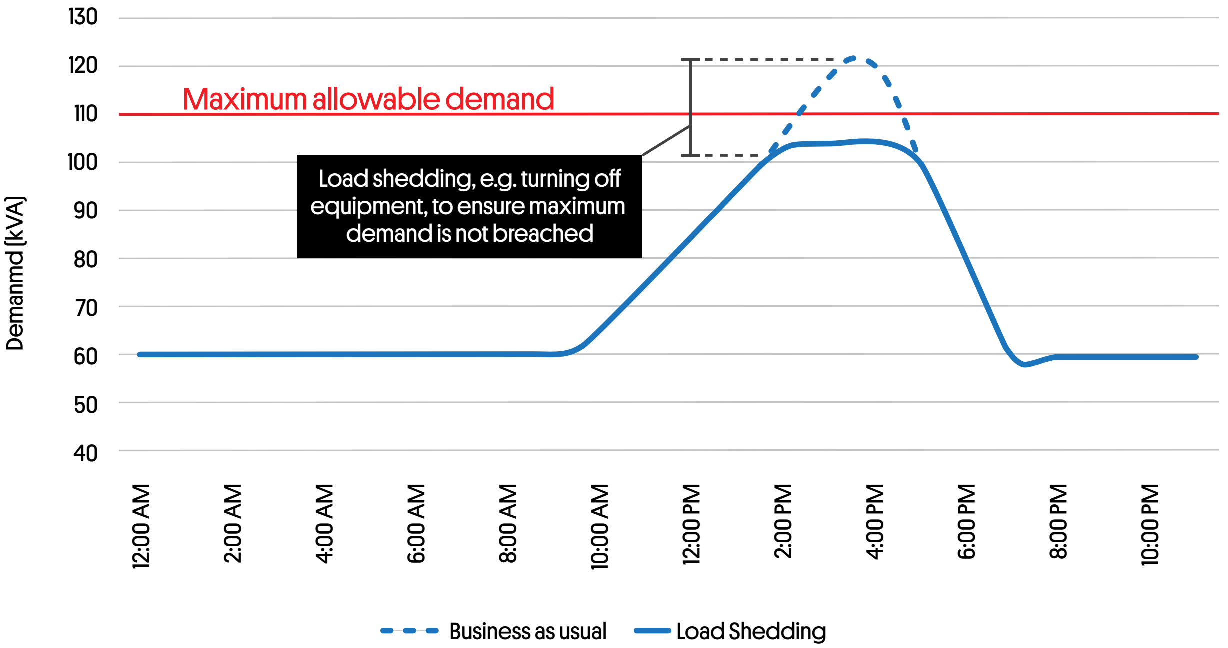


Figure 21: *Load Shedding*

Due to the need for real-time data, load shedding requires the sites main electricity supply to be monitored and displayed / controlled in real time by an electrical submeter. Submetering equipment can be installed to alert staff when the winery is nearing a pre-defined demand value and additional systems can be installed to automatically reduce site demand. Due to the high electricity use and flexibility of refrigeration systems, they are the focus of load shedding.

Strategy Principle

During vintage, high demand events usually occur for a few hours in the afternoon during one or two of the hottest days of summer. During this high demand, cooling can be limited to one or two key processes and refrigeration systems can be ramped down or turned off to prevent exceeding a specified demand and avoid additional costs. These systems can be returned to regular operations as soon as site electricity demand returns to a reasonable level. There is no need to interrupt high priority tank cooling (must chilling or ferment chilling) or other time critical processes if this strategy is correctly implemented. As such, there is no risk of damage to wine.

Outside of vintage, maximum demand events are rare but load shedding practices can still be implemented to prevent a breach of the maximum demand.

Demand Management Opportunity

Load shedding of electricity demand requires real-time electricity monitoring and a predetermined maximum demand value. Electricity monitoring systems can be installed for a relatively low cost and many systems offer the ability to alert wineries when demand is reaching a set value. It is recommended to use a demand value 10% below your target maximum demand.

When alerted of reaching this demand, there are two ways to reduce refrigeration loading:

- increase brine setpoint temperature to ramp down refrigeration chillers
- turn of low priority tank cooling to reduce pumping and refrigeration loading

The cost savings for this type of strategy vary depending on demand costs and future demand targets. As an example, a modest reduction of 25kVA would provide an annual saving of ~$3,000 and cover the cost of installing electricity monitoring.

Once you have demonstrated that you have reduced your maximum demand, you can apply to SA Power Networks to have your agreed annual demand reduced. Sufficient evidence (e.g. 12 months of data) must be provided to SA Power Networks to prove that the maximum electricity demand on site has been consistently reduced.

Opportunity 3 - Power Factor Correction

Summary

Electricity demand is measured in kVA, which is a measurement of both **real (kW)** and **reactive (kVAr)** power. Reactive power is wasted and performs no work. Real power is the actual work done. Heavy inductive or capacitive loads (motors, transformers, etc) increase **reactive** power onsite and drive up demand (kVA). This reactive power can be reduced by installing power factor correction technology. Power factor correction leads to lower maximum demand and reduced demand costs.

Strategy Principle

On-site demand is measured in kVA, but this is a combination of both kW and kVAr, as illustrated using a glass of beer below in Figure 21. kW's (kilo-watts) is a measurement of demand which only includes the components of electricity which actually performs work (also known as active or real power), and is represented by the beer itself. The other component of power is kVAr which is a measurement of reactive power and is caused by heavy inductive loads (electric motors) on your site (refrigeration compressors, pumps, etc.). This reactive power can be thought of as wasted power, like the head of a beer.

Power Factor (PF) is a way to describe the quality of power at your winery (not to be mistaken with Distribution Loss Factor). Power factor is the ratio of actual power, kW, and total demand, kVA. A power factor of 1 means that there is no reactive power on-site and that no power is wasted. A power factor of 0.8 means that 20% of total demand is driven by reactive power and therefore, 20% of your actual demand is wasted.

Most wineries pay for both real power and reactive power. For this reason, decreasing the reactive power (increasing the Power Factor) will decrease network charges and increase 'useful power'.

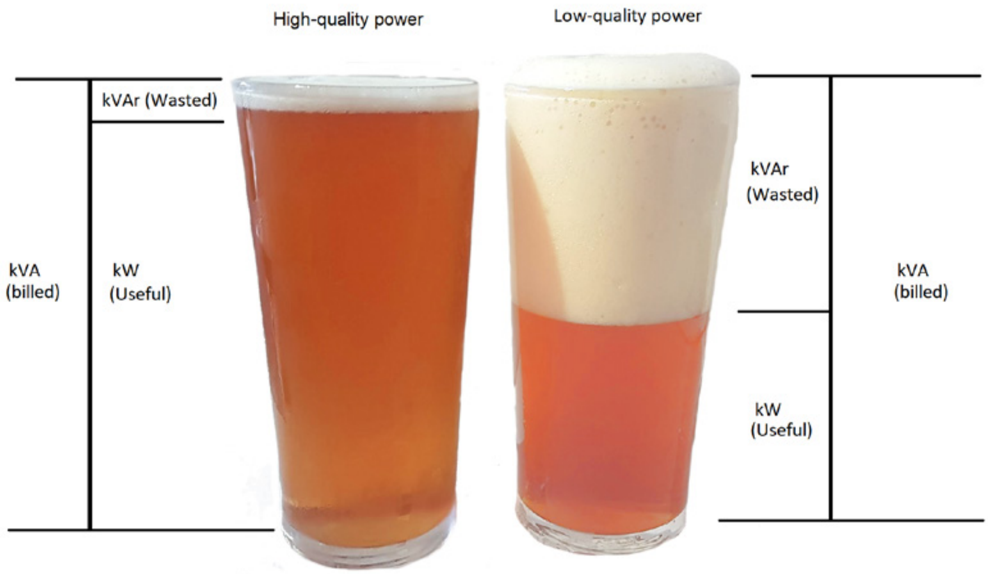


Figure 22: Power factor explained

Demand Management Opportunity

A winery can determine their power factor by analysing interval meter data, sub-meter data or by getting in touch with SA Power Networks directly. If your power factor at maximum electricity demand is below 0.90, there is reasonable potential to improve your power factor and reduce demand costs. Power factor can be improved by installing power factor correction technology which improves power factor quality.

Installing power factor correction is a straight forward project which can provide high savings. If your winery's power factor has not been analysed, get in touch with SA Power Networks or an energy expert.

Power Factor Correction: A Case Study

Figure 22 illustrates the power factor of a winery using a 'heat map'. The horizontal axis for the heat map outlines the time of day for each reading at 30-minute intervals, and the vertical axis lists the days during vintage. All PF values lower than 0.8 are highlighted in red, PF values between 0.8-0.9 in yellow, and good PF values (>0.9) are highlighted in green.

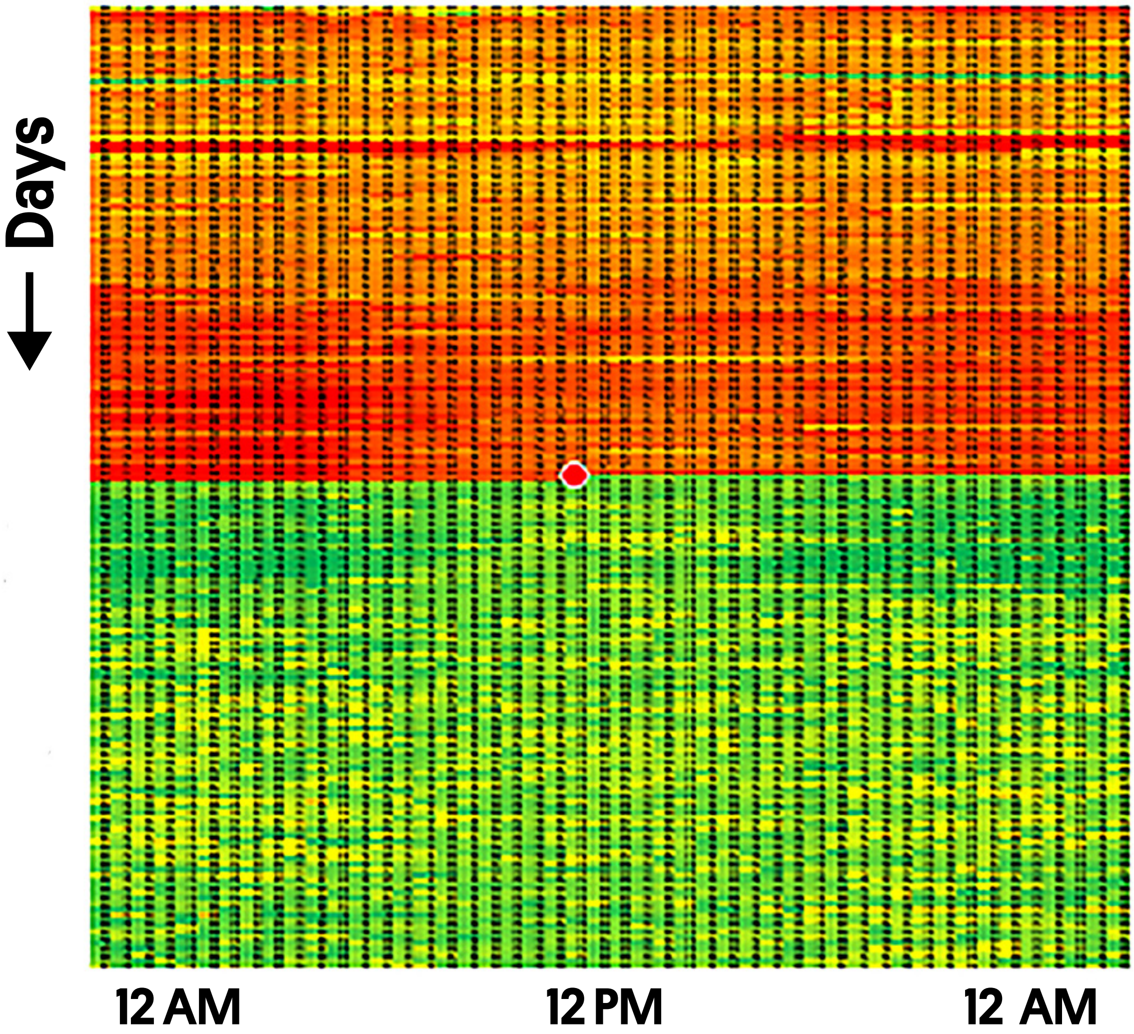


Figure 23: *Power factor correction case study*

The heat map illustrates the improvement in a winery's power factor after the installation of a power factor correction unit. Prior to this installation, the winery had a maximum peak demand of 540kVA and a power factor of 0.7, meaning that 30% of their electricity demand was wasted and their peak demand was 30% higher than it needed to be. The installation of a power factor correction unit cost $20,000 and increased the power factor to 0.95-1. This reduced their maximum peak demand by 162kVA for a new maximum demand of 378kVA. The winery requested SA Power Networks reduce their agreed demand and this resulted in an annual demand saving of ~$20,000.

Other Opportunities

Solar Photovoltaic Systems

Many wineries are opting to install solar photovoltaic (solar PV) systems to reduce their grid electricity consumption. Depending on your winery's annual electricity use profile, installing a solar PV system may be a valuable investment. Solar PV will reduce grid electricity demand during the day while it is producing electricity, but it is not an ideal electricity demand management solution. This is because the sun may not be shining when your winery reaches its maximum electricity demand. If you want more information regarding solar PV for wineries get in touch with SAWIA directly or contact an energy expert.

Figure 24: *Solar PV System*

Diesel Generators

Correctly configured diesel generators can be automatically controlled by software and turned on to reduce grid electricity demand during peak periods. This load shedding ability requires the generator to be connected to a site electricity meter. For example, a 100kVA generator could reduce maximum peak demand by 100kVA for the entire year if it is correctly installed and operated. This could provide an annual demand cost saving of between $12,500 and $17,500 depending on the tariff structure of your winery. However, many winery diesel generators are not set up to supplement grid electricity supply and wineries lack the software and systems required for automatic curtailing of demand.

Figure 25: *Diesel Generator*

Diesel generators use a substantial amount of fuel and the price of operating a diesel generator is currently fluctuating around 40c/kWh while grid electricity costs between 20-30c/kWh. Using diesel generators to manage your winery's electricity demand is a complicated and costly process. However, if a diesel generator is being purchased as a back-up, ask your contractor or an energy expert for advice on setting it up to automatically manage demand costs.

Battery Technology

Battery technology has recently become more prominent in homes and businesses around Australia. Prices of battery systems have dropped dramatically since 2013 [Figure 25], and prices are expected to fall another 40% in the next 2 years. Because of the fall in price and increased media attention, many wineries are asking if they should be investing in batteries.

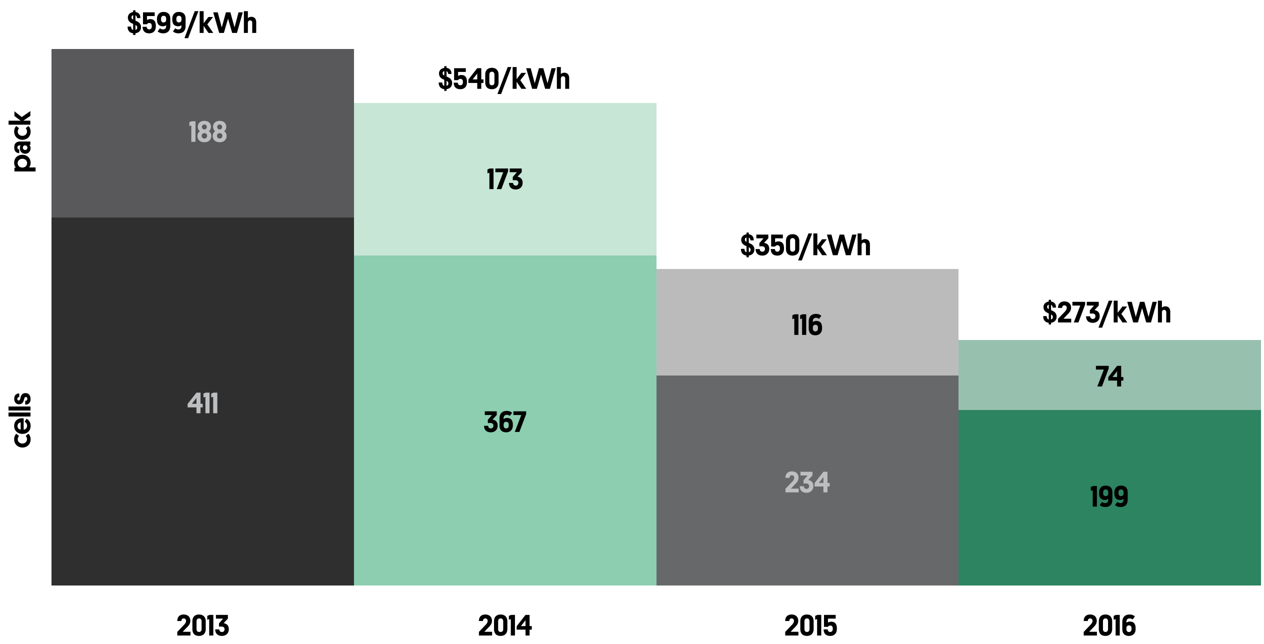


Figure 26: Battery prices [Bloomberg new energy finance]

Batteries pair well with solar and allow businesses to store any excess solar energy for later use, rather than selling it back to the grid. Batteries can be used to load shed during times of peak demand and can provide additional energy security. A newly installed solar PV and battery system has an average payback period of over 15 years, less if batteries are purchased using rebates from government programs. At this stage the business case is poor for installing battery systems for winery operations. As prices continue to fall this will change and you should attempt to keep up to date with the feasibility of battery systems as many energy experts believe they will become a crucial component of the entire electricity grid.

Demand Response

If you have successfully implemented load shedding or load shifting technologies, you may be able to participate in demand response programs. The Australian Renewable Energy Agency (ARENA) recently funded investigations into demand response technologies with the funding outlined in Figure 26 below. Demand response is a new way for retailers and distributors to reduce loading on the electricity grid during times of intense grid demand peaks, such as during a heat wave.

Figure 27: ARENA Demand Response Funding[6]

Wineries participating in these programs are notified by their retailers when they need to reduce demand. If wineries successfully reduce their peak demand during these times, they are reimbursed with reduce electricity costs or a direct payment. Figure 27 below outlines several strategies used in demand response. If you have a large winery with a high sacrificial refrigeration load (>200kVA) you may be able to participate in a demand response program. If you want to find out more, get in touch with your electricity retailer or distributor.

6 https://arena.gov.au/blog/flow-power/

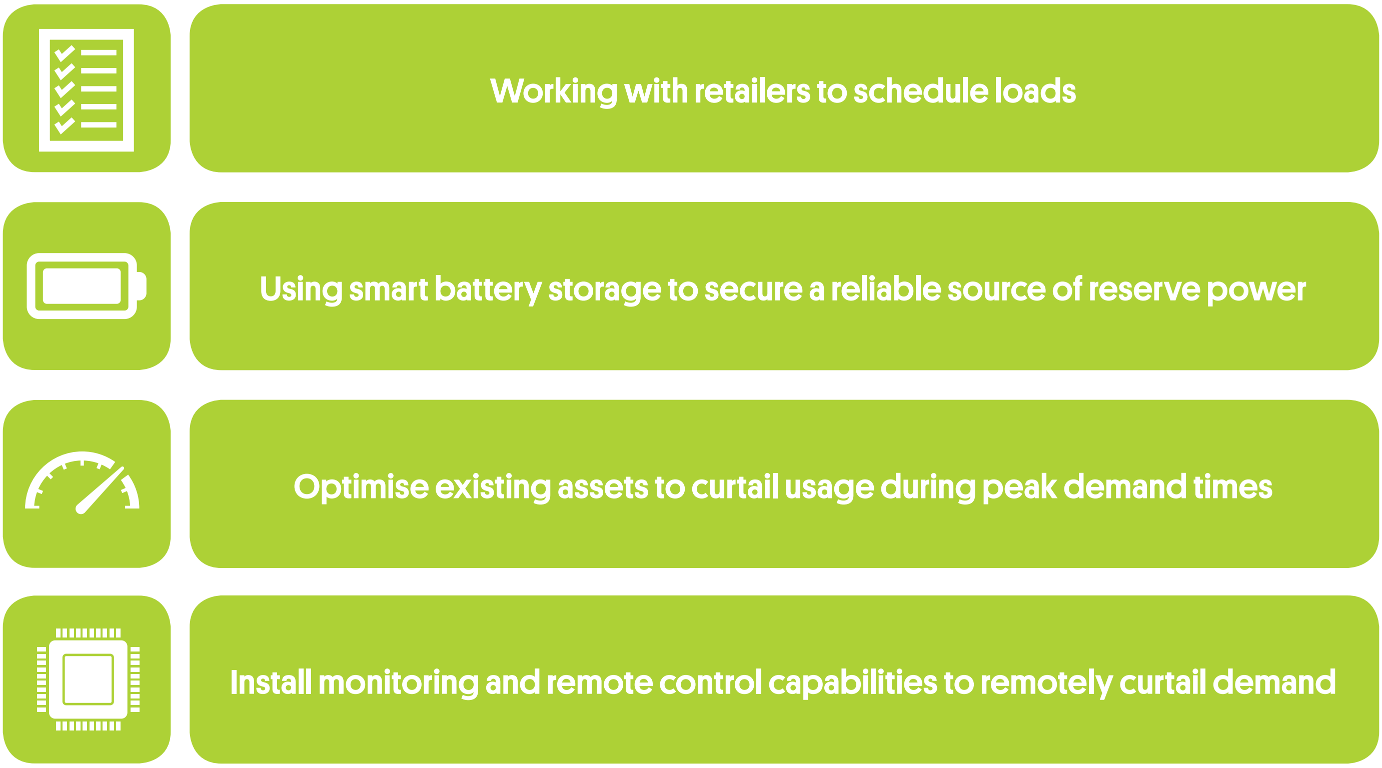


Figure 28: *Demand Response Strategies*

Conclusion

The Australian energy market is continually evolving. It is critical that wineries in South Australia are aware of the drivers and future trends in the energy market. This enables wineries to assess their level of exposure and to prepare for future changes.

Wineries who have a basic understanding of electricity generation / transmission, supply & demand, and a rudimentary knowledge of electrical consumption and demand in their winery will be in the best position to make informed decisions to both manage electricity costs, and plan for future changes to the energy market.

Demand Tariffs are not new in Australia, but all wineries will soon operate under a demand-based tariff structure. It is important for every winery to understand the rules and implement strategies to manage these demand charges.

There are many methods to manage both electricity use and demand charges. The most important step is to understand your own electricity profile. This can be done in a basic form by accessing and analysing your interval meter data or by using more complex systems in the form of real time monitoring, visual information, alerts or automation.

Understanding the structure of demand tariffs allows wineries to implement strategies and technology to minimise their exposure. This may include passive strategies to minimise electricity costs, or active strategies to decrease maximum demand during monitored demand periods.

Refrigeration system management plays a vital role in controlling electricity demand. Wineries are one of the few industries that can make use of large thermal masses of stored wine as an energy buffer system.

There are numerous strategies which wineries can implement on-site to manage demand costs. The important first step is understanding your electricity profile so wineries can select the best solution for their operations.

Appendices

Appendix A – Tariff Structures

There are two main categories for business network tariffs, Small and Large Business tariffs. The allocation is based on a business's annual electricity consumption.

- Small Business is any business premises consuming less than 160MWh per annum
- Large Business is any business premises consuming more than 160MWh per annum

Business 2 rate (B2R) – available to small business customers only

This tariff is based on Time-of-Use (ToU) consumption, along with a fixed supply charge per annum, refer to Figure 28 and Table 1 below. Since 2017 this tariff is only available to existing customers and new single-phase customers.

Wineries that are still on this tariff and have a multi-phase supply will be rolled over to a cost-reflective tariff between now and 2020.

Figure 29: *Business 2 Rate - consumption Time-of-Use structure*

Components	Measurement	Charging parameter
Fixed	$/customer/day	Fixed supply charge per annum
Usage	$/kWh	Based on usage: • Higher rate for peak 7am – 9pm of working days • Lower rate for off-peak 9pm – 7am on working days and all hours on non-working days

Table 1: *B2R pricing structure*

Low Voltage monthly actual kVA demand – available to small (SBD) and large business (BD) customers

This tariff is a combination of consumption, demand and fixed supply charge (refer to Table 2 below). Consumption is charged at a single rate for all usage (i.e. consumption is no longer split into ToU periods and charged at different rates). Demand is based on the actual monthly maximum kVA demand measured over a 30-minute period during Shoulder and Peak Time-of-Use periods, as illustrated below in Figure 29, and re-sets every month.

Figure 30: LV Monthly actual kVA demand – demand Time-of-Use structure

Components	Measurement	Charging parameter
Fixed	$/customer/day	Fixed supply charge per annum
Usage	$/kWh	Anytime based on usage
Demand	$/kVA/day	Maximum demand charge based on actual monthly maximum kVA demand measured over a 30min period • Shoulder: 12pm – 4pm on working days, 12-months of the year • Peak: 4pm – 9pm on working days, between November – March Currently Off-peak demand is measured, however not charged.

Table 2: SBD pricing structure

Since July 2017, this was the default tariff for Small Businesses with a multi-phase connection and is applicable to all new multi-phase connections. Existing multi-phase customers who alter their supply (e.g. upgrade from single-phase to multi-phase or install solar PV) or have a maximum demand over 250kVA will be moved onto this tariff. SA Power Networks have also provided a transitional (SBDT) version of this tariff that businesses can opt into or for businesses that would see a price increase from the fully cost-reflective tariff. The transition tariff is designed to ease customers into the new structure by charging a lower price per kVA and a higher price for consumption (kWh), which is still split into the traditional ToU periods (refer to Table 3 below). The price will shift each year until 2020 until pricing reflects the full cost-reflective version (SBD) of the tariff.

Components	Measurement	Charging parameter
Fixed	$/customer/day	Fixed supply charge per annum
Usage	$/kWh	Based on usage: • Higher rate for peak 7am – 9pm of working days • Lower rate for off-peak 9pm – 7am on working days and all hours on non-working days
Demand	$/kVA/day	Maximum demand charge based on actual monthly maximum kVA demand measured over a 30min period • Shoulder: 12pm – 4pm on working days, 12-months of the year • Peak: 4pm – 9pm on working days, between November – March Currently Off-peak demand is measured, however not charged.

***Table 3:** SBDT pricing structure*

Low Voltage annual agreed kVA demand – available to small (SLV)[7] and large business customers (LV)

This tariff is a combination of consumption, demand and fixed supply charge (refer to Table 4 below). Consumption is charged at a single rate for all usage. Demand is based on the maximum kVA demand measured over a 30-minute period during the annual demand period, defined as 12pm to 9pm on working days (Figure 30) and is fixed for the next 12-months.

Figure 31: *LV business annual agreed kVA demand*

Components	Measurement	Charging parameter
Fixed	$/customer/day	Fixed supply charge per annum
Usage	$/kWh	Anytime based on usage
Demand	$/kVA/day	Maximum demand charge based on maximum demand over November to March between 12pm – 9pm on working days and charged in a declining block • Block 1: 0-1,000kVA, charged at a higher rate • Block 2: >1,000kVA, charged at a lower rate
Additional Demand	$/kVA/day	Maximum demand charge if anytime demand exceeds agreed demand (Additional demand – Anytime demand – Annual demand) and is charged at a lower rate.

Table 4: *SLV pricing structure*

7 For small businesses this tariff has been closed to new connections from July 2016, however existing customers may remain on the tariff.

Agreed demand is fixed and will only be changed if:

- A request is made by the customer through their retailer. Customers can request to reduce their agreed demand if it has not been reached in the last 12-months. A minimum of 12-months data as evidence is required, unless a physical change has been made, e.g. Power Factor Correction equipment, then only 3-months of data is required. It is important to keep in mind, if you request to reduce your agreed demand and you exceed the new level within 12-months, you will be back-billed for the additional demand over the lowered value. If it is exceeded after 12-months, there is a risk of incurring augmentation fees as SA Power Networks will have utilised your capacity elsewhere in the network.
- The recorded demand at your site exceeds the agreed demand over any 30-minute period, during the Agreed Annual Demand Period. This will reset your agreed demand to this new higher level. If demand is exceeded outside of the Agreed Annual Demand Period agreed annual demand remains the same, however an additional demand charge is applied.

Which structure should I use?

There are two tariff structures available to large businesses, either monthly actual demand or annual agreed demand-based tariffs, so which one is best for your winery? The answer is that it will depend on the operations occurring on site. This is demonstrated in the following two case studies.

Case Study 1: LV monthly actual kVA demand

The annual electricity profile for Winery 1 is presented below in Figure 31. The winery has a distinct peak in both consumption and demand during vintage (February and March). The vintage period accounts for 30% of total annual consumption and demand is on average 50% higher than the remainder of the year.

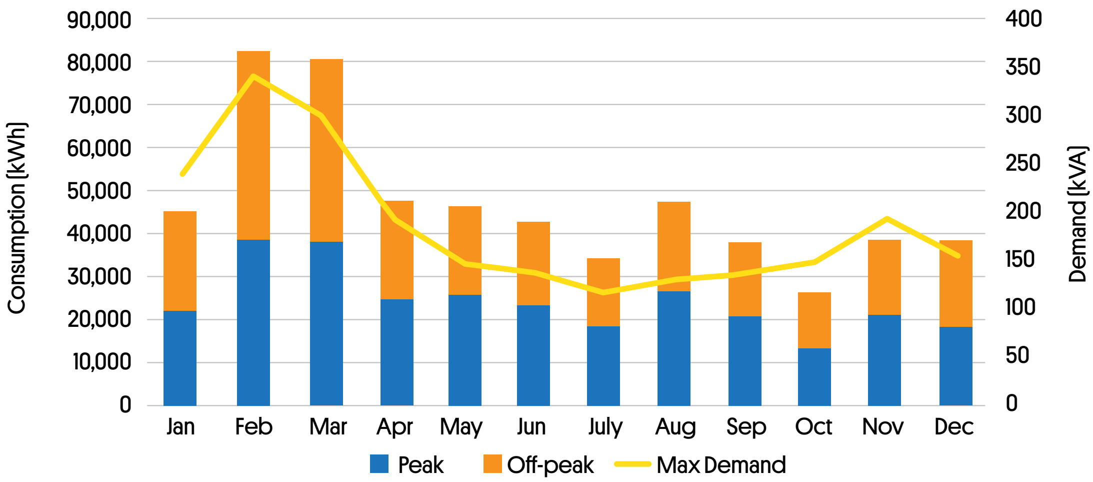


Figure 32: Winery 1 annual consumption & demand profile

Table 5 overleaf shows the maximum demand for each of the monitoring periods for both tariff structures. On the Annual Agreed tariff, Winery 1 would have an agreed demand of 340kVA for which it would be charged regardless of the lower demand for the remainder of the year. On the actual tariff, Winery 1 would be charged for the maximum demand recorded during the Peak and Shoulder demand periods. Although peak and shoulder demand is high during vintage, for the remainder of the year shoulder demand is considerably lower than what the agreed demand would be.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max demand	240	340	298	195	148	137	117	131	137	148	193	156
Max peak demand	145	340	266				-				193	131
Max shoulder demand	149	325	298	188	144	134	114	130	137	148	174	146

Table 5: *Winery 1 maximum demand by tariff monitoring period*

The impact that the demand profile has on total cost is illustrated below in Figure 32. As can be seen, the network cost over vintage on the actual tariff is considerably higher than the agreed, by ~$5,000, however for the remainder of the year cost is on average $2,500 per month lower than the agreed tariff. Overall, the actual tariff is more cost effective for Winery 1 with an annual cost difference of $14,000 between the two tariffs.

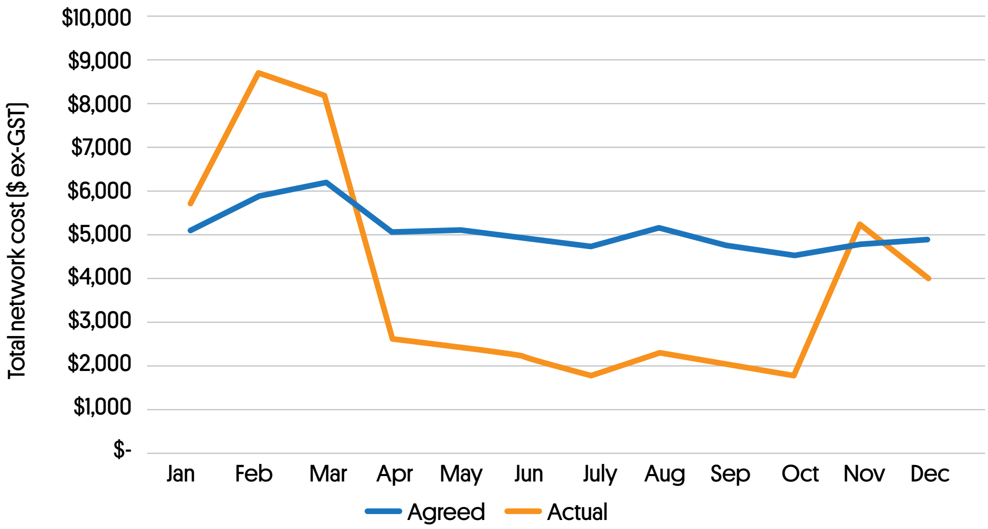


Figure 33: *Winery 1 tariff comparison*[8]

Typically for wineries where vintage accounts for 30% or more of total annual consumption and demand is significantly lower outside of vintage an actual demand tariff is the more cost-effective option.

8 Cost based on SA Power Networks Pricing Proposal 2018-19.

Case Study 2A: LV annual agreed kVA demand

The annual electricity profile for winery 2 is outlined below in Figure 33. The winery has a peak in both consumption and demand during vintage (February and March). The vintage period accounts for 20% of total annual consumption and demand is on average 36% higher than the remainder of the year.

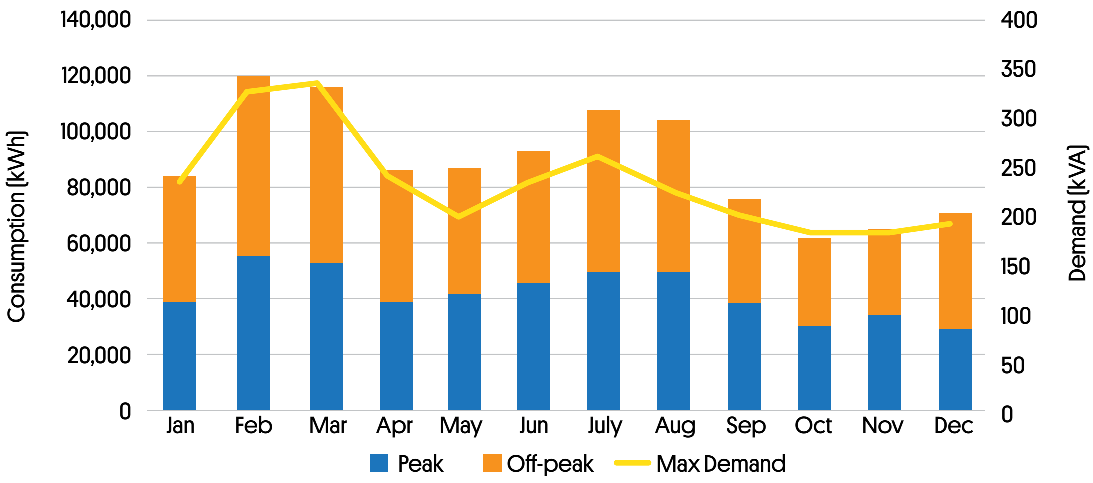


Figure 34: Winery 2 annual consumption & demand profile

Table 6 below shows the maximum demand for each of the monitoring periods for both tariff structures. On the Annual Agreed tariff, Winery 2 would have an agreed demand of 337kVA that would be charged, regardless of if maximum demand is lower for the remainder of the year. On the actual tariff, Winery 2 would be charged for the maximum demand recorded during the Peak and Shoulder demand periods. There is only a minor (~36%) variance between shoulder demand and what the agreed demand would be.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Max demand	233	330	337	238	199	235	261	227	201	181	184	183
Max peak demand	217	308	317				-				158	160
Max shoulder demand	233	330	337	238	199	235	261	227	201	182	184	91

Table 6: Winery 2 maximum demand by tariff monitoring period

The impact that the demand profile has on total cost is illustrated below in Figure 34. As can be seen, the network cost over vintage on the actual tariff is considerably higher than the agreed by ~$14,000 and for the remainder of the year the cost on both tariffs is relatively similar. Overall the agreed tariff is the more cost-effective for Winery 2 with an annual cost difference of $16,000 between the two tariffs.

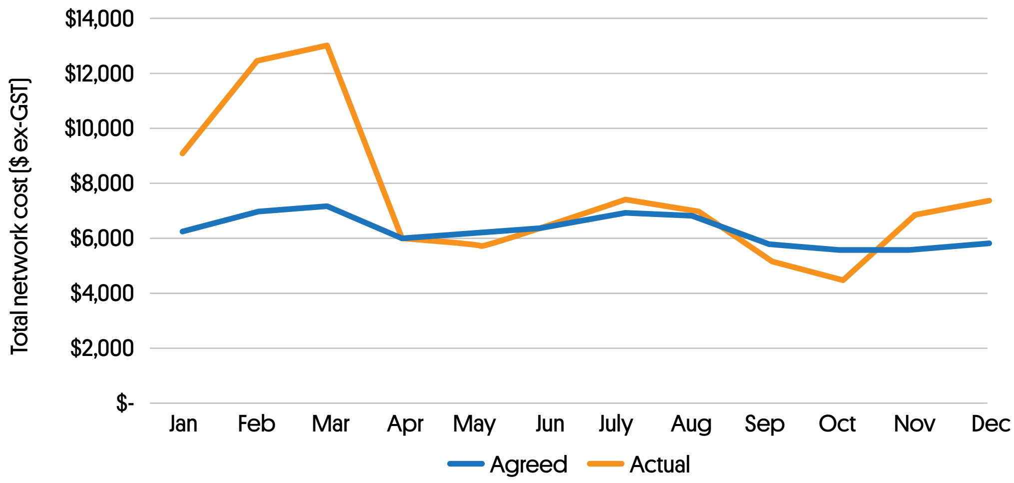


Figure 35: Winery 2 tariff comparison[9]

9 Cost based on SA Power Networks Pricing Proposal 2018-19.

Appendix B – Automated Refrigeration Load Shifting Example

A case study was conducted by the Australian Wine Research Institute in 2012 to understand the benefits of shifting refrigeration loading. The tanks underwent alternating periods of a single, constant cooling temperature set-point and periods of having distinct day and night set-point cooling temperatures (dual set-points). This is shown in Figure 35. Employing such a scheme forced the refrigeration system to kick in overnight to cool the wine to a low temperature, so it required no day-time cooling. In addition to shifting electricity demand, this process shifted approximately 580,000 kWh from peak electricity consumption hours to off-peak hours – an additional saving of approximately $38,000 p.a. (Australian Wine Research Institute, 2012).

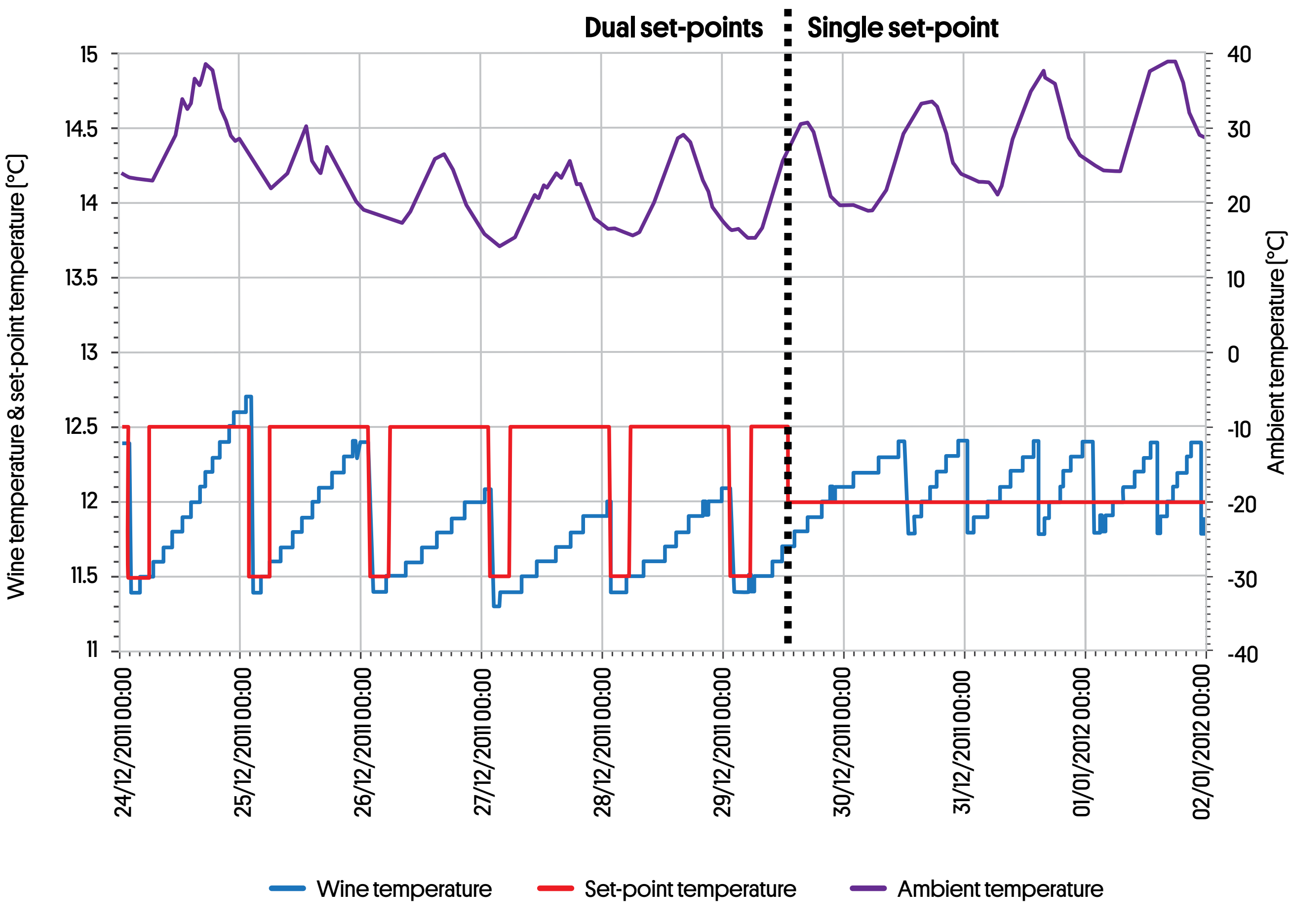


***Figure 36:** Dual Setpoint Load Shifting*

This case study can be found in its entirety at the following link:

https://www.awri.com.au/wp-content/uploads/WineryB-CaseStudyReport2.pdf