



Energy Saver

Murray Farm Energy Forum

Understanding Electricity

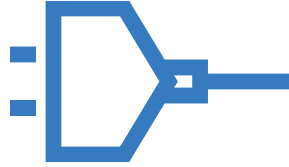
August 2019



Presenter:
Luke Christiansen from 2XE



By the end of this presentation, you will be able to:



01

Understand Energy Basics – Network setup, grid and costs

02

Understanding your energy bill

03

Energy Management

04

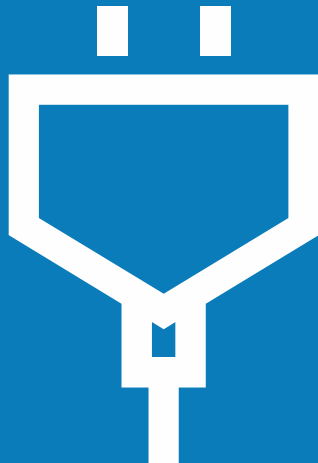
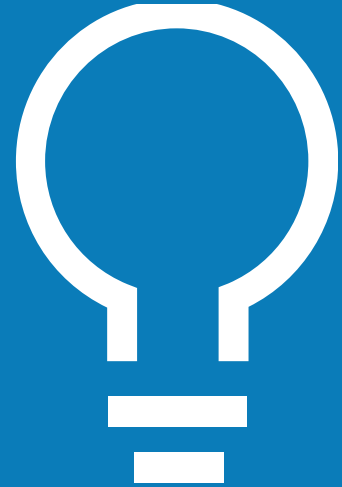
Energy Efficiency and Practical Steps

05

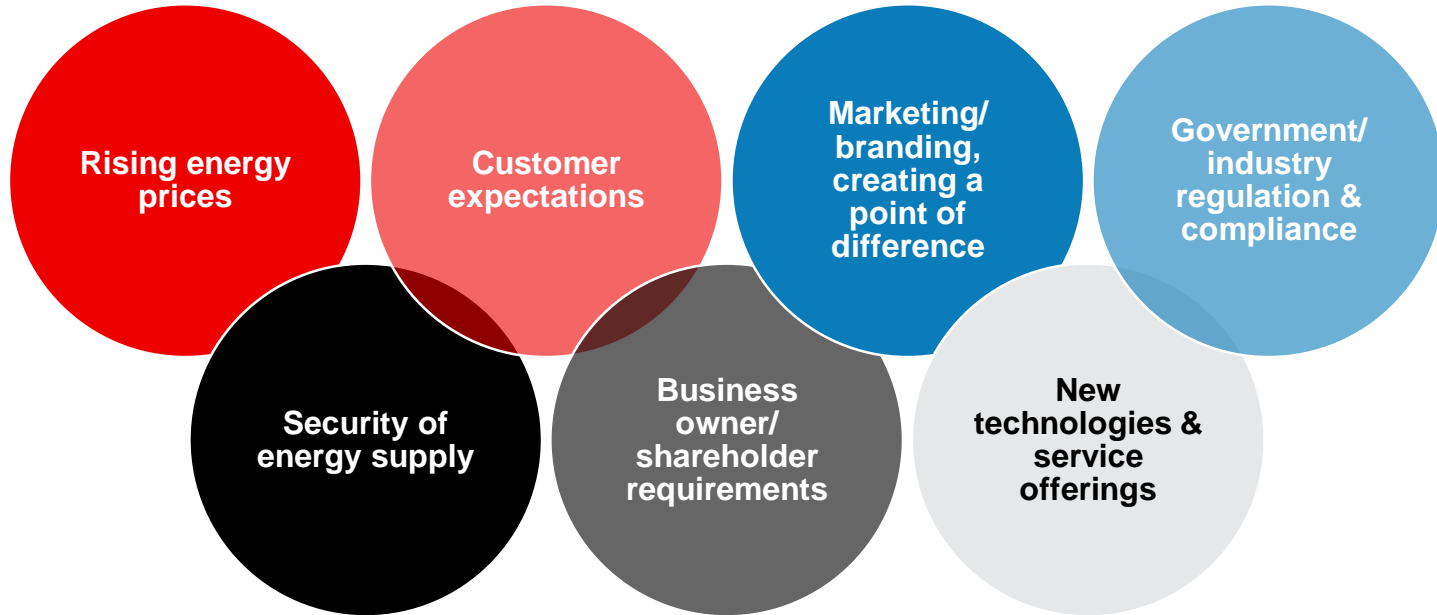
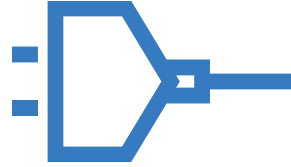
Support & Grants



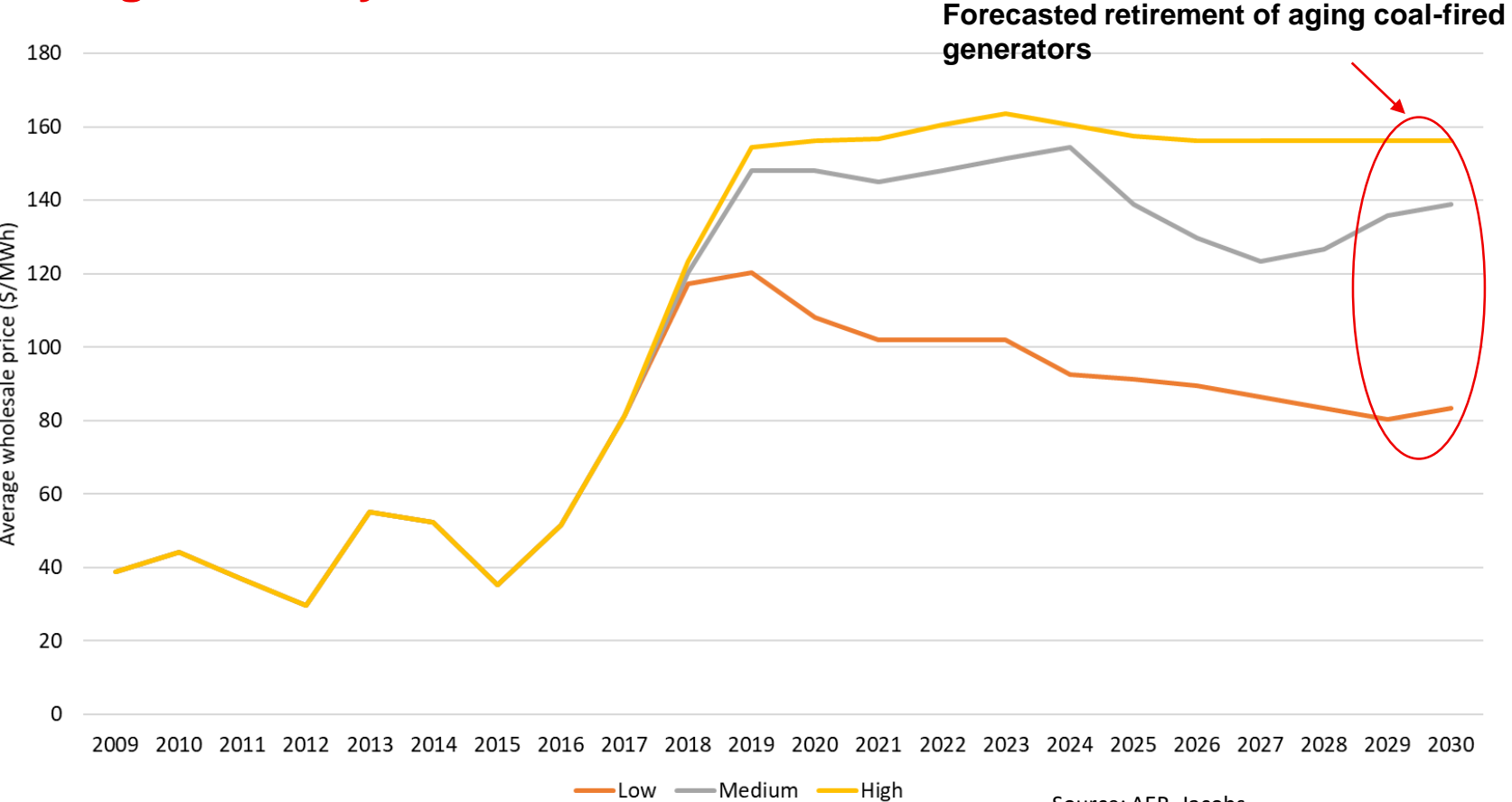
Part 1: Energy Basics



What's driving the demand for energy management?



Rising electricity costs

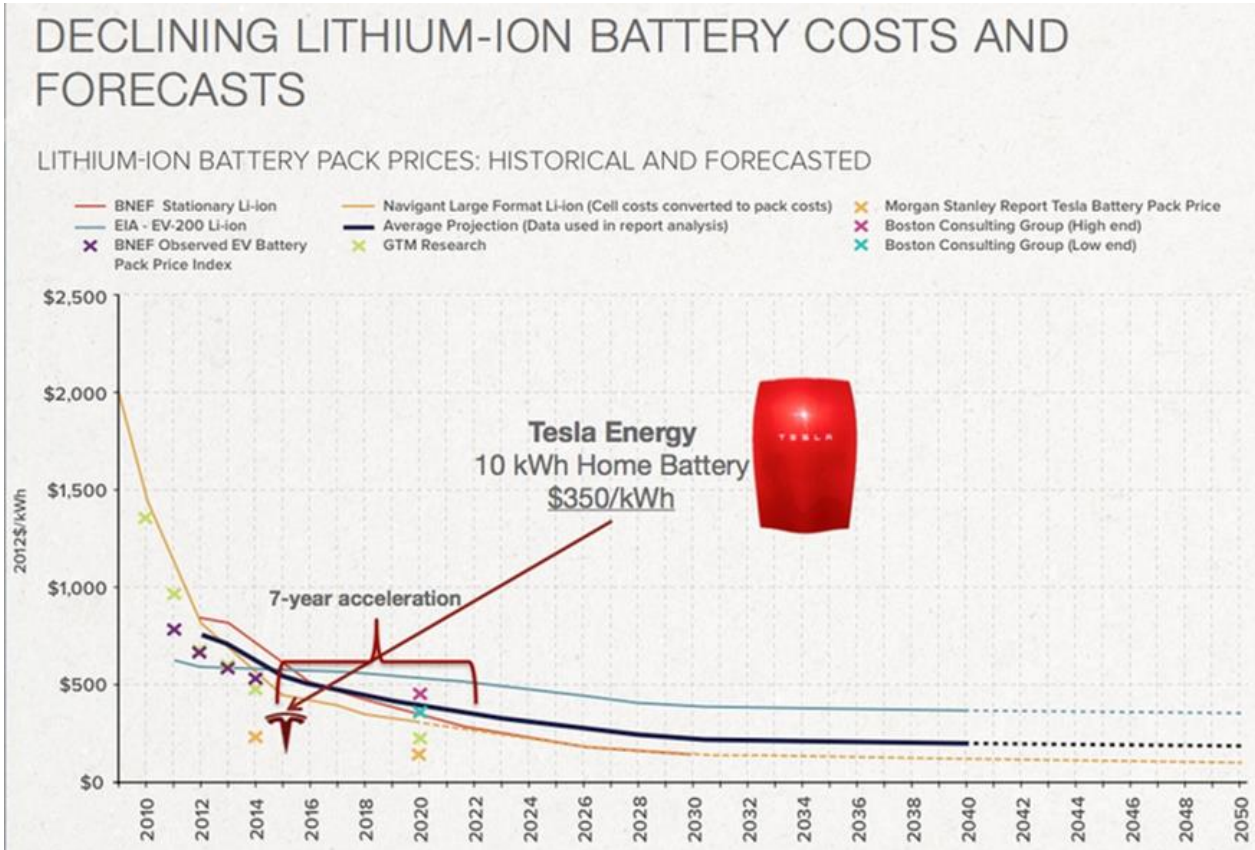


Source: AER, Jacobs

Energy Security



New Energy Solutions



How can you make the most of these changes?

Energy Management

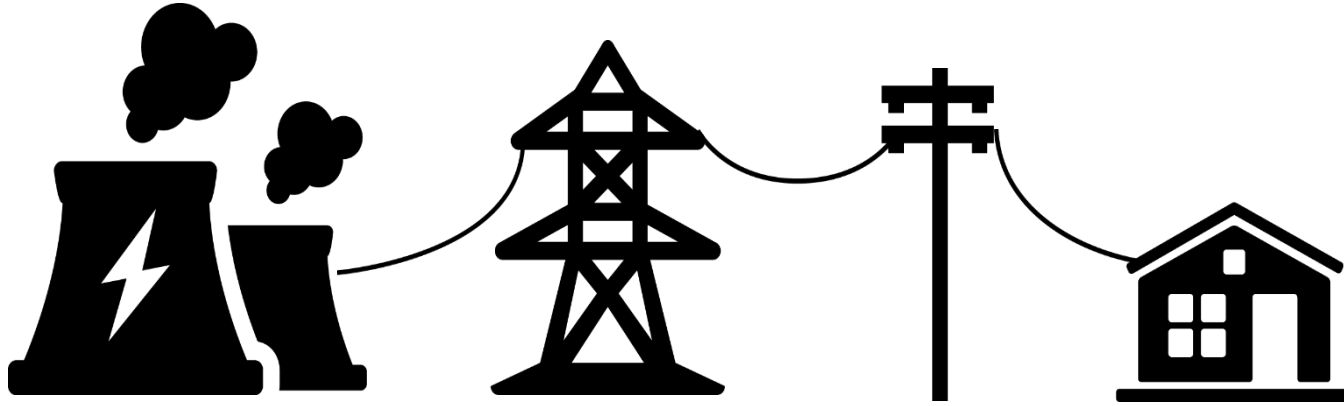
Energy management is a systematic approach to:

Understanding how your organisation **uses** energy

Identifying opportunities to **control** and **conserve** energy consumption and cost

Driving **continuous improvement** in energy performance

Where does electricity come from?



Generators

Electricity is generated at a power plant and sold to electricity retailers



Transmitters

Electricity is transmitted at a high-voltage from the power plant to distributors



Distributors

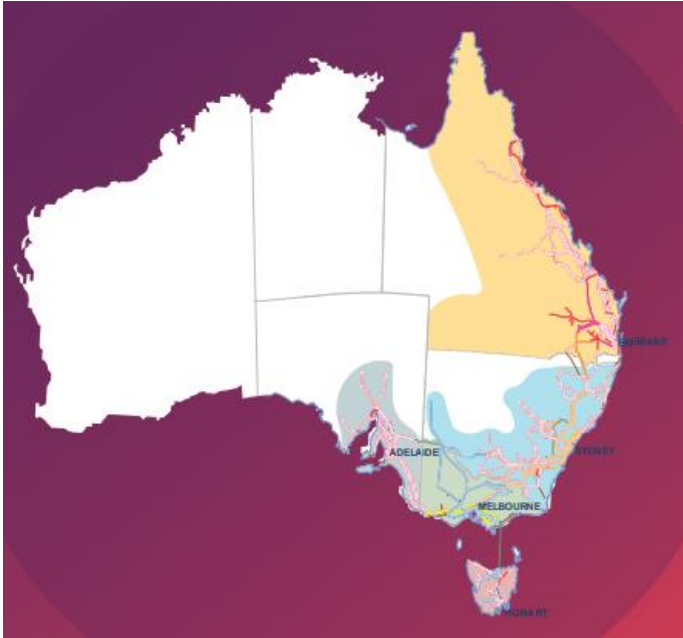
High-voltage electricity is converted to low-voltage and distributed to customers



Retailers

Customers buy electricity from retailers who are the middleman between the customer and the electricity supply chain

The National Electricity Market (NEM)



Wholesale market where generators sell electricity and retailers buy it to on-sell to consumers.

Managed by the Australian Energy Market Operator (AEMO)

Price of electricity in the NEM is based on:

1. Offers by generators to supply electricity to the market at certain volumes and time
2. Demand at any given time

Financial market price:

To manage price volatility, retailers and generators often enter into hedging contracts to fix the price for future energy sales

- 40,000 km of network
- Supply 9 million customers
- Over 100 generators and retailers

The National Electricity Market (NEM)



Continual state of
change



Electricity **demand**
varies every minute

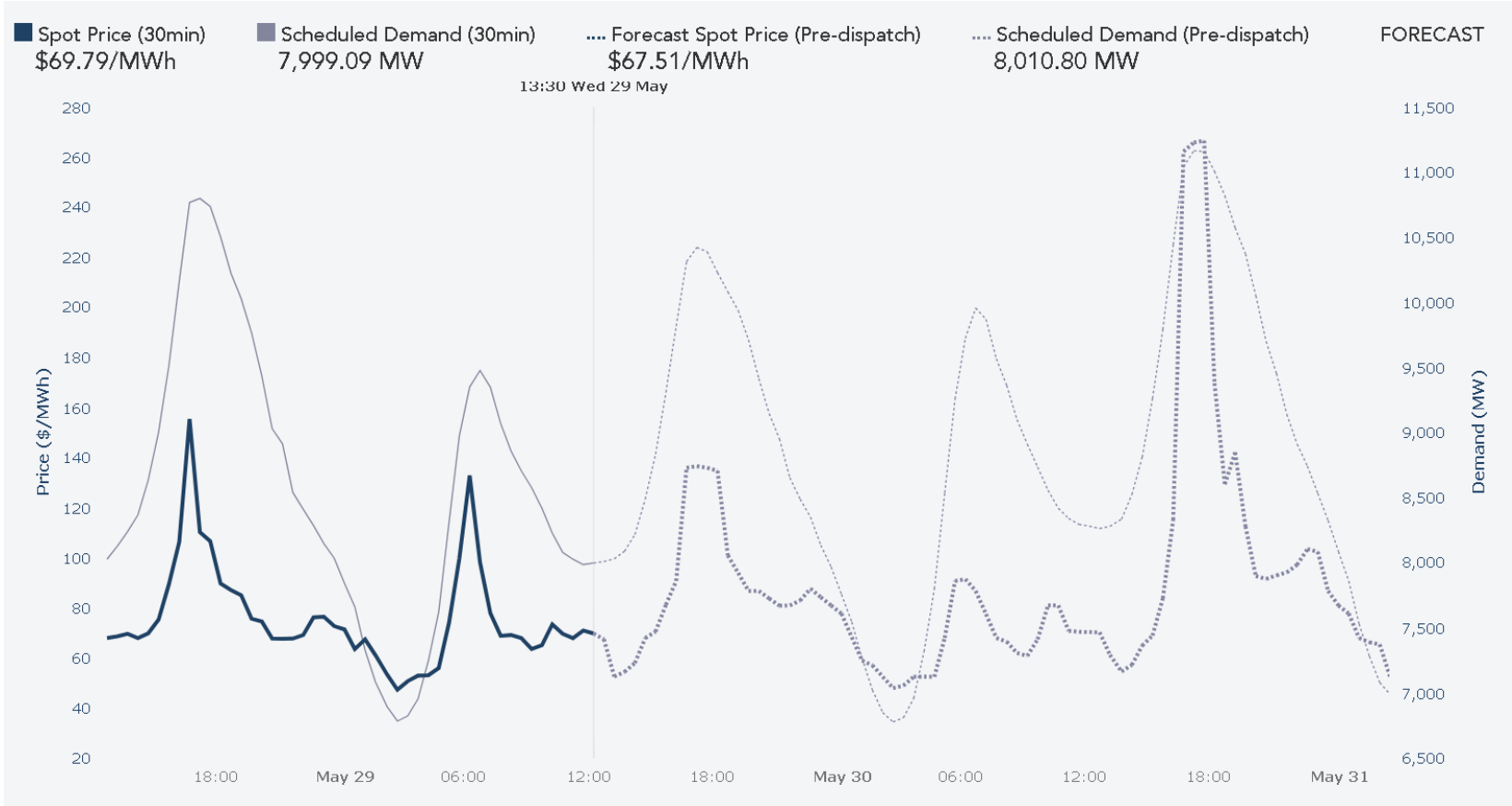


Electricity **supply** by
renewables varies
every minute

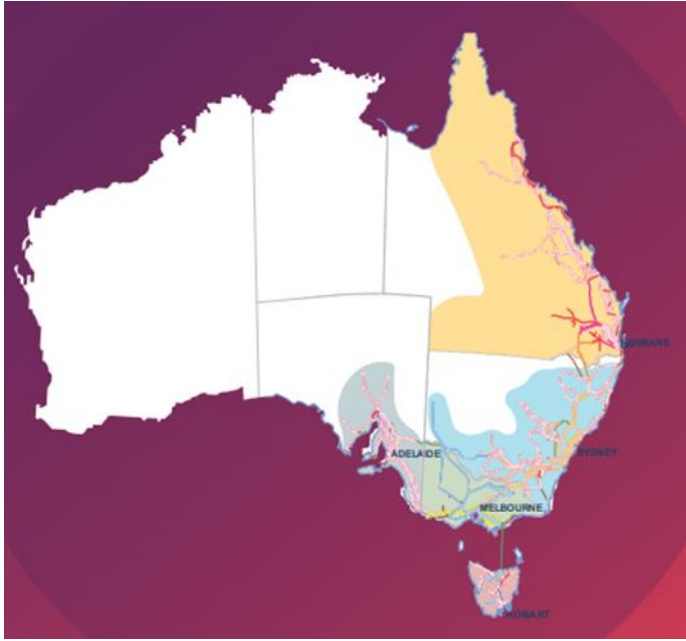


Electricity **supply** by all
other sources needs to
balance demand

Supply and Demand



Supply and Demand



Your retailer will set a price for your electricity



The actual cost of electricity will vary A LOT



1c/kWh - \$1.kWh in the real market



High demand = expensive electricity



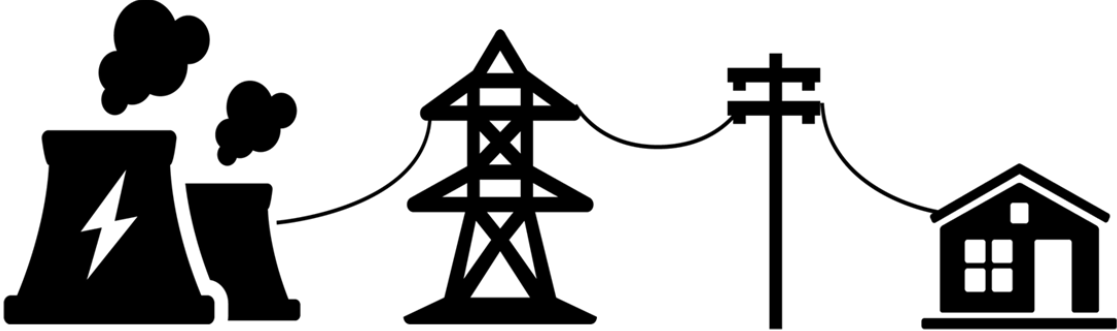
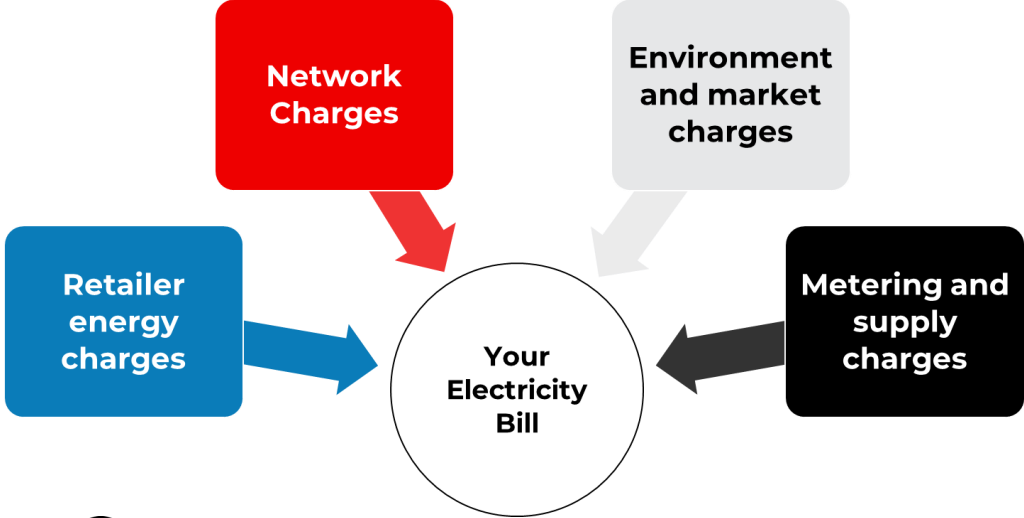
Low demand = cheap electricity



Part 2: Understanding your Energy Bill



Understanding your electricity bill



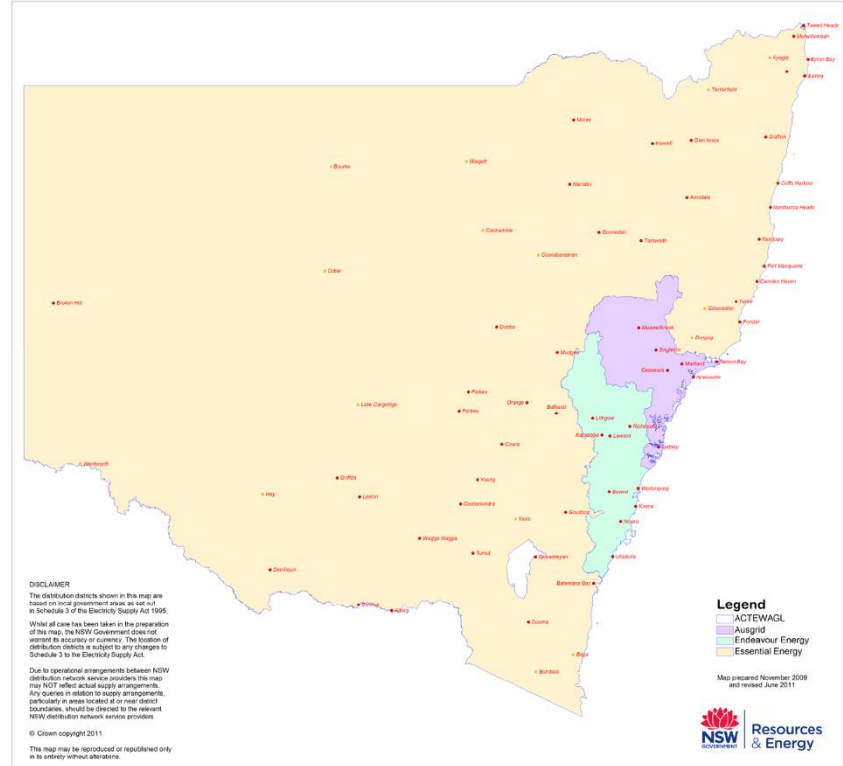
How is your business charged for electricity use?

The way you are charged for electricity use depends on your electricity distributor. There are three electricity distributors in NSW.

Ausgrid:
Inner, northern and eastern metropolitan Sydney

Endeavour:
Southern and western metropolitan Sydney

Essential Energy:
Country and regional NSW



How is your business charged for electricity use?

How you are charged is also dependent on whether you are a small or a large business.



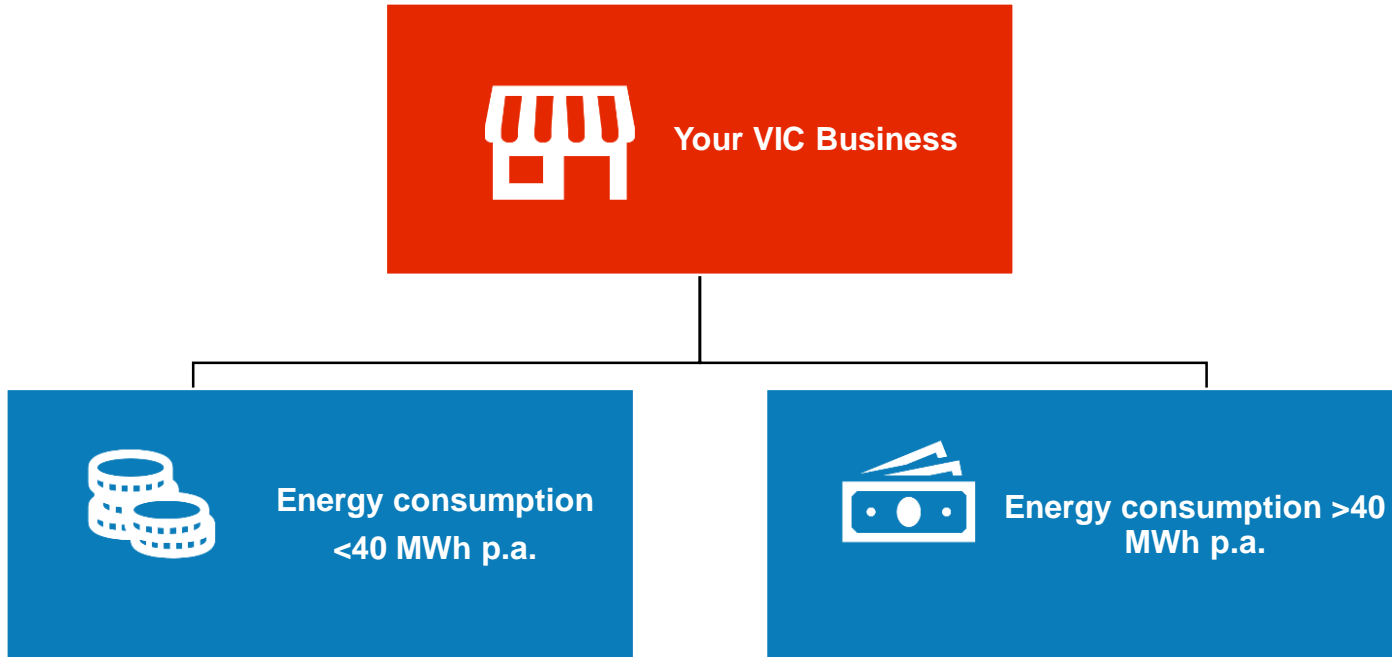
How is your business charged for electricity use?

The way you are charged for electricity use depends on your electricity distributor. There are 5 electricity distributors in Victoria.



How is your business charged for electricity use?

How you are charged is also dependent on the amount of electricity you consume.



How is your business charged for electricity use?

As a small business you may be on one of two tariff types:



Block Anytime (closed for VIC)

- Charged for energy consumed regardless of when it is consumed
- Energy charge varies according to the level of energy consumption in quarterly billing
- Must have an accumulation meter



Time-of-use

- Charged for electricity consumption based on peak, shoulder and off-peak periods
- Must have a type 5 meter or smart meter

How is your business charged for electricity use?

As a large business you will be transitioned onto a smart meter and you have no choice as to the type of tariff you are on:



Time-of-use & Capacity Charge

- Charged for electricity consumption based on peak, shoulder and off-peak periods
- You have to pay for the maximum electricity demand that occurred between 2pm & 8pm on a working weekday over the last 12 months.
- Must have a type 5 meter or smart meter

How is your business charged for electricity use?

If your business is classed as a large business, or you have opted into a demand-based tariff, you are charged based on your network demand (kVA) as well as consumption (kWh). But what is demand?

Consumption

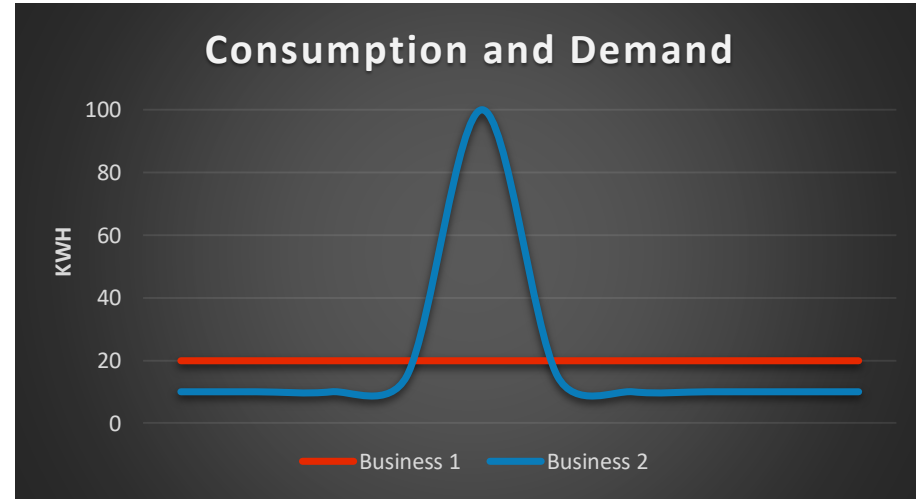
Business 1 and Business 2 have the same daily consumption (220kWh).

Demand

- Business 1 has a low and constant demand.
- Business 2 has a very high peak demand caused by using high-power equipment.

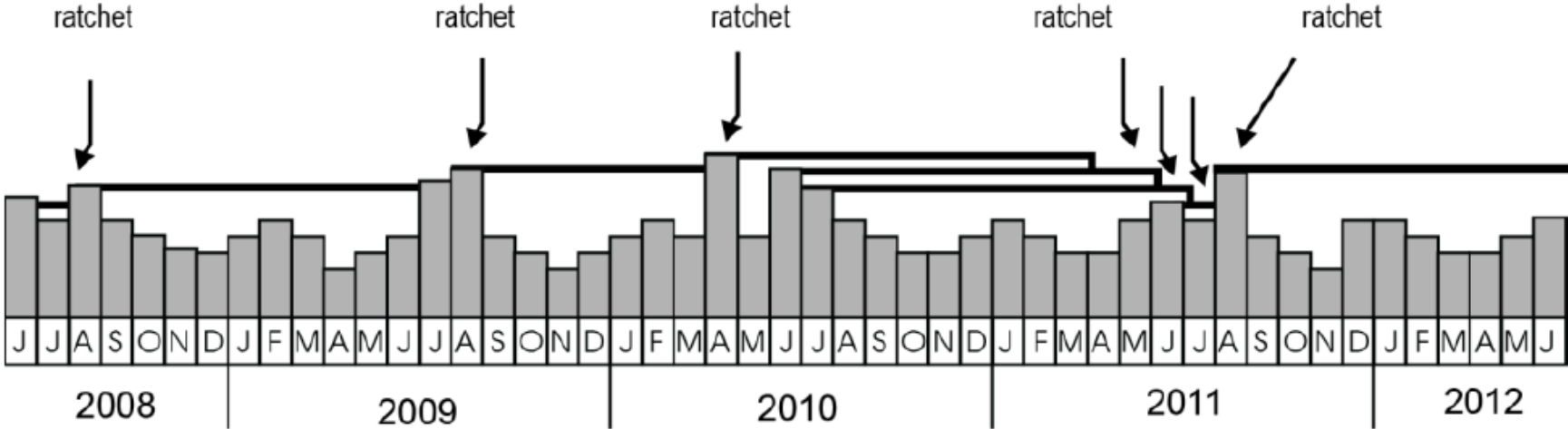
Strain

- Business 1 creates very little strain on the network infrastructure.
- Business 2 creates a lot of strain on the network infrastructure, and they pay for it!

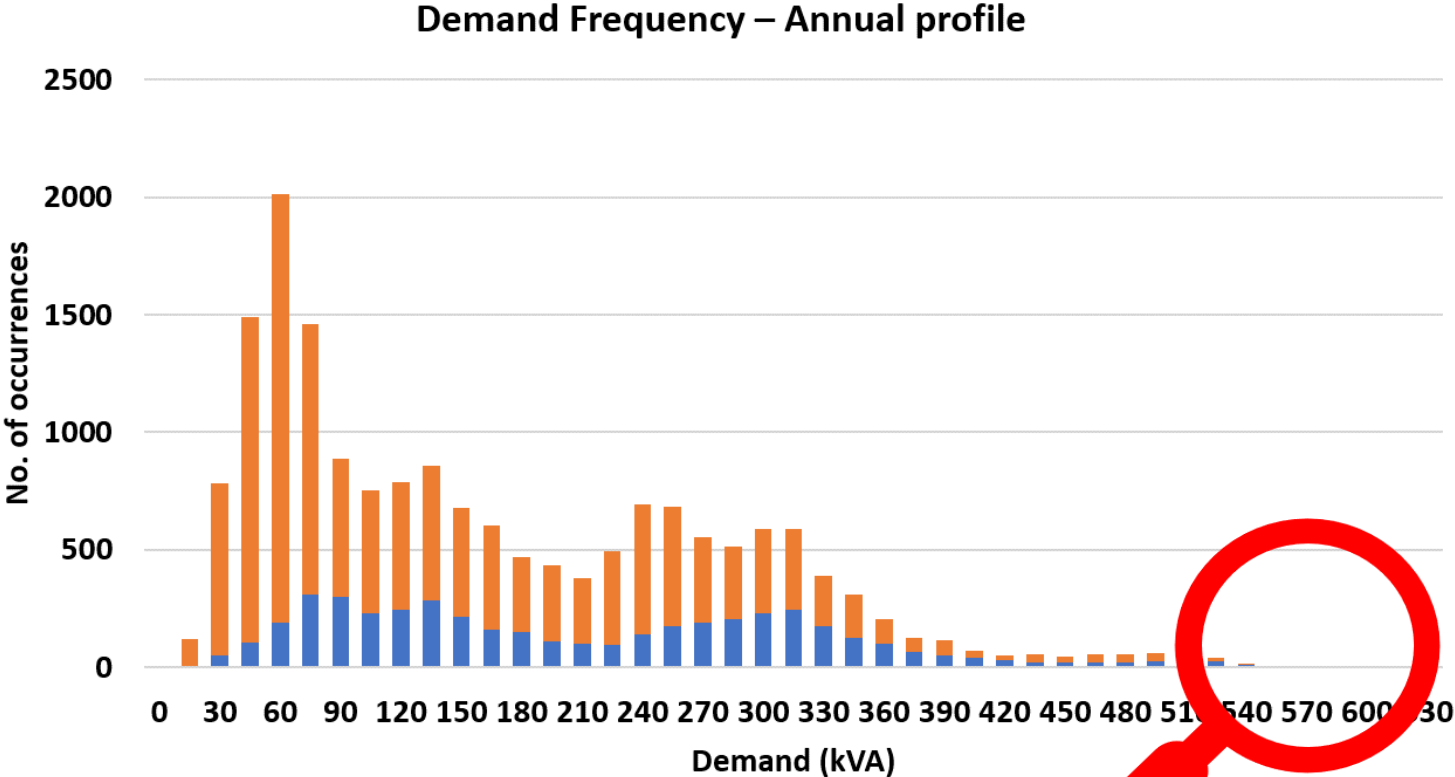


Rolling capacity charge – applicable to large business customers in VIC

Illustrative example of the ratcheting of the capacity charge calculation



What does a rolling capacity charge mean?



NSW Electricity Bill Analysis

Analysis of small business retail energy bills in Australia

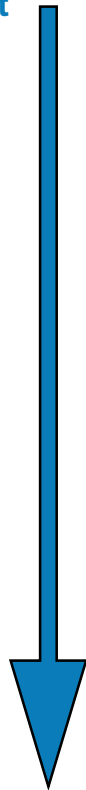
Final Report, June 2019

Small and Medium Enterprise (SME) Retail Tariff Tracker Project

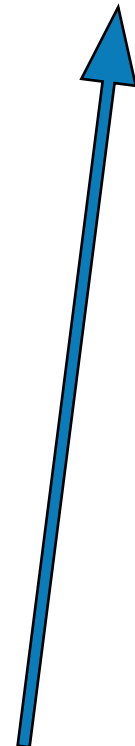
Prepared by Alvis Consulting, with Energy Consumers Australia



Cheapest



	Powerclub	\$6,290
	Energy Australia	\$6,600
	QEnergy	\$6,625
	AGL	\$6,679
	Energy Locals	\$6,689
	Momentum Energy	\$6,741
	Sumo Power	\$6,860
	CovaU	\$6,882
	Simply Energy	\$6,896
	BlueNRG	\$6,901
	Amaysim	\$6,975
	Powershop	\$6,983



	Next Business Energy	\$7,050
	Red Energy	\$7,107
	Alinta Energy	\$7,121
	Origin Energy	\$7,239
	1st Energy	\$7,476
	Powerdirect	\$7,536
	Diamond Energy	\$7,881
	Commander Electricity	\$8,066
	Click Energy	\$8,332

Most expensive

This report analyses the bills for SMEs consuming 20,000kWh of electricity per annum on a single rate tariff. Research Published by AEMO.

Available at:
<https://energyconsumersaustralia.com.au/wp-content/uploads/SME-Retail-Tariff-Tracker-Final-Report-June-2019.pdf>

VIC Electricity Bill Analysis (AUSNET)

Analysis of small business retail energy bills in Australia

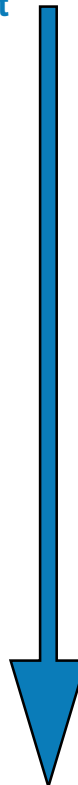
Final Report, June 2019














Small and Medium Enterprise (SME) Retail Tariff Tracker Project

Prepared by Alvis Consulting, with Energy Consumers Australia



Cheapest



	Tango Energy	\$6,199
	Powerdirect	\$6,237
	Energy Australia	\$6,437
	AGL	\$6,602
	Sumo Power	\$6,755
	Red Energy	\$6,792
	Powershop	\$6,024
	Origin Energy	\$7,088
	Momentum Energy	\$7,150
	Lumo Energy	\$7,195
	Commander Electricity	\$7,231
	Alinta Energy	\$7,238
	CovaU	\$7,445



	BlueNRG	\$7,459
	People Energy	\$7,557
	1st Energy	\$7,756
	Next Business Energy	\$7,906
	Simply Energy	\$7,924
	Click Energy	\$7,927
	Diamond Energy	\$8,298
	Amaysim	\$8,524
	GloBird	\$8,638

Most expensive

This report analyses the bills for SMEs consuming 20,000kWh of electricity per annum on a single rate tariff. Research Published by AEMO.

Available at:

<https://energyconsumersaustralia.com.au/wp-content/uploads/SME-Retail-Tariff-Tracker-Final-Report-June-2019.pdf>

VIC Electricity Bill Analysis (Powercor)

Analysis of small business retail energy bills in Australia

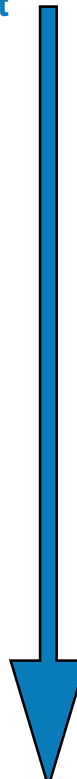
Final Report, June 2019

Small and Medium Enterprise (SME) Retail Tariff Tracker Project

Prepared by Alvis Consulting, with Energy Consumers Australia



Cheapest



	Momentum Energy	\$4,837
	Tango Energy	\$4,851
	Powerdirect	\$5,024
	AGL	\$5,308
	BlueNRG	\$5,475
	Sumo Power	\$5,490
	Alinta Energy	\$5,566
	Click Energy	\$5,572
	Lumo Energy	\$5,574
	1st Energy	\$5,624
	Energy Australia	\$5,658
	Commander Electricity	\$5,692
	Powershop	\$5,724

	CovaU	\$5,789
	Red Energy	\$5,849
	Amaysim	\$5,991
	Next Business Energy	\$6,010
	Simply Energy	\$6,047
	Origin Energy	\$6,121
	Diamond Energy	\$6,370
	GloBird	\$6,527
	People Energy	\$6,609

Most expensive

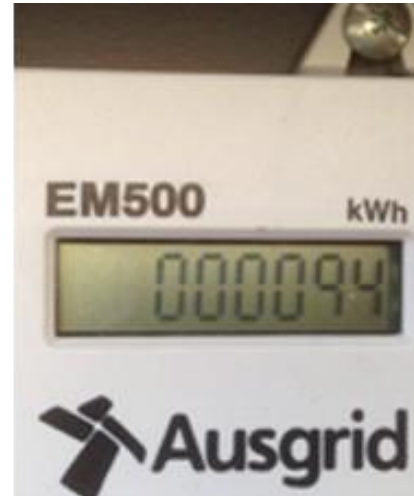


This report analyses the bills for SMEs consuming 20,000kWh of electricity per annum on a single rate tariff. Research Published by AEMO.

Available at:
<https://energyconsumersaustralia.com.au/wp-content/uploads/SME-Retail-Tariff-Tracker-Final-Report-June-2019.pdf>

Types of Meters – Three types – Accumulation Meters

Accumulation meters, also known as single rate or flat meters, measure how much electricity has been consumed by the property. Accumulation meters can't discern when the electricity has been used, so customers are charged the same rate for electricity regardless of the time of day that they use power. Some customers may also choose a [block rate tariff](#) depending on the distributor. These tariffs charge different rates depending on how much electricity you've used.



Interval Meters

Interval meters record electricity usage every 30 minutes. This means power retailers can charge you different rates depending on the [time of the day](#) you use electricity. In this case, you may be charged with a [time of use tariff](#). Time of use tariffs can charge customers extremely low rates during off-peak times such as late at night. But the trade-off is that you're charged very high rates during peak demand times around the early evening. Even if you have an interval meter, you can still opt to be charged on a flat rate or block rate if you're not comfortable with paying different prices for different times of day



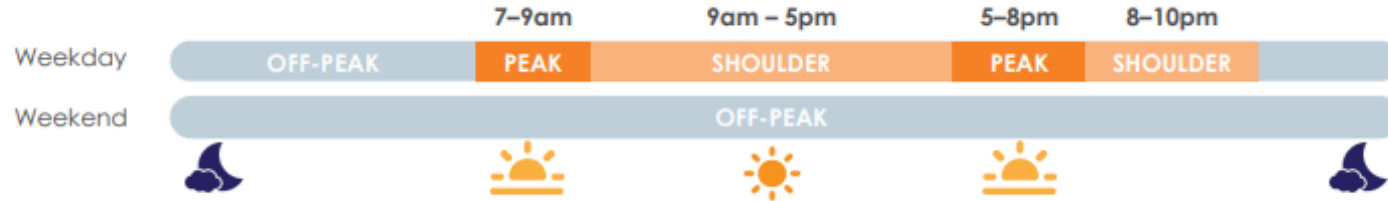
Smart Meters

Smart meters, also commonly known as 'digital meters', are the latest in energy metering technology. Similar to interval meters, they record electricity usage in 30-minute intervals allowing different rates to be charged at different times of day. In some parts of Australia, your smart meter may even be referred to as an interval meter – the difference however is that smart meters can be remotely read. This means a meter reader doesn't need to visit your property and you should never receive estimated bills.



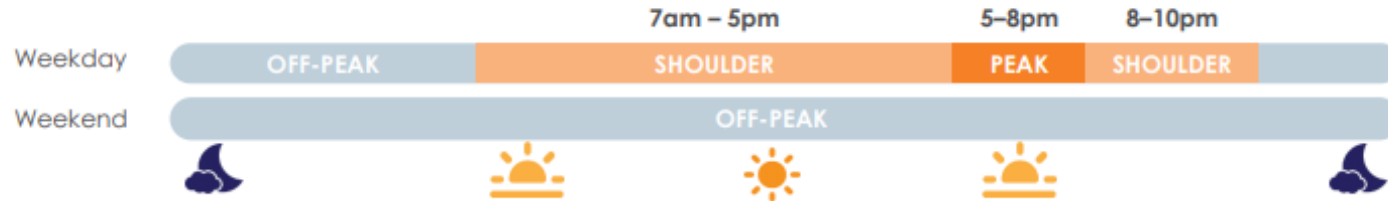
Network Tariffs Times – Essential energy (NSW)

Charging windows for Type 5 meter



Interval/smart meters can be remotely reprogrammed. There is just one peak period for these types of meters.

Charging windows for interval/smart meters



- <https://www.essentialenergy.com.au/-/media/Project/EssentialEnergy/Website/Files/Our-Network/TimeofUseBrochure.pdf>
- <https://www.essentialenergy.com.au/-/media/Project/EssentialEnergy/Website/Files/About-Us/EssentialEnergyRevisedProposal12-1RevisedTSS.pdf?la=en&hash=5C7C97AAC68F067FABB3C5EBE2C32CA0608E7AF2>

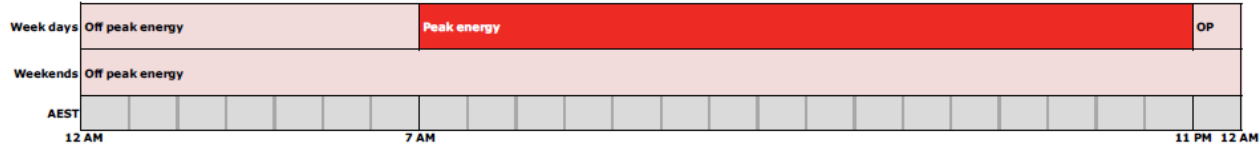
Network Tariffs Times – Ausnet (VIC)

Generally

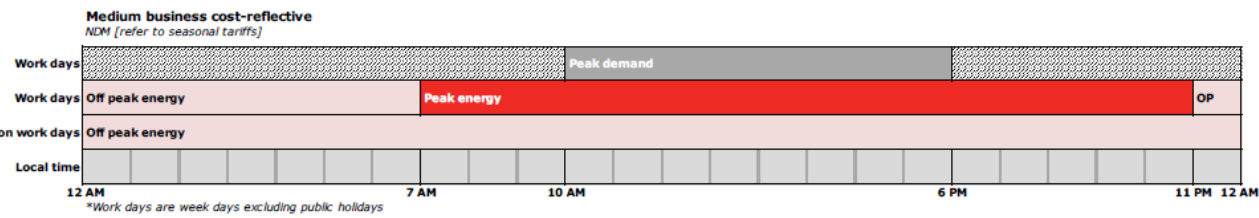
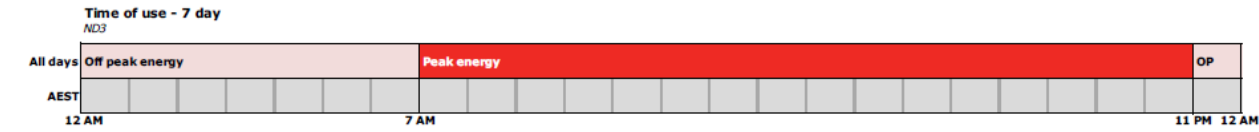
Peak: 7am – 11pm, Mon-Fri

**Ask your electricity retailer or
check your bills for more info**

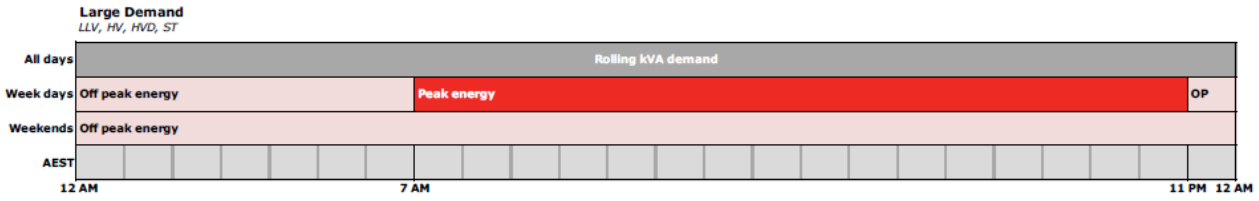
Network Tariffs Times – Powercor (VIC)



Small business tariff



Medium business tariff



Large business tariff

1. <https://www.aer.gov.au/system/files/AER%20approved%20-%20Powercor%20-%20Pricing%20proposal%202019%20-%202031%20October%202018.pdf>

Types of bills

Bundled

- For homes and small businesses
- Simple
- Bundled bills often hide additional charges and expenses which can be reduced or removed.

Unbundled

- All large businesses
- Complex
- Unbundled bills outline all of the various charges that make-up the total electricity cost.

Your electricity bill

22 Dec 18 - 21 Mar 19

LOT 111 275 MAIN RD KANOOKA NSW 2550

YOUR ACCOUNT DETAILS	DUE DATE	AMOUNT DUE
Account number 200 025 329 273 Tax invoice 127 001 529 927 Issue date 22 Mar 19 Total amount due See the Account Summary on page 2	5 Apr 19	\$3,751.56

\$12.00 fee may apply if paid after due date

YOUR ENERGY PLAN	YOUR USAGE SUMMARY
BusinessSaver ending 4 Mar 21 This bill also includes benefits from your previous energy plan Benefits available on this energy plan Guaranteed usage discount (32%)	<p>Average cost per day \$41.68 Average daily usage 176.30 kWh Same time last year 181.45 kWh</p> <p>2.84% decrease in usage since last year</p> <p>Your indicative greenhouse gas emissions Total for this bill 15.2 tonnes Same time last year 15.7 tonnes Saved with GreenPower N/A</p> <p>For more information on greenhouse gas emissions visit originenergy.com.au</p>

NEED TO GET IN TOUCH?
Enquiries & moving address: 1800 444 345
8 am - 6 pm local time Mon - Fri

Faults & emergencies: 13 20 80
Call Essential Energy 24 hrs

FIND OUT MORE
originenergy.com.au

HOW TO PAY		
DIRECT DEBIT Register online at originenergy.com.au/busmyaccount or call 1800 444 345 to arrange automatic payment of future accounts	MAIL Send this slip with your cheque made payable to: Origin Energy Holdings Limited, Locked Bag 304 Silverwater NSW 1811	TELEPHONE & INTERNET BANKING - BPAY* Contact your bank or financial institution to make this payment from your cheque, savings, debit, credit card or transaction account. More info: www.bpay.com.au
VISA OR MASTERCARD** Call 1300 658 783 or visit originenergy.com.au/buspayout	IN PERSON Pay at any Post Office™	
Biller Code: 41 Ref: 200 025 329 273	Billpay Code: 2958 Ref: 1200 0253 2927 3	Biller Code: 130112 Ref: 200 025 329 273

*Card payment fee may apply to the total payment amount (incl GST) - debit card (Visa 0.26%, Mastercard 0.32%), credit card (Visa 0.60%, Mastercard 0.72%). For NSW customers 0.49% if payment made at Australia Post. Fees on rent bill. Conditions apply. **Payment processing fee of the higher of \$2.00 or 0.49% may apply (incl GST)

YOUR USAGE SUMMARY

Average cost per day **\$41.68**
Average daily usage **176.30 kWh**
Same time last year **181.45 kWh**

2.84% decrease
in usage since last year

Your indicative greenhouse gas emissions
Total for this bill **15.2 tonnes**
Same time last year **15.7 tonnes**
Saved with GreenPower **N/A**

For more information on greenhouse gas emissions visit originenergy.com.au

181.45 kWh LAST YEAR
176.30 kWh THIS YEAR

ACCOUNT SUMMARY	NEED TO GET IN TOUCH?
Previous activity Opening balance \$4,421.64 Payments received \$4,421.64 CR	Moving address? Go online originenergy.com.au/busmovers (allow 3 business days notice)
Balance carried forward \$0.00	Contact us We're happy to help - any questions or complaints: My Account login originenergy.com.au/busmyaccount Call us 1800 444 345
Your new charges Total electricity charges - incl discounts and rebates (incl GST of \$352.04) \$3,872.39	
Your solar contribution	

ACCOUNT SUMMARY

Previous activity	
Opening balance	\$4,421.64
Payments received	\$4,421.64 CR
Balance carried forward	\$0.00
Your new charges	
Total electricity charges - incl discounts and rebates (incl GST of \$352.04)	\$3,872.39
Your solar contribution	\$120.83 CR
Total amount due <small>(incl net GST charges of \$352.04)</small>	\$3,751.56

PAYMENTS RECEIVED

13 Jan 19	BPAY Bank Account	\$4,421.64 CR
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TOTAL ELECTRICITY CHARGES

Your site details

Supply address
LOT 111 275 MAIN RD KANOONA NSW 2550

National Meter Identifier (NMI)
42040907581

Next billing date
3 month(s)

Meter read
Actual

Period: 22 Dec 18 - 21 Mar 19 (90 days)
Your rate: General Supply ToU

Peak: 7 am-9 am and 5 pm-8 pm weekdays | Shoulder: 9 am-5 pm and 8 pm-10 pm weekdays | Off peak: all other times. Times are AEST. If you have an interval meter it'll adjust for daylight savings.

Meter no	Usage type	Usage (kWh)
216840881	Peak	3026.321
	Off-Peak	9670.674
	Shoulder	3170.411
	Total kWh	15867.406

22 Dec 18 - 4 Mar 19 (73 days)	Usage (kWh)	Charge	Amount
Charges			
Peak Usage	2196.753	36.45 c/kWh	\$800.72
Off-Peak Usage	7846.491	21.43 c/kWh	\$1,681.50
Shoulder Usage	2474.62	35.20 c/kWh	\$871.07

Continued on the next page...

NEED TO GET IN TOUCH?

- Moving address?**
- Go online: originenergy.com.au/busmovers (allow 3 business days notice)
- Contact us**
- We're happy to help - any questions or complaints
- My Account login: originenergy.com.au/busmyaccount
 - Call us **1800 444 345** (8 am - 6 pm local time Mon - Fri)
 - Go online: originenergy.com.au/buscontact
 - Write to us (no payments): Origin Energy Business Centre, GPO Box 186, Melbourne VIC 3001
- Solar and Home Products**
- For Solar Power, Emergency Hot Water (24/7), Heating and Cooling Products. Sales, installation, service and solar billing enquiries call **1300 791 468**.

National Relay Service

If you have a hearing or speech impairment, contact us through the National Relay Service. For more information, visit www.relaysservice.gov.au

Need an interpreter?
Call **1300 137 427**

خدمة الترجمة الهاتفية للناطقين في اللغة العربية.
Servico Telefonico de Interpretes para ome idiomas.
Pho lingua oita el inglese contatate il Servico el interpretacion telefonica.
Dinh vu nhing dinh oai dien thoi ome nhing ngoi ngu.
Hoc tieng anh sang Anh.
Tolkovneni Yngvinda Isppjovner ves tilkall, vildnast ogok tilk omyklic.
非英語語言電話傳譯服務。

TOTAL ELECTRICITY CHARGES

Your site details

Supply address
LOT 111 275 MAIN RD KANOONA NSW 2550

National Meter Identifier (NMI)
42040907581

Next billing date
3 month(s)

Meter read
Actual

Period: 22 Dec 18 - 21 Mar 19 (90 days)

Your rate: General Supply ToU

Peak: 7 am-9 am and 5 pm-8 pm weekdays | Shoulder: 9 am-5 pm and 8 pm-10 pm weekdays | Off peak: all other times. Times are AEST. If you have an interval meter it'll adjust for daylight savings.

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216840881

Usage type	Usage (kWh)
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Shoulder Usage	2474.62	35.20 c/kWh	\$871.07

Continued on the next page...



*29581 200025329273

Trancode	User code	Customer reference number
831	067222	000200025329273

Due date
(for new charges only)

05 / Apr / 19

Amount due

\$ 3,751.56

<0000375156> <067222> <000200025329273> >

...Continued from the previous page

Supply Charge	669.01 c/Day	\$488.38
Discounts and Rebates		
Guaranteed usage discount (32%)		\$1,073.05 CR
5 Mar 19 - 21 Mar 19 (17 days): energy plan change		
Charges		
Peak Usage	829.568 36.45 c/kWh	\$302.38
Off-Peak Usage	1824.183 21.43 c/kWh	\$390.92
Shoulder Usage	695.791 35.20 c/kWh	\$244.92
Supply Charge	669.01 c/Day	\$113.73
Discounts and Rebates		
Guaranteed usage discount (32%)		\$300.22 CR
Total for period 22 Dec 18 - 21 Mar 19 (excl GST)		\$3,520.35
Total electricity charges		
Charges less discounts and rebates		\$3,520.35
GST		\$352.04
Your total electricity charges (incl GST)		\$3,872.39

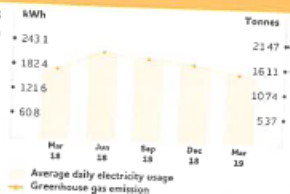
TOTAL SOLAR FEED-IN CREDIT

Period: 22 Dec 18 - 21 Mar 19 (90 days)

Meter no	Export (kWh)
216840881	1510.271
22 Dec 18 - 4 Mar 19 (73 days)	Export (kWh) Rate (credit) Amount:
Solar Feed-in (incl. any GST)	
First 0-20000	1299.823 8.00 c/kWh \$103.99 CR
5 Mar 19 - 21 Mar 19 (17 days)	
Solar Feed-in (incl. any GST)	210.448 8.00 c/kWh \$16.84 CR
First 0-4657	
Your total solar feed-in credit:	\$120.83 CR

YOUR USAGE BREAKDOWN

Average cost per day	\$41.68
Average daily usage	176.30 kWh
Same time last year	181.45 kWh
Your indicative greenhouse gas emissions	
Total for this bill	15.2 tonnes
Same time last year	15.7 tonnes
Saved with GreenPower	N/A



For more information on greenhouse gas emissions visit originenergy.com.au

Unbundled bill

Large business

Pricing Details			Account:	
Charges	Usage	Unit Price	Loss Factor	Total Price (excl GST)
Retail Energy Usage Charges				
NSW Peak	6,250.240 kWh	4.6029 c/kWh	1.13016	\$325.14
NSW Off Peak	14,604.640 kWh	3.2129 c/kWh	1.13016	\$530.31
NSW Shoulder	15,047.200 kWh	4.6029 c/kWh	1.13016	\$782.76
Environmental Schemes				
NESC	35,902.080 kWh	0.0823 c/kWh	1.08690	\$32.12
LRECs	35,902.080 kWh	0.3954 c/kWh	1.08690	\$154.29
Greenpower (6%)	35,902.080 kWh	0.3124 c/kWh	1.08690	\$121.90
SRECs	35,902.080 kWh	0.4669 c/kWh	1.08690	\$182.19
Network Charges				
BLND3AO - Peak	6,250.240 kWh	4.4928 c/kWh		\$280.81
BLND3AO - Shoulder	15,047.200 kWh	4.4928 c/kWh		\$676.04
BLND3AO - Off Peak	14,604.640 kWh	2.8655 c/kWh		\$418.50
BLND3AO - Demand Peak	124.000 kVA	8.1296 \$/kVA/Mth		\$1,008.07
BLND3AO - Demand Off Peak	65.000 kVA	1.8581 \$/kVA/Mth		\$120.78
BLND3AO - Demand Shoulder	138.000 kVA	8.1296 \$/kVA/Mth		\$1,121.88
BLND3AO - Supply Charge	31 Days	13.9081 \$/Day		\$431.15
Market Operator Charges				
AEMO Ancillary Fee	35,902.080 kWh	0.0227 c/kWh	1.08690	\$8.86
AEMO Market Fee	35,902.080 kWh	0.0315 c/kWh	1.08690	\$12.29
Metering Charges				
Meter Charge		820.00 \$/mtr/pa		\$69.64
GST				\$627.67
Total (excl GST)				\$6,276.73
TOTAL for NMI				\$6,904.40



Find an energy plan

Select the right plan for you



Get energy smart

Understand plans, bills and your rights



Control your costs

Help to reduce your energy bills

Find an energy plan

We compare all the retailers to help select the right plan

Compare plans and prices



Electricity



Gas



Electricity and Gas

Your **postcode**



Enter your postcode

Get started

[Information for customers who are off-grid or in an embedded network](#)



Hot topics | [View all](#)

Switch

Ready to switch providers? Look over our checklist first!

Save

Read our tips to help you pay less for your energy.

QUICK LINKS

- [Need help comparing energy plans? \[video\]](#)
- [Having trouble paying your energy bill? \[video\]](#)
- [How much energy are you using?](#)



For consumers

How to make a PowerCall



Once you get onto a customer service representative, ask them the following questions:

- **Is my current plan the best one for me?**
- **How can I lower my energy bills?**

If you're having difficulty paying your bills, it's your right to ask for help. Say:

- **I'm having trouble paying my bill, what can you do to help?**
- **I can't pay what you're asking me to, are you able to put me on your hardship program?**
- **Am I eligible for a government concession?**

Great. I did it. Now what?

Make a PowerCall

Make a call to your energy company now. Just choose your energy company below and we'll give you the best number to call to get a better deal.

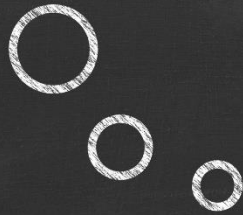
Origin

132 461

“What uses energy on my farm?”

Think of up to 9 reasons!

Time: 2 mins



Evaluate

For each option score them from 1 to 10



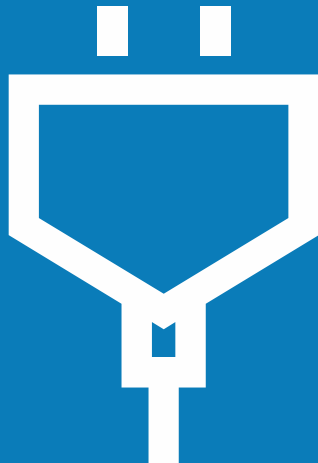


Let's take a break!



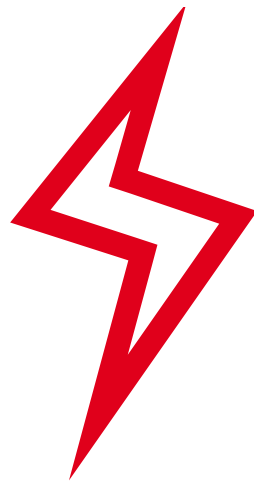


Part 3: Energy Management



What is energy management?

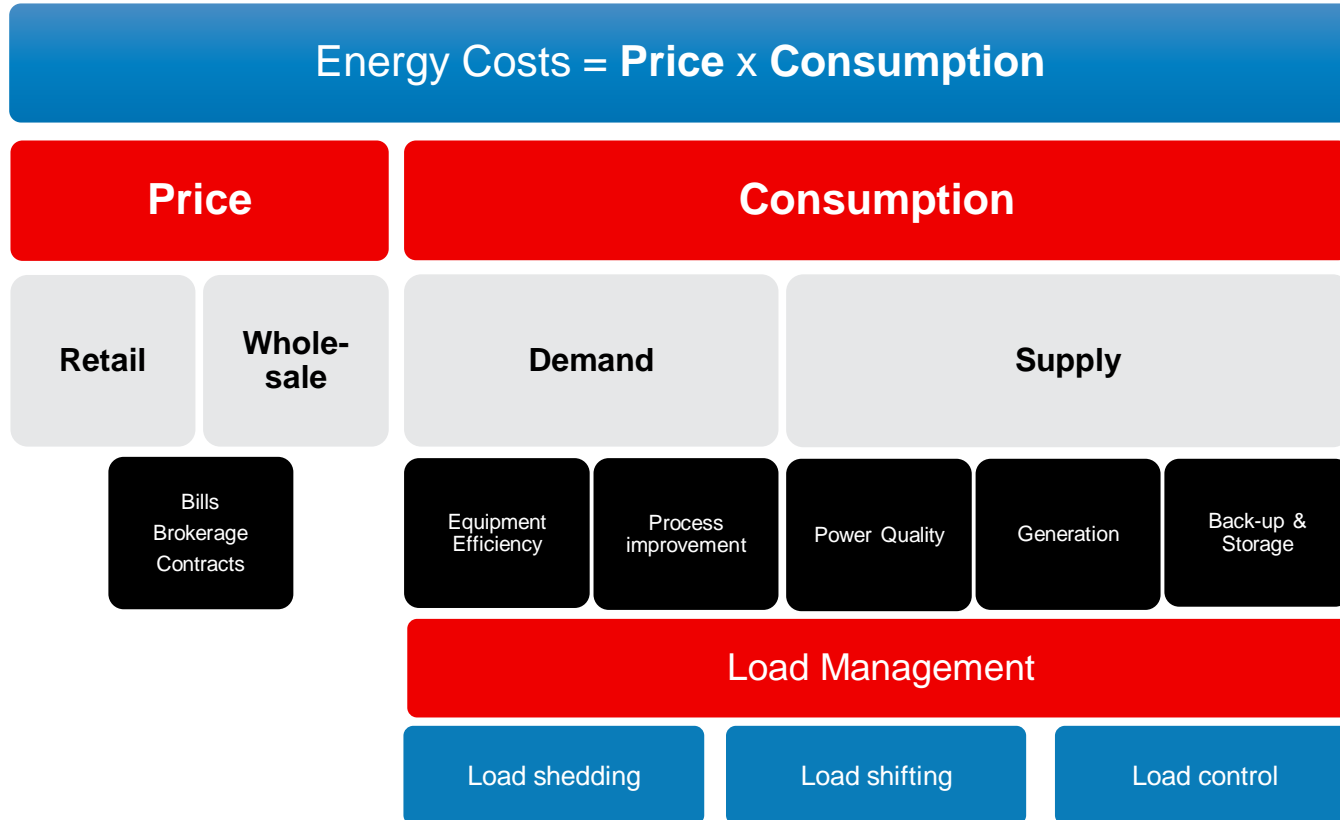
Energy management is a systematic approach to:		
Understanding how your farm uses energy	Identifying opportunities to control and conserve energy consumption and cost	Driving continuous improvement in energy performance



Energy management is a discipline.

(not just a one-off measure)

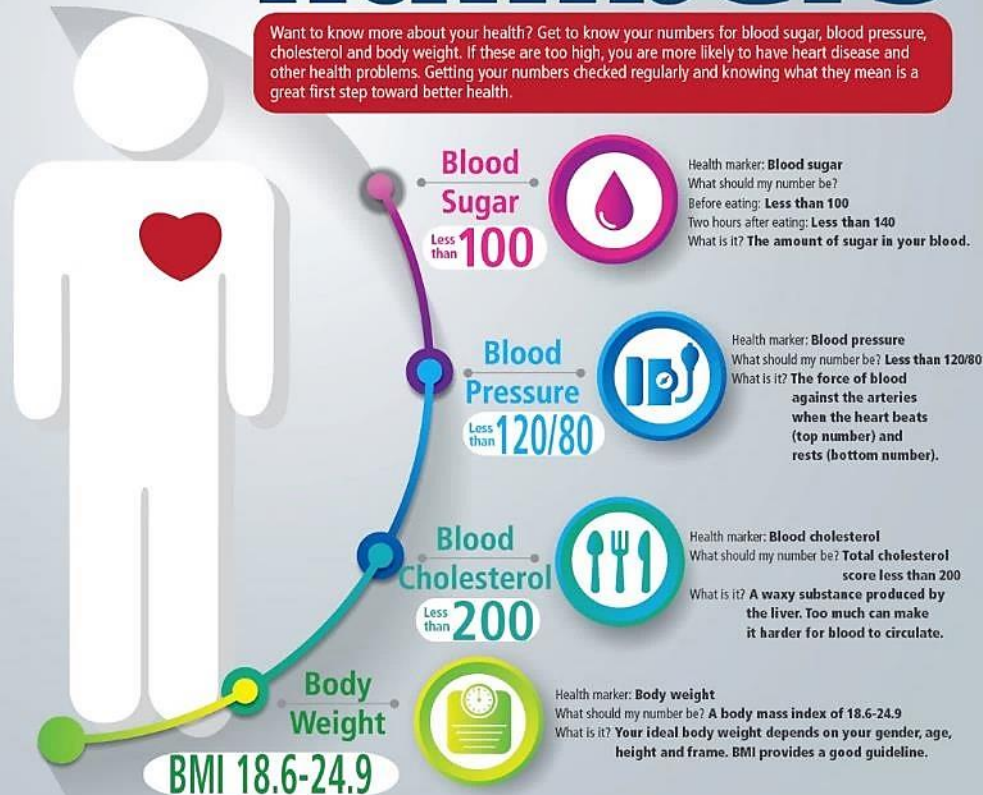
Energy management strategy



Knowing your numbers Why is energy data important?

Know your numbers

Want to know more about your health? Get to know your numbers for blood sugar, blood pressure, cholesterol and body weight. If these are too high, you are more likely to have heart disease and other health problems. Getting your numbers checked regularly and knowing what they mean is a great first step toward better health.

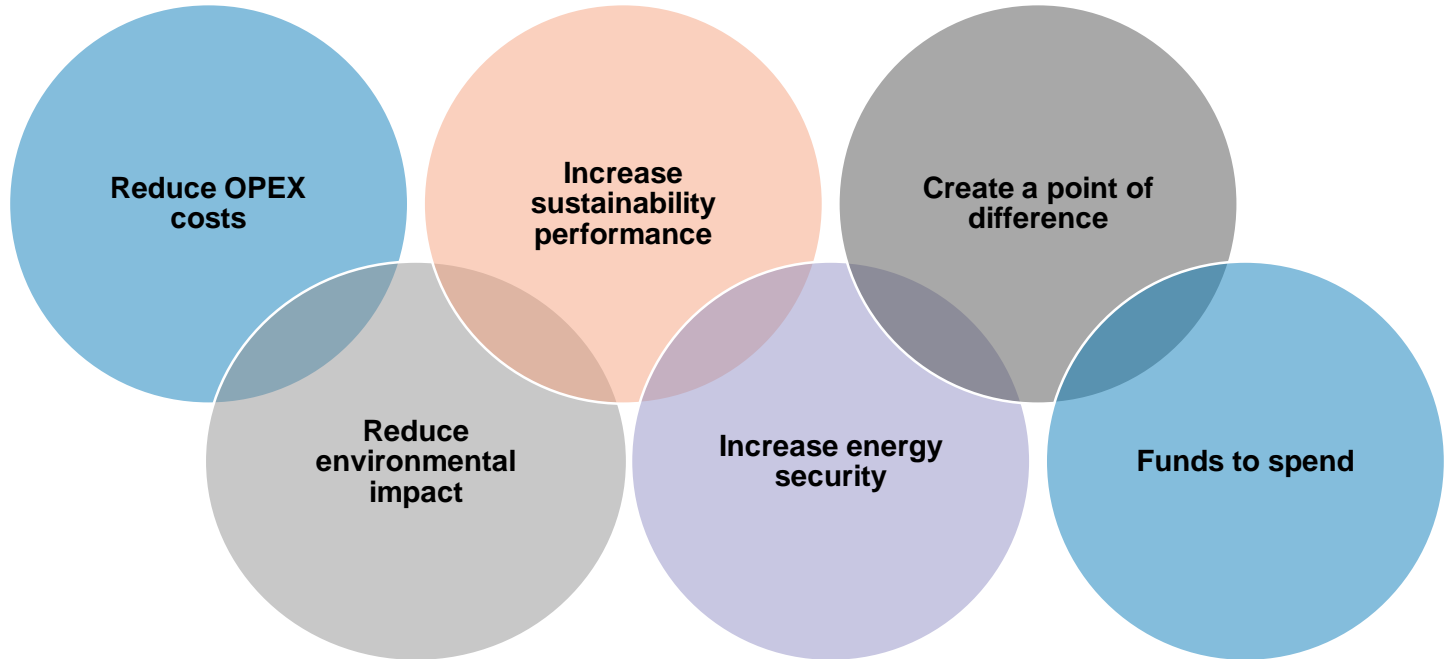


Steps to implement energy management in your daily operations



Steps to implement energy management in your daily operations (cont'd)

Step 1: Identify motivations and objectives.



Steps to implement energy management in your daily operations (cont'd)

Step 2: Select the appropriate data source for analysis.

Bills

Steps to implement energy management in your daily operations (cont'd)

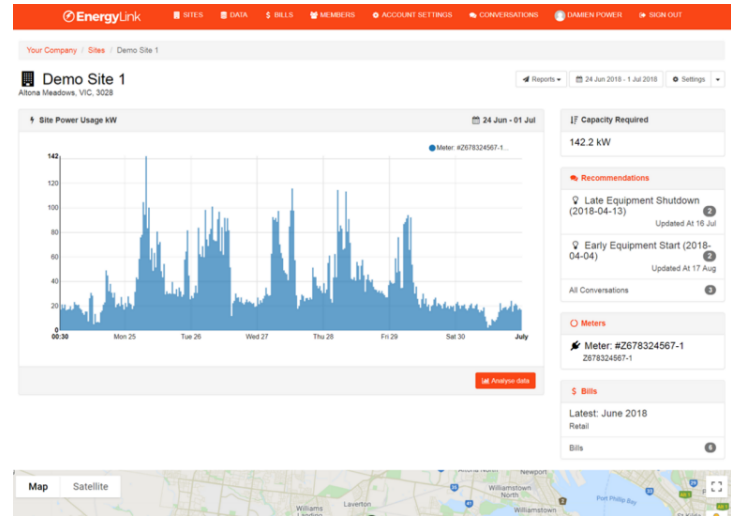
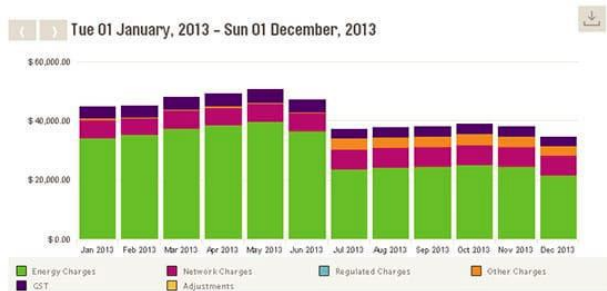
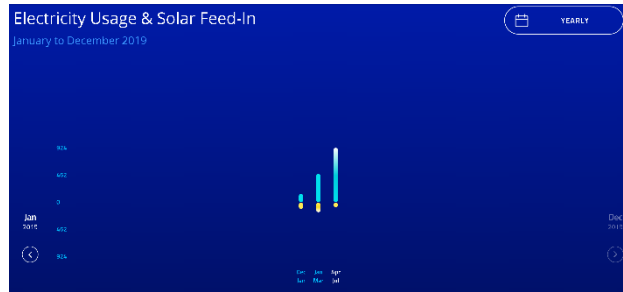
Data sources: Interval meter

- Available from your **retailer** for **electricity** if you have a smart meter
- Explore electricity use throughout the **day**
- Data for each **15-minute** or **30-minute** interval
 - Electricity consumption (kWh)
 - Power (kW)
 - Reactive power (kVAr)
 - Maximum demand (kVA)
 - Power factor

Read Date/Time	kWh	kW	kVArh	kVAr	kVA	PF
01.01.2013 01:00:00	9.168	36.672	4.128	16.512	40.218	0.912
01.01.2013 01:15:00	9.216	36.864	4.152	16.608	40.432	0.912
01.01.2013 01:30:00	8.976	35.904	4.152	16.608	39.559	0.908
01.01.2013 01:45:00	8.784	35.136	4.008	16.032	38.621	0.91
01.01.2013 02:00:00	8.76	35.04	3.888	15.552	38.336	0.914
01.01.2013 02:15:00	8.688	34.752	3.912	15.648	38.112	0.912
01.01.2013 02:30:00	8.736	34.944	3.96	15.84	38.367	0.911
01.01.2013 02:45:00	8.328	33.312	3.864	15.456	36.723	0.907
01.01.2013 03:00:00	8.28	33.12	3.864	15.456	36.549	0.906
01.01.2013 03:15:00	8.448	33.792	3.84	15.36	37.119	0.91
01.01.2013 03:30:00	8.448	33.792	3.84	15.36	37.119	0.91
01.01.2013 03:45:00	8.568	34.272	3.888	15.552	37.636	0.911
01.01.2013 04:00:00	8.352	33.408	3.864	15.456	36.81	0.908
01.01.2013 04:15:00	8.16	32.64	3.864	15.456	36.115	0.904
01.01.2013 04:30:00	8.592	34.368	3.912	15.648	37.763	0.91
01.01.2013 04:45:00	8.496	33.984	3.912	15.648	37.414	0.908
01.01.2013 05:00:00	8.688	34.752	3.984	15.936	38.232	0.909
01.01.2013 05:15:00	8.328	33.312	3.888	15.552	36.763	0.906
01.01.2013 05:30:00	8.472	33.888	4.008	16.032	37.489	0.904

Other electricity data

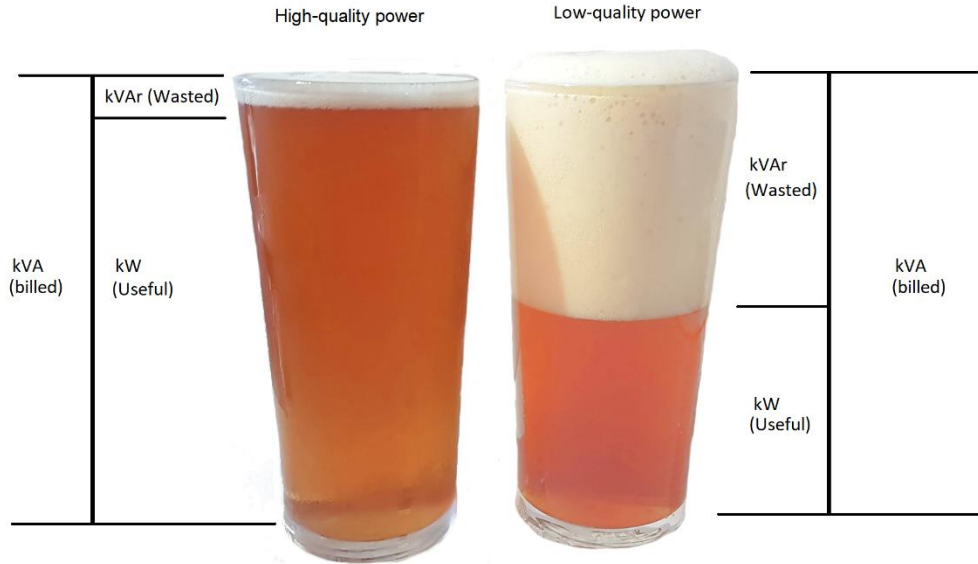
Many electricity retailers now provide free web portals for you to access and view your electricity data.



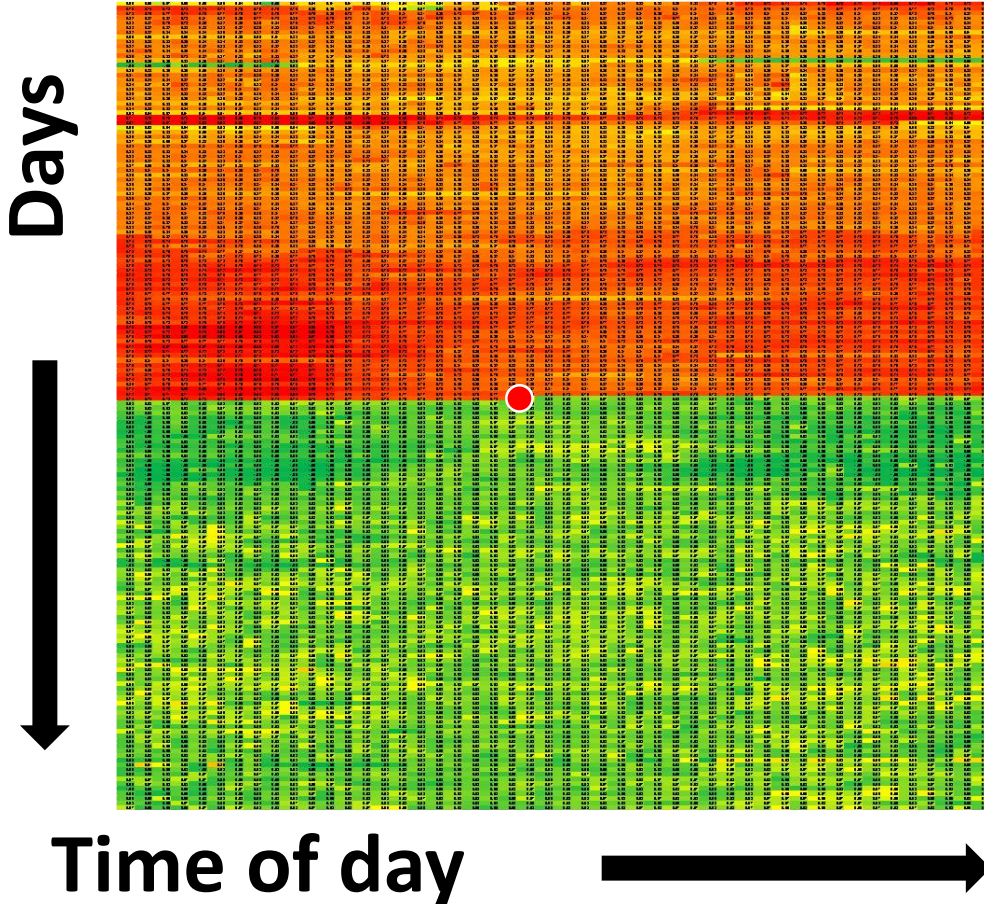
Steps to implement energy management in your daily operations (cont'd)

Power demand data explained

- **Power** (kW) does the work
- **Demand** (kVA)
 - = power (kW) + reactive power (kVAr)
- **Reactive power** (kVAr) sustains the magnetic field (if required)
- **Power factor** is the efficiency of power use
 - = power (kW) / demand (kVA)



Power Factor Correction Example



Maximum demand = 540kVA
Power Factor at Maximum demand = 0.7

30% of demand is being wasted!

New Maximum demand = 378kVA
Savings = 162kVA

Cost saving of ~\$20,000 per annum

Steps to implement energy management in your daily operations (cont'd)

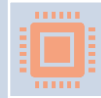
Sub-metering



Detailed energy use of sub-systems



Easier to identify opportunities



First step towards automated demand management



Helps you conduct preventative maintenance

Types of submeters



Electromechanical meter



Solid state – consumption meter



Solid state – demand meter



Solid state – power quality meter

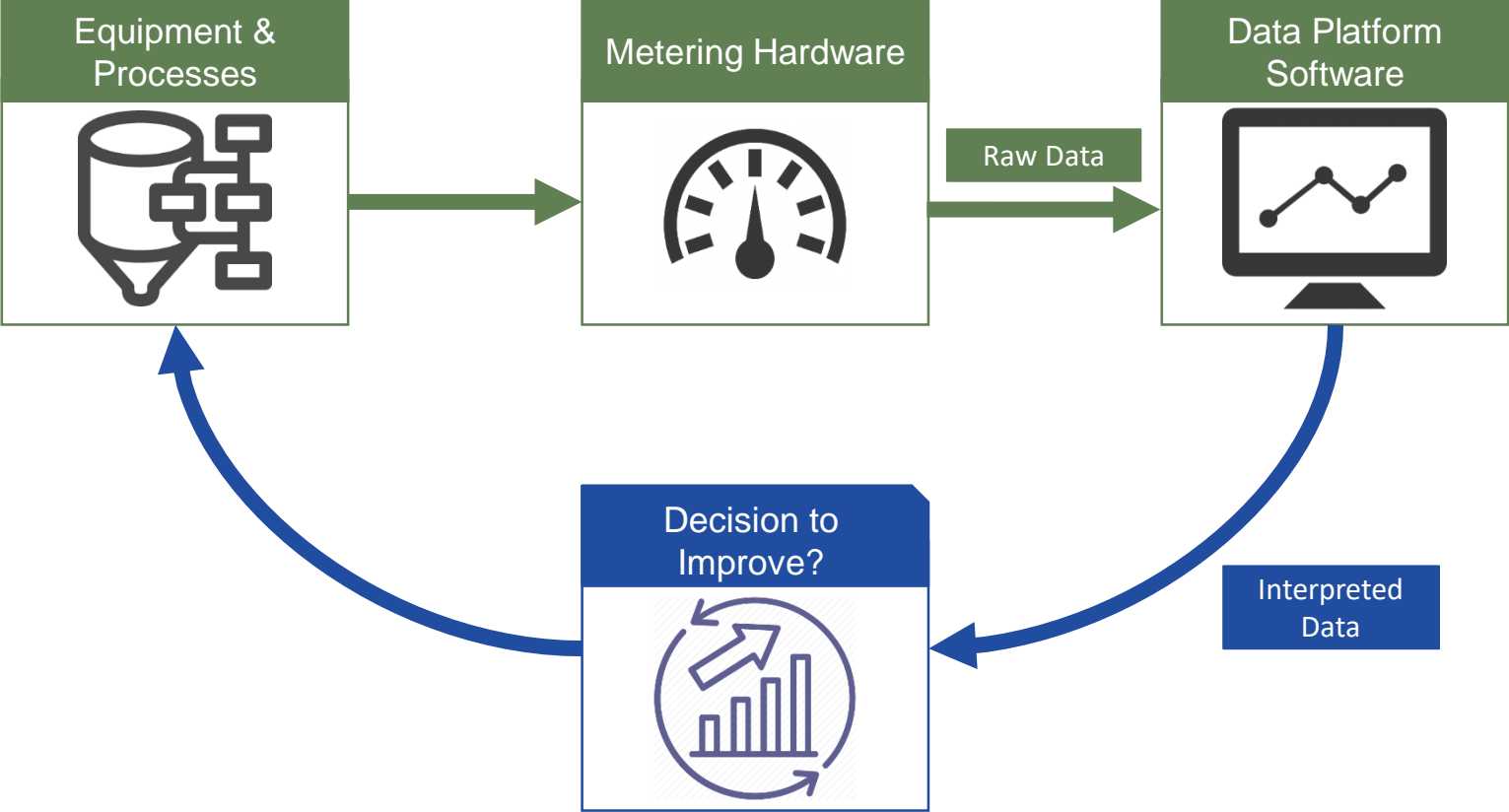


Flow meter



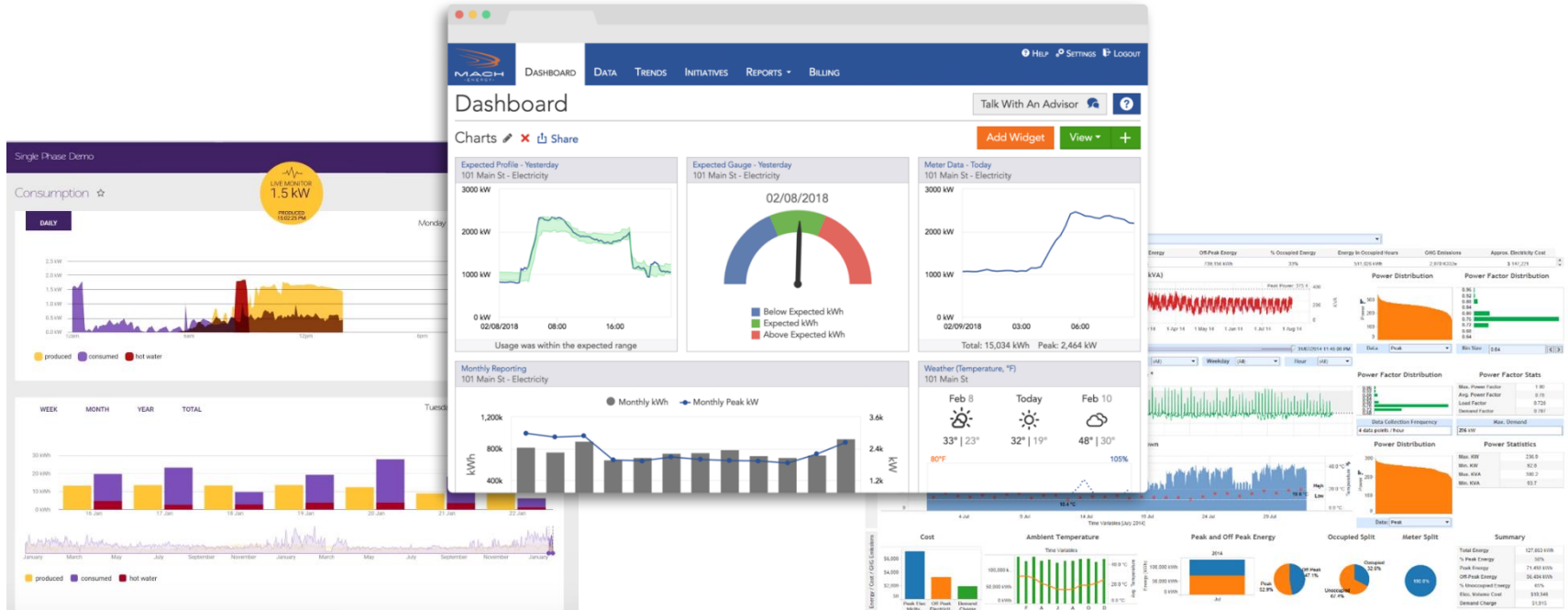
Pressure meter

Sub-metering



Sub-metering

There is no point installing metering if the data can't be monitored.



Sub-metering - Manage your electricity use with confidence

Improve your energy management practices:

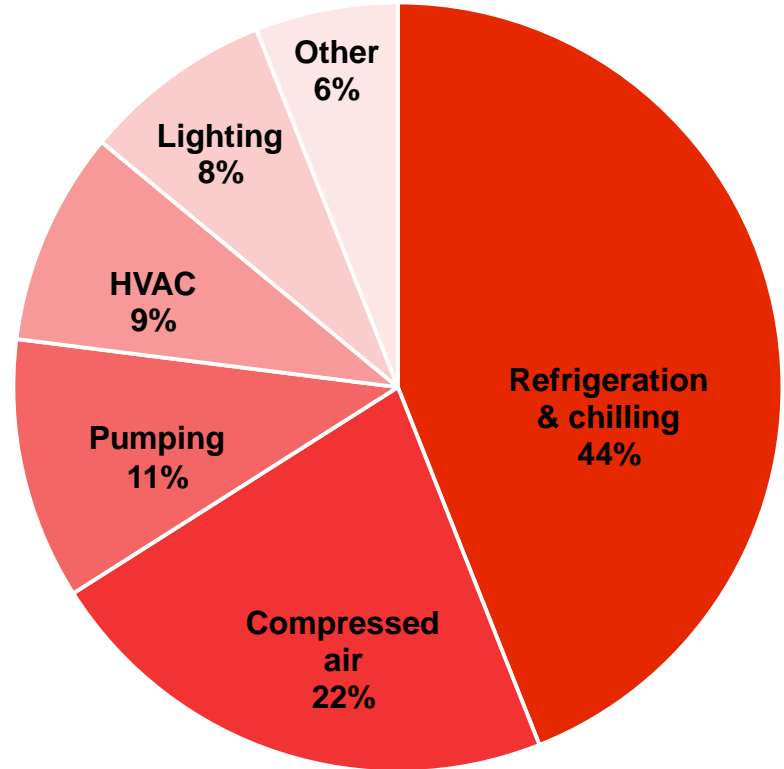
Set and achieve energy performance targets

Benchmark your site and compare it with others

Establish an energy baseline to know the impact of each equipment item or area

Estimate the savings and monitor the impact of efficiency measures (build the business case)

Food/beverage manufacturer - example



Sub-metering - Operate your facility more effectively

Reduce risks and effectively test technology

Optimise your equipments operation

Fault detection and diagnosis

Use metering to expose inefficiencies and identify new control strategies for your control systems e.g. BMS and SCADA systems



Equipment condition



Steps to implement energy management in your daily operations (cont'd)

What are the barriers to sub-metering?

- Estimating financial return
- Determining what or where to measure
- Capital cost

How to overcome barriers?

- Fit-for-purpose design
- Start small

Sub-metering - How much can I expect to save?

Energy savings depend on the actions you take once metering is installed

Action	Typical Energy Savings	Savings Mechanism
Installation of meters only	0 to 2%	Awareness that consumption is being monitored; savings not likely to persist
Enhanced billing and allocation	2 to 5%	Improved awareness, ongoing
Feedback on consumption and facility tune-up	5 to 15%	Improved awareness, and identification of opportunities for simple operational and maintenance improvements
Real-time feedback and continuous commissioning	15 to 30+%	Improved awareness, and identification of opportunities for simple operational and maintenance improvements, implementation of energy efficiency projects with verified results, continuing management attention

The above example is based on the aggregation of findings of several studies of submetering in commercial buildings. Note: similar trends are expected in all sectors

Sub-metering - Example



Steps to implement energy management in your daily operations (cont'd)

Permanent vs temporary sub-metering

Temporary: short-term (limited period) monitoring/logging of energy data

- Used to identify anomalies, assist in developing a site energy balance or developing optimisation/upgrade opportunities

Permanent: long-term continuous energy data

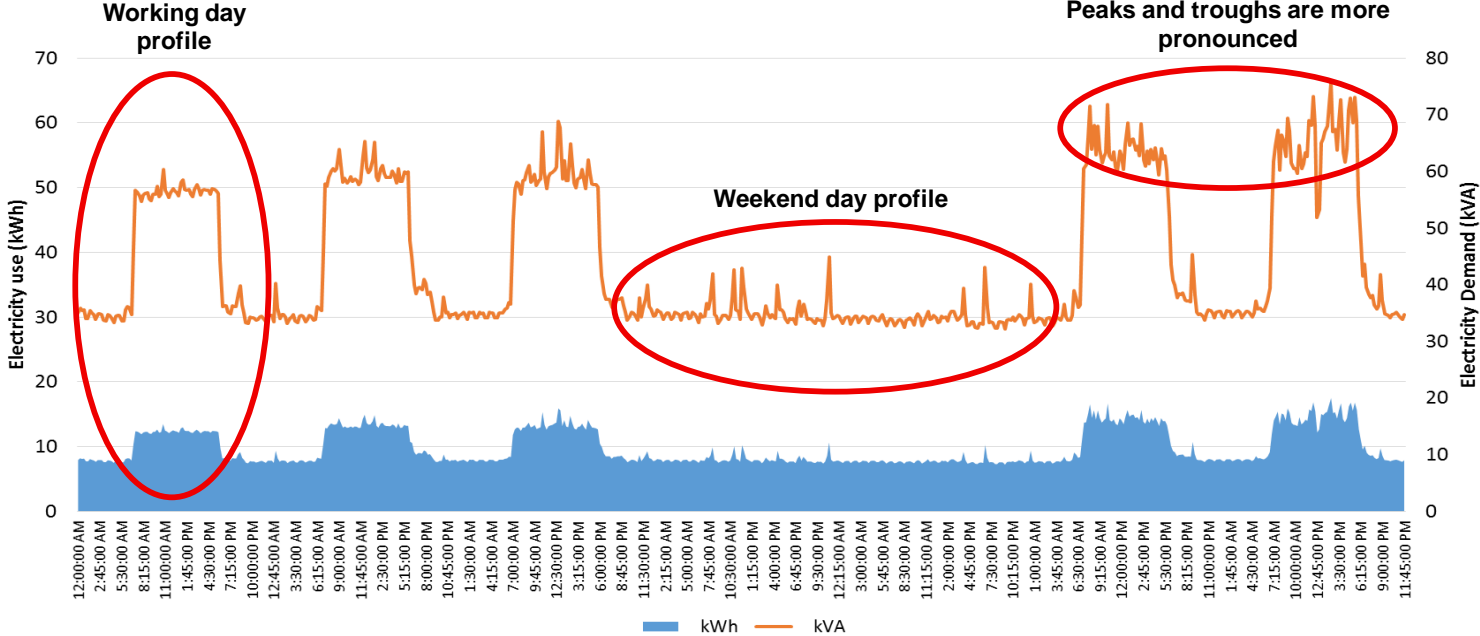
- Installed or retrofitted as part of fixed electrical, gas or fuel infrastructure to monitor buildings, circuits, processes or individual equipment
- Used to identify consumption patterns overtime, identify optimisation/upgrade opportunities or identify maintenance issues

Steps to implement energy management in your daily operations (cont'd)

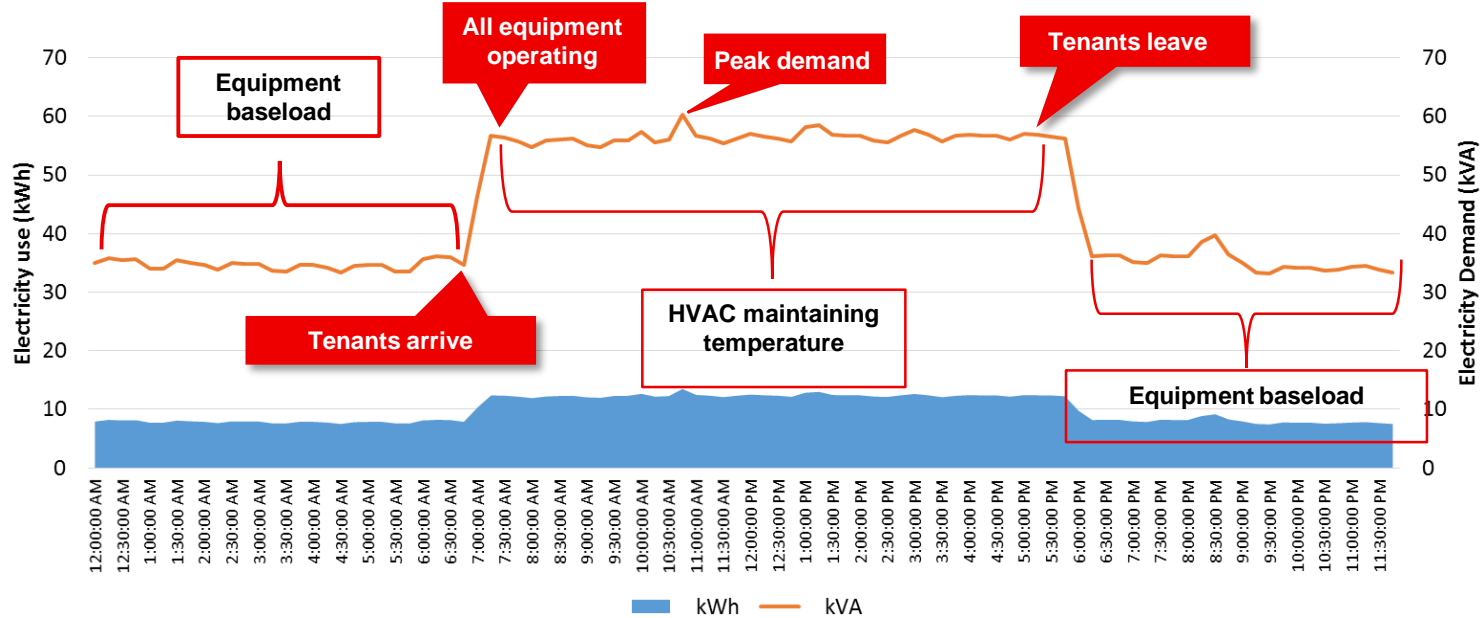
Step 3: Present data to simplify analysis.

We want to identify **interesting points** that might indicate **opportunities**

Example (cont'd)



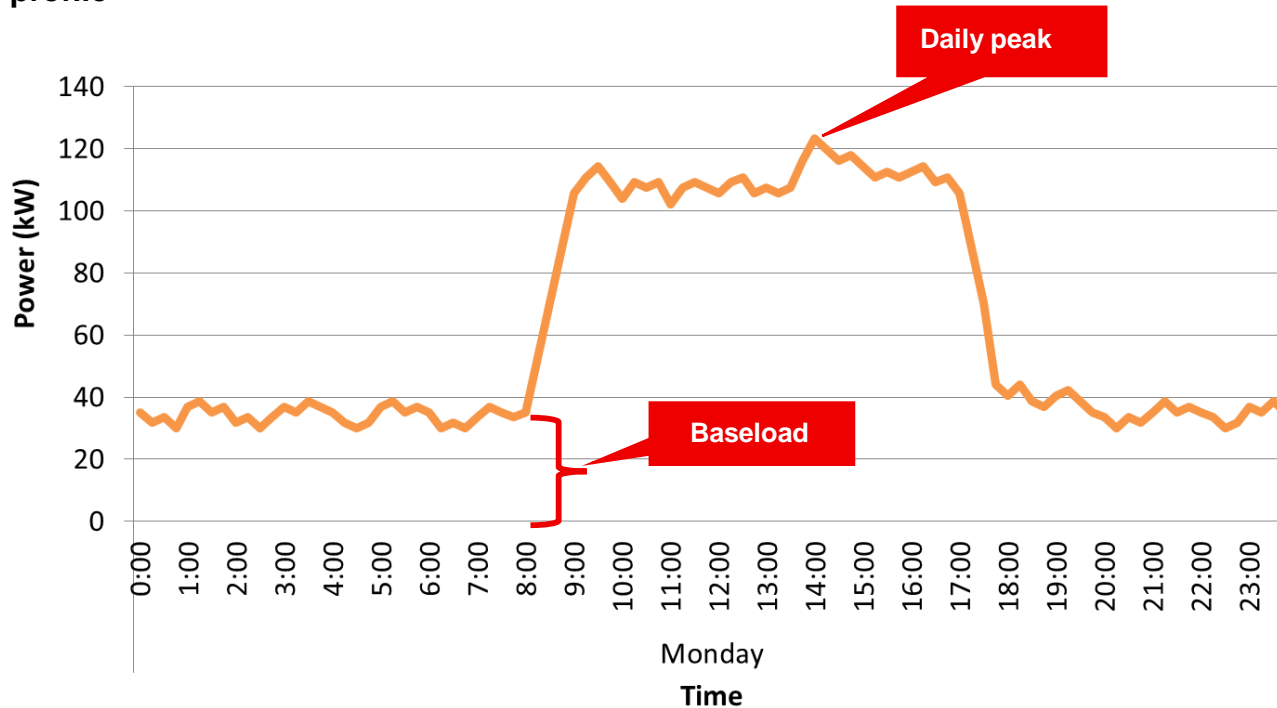
Example



Steps to implement energy management in your daily operations (cont'd)

Data presentation: line chart

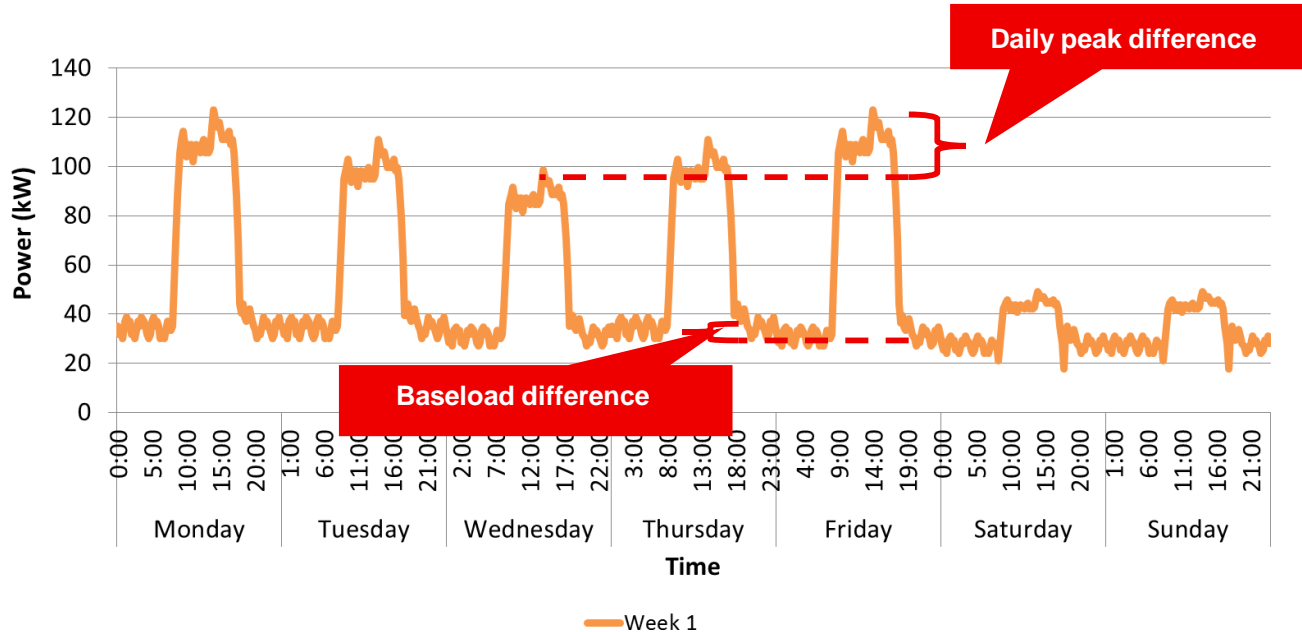
Daily load profile



Steps to implement energy management in your daily operations (cont'd)

Data presentation: line chart

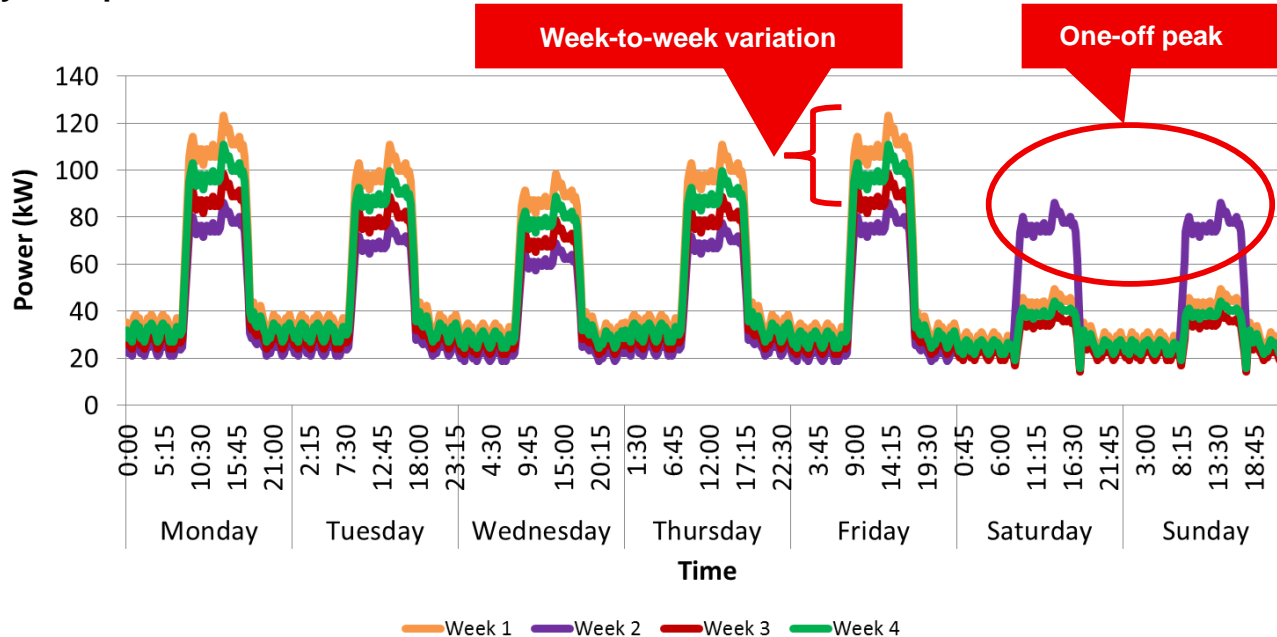
Weekly load profile



Steps to implement energy management in your daily operations (cont'd)

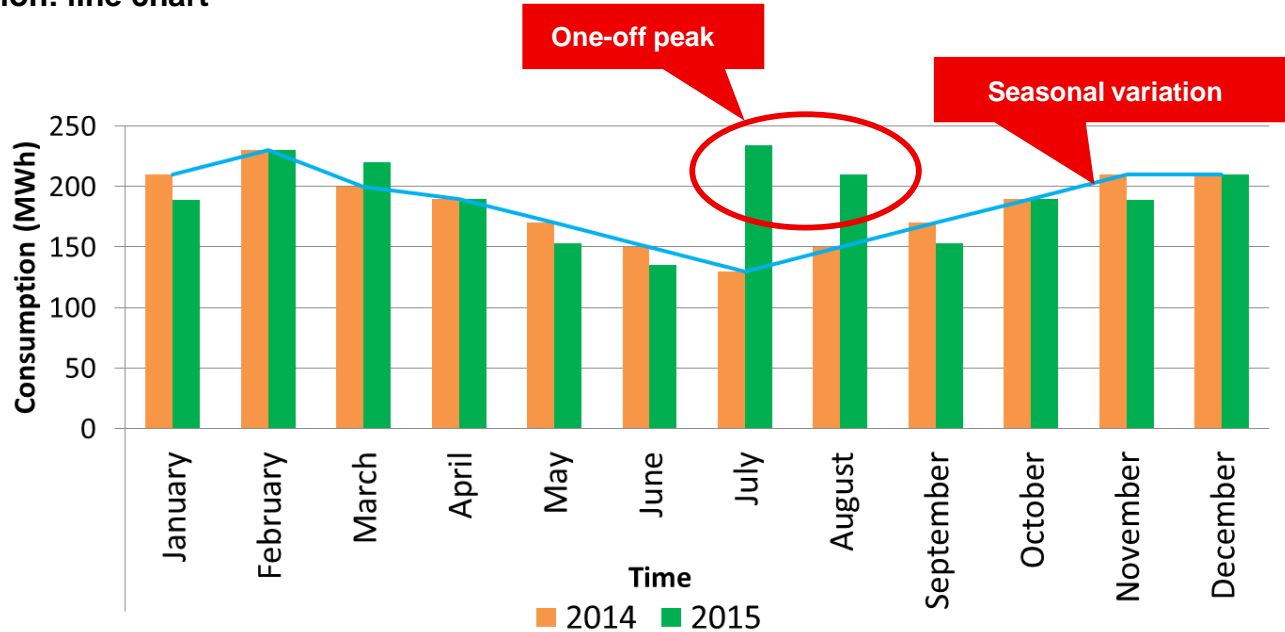
Data presentation: line chart

Monthly load profile



Steps to implement energy management in your daily operations (cont'd)

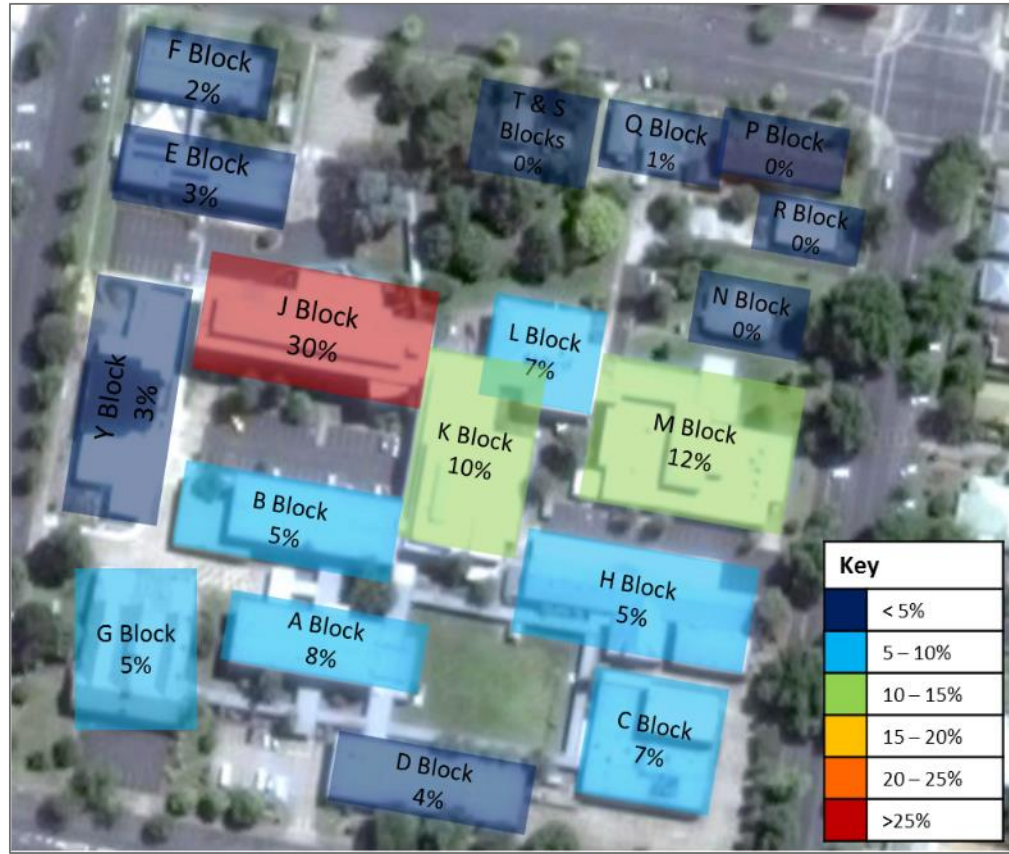
Data presentation: line chart



Steps to implement energy management in your daily operations (cont'd)

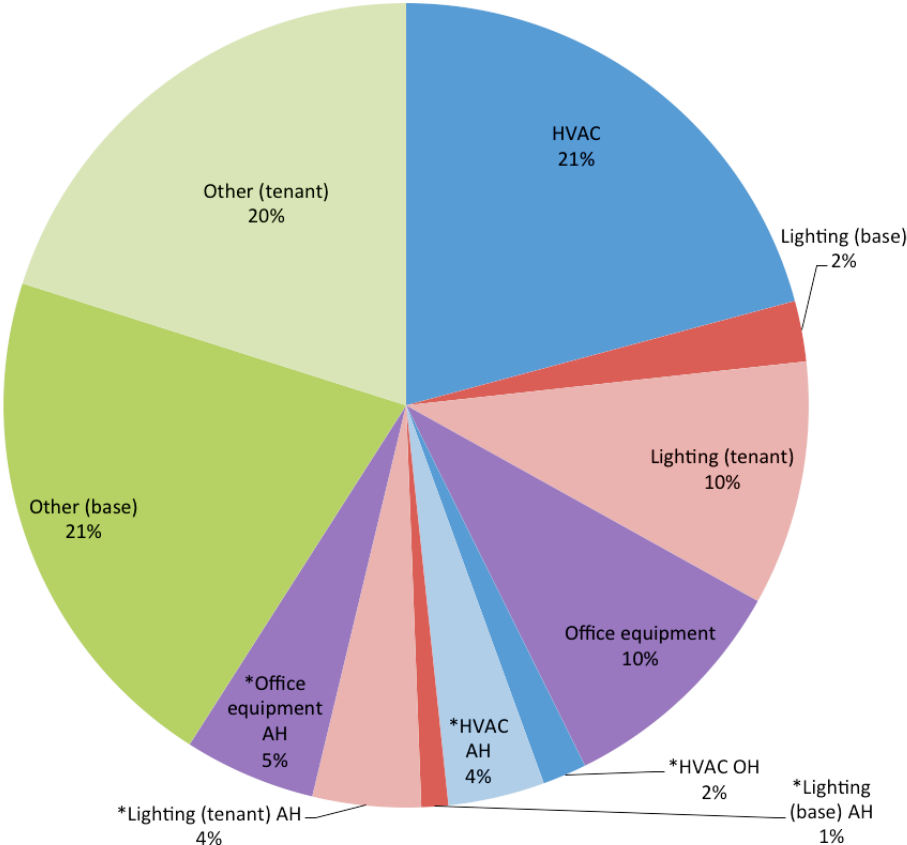
Data presentation:

Topographical 'hot spot' maps



Steps to implement energy management in your daily operations (cont'd)

Data presentation at the asset level

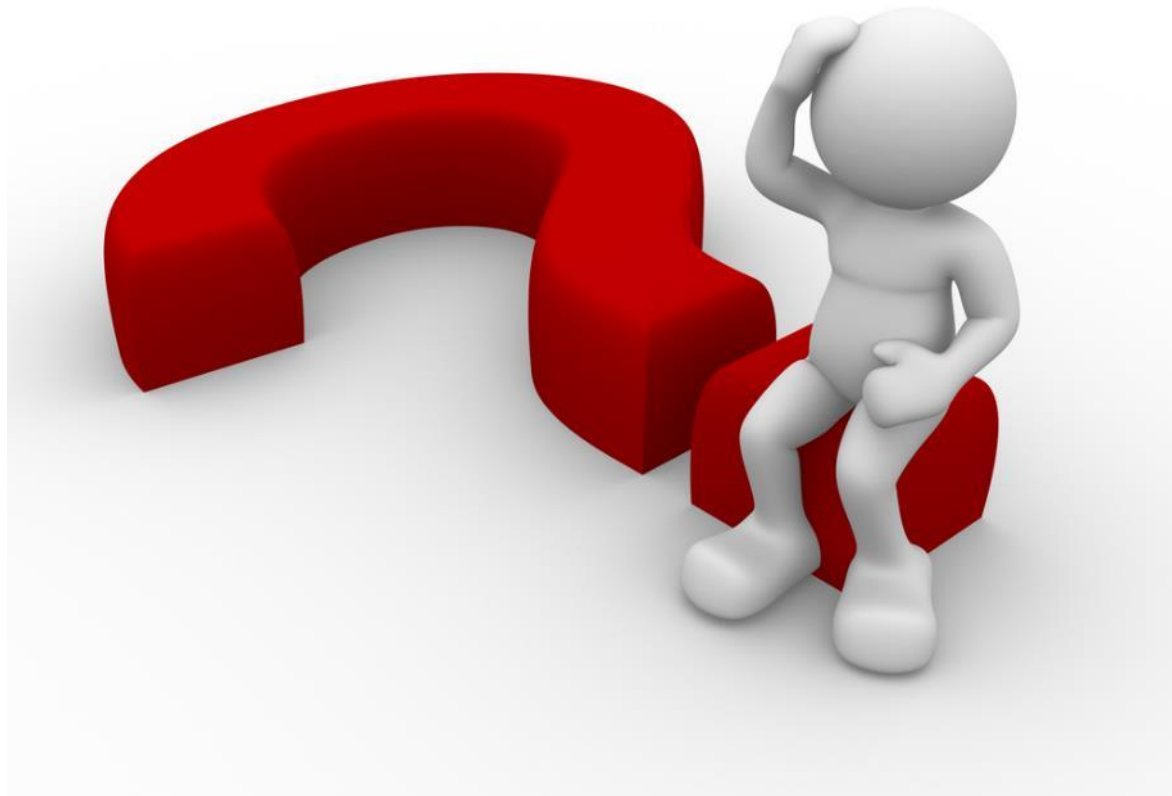


Steps to implement energy management in your daily operations (cont'd)

Step 4: Iteratively interrogate and analyse at various timescales.

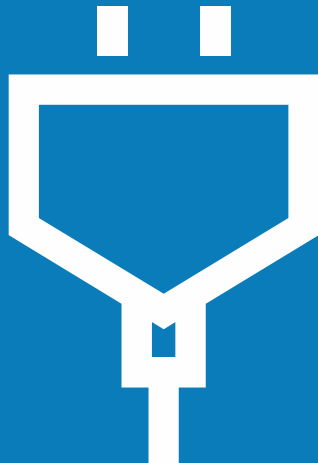
Start **simple**; use **invoices**

Questions?

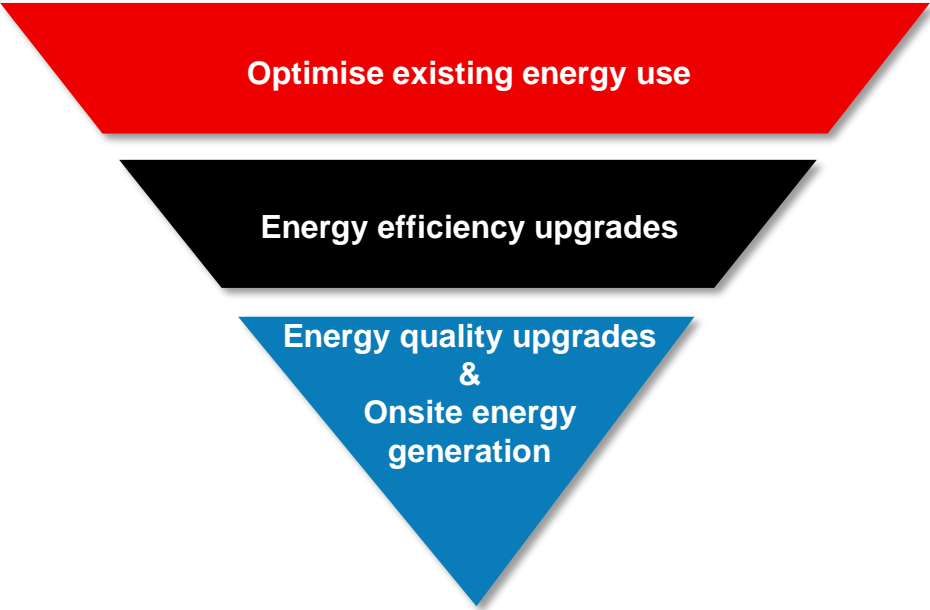


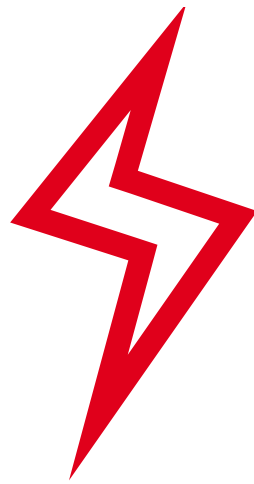


Part 4: Energy Efficiency & Practical Steps



Energy efficiency hierarchy





How to find opportunities – some simple tools

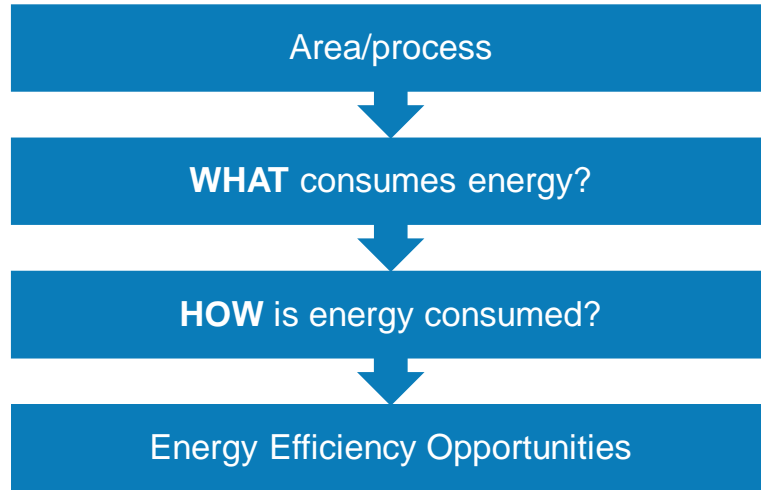
What consumes energy?





**How is energy
consumed?**

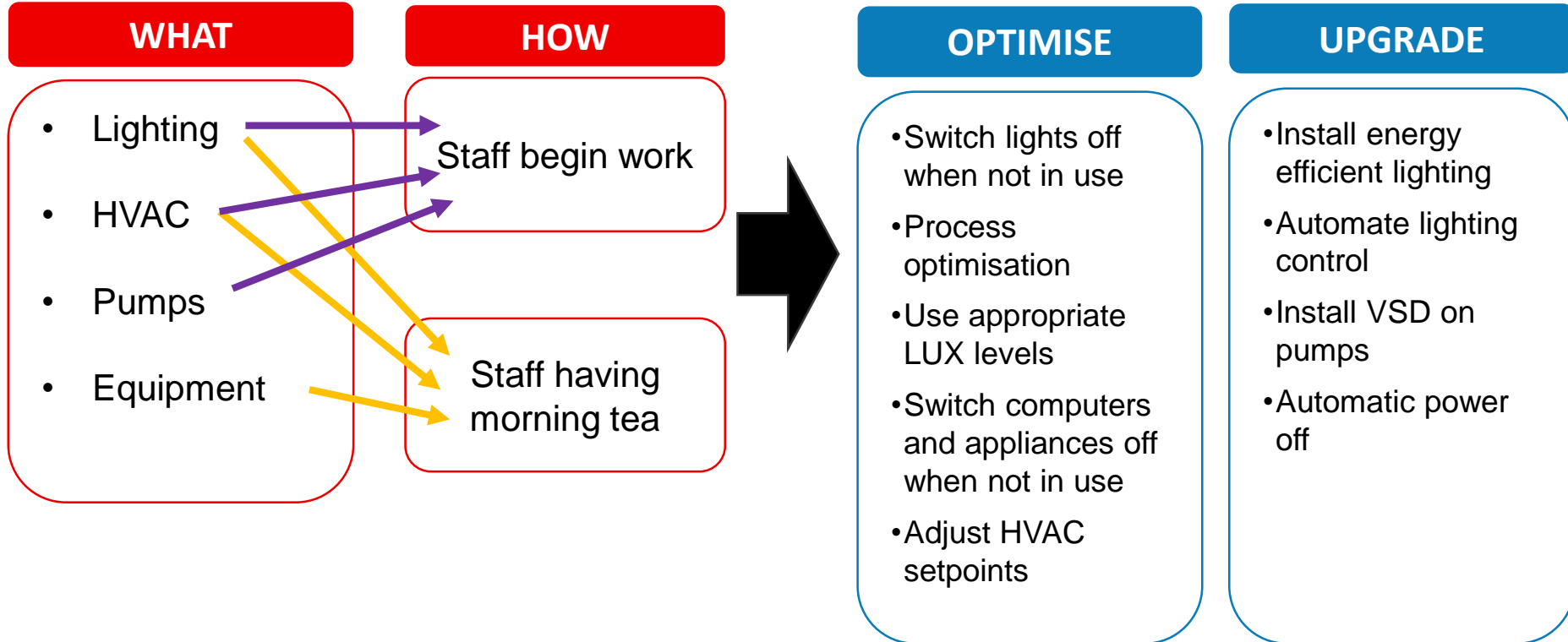
What/how mapping



You can't optimise, if you don't know **HOW**
the **WHAT** is being used

People focus
mostly on the
WHAT, and
not much on
the
HOW

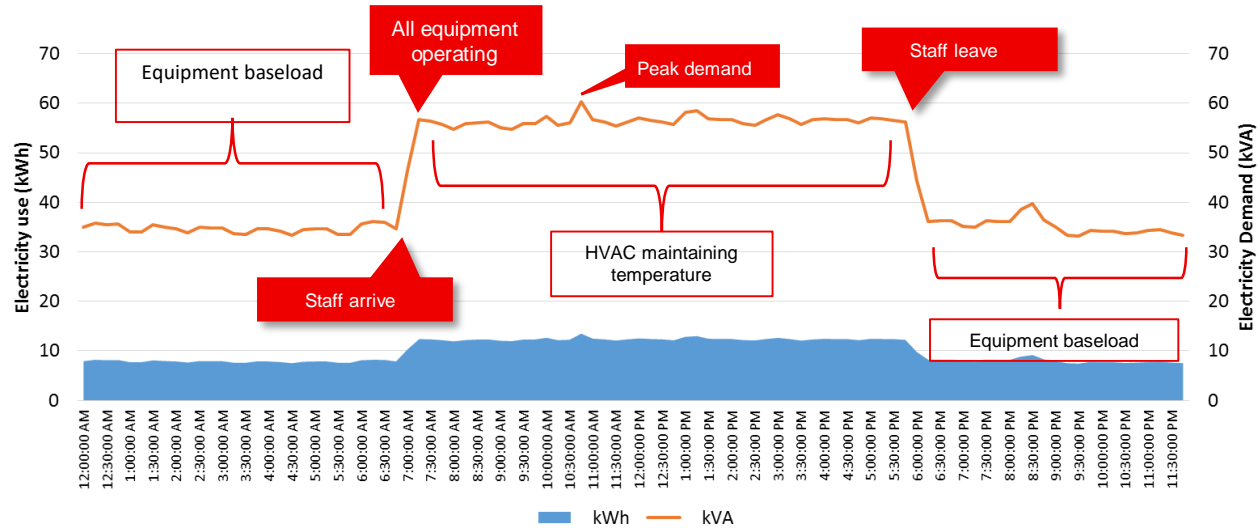
Example:



What/how mapping: daily load profile

Process: administration / office operations

Equipment: lighting, computers & appliances, HVAC



Fishbone diagram

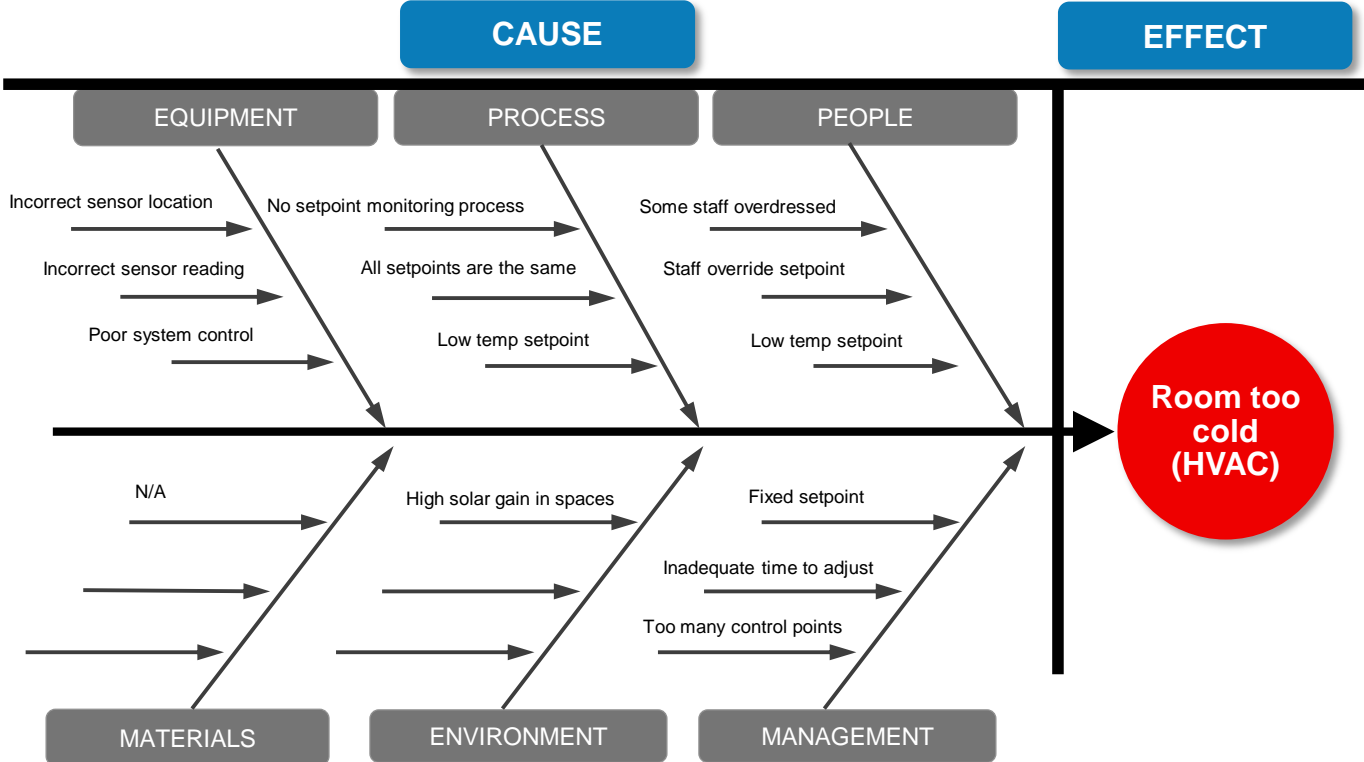
Process focus

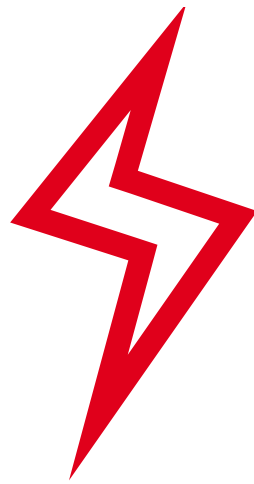
Used to understand cause and effect

Classifications

- Equipment
- Process
- People
- Materials
- Environment
- Management

Fishbone Diagram - Example





How to find opportunities – advanced approaches

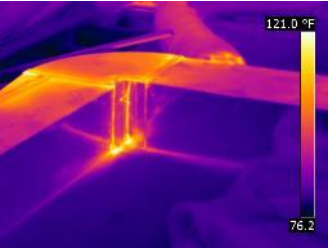
Walkthrough checklist

- ❑ **Equipment focus**
- ❑ **Used to identify inefficient equipment and inefficient equipment use**
- ❑ **Technology areas**
 - ❑ Lighting
 - ❑ Office equipment
 - ❑ Building envelope
 - ❑ Heating, Ventilation and Air Conditioner (HVAC)
 - ❑ Hot water and steam
 - ❑ Refrigeration
 - ❑ Pumping
 - ❑ Compressed air



Some basic tools

Thermal camera



Lux meter



Temperature meter



Plug meter



Energy audits: types

Criteria	Type 1: Basic
Included uses	Contribute >20% of consumption
Energy balance	No
Data detail	Facility-level
Appropriate opportunities	No-cost or low-cost operational <2-year payback
Calculation methods	Rules of thumb Benchmarks
Accuracy	Broad (+/- 40% for savings and costs estimates)
Capital cost bases	Indicative

Description of Energy Conservation Measure (ECM)	Electricity savings MWh p.a.	Gas savings GJ p.a.	Estimated Implementation Cost \$ total	Simple Payback years	GHG savings t CO ₂ -e p.a.
Compressor – air leak fix	22.2	0.0	\$5,000	0.9	24.0
Process – insulation of steam condensate pipe (steam blankets)	0.0	73.9	\$2,375	2.3	3.8
Process – insulation of chilled pipe	47.6	0.0	\$2,675	0.2	51.4
HVAC – site zoning	52.8	0.0	\$50,000	3.8	57.0
Lighting – upgrade	61.5	0.0	\$10,000	0.7	66.4
High Bay Lighting Upgrade	29.75	0	\$15,000	2.0	32.1
High Bay occupancy sensors	13.5	0	\$9,600	2.8	14.6
Heat recovery / exchangers on boiler	0.0	1,517.9	\$10,000	0.6	78.2



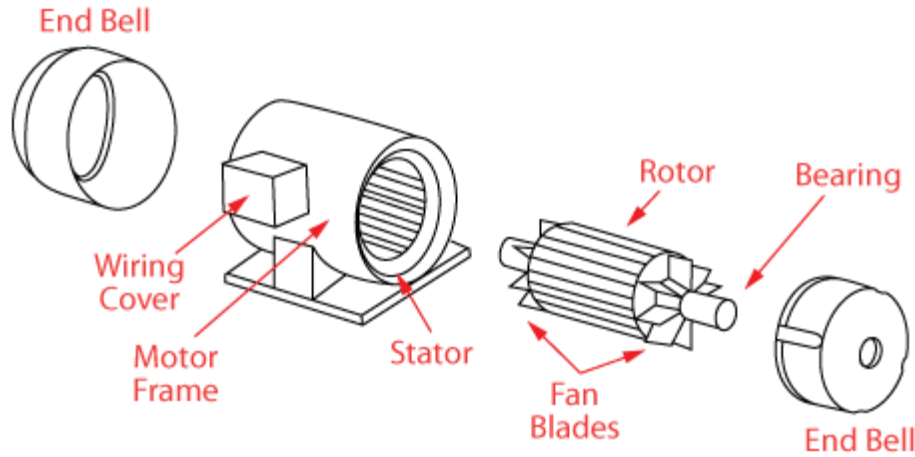
Specific technologies – motors and VSDs



Motors – how do they work?

Induction motor - Key components

- **Stator** – Outer shell which remains stationary. Contains windings of wire which transform incoming electricity into a rotating magnetic field.
- **Rotor** – Only moving component. Contains aluminium or copper bars that run lengthways. The magnetic field generated by the stator induces current into these bars creating an opposing magnetic field, causing it to rotate.
- **Bearings** – the rotor is mounted on bearings which allow to spin freely
- **Fan blades** - move air through the motor to keep it cool



The nameplate contains the following information:

Manufacturer Name		IE1	CE
Model No			
Serial No	Poles	4	
Δ/Y	400 V	29 A	
Nominal speed	51	15 kW	$\cos \phi$ 0.85
	1430 u/min	50 Hz	
Ingress protection rating	IP 55	INS	

Labels on the left side of the nameplate:

- Rated voltage
- Rated power
- Nominal speed
- Ingress protection rating

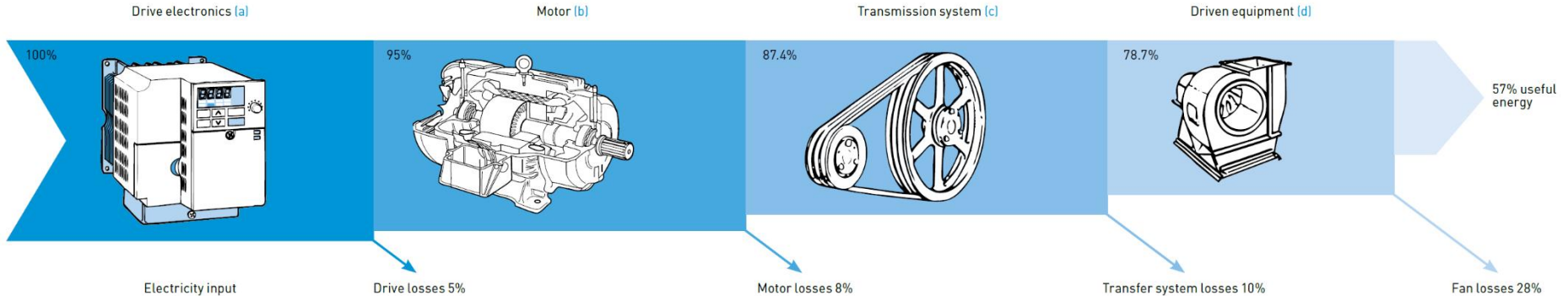
Labels on the right side of the nameplate:

- Efficiency class
- Winding configuration
- Rated amps
- Power factor
- Mains supply frequency

Motors – what impacts their efficiency?

Motors are one aspect of a motor driven system which consists of:

- Drive electronics
- Motor
- Transmission system
- Driven equipment



Motors – what impacts their efficiency?

Motor efficiency is effected by the following factors:

Heat losses due to electrical resistance in the windings

Magnetic losses in the stator & rotor

Friction in the bearings and air gap between rotor & stator

Energy absorbed by the cooling fan

Quality of the electrical power being used

Motor sizing and loading

Solutions to low motor efficiency

- **Purchase higher efficiency motors (HEMs)**
- **If a motor breaks down almost always replace it with a HEM rather than repair it - rewinding motors is expensive and reduces their efficiency**
- **Motors operate most efficiently above 50% loading, with a peak in efficiency between 75% and 90% load – use the right sized motor for the job**
- **Check the electrical power quality to make sure voltages are balanced**
- **Ensure the motor system is appropriately maintained**

Efficiency Levels 3-phase induction motors	Efficiency Classes
	IEC 60034-30-1 Global classes IE-Code 2008; rev. 2013 *
Super Premium Efficiency	IE4
Premium Efficiency	IE3
High Efficiency	IE2
Standard Efficiency	IE1

IE5 a proposed efficiency class and already promoted

Variable speed drive (VSD)

- **Mostly frequency converters, but not always**
- **VSD / VFD / VVVF / FC – same thing?**
- **Adjusts electrical supply to electric motors**
- **Changes motor speed (RPM)**
- **Allows matching of motor speed and duty**
- **Can retrofit to most existing motors**
- **Integrated in many new motors**
- **Single & three-phase versions readily available**
- **Choice of ‘out-of-the-box’ functions vs. external in- and outputs**

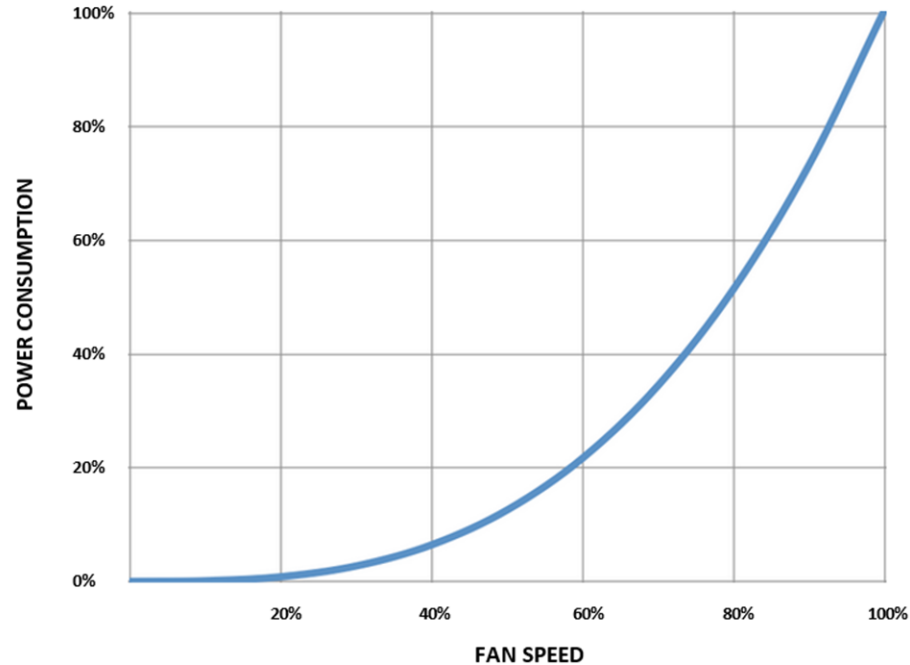


Frequency converters

Varying speed – ‘affinity law’

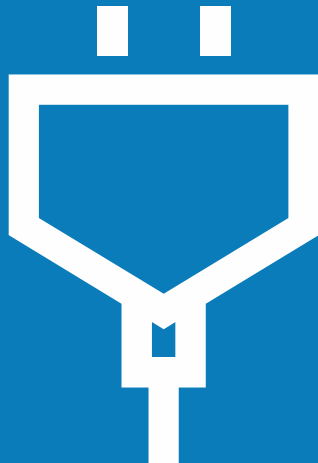
- Flow, pressure and power in relation to motor speed
- Pump speed reduced by 10%, then:
 - flow reduces by 10%
 - pressure reduces by 19%
 - power reduces by 27%
- Assumptions – not always true but good approx.

Using a VSD to slow down a fan or pump motor from 100% to 80% can save as much as 50% on energy use





Step 5: Further Support & Grants










For households 

For business 

Energy Saver

[Home](#) > [For business](#) > [Courses and webinars](#) > Webinars

For business - overview

-  [Discounts and incentives](#)
-  [Evaluate your usage](#)
-  [Equipment and technology guides](#)
-  [You and energy providers](#)
-  [Courses and webinars](#)
 - [Energy management](#)
 - [Equipment and technology](#)
 - [Webinars](#)
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Webinars

Are you a small business wanting to reduce energy costs?



Register for our free, interactive webinars on a range of topics and learn how to save your business thousands of dollars.

Other Energy Management Courses



BUSINESS CASE



ENERGY MANAGEMENT



ENERGY MANAGEMENT
FOR FACILITY MANAGERS



ADVANCED ENERGY
MANAGEMENT



BATTERY STORAGE



LIGHTING



HVAC



REFRIGERATION



COGENERATION



VOLTAGE OPTIMISATION



ENERGY SAVINGS SCHEME



AGED CARE



REGISTERED CLUBS



PIAM&V

Google:
“NSW energy efficiency training”

Energy Management Support offerings
David Hoffman - DPIE



Energy Management Support & Coaching – NSW businesses

Energy management project support (>30MWh savings)

- Access 15 hours of support from an energy expert for a range of activities
- Supported activities include:
 - development of an energy efficiency business case (can include multiple projects)
 - engineering design process improvement or preparation of technical specifications
 - development of a request for quotations and evaluation of quotations from suppliers for energy management project
 - commissioning of installation

\$300

\$150

Must be done within 6 months

**Energy Management Support offerings
Victoria**



<https://www.victorianenergysaver.vic.gov.au/energy-advice-for-business>

Practical Steps to do tomorrow:



Check your Bill and Retailer

- Make a PowerCall - Is my current plan the best one for me? - How can I low my power bills?
- Energy Made Easy – check the competition
- Confirm your meter type and time of billing details – ie peak, off peak
- Request your last 12 months of meter data, ask if they have a portal to do analytics
- If you are paying KVA (demand charges) know what your threshold is & look at Power Factor



Farm Energy Audit

- List all major energy users , note time of day used or 24/7
- Look at sub metering for large uses, or plug meters where possible
- Review grants and training support



Optimising

- Can you move loads to off peak times?
- Build a business case for upgrades
- Maintenance schedules

Other Funding and Grant Opportunities

NSW Energy Saver Scheme - <https://www.ess.nsw.gov.au/Home>

NSW Energy Saver - <https://energysaver.nsw.gov.au/>

VIC Energy Upgrades Program (previously Vic Energy Efficiency Target) - <https://www.esc.vic.gov.au/victorian-energy-upgrades-program>

VIC Energy Saver - <https://www.victorianenergysaver.vic.gov.au/energy-advice-for-business>

Federal Rebates - <https://www.energy.gov.au/rebates>

Energy Efficiency Communities Program - <https://www.energy.gov.au/government-priorities/energy-programs/energy-efficient-communities-program>

ARENA - <https://arena.gov.au/>

Clean Energy Finance Corporation - <https://www.cefc.com.au/>

\$20,000 instant asset write-off - [https://www.ato.gov.au/newsroom/smallbusiness/lodging-and-paying/\\$20,000-instant-asset-write-off/](https://www.ato.gov.au/newsroom/smallbusiness/lodging-and-paying/$20,000-instant-asset-write-off/)

Questions?

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“Mr. Osborne, may I be excused? My brain is full.”



Thank you