



# The role of hybridisation in energy cost reduction

Contracts, uncertainty and capturing value

Dr Mary Stewart | 27 August, 2018

energetics<sup>o</sup>



# Agenda

1 Energy costs

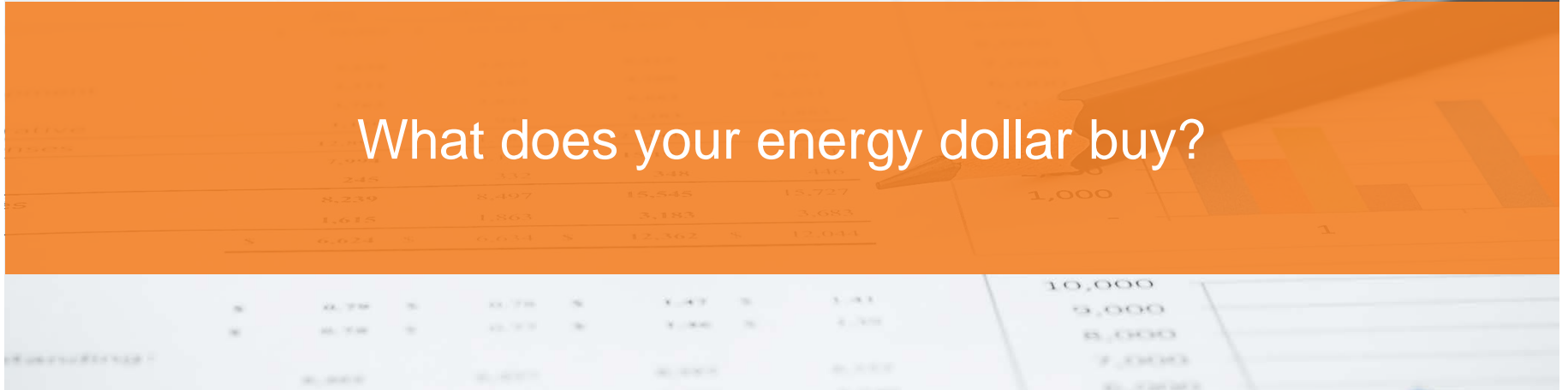
2 Costs will remain high

3 The role of renewables

4 Where to next



What does your energy dollar buy?



	2010	2011	2012	2013
Revenue	245	332	438	496
Operating Expenses	8,239	8,497	15,545	15,727
Operating Income	1,675	1,863	3,183	3,683
Operating Margin	6.83%	5.61%	12.36%	12.03%

	2010	2011	2012	2013
Operating Income	\$ 1,675	\$ 1,863	\$ 3,183	\$ 3,683
Operating Margin	6.83%	5.61%	12.36%	12.03%





# What does your electricity \$ buy?



## Retail charges

- Consumption (kWh)
- Peak, shoulder and off peak



## Environmental

- LRET (kWh)
- SRES (kWh)



## Network

- Fixed (day)
- Capacity (kVA and rolling kVA)
- Demand (kWh)

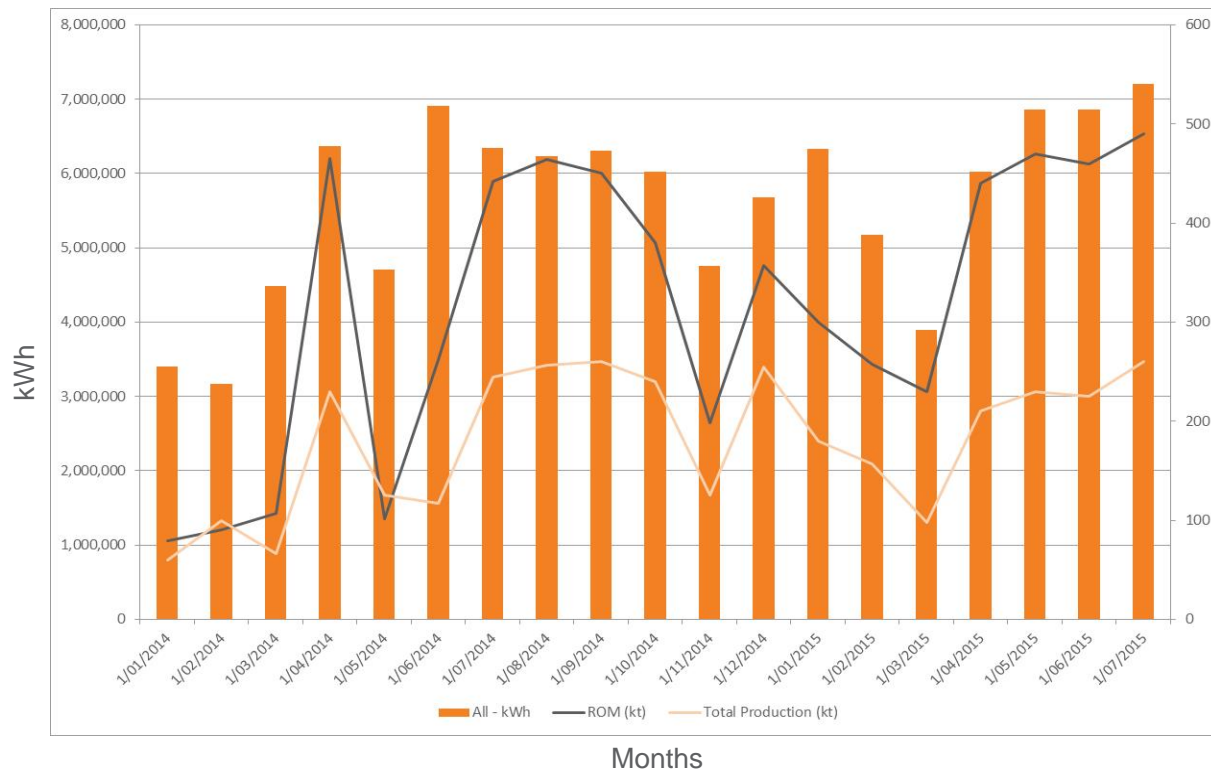


## Other contestable

- Market (kWh)
- Metering (day)

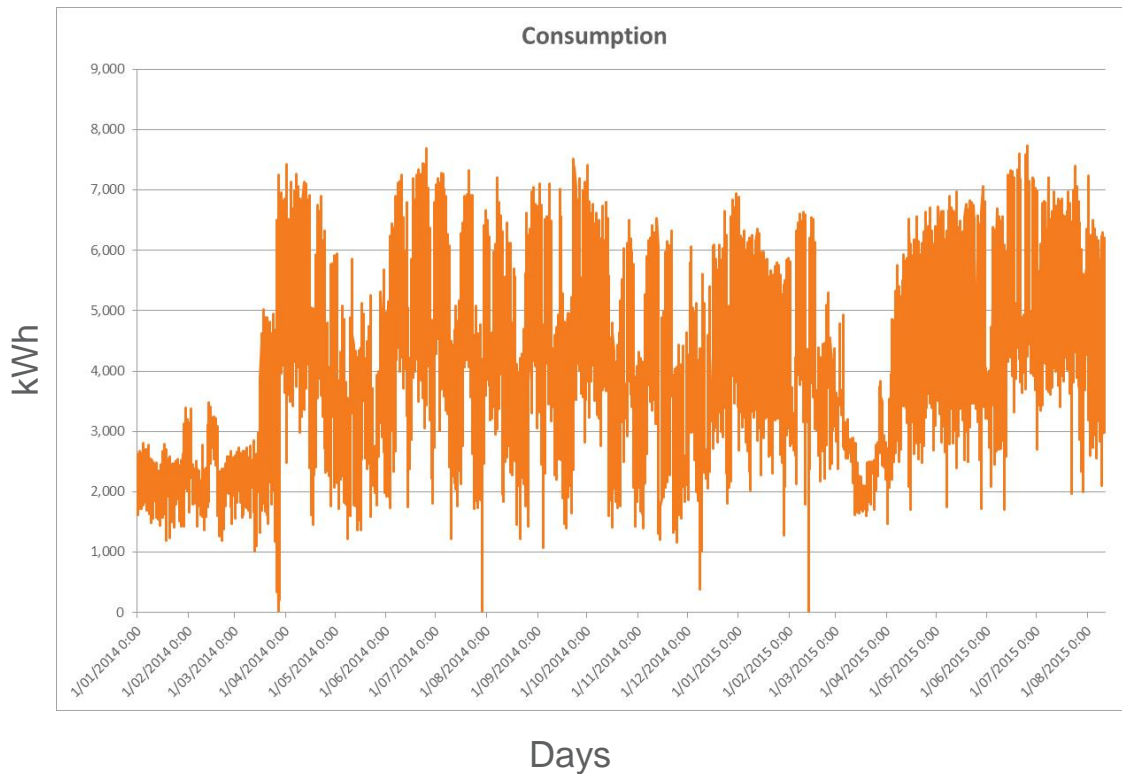


# Applying this to an open cut mine



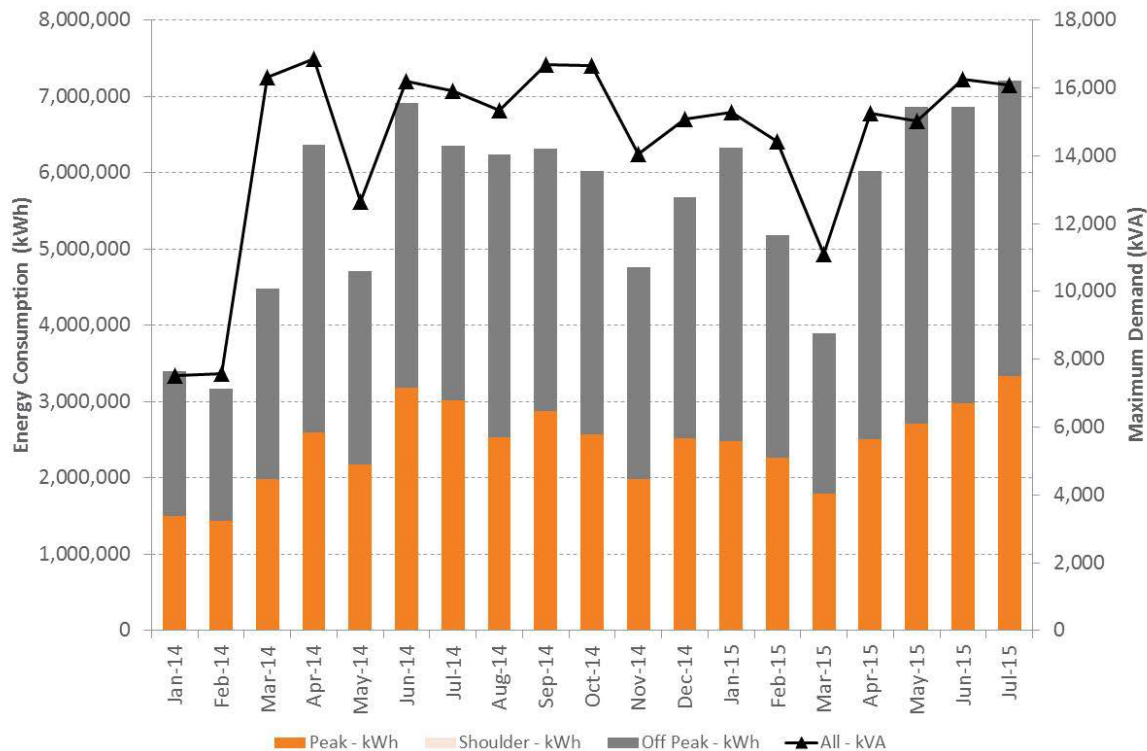


# Based in 15 minute interval data



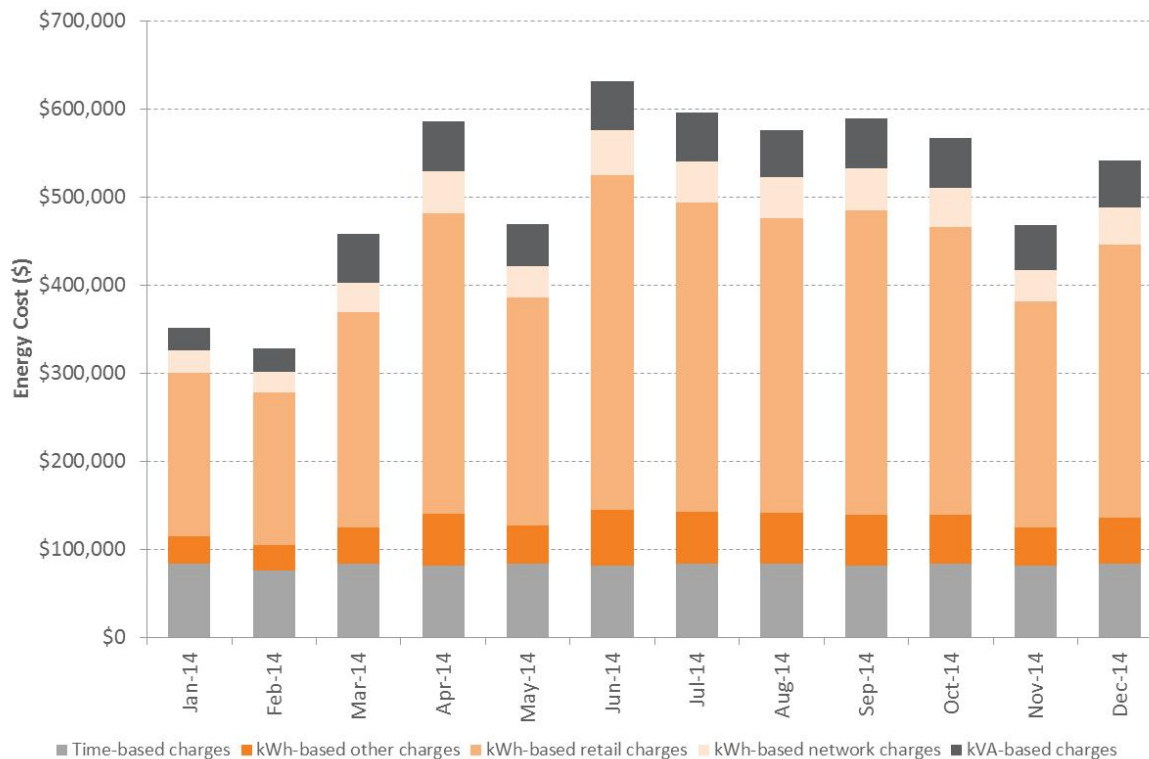
18 months of  
interval data

# Breaking down time of use





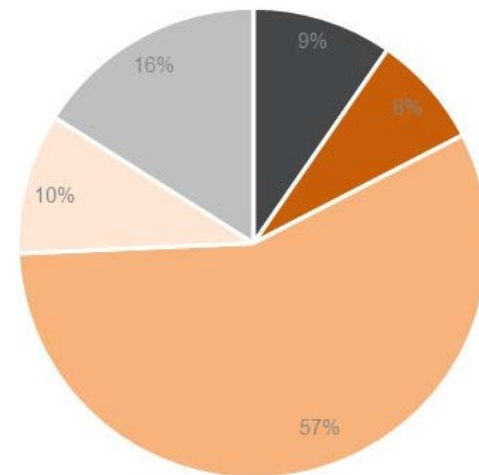
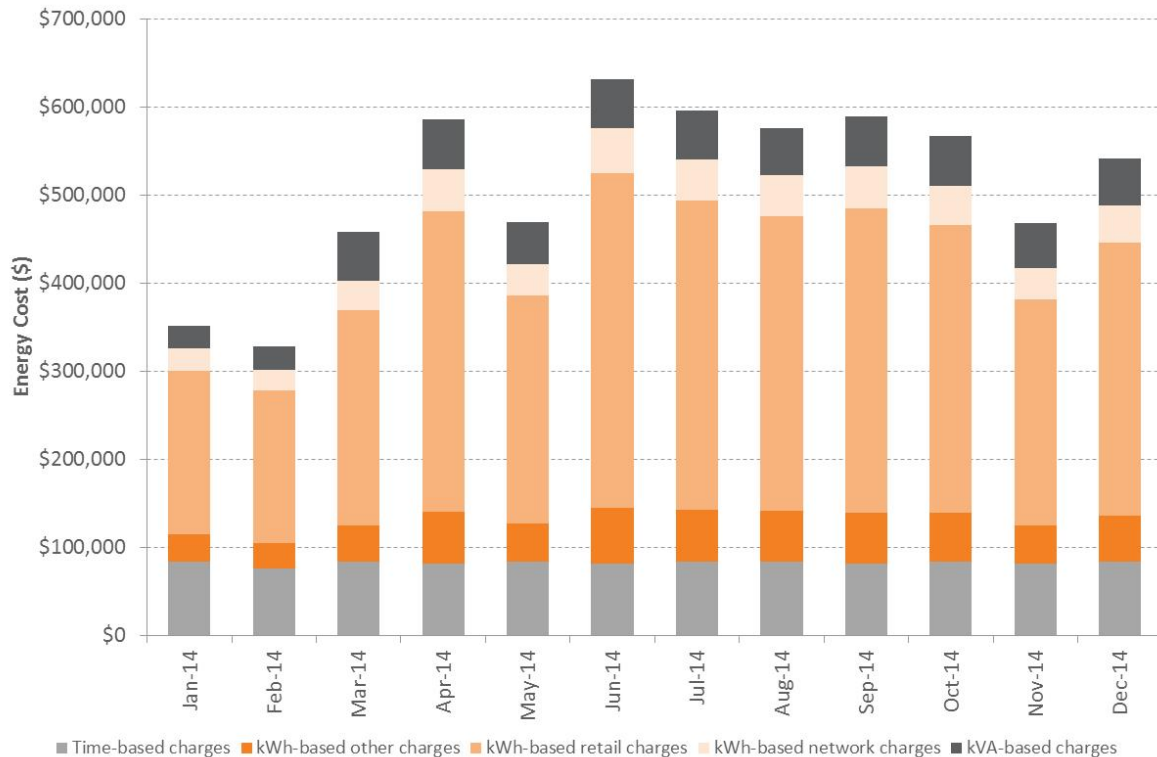
# Applying differential costs





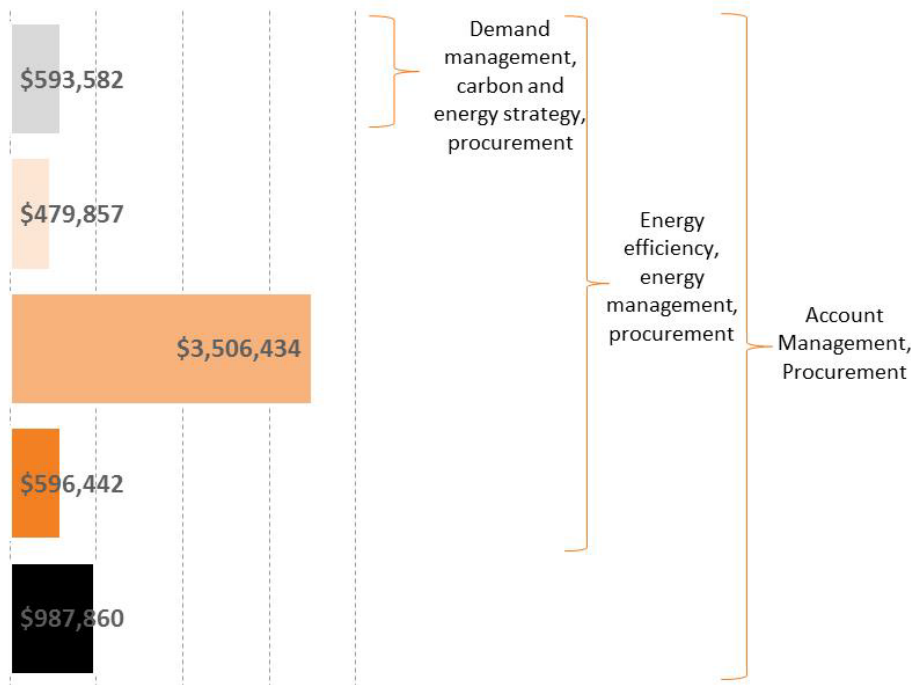


# Applying differential costs





# How can this be improved?

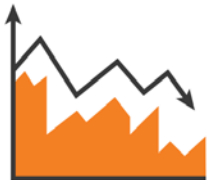


▪ Time based charges    ▪ kWh based other charges    ▪ kWh based retail charges    ▪ kWh based network charges    ▪ kVA based charges



# The bigger picture

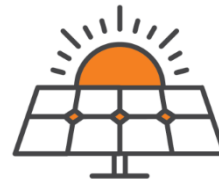
Lower total energy demand has multiple benefits



Reduces the size of any installed site generation capacity



Reduces demands on aging reticulation equipment and associated connection costs



Improves the case for renewables on site

Changing the energy cost profile over time can extend mine life



# The site challenge

- Energy savings are typically under-estimated when treated as a fixed cost: \$ per kWh
- Consider impacts of reductions in:

**↙ kVa**

power draw, start up power

**↙ kWh**

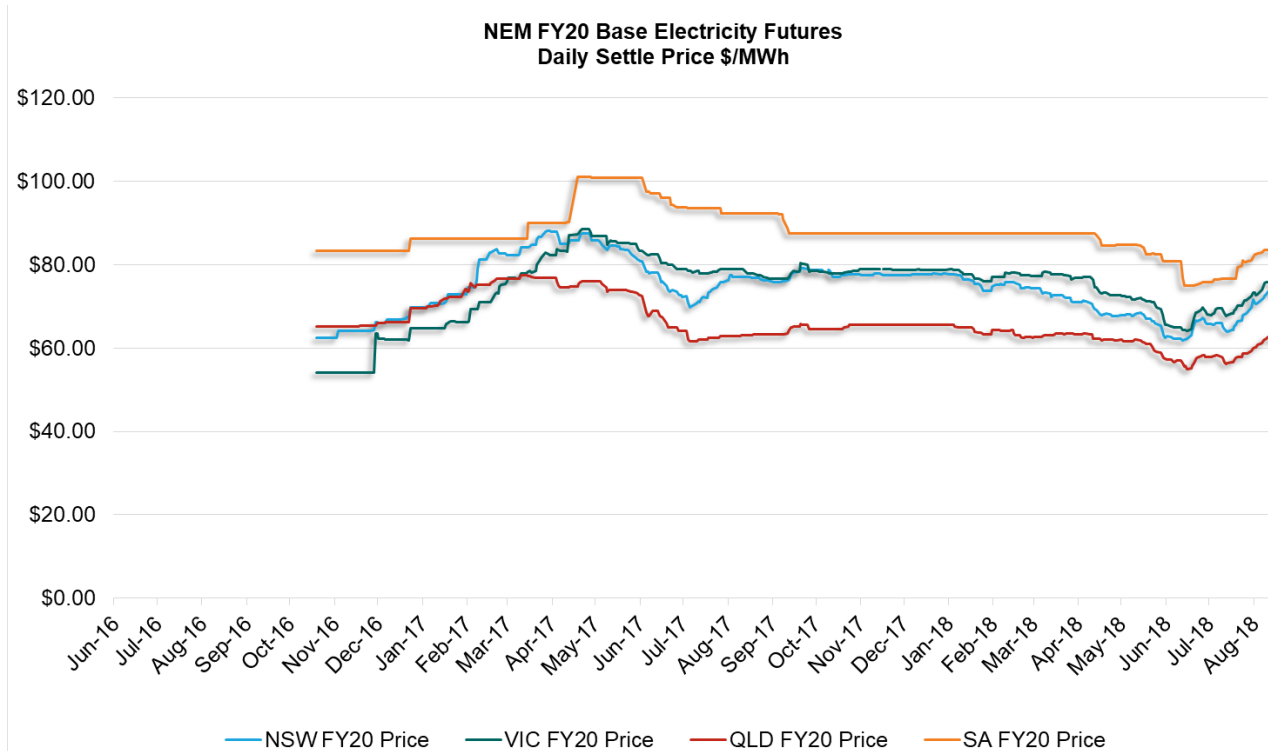
as well as shifting time of  
use

- Energy costs should be encoded as non-linear functions in business cases and optimisation
  - Time
  - kWh
  - kVa

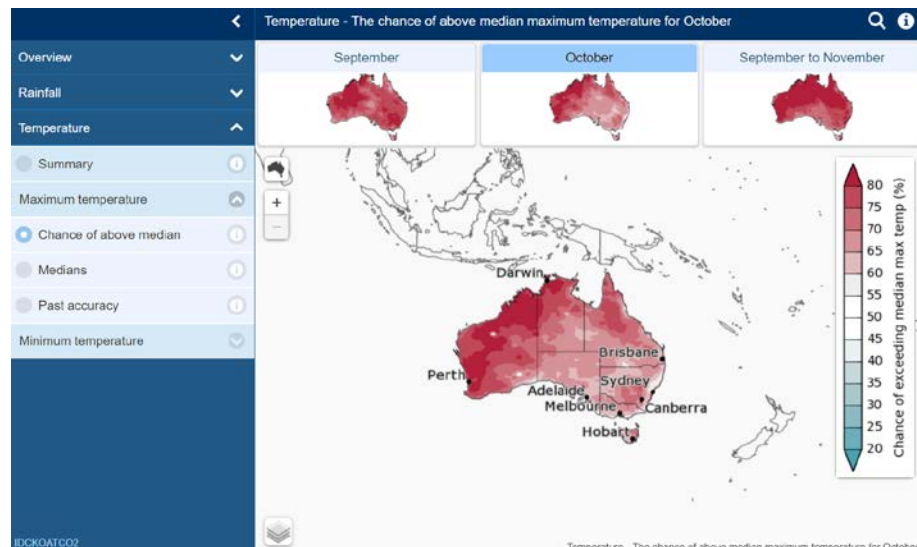
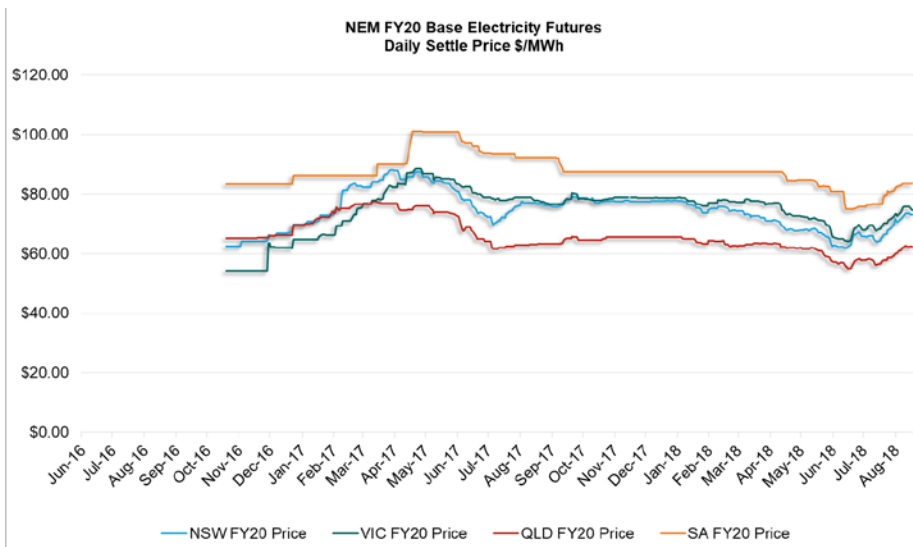


Costs will remain high

# Energy futures contract prices for 2020 delivery



# Energy futures contract prices for 2020 delivery



<http://www.bom.gov.au/climate/outlooks/#/temperature/maximum/median/monthly/1>



# Market drivers

Drivers	Description	Impact
Supply factors	Availability of inputs, constraints in existing generating assets, fuel costs	Mainly inflationary
Demand factors	Demand from other sectors (industrial and manufacturing reducing), uptake of behind the meter solar	Deflationary
State regulations	Changes to environmental certificates, support for renewables projects	Deflationary
Federal regulations	Changes to RET, energy and climate policy TBC	TBC





## The role of renewables



# Incremental hybridisation

- Secure long term prices for part of your load
  - Manage Environmental costs
  - Additional funding sources (CEFC, ARENA)
- Flatten site load, reduce or shift peaks
  - Reduce total consumption and total price
  - Role of site reticulation systems
- Batteries prices are tumbling, will enhance uptake of renewables
- Additional benefits
  - Increase life of mine
  - Asset remains post closure



Hybrid power generation for Australian off-grid mines, ARENA, June 2018  
<https://arena.gov.au/assets/2018/06/hybrid-power-generation-australian-off-grid-mines.pdf>



# Sandfire/DeGrussa case study

## The site

- 19MW diesel gensets
- Average load: 11MW
- Average power usage: 100 GWh per annum
- Average diesel consumption: 25,000,000 l/a

## The project

- Commissioned in 2016, 5.5 year PPA with the site, 20 hectares, +34,000 panels
- 6MW lithium-ion batteries (smoothing, ramp rate control)
- \$41 million (\$20.9 from ARENA)
- Supplies 15-20% of site consumption, 21 GWh per year, reduces diesel by 5,000,000 l/a



A blurred background image of a person writing in a notebook with a pen. The person is wearing a patterned shirt. The image is overlaid with a solid orange banner at the bottom.

Where to next?

# Summary



**What does your energy dollar buy?**

Contract structures and time of use considerations

**Energy prices will remain volatile**

Many drivers outside control of the site

**Renewables can help you fix a long term price**

Reduce price risk, increase project life

**What next?**

Understand the real cost of energy, reduce consumption, manage price volatility



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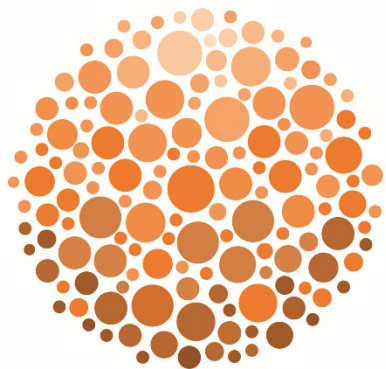


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