

# UNLOCKING THE POWER OF DEMAND RESPONSE

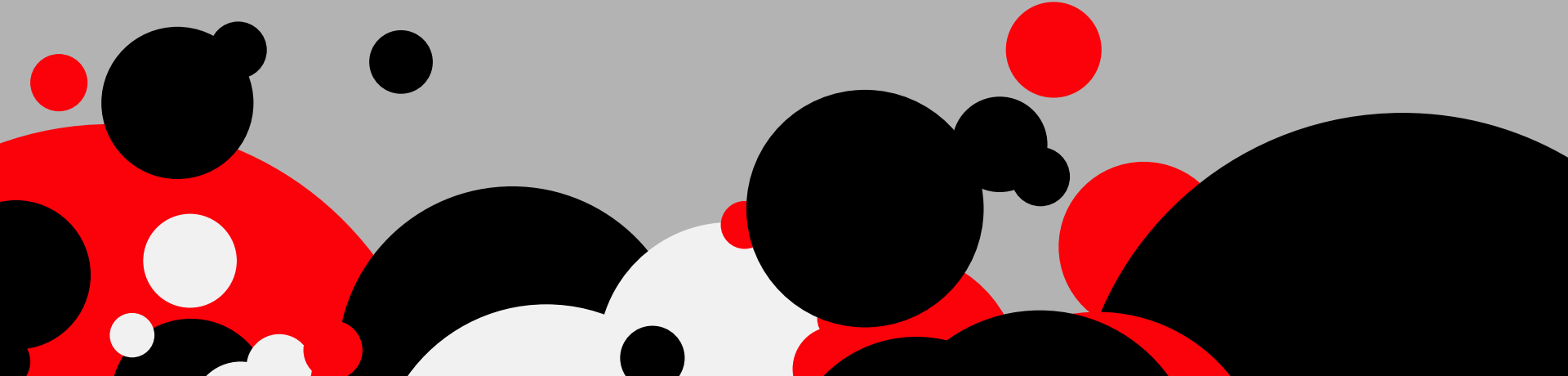


National Energy Efficiency Conference  
Melbourne, 20 Nov 2017

**Chris Dunstan**

Research Director

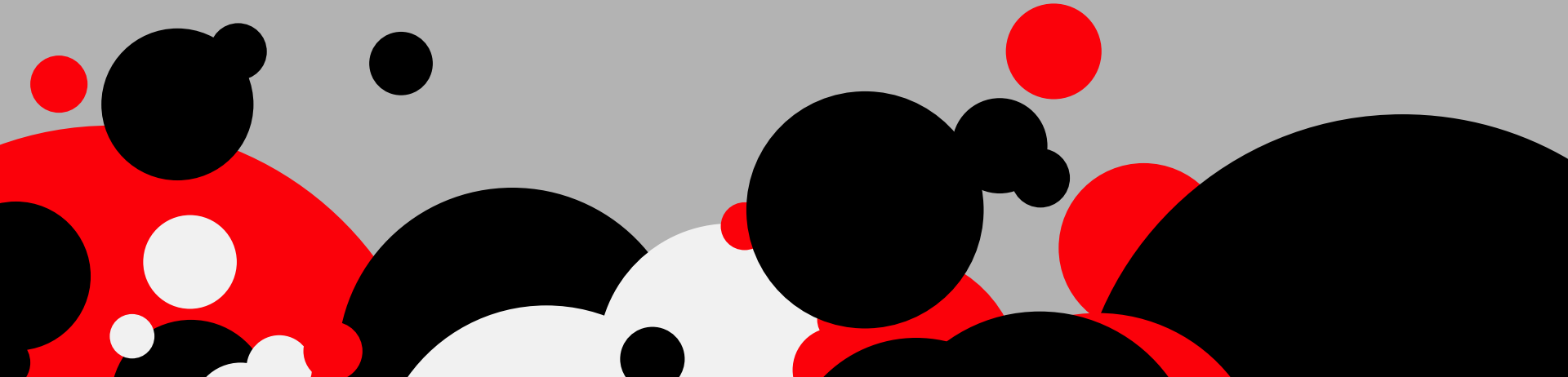
UTS Institute for Sustainable Futures



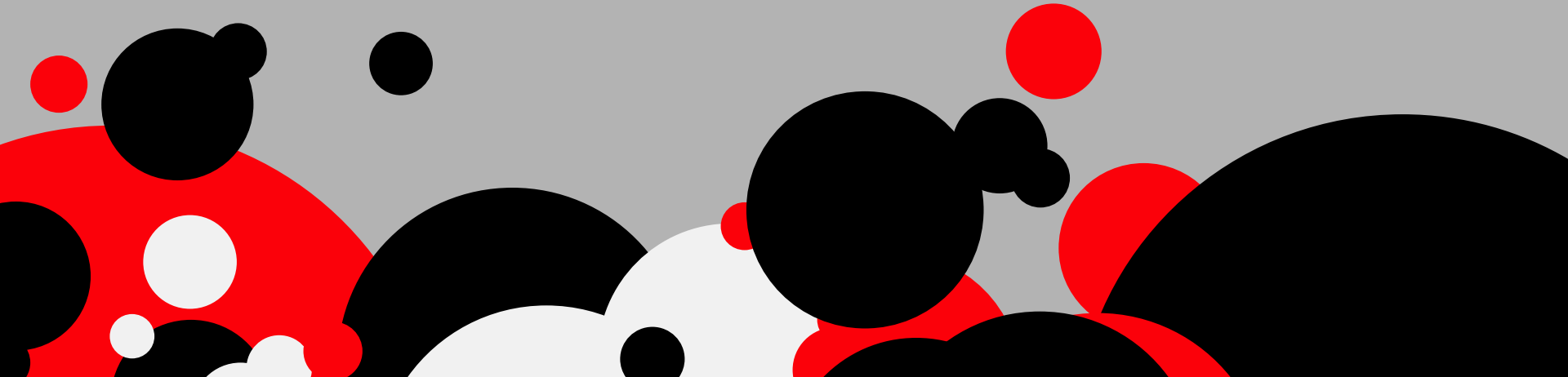
# Summary:



1. Context: Security, Affordability, Productivity
2. Network Opportunity Maps
3. Demand Management Incentive Scheme
4. Beyond Coal: Alternatives to extending Liddell Power Station

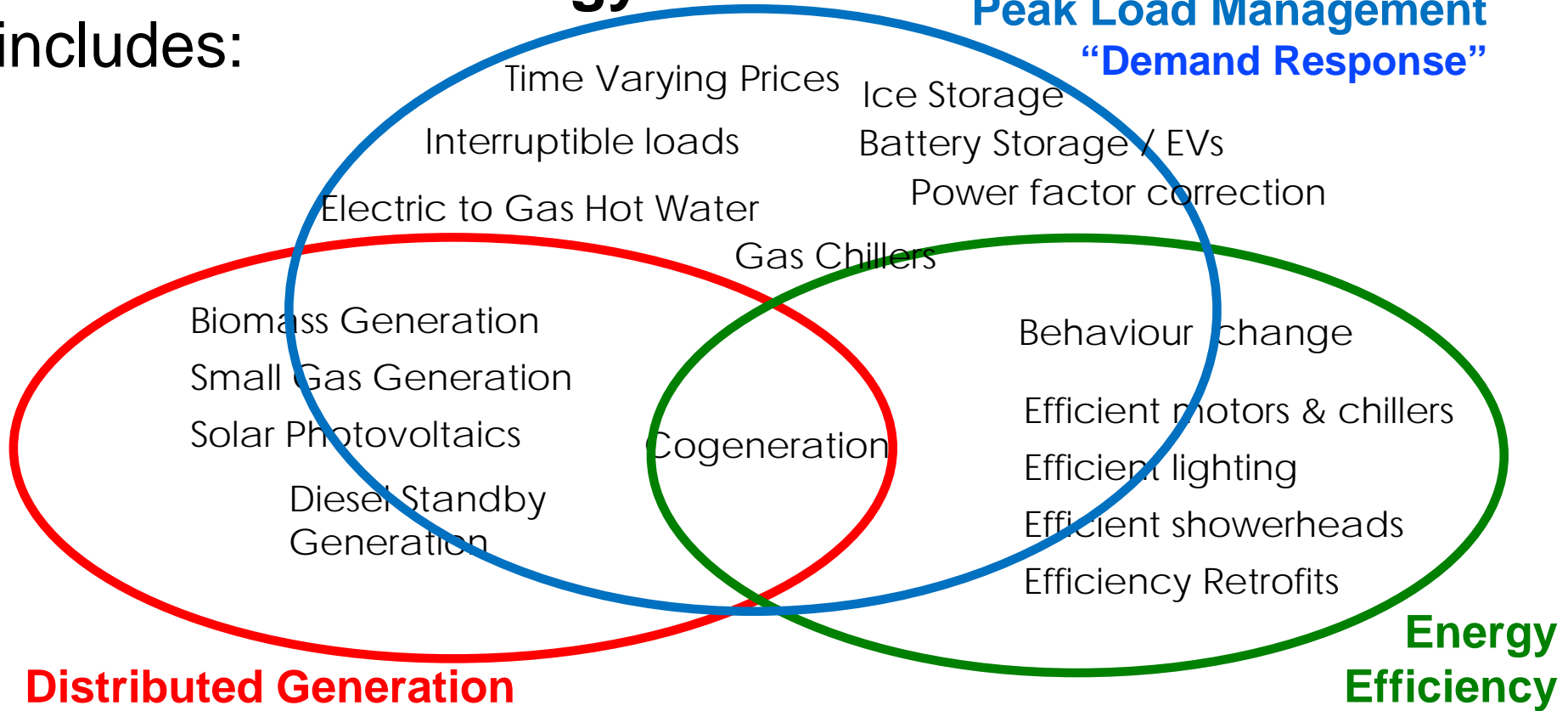


# 1. Context: Security, Affordability, Productivity



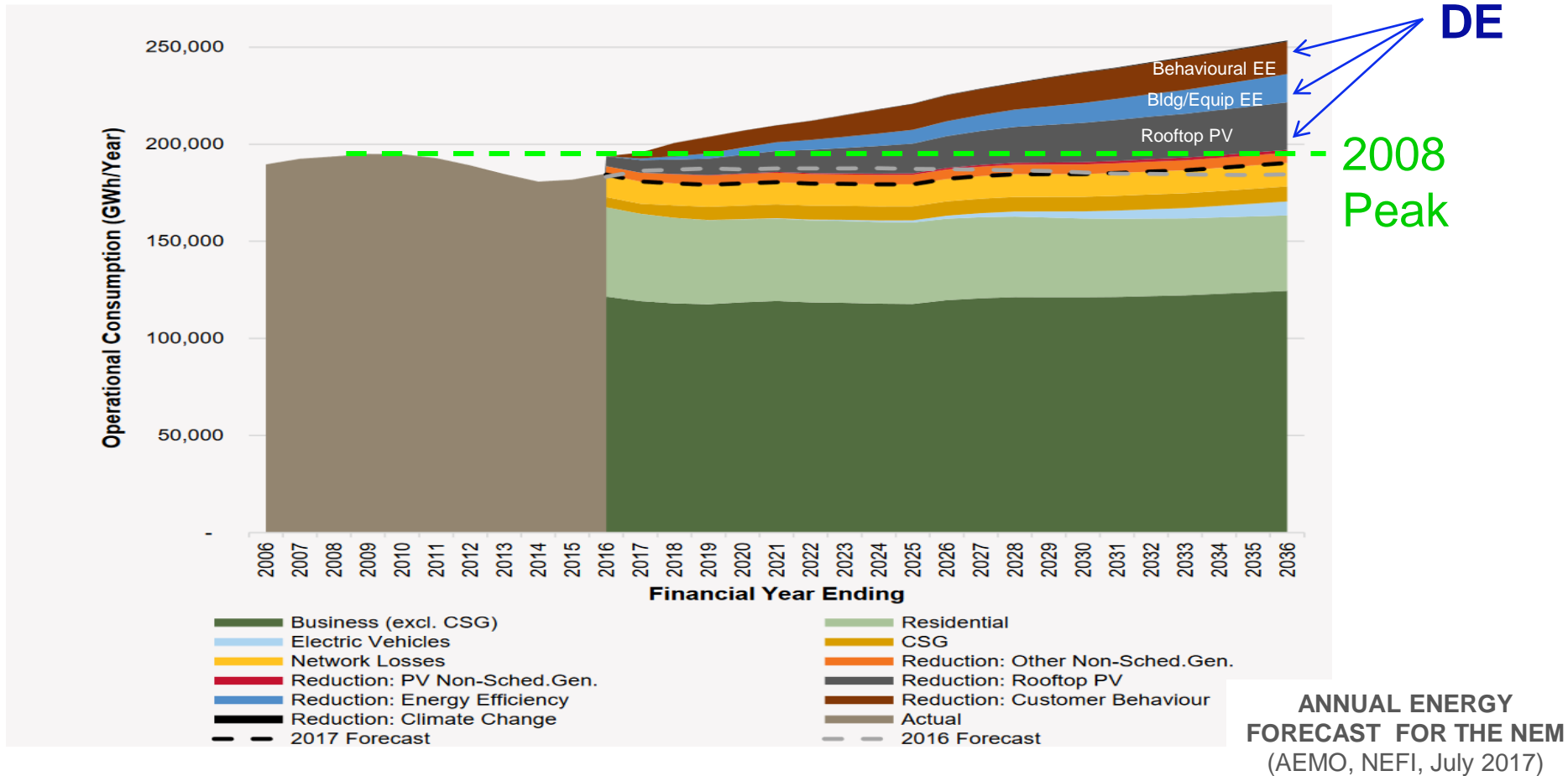
# Decentralised Energy

includes:

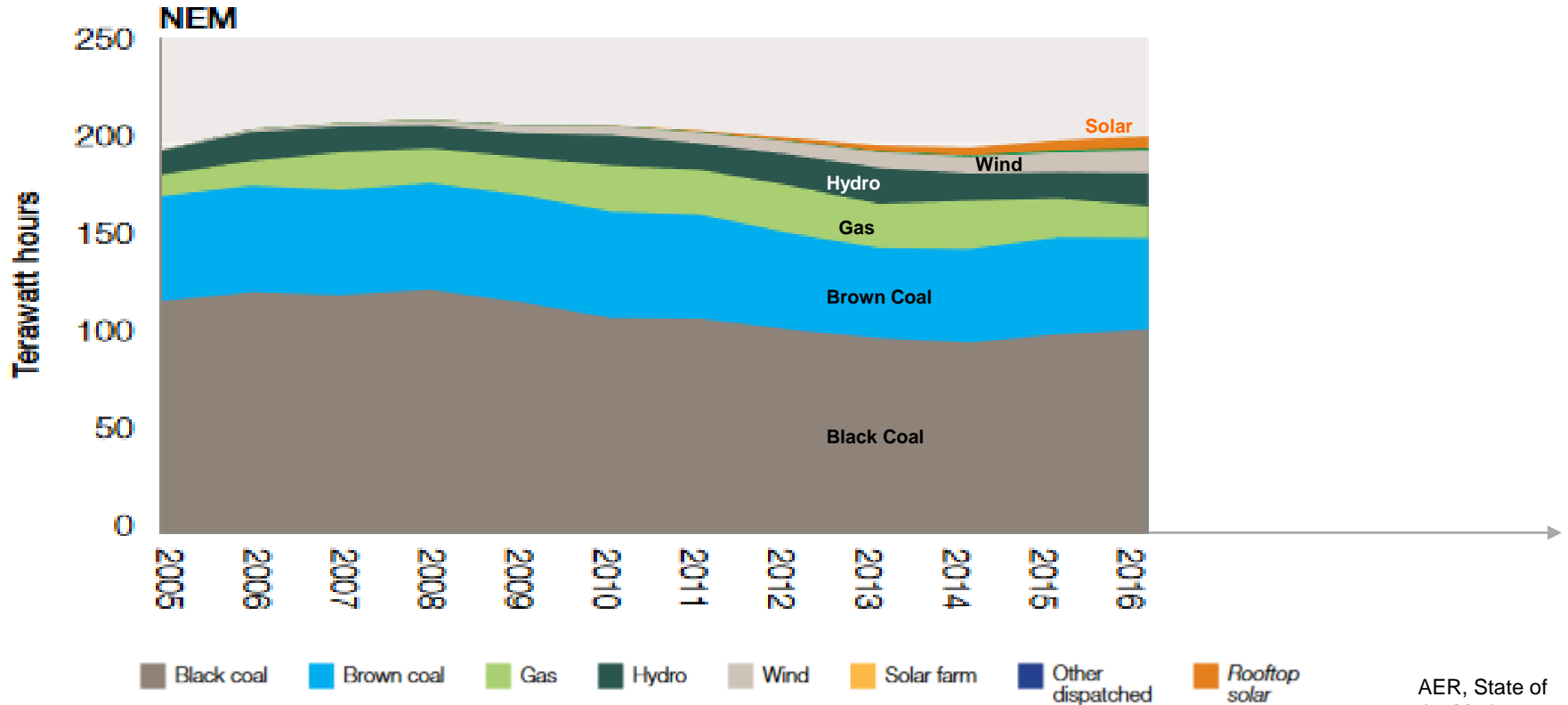


# Forecast Energy Consumption; Decentralised Energy growing

Figure 1 Neutral scenario annual operational consumption forecast for the NEM

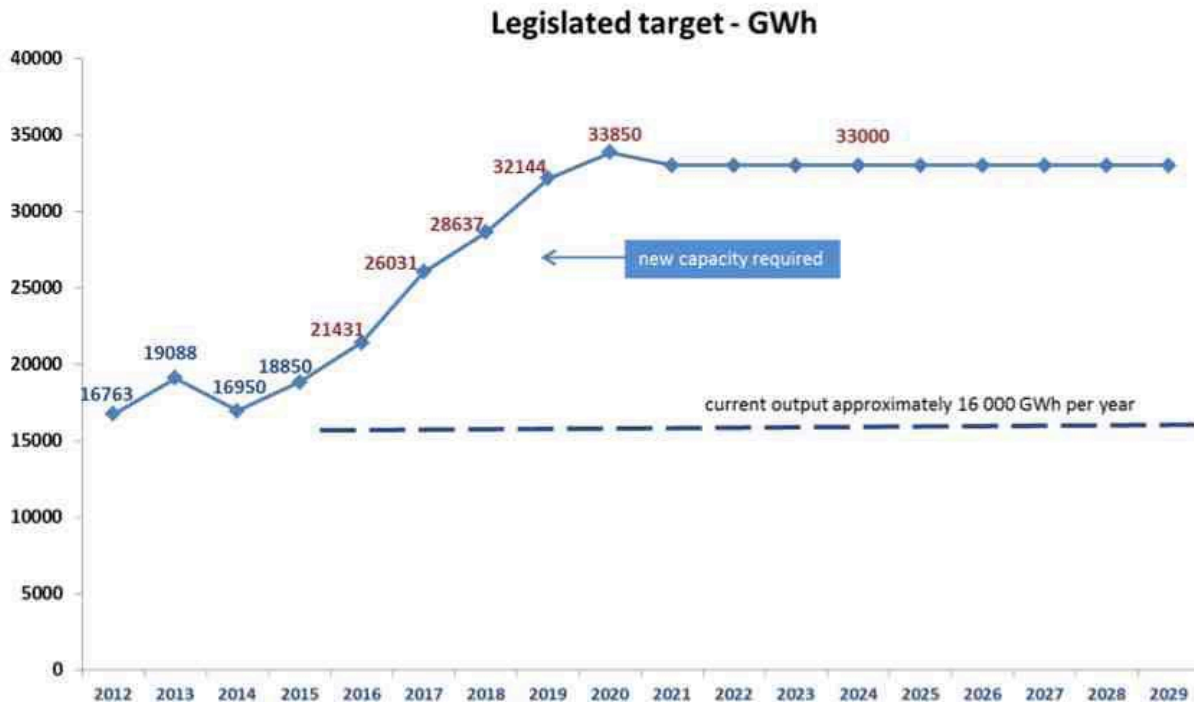


# Generation sources in the NEM



# And the RET:

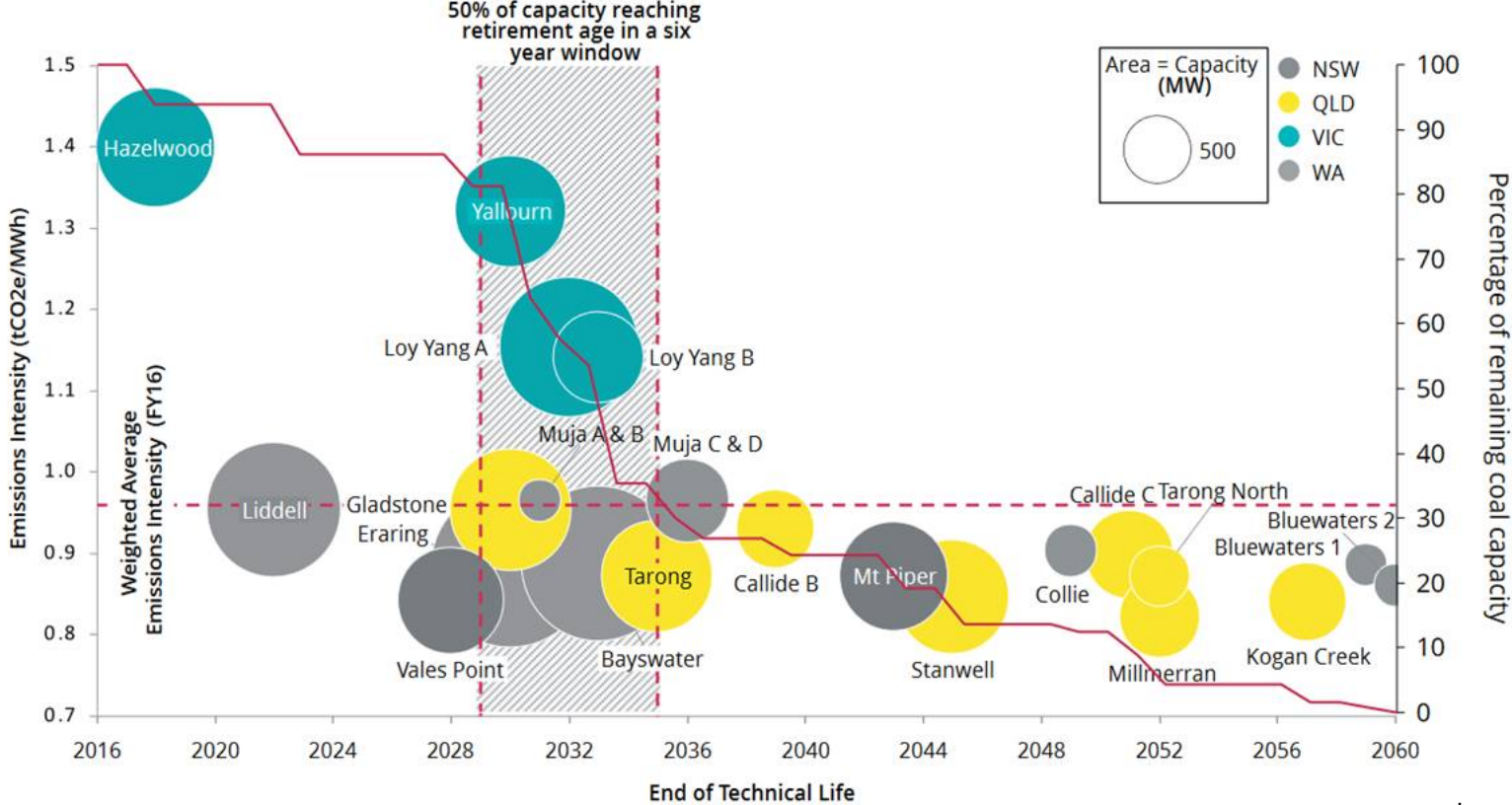
Adds another ~12 TWh p.a. of renewable energy by 2021



Note:

- + Small scale solar (6TWh pa)
- Hazelwood (12TWh p.a.)
- Liddell (~8TWh p.a.)

# Coal power station retirement: No time to waste

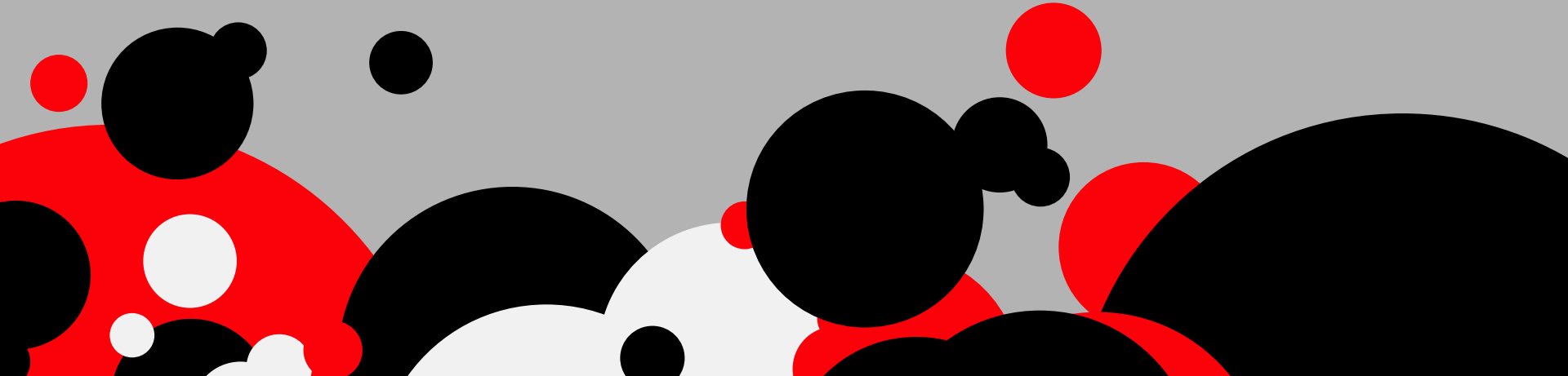


Source:  
 Investor Group on  
 Climate Change

Figure 4 – Potential future coal-fired capacity losses, based on coal generator age (Australian Energy Market Operator, 2017; EY analysis)

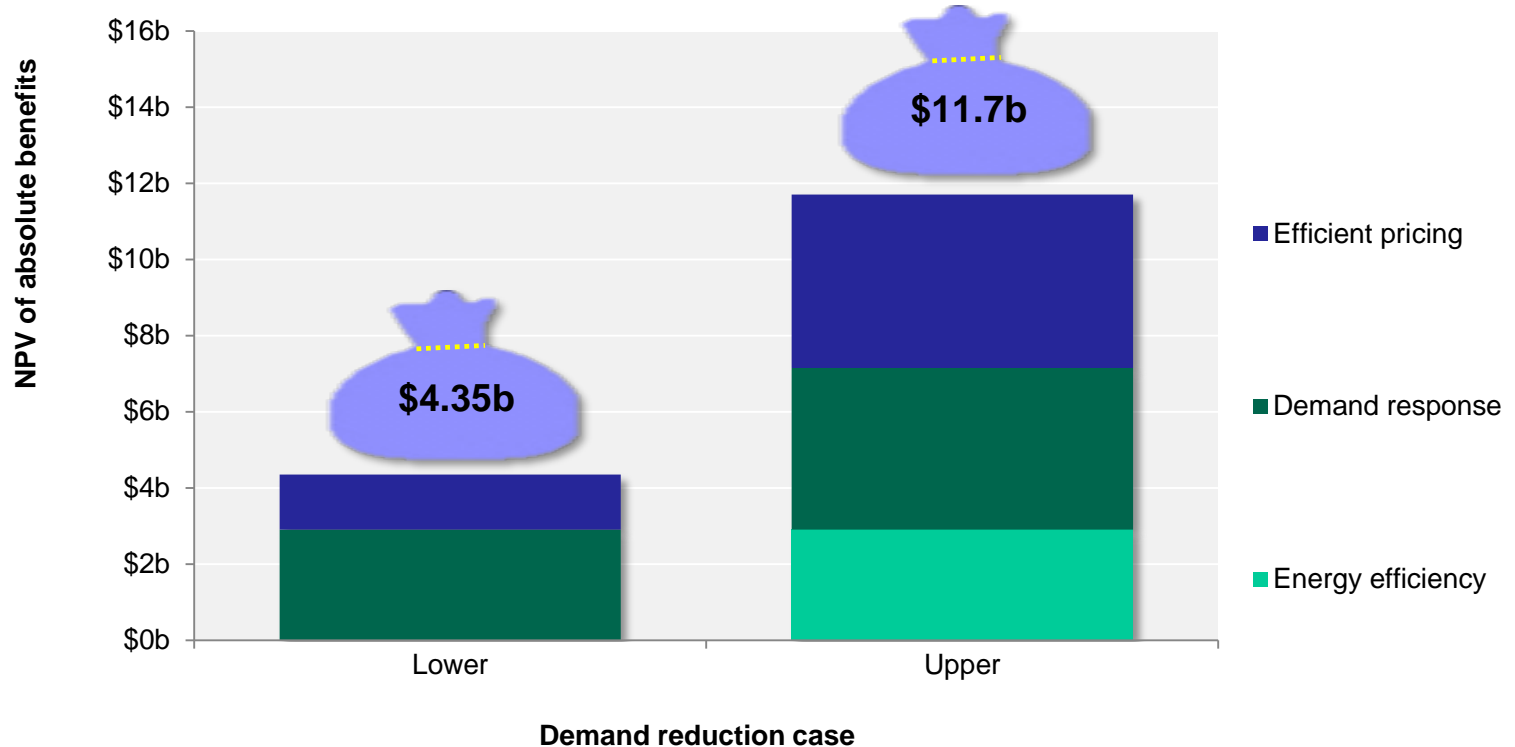


## 2. Network Opportunity Maps



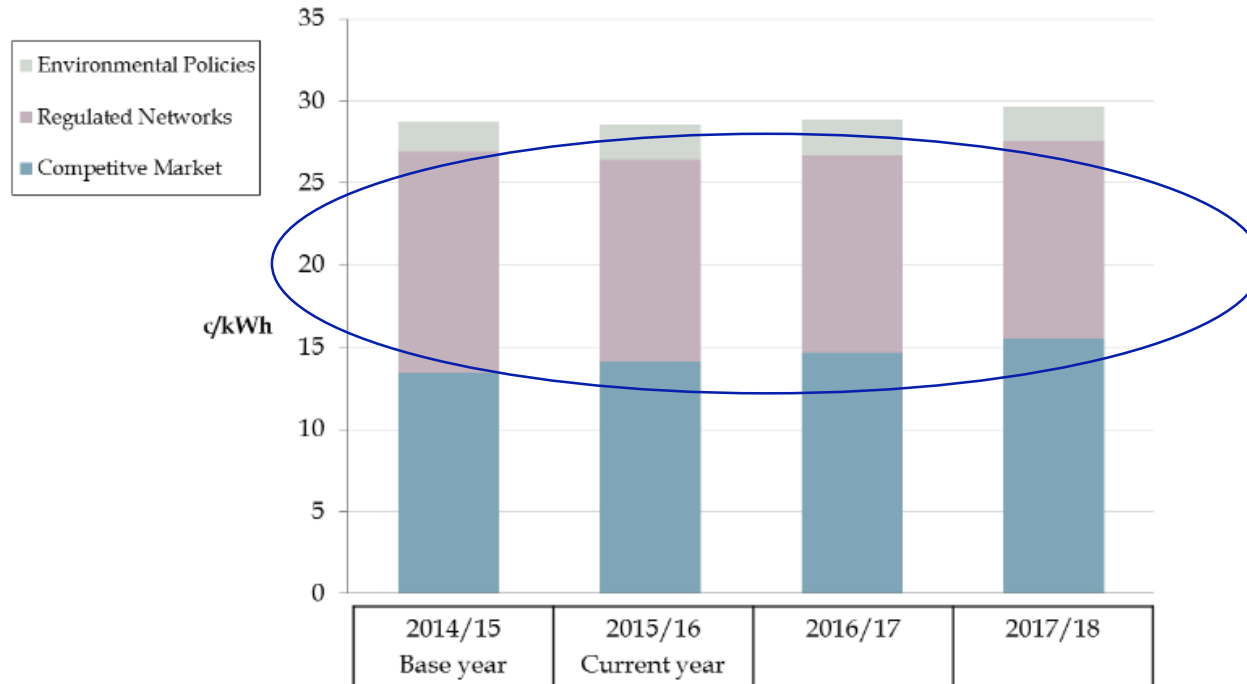
# The Demand Management Opportunity

Total benefit of demand reduction in the NEM 2013/14 to 2022/23



# Electricity Networks: location, location, time!

## Electricity prices in the NEM (2014-2018)



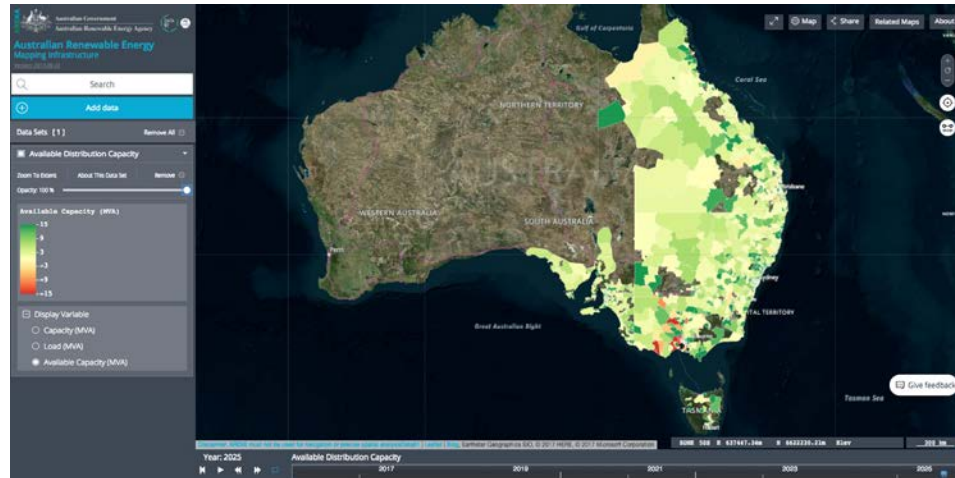
- **Networks comprise ~43% power bills (nationally)**
- Network costs are highly location & season specific
- **Mapping can help identify priority areas for non-network alternatives (Decentralised Energy Resources)**

Source: AEMC, 2015 Residential Electricity Price Trends December 2015, Sydney

# Network Opportunity Maps

1. **Where** are the most cost-effective opportunities for DE in our grid?
2. **How much** could DE be **worth** at these locations?
3. **When** are the key years and times of constraint?

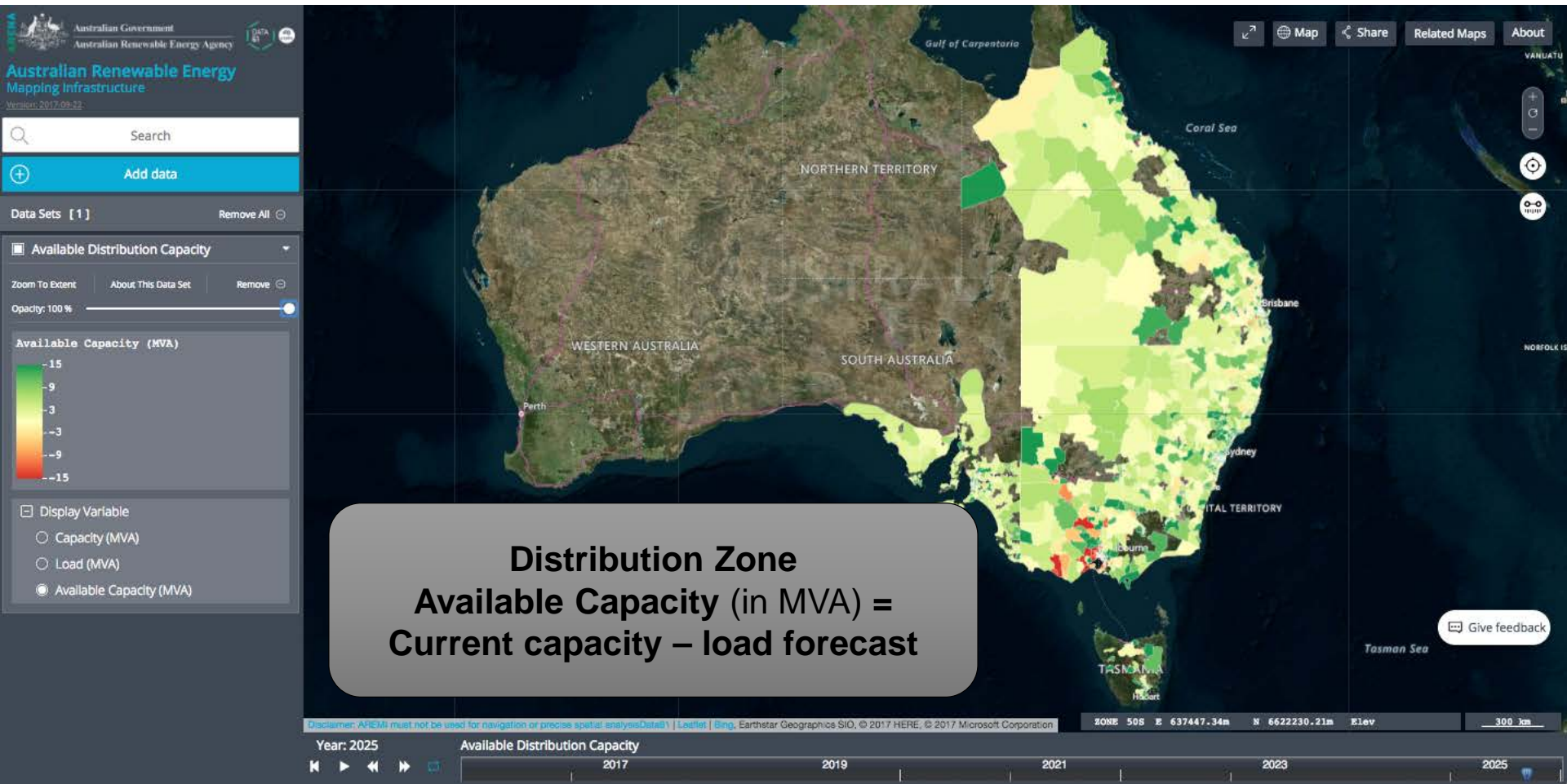
To answer these questions, we created  
**Network Opportunity Maps**



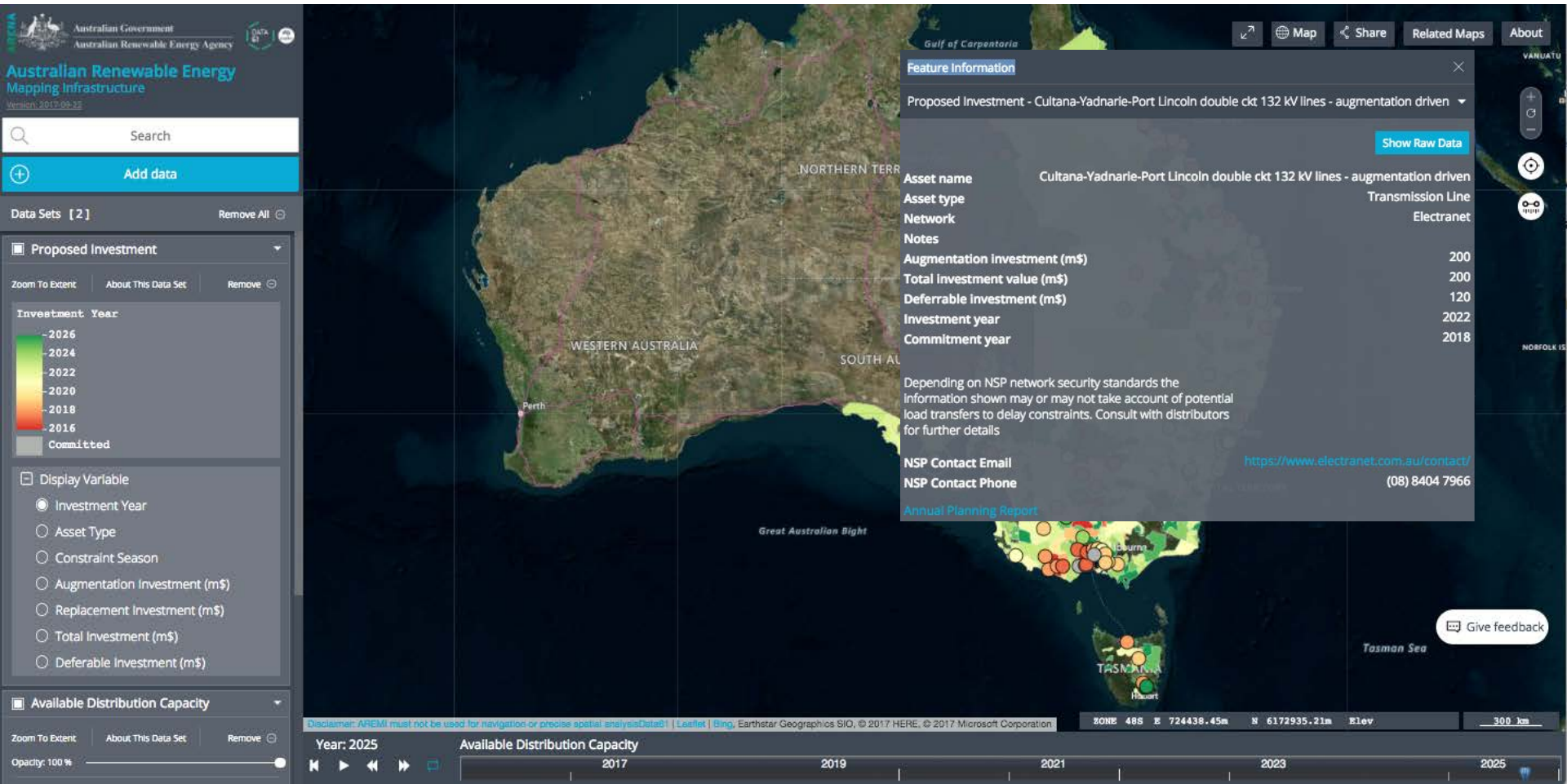
# Network Opportunity Maps: a 3-year partnership



# Available distribution network capacity

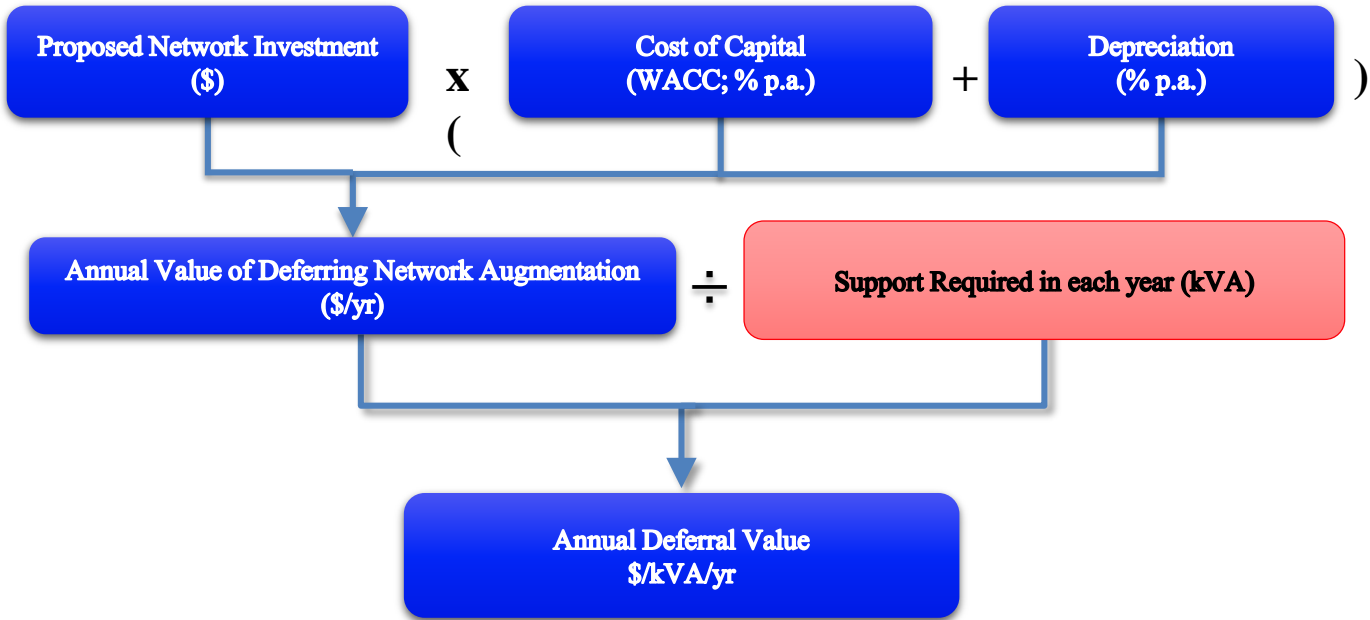


# Proposed investment





# Annual Deferral Value Calculation





# Annual Deferral Value (\$/kVA/yr)

Australian Government  
Australian Renewable Energy Agency

**Australian Renewable Energy Mapping Infrastructure**  
Version: 2017-09-23

Search

Add data

Data Sets [ 2 ] Remove All

Zoom To Extent About This Data Set Remove

Opacity: 80 %

Deferral Value (\$/kVAyr)

MVA support required

Display Variable

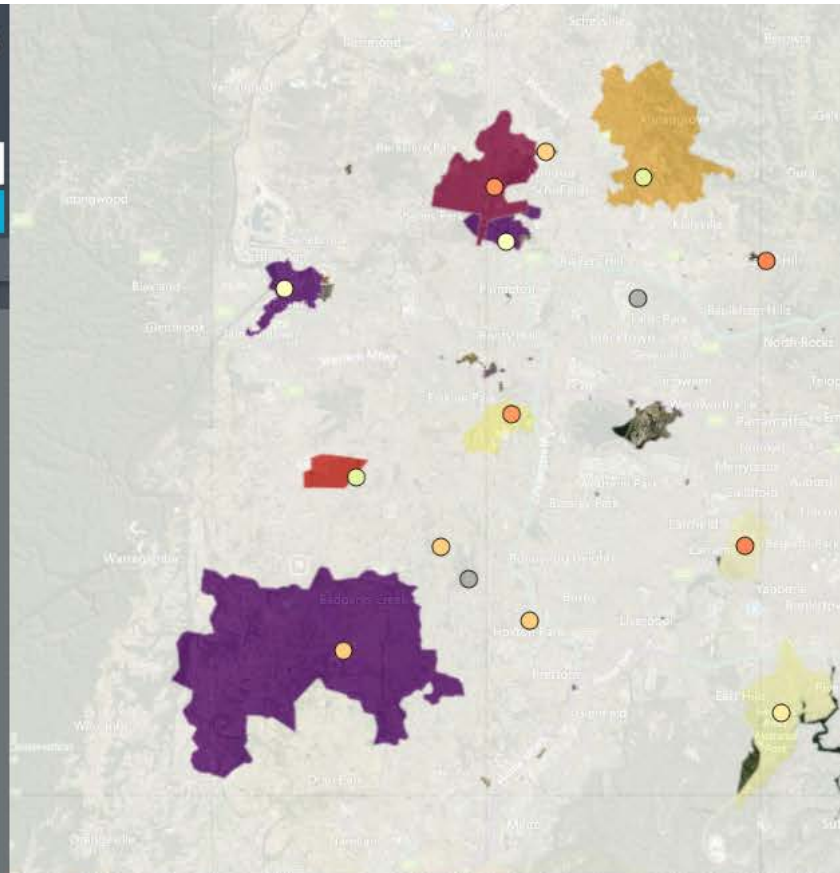
Proposed Investment

Zoom To Extent About This Data Set Remove

Deferable Investment (m\$)

(No value)

Display Variable



Map Share Related Maps About

Feature Information

Notes

Establish South Penrith ZS to offload Penrith and Kingswood zone substations

NSP Contact Email [consultation@endeavourenergy.com.au](mailto:consultation@endeavourenergy.com.au)

NSP Contact Phone 133 718 (Ask to speak to Demand Management Section)

[Annual Planning Report](#)  
[NSP demand management information](#)

Year	ADV (\$/kVAyr)	Support required (MVA)
2016	0	0
2017	0	0
2018	0	1.8
2019	0	2.3
2020	1084.8	2.3
2021	1084.8	2.3
2022	1039.6	2.4
2023	1039.6	2.4
2024	998	2.5
2025	924.1	2.7

Deferral Value vs Support Required

Expand

Feedback

DISCLAIMER: AREMI must not be used for navigation or precise spatial analysis. Data61 | Leaflet | Bing, Earthstar Geographics SIO, © 2017 HERE, © 2017 Microsoft Corporation

Zone 568 E 275082.20m N 6235768.17m Elev

5 km

Year: 2021 Annual Deferral Value

2017 2019 2021 2023 2025

# Applying Annual Deferral Value

- A \$10m network investment is driven by a commercially-driven summer 2pm peak constraint
- Requires 2.5MVA/yr of non-network support to achieve successful deferral
- The value noted on the Annual Deferral Value layer is \$400/kVA/yr
  
- A proponent in this zone substation area is looking at developing a 3 MVA gas trigeneration system, delivering:
  - 3 MVA of peak electrical generation power
  - A further 0.75MVA offset of peak electrical cooling demand
  - This 3.75 MVA summer afternoon peak reduction could achieve a 1.5 year deferral of that asset
  
- The \$400/kVA/yr ADV is applied as follows:
  - $\$400 \times 2,500\text{kVA} \text{ (2.5 MVA)} \times 1.5 \text{ yrs} = \$1.5\text{m}$
  - i.e. Firm generation of this scale is worth *up to* \$1.5m to the network.
- To achieve a more efficient solution the network will want to spend *less* than this amount (+ runs competitive process)
- But this generation might then factor in ~\$0.5-1.5m network support revenue stream if it is to enter into contract with the network

# Peak Day Available Capacity

nationalmap.gov.au/renewables/

Australian Government  
Australian Renewable Energy Agency

Australian Renewable Energy  
Mapping Infrastructure  
Version: 2017-11-13

Search

Add data

Data Sets [ 1 ] Remove All

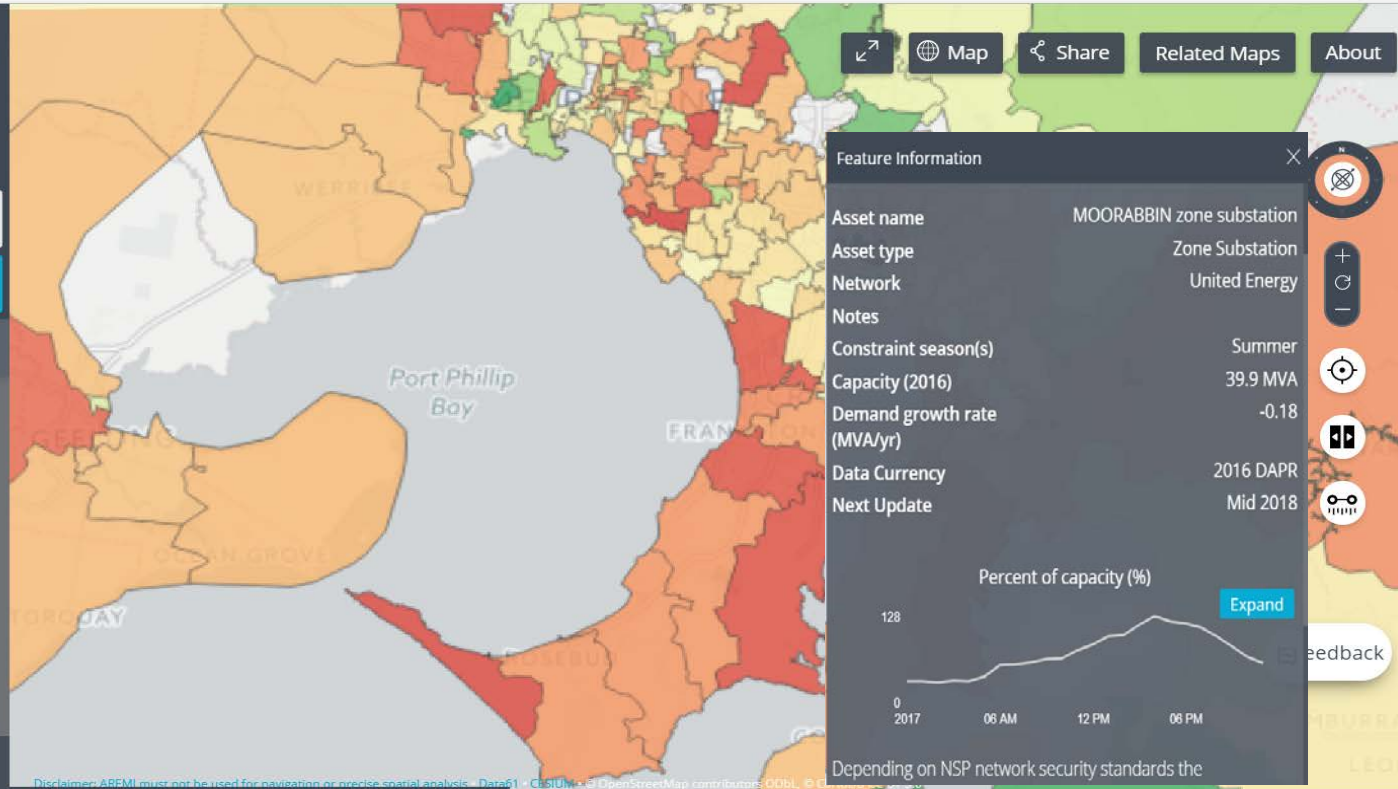
Peak Day Available Capacity

Zoom To Extent About This Data Split Remove

Opacity: 80 %

Time: 01/01/2017, 17:00:00

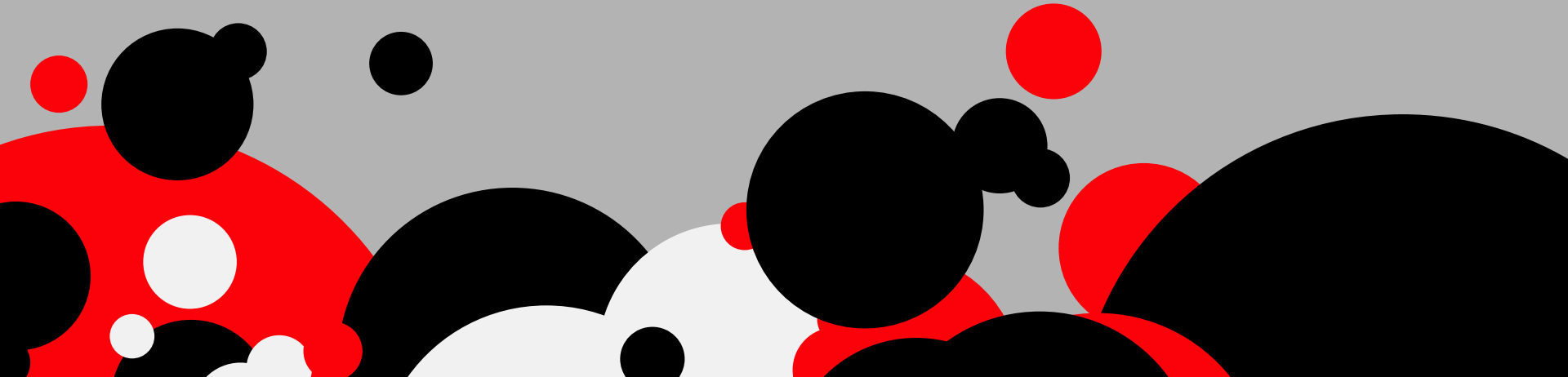
Timeline



Peak Day Available Capacity Hour of day: 05 pm Lat 38.399°S Lon 144.362°E Elev 10 km



# 3. Demand Management Incentives Scheme & DM Incentives Review



# DM Incentive Scheme:

- Proposed by AEMC: 2012
- Rule Change via COAG 2015
- Draft Scheme: August 2017
- **Final Scheme: December 2017**
  
- Due to commence in next regulatory period in each state
  - NSW, ACT, Tas: July 2019; SA, Qld, July 2020; Vic: Jan 2021
  - ***But*** AER has proposed Rule Change to ***start across NEM in 2019***

# *Draft DM Incentive Scheme:*

- **Allows Distribution Network Service Provider (NSPs) to recover up to 50% of the cost of DM, subject to:**
  - Must be shown to be cost effective (benefits exceed costs)
  - Total cost must not exceed 1% of revenue (~\$90 million p.a.)
  - Therefore max. total spending on DM (~\$180 million p.a.)
  - DMIA to support innovative DM (~\$20 million p.a.)
- Encourages third party DM service provision
  - Issue request to the market for solutions
- Compliance Reporting

# Demand Management Incentives Review

Assume a Distribution Network Service Provider (NSP) faces a network constraint with two equally reliable solutions:

1. A network (Capex) solution; and,
2. A DM (Opex) solution.

Assessed financial impact (cost benefit analysis) on:

- a) Distribution NSPs &
- b) customers

...given current economic regulatory settings (AER)



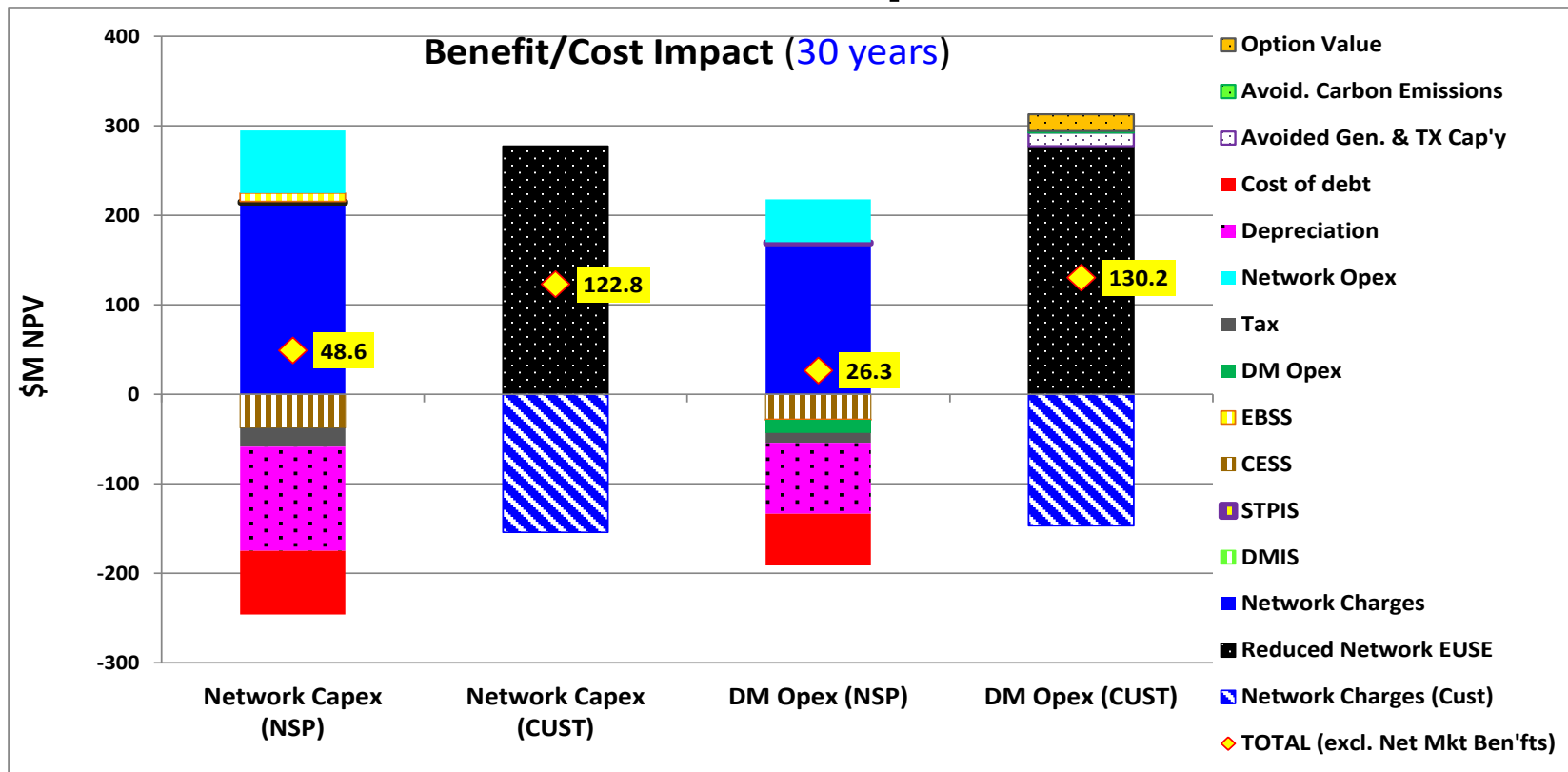


# CASES for analysis

Case	Network Constraint	Network Solution	DM Solution
1	<b>Urban regional high voltage (HV) cables, reaching end of service life</b>	Retire aging 33kV cables – Replace with 132KV cable  (capacity: 200MWp, cost: \$300M)	Large scale energy efficiency and peak load mgt  (capacity: 50MWp, cost: \$132/kW/yr, 5 year deferral)
2	<b>Over- and under-voltage on distribution feeder</b>	Install power factor correction, Static VAR Compensation and Distribution Transformer Automatic Tap Changers  (capacity: 0.5MWp, cost: \$0.5M)	Peak load mgt, local batteries and network support (incl. from PV inverters)  (capacity: 0.5MWp, cost: \$143/kW/yr, 30 year deferral)
3	<b>Distribution zone approaching capacity on urban fringe</b>	New zone substation for new residential estate (capacity: 10MWp, cost: \$30M)	Establish minigrid (energy efficiency, load mgt, PV, batteries & diesel back up) for new subdivision; maintain connection to main grid  (capacity: 10MWp, cost: \$113/kW/yr, 30 year deferral)
4	<b>Unreliable distribution feeder to community on rural fringe-of-grid</b>	Retire existing feeder - replace like for like  (capacity: 5MWp, cost: \$5M)	Establish minigrid (energy efficiency, load mgt, PV, batteries & diesel back up) - keep existing feeder as back up  (capacity: 5MWp, cost: \$113/kW/yr, 30 year deferral)



# Current network regulation (Case 1): DM better for customers, Capex better for NSP's



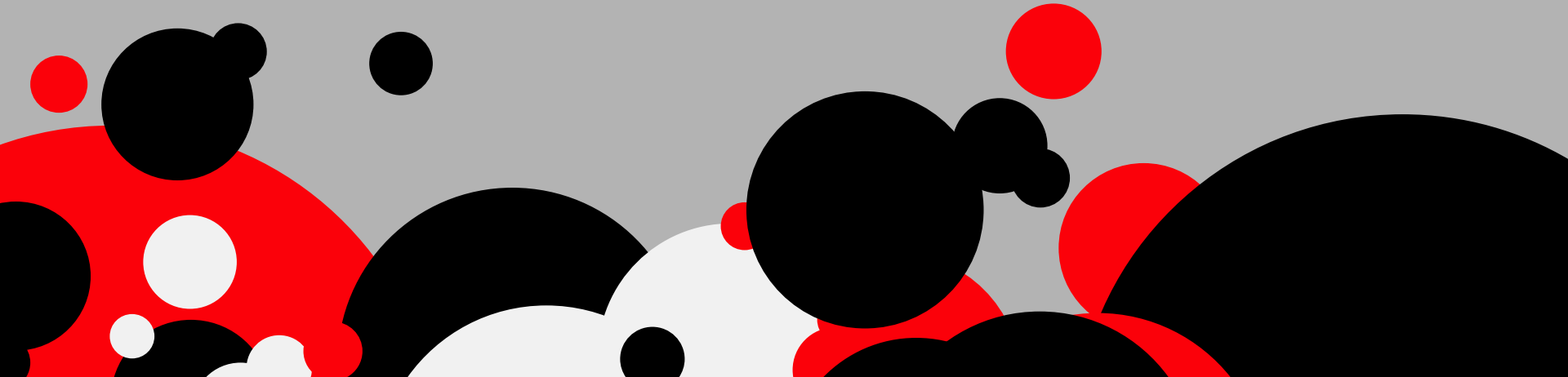
# DM Incentives Review conclusions

1. There is **currently** bias in net profit results (and return on equity)
  - DM gives lower net profit, but higher customer benefit, than network Capex
  - Bias **not** apparent in short term
2. There is **currently** bias in not allowing NSPs direct DM cost recovery
3. Excluding NSPs from accessing a share of “net market benefits” leads to higher costs for customers

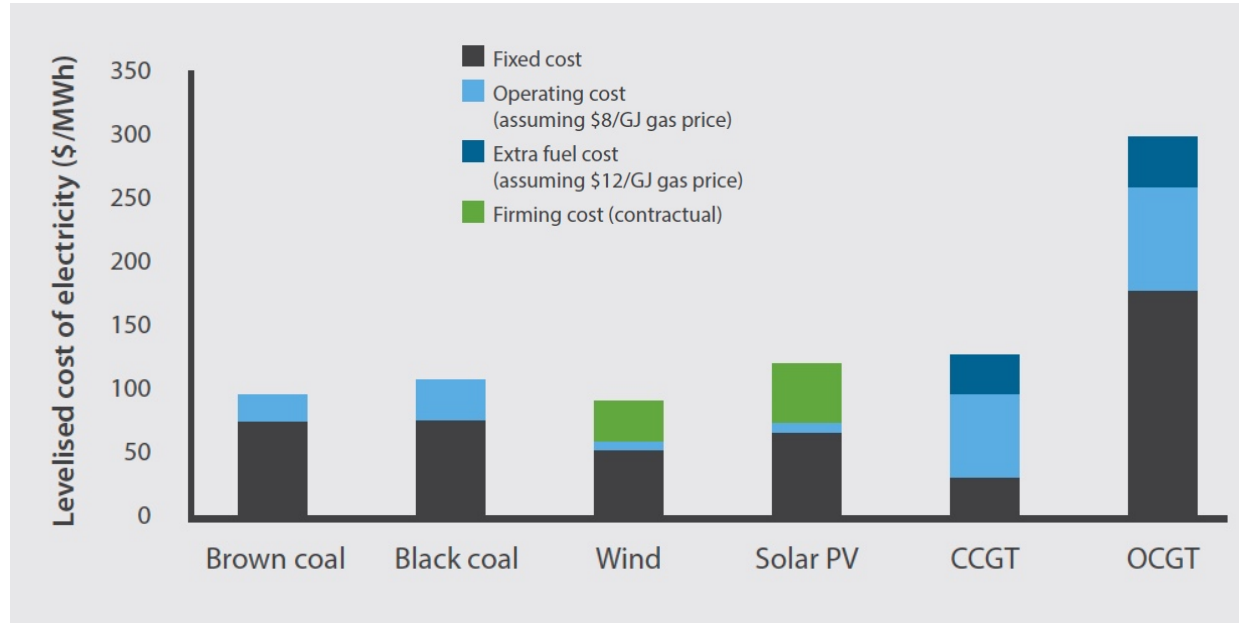
The DM Incentive Scheme is likely to overcome this bias.

4. New report released today

# **Beyond Coal: Alternatives to extending the life of Liddell Power Station**

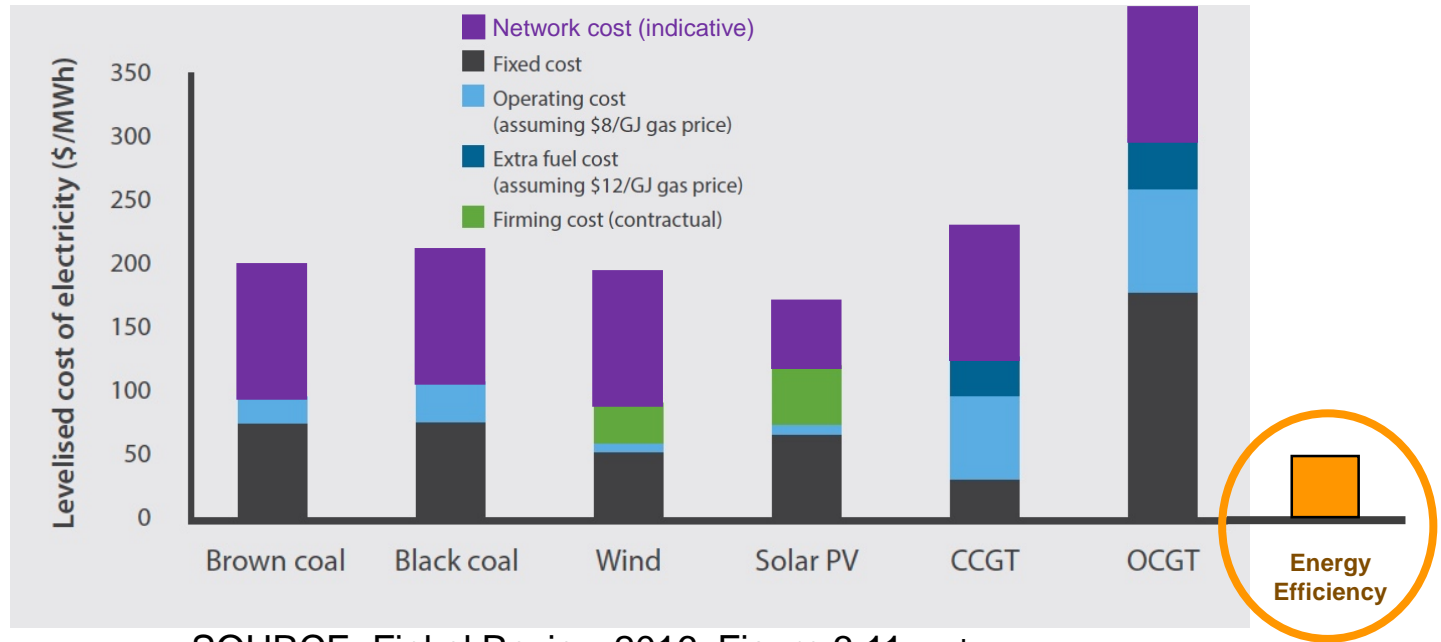


# The lowest cost resource?



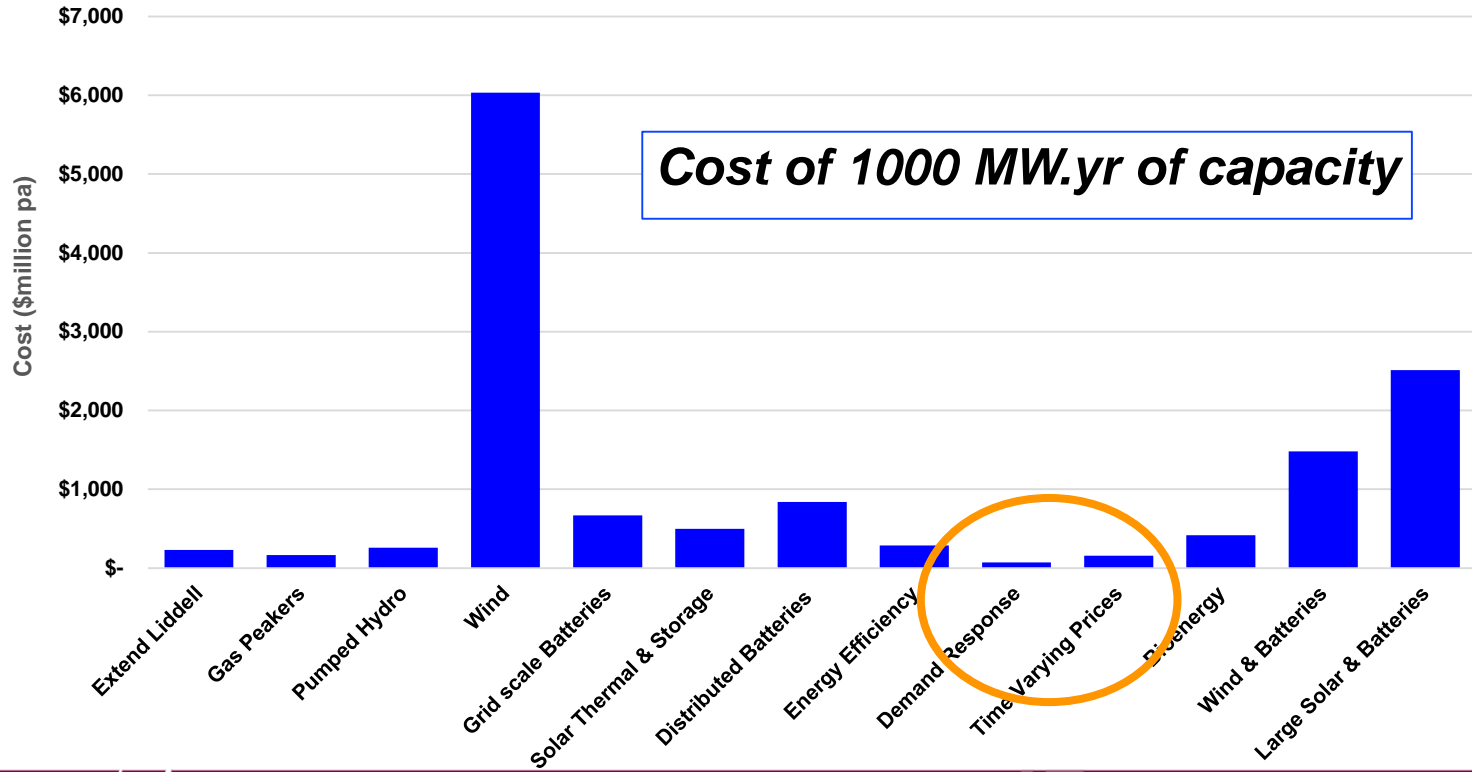
SOURCE: Finkel Review 2016 Figure 3.11

# The lowest cost resource? For energy: Energy Efficiency

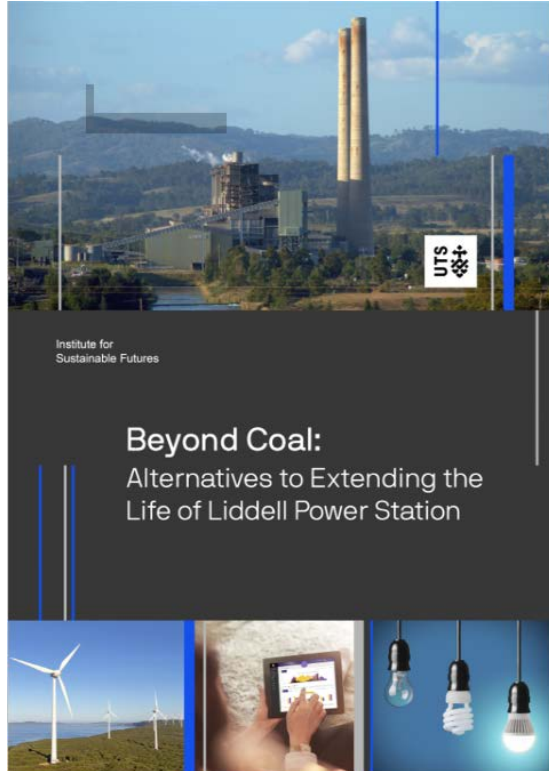


SOURCE: Finkel Review 2016, Figure 3.11 and US Energy Information Administration

# The lowest cost resource? For capacity: Demand Response



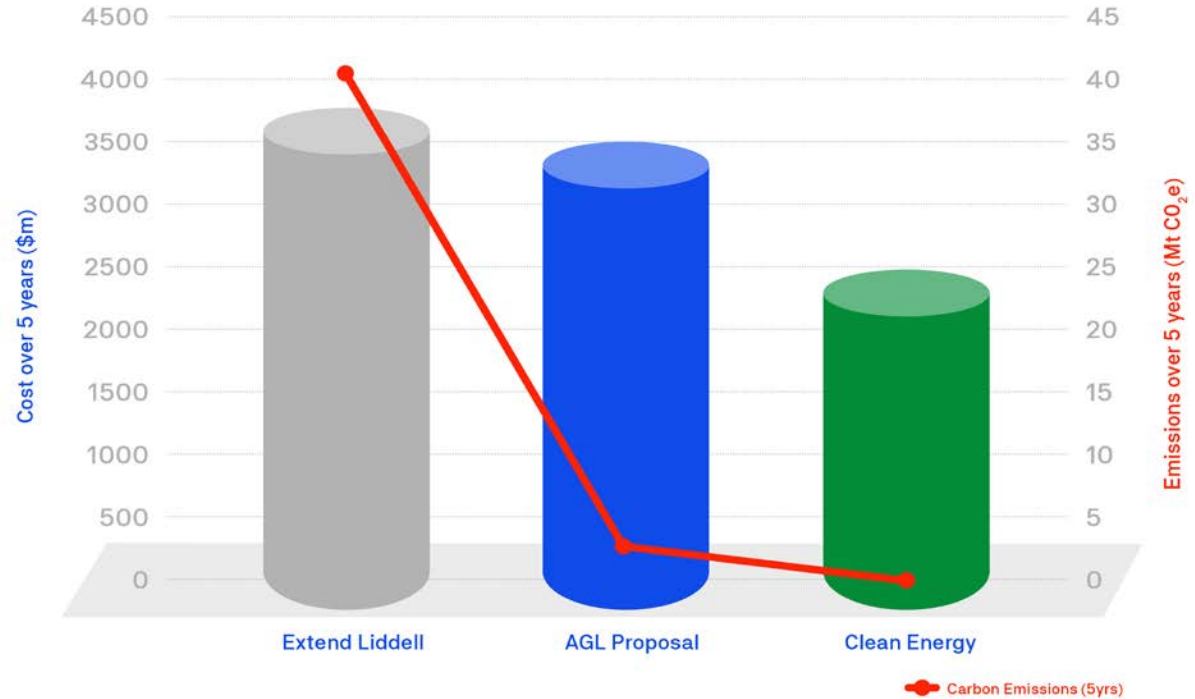
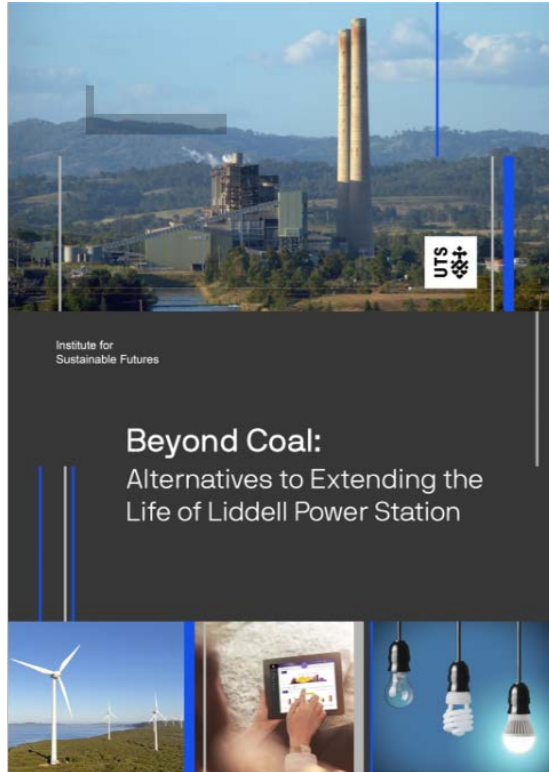
# New report (out today)- **Beyond Coal: Alternatives to extending the life of Liddell Power Station**



*How to replace Liddell's*

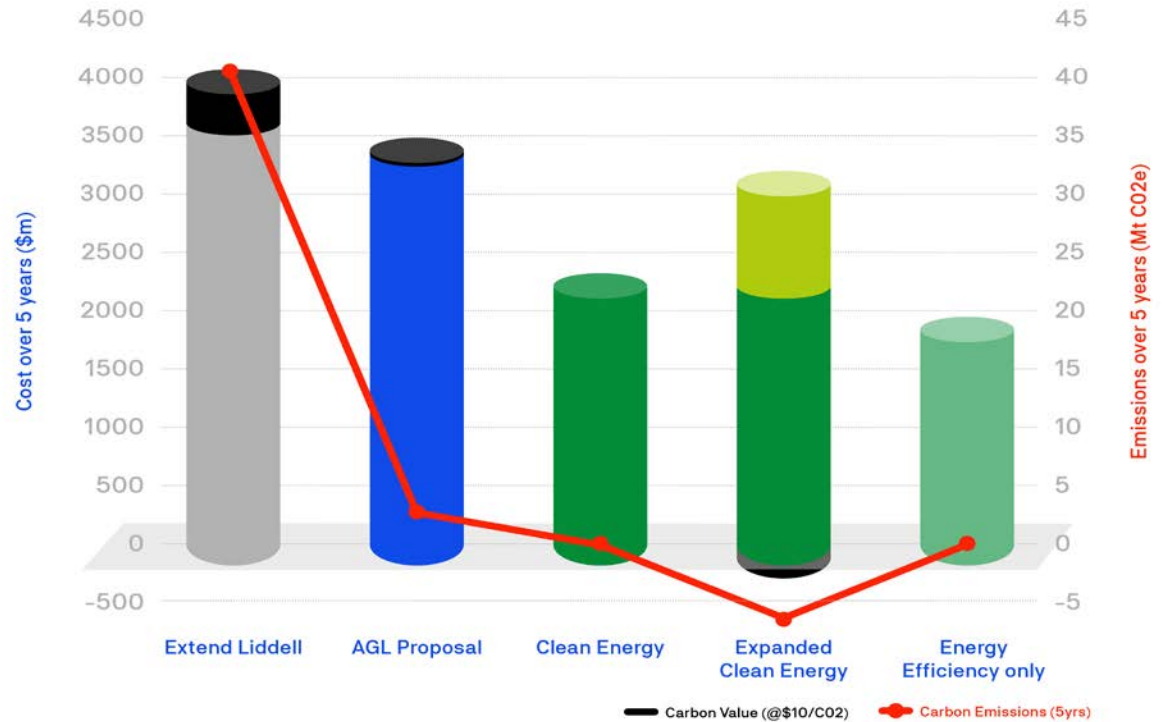
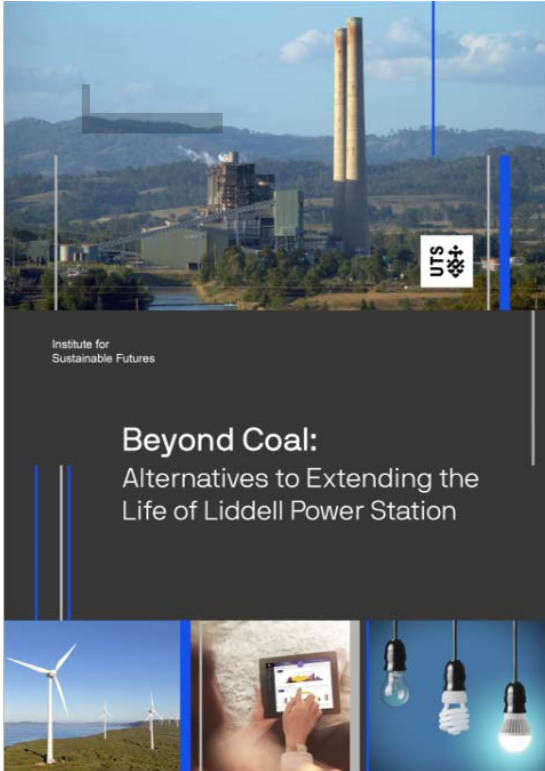
- *1000MW of capacity &*
- *8,000 GWh per annum of energy?*

# New report (out today)- **Beyond Coal:** **Alternatives to extending the life of Liddell Power Station**



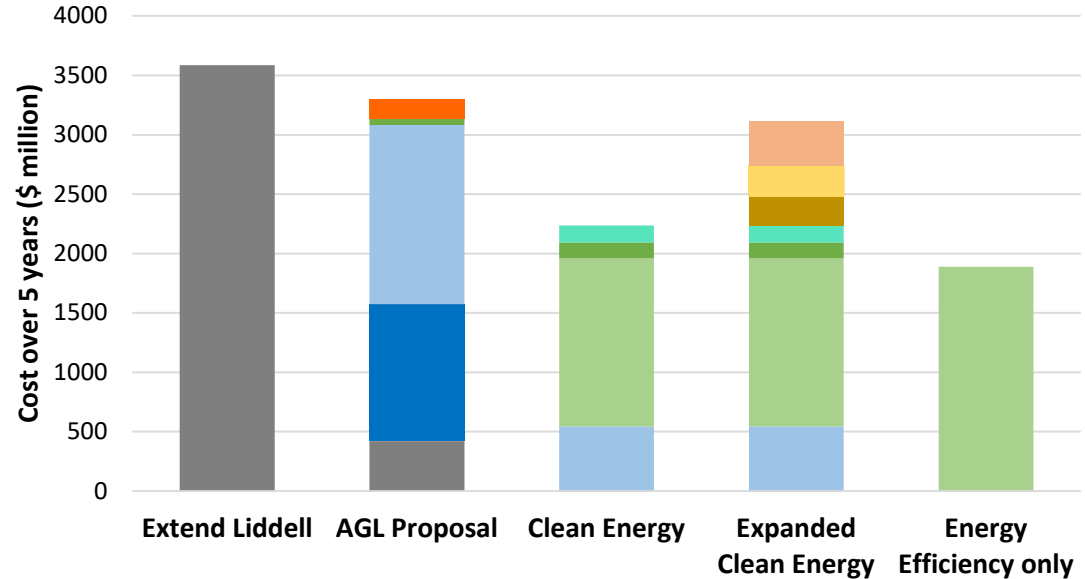


# New report (out today)- **Beyond Coal:** **Alternatives to extending the life of Liddell Power Station**



# Alternatives to extending the life of Liddell Power Station

## Cost Mix

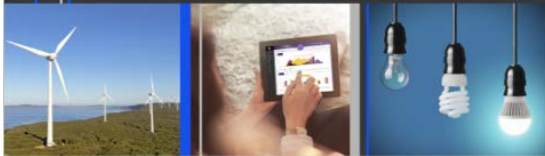


- Coal
- Wind
- DM - Demand Response
- Bioenergy
- Distributed Batteries (for existing PV)
- Gas peakers
- DM- Energy Efficiency
- DM- Time Varying Prices
- Solar thermal
- Grid scale batteries



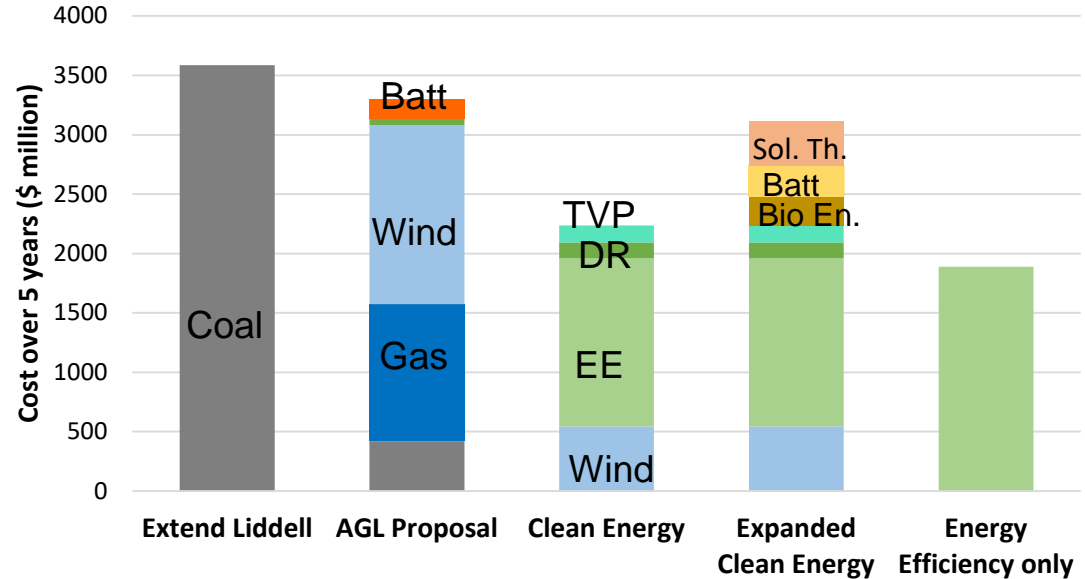
Institute for Sustainable Futures

**Beyond Coal:**  
Alternatives to Extending the Life of Liddell Power Station



# Alternatives to extending the life of Liddell Power Station

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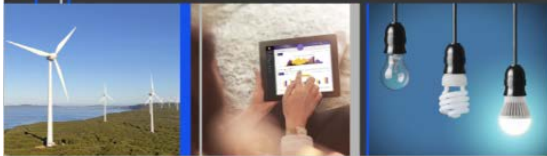


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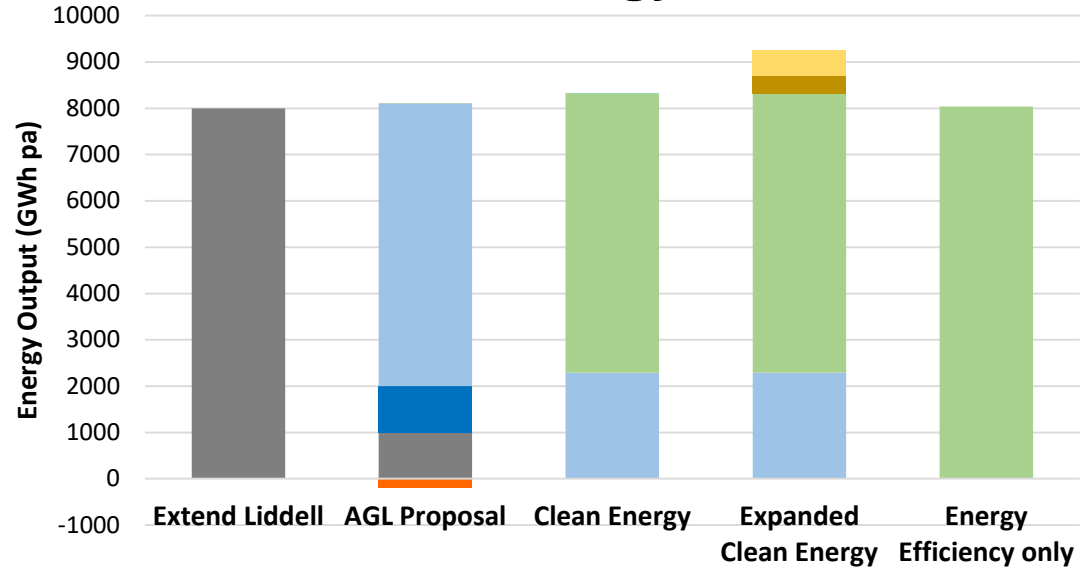
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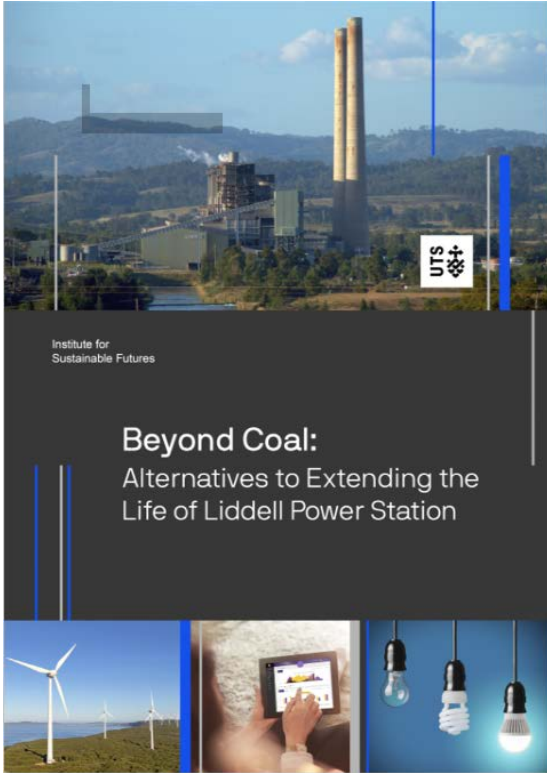


# Alternatives to extending the life of Liddell Power Station

## Energy Mix

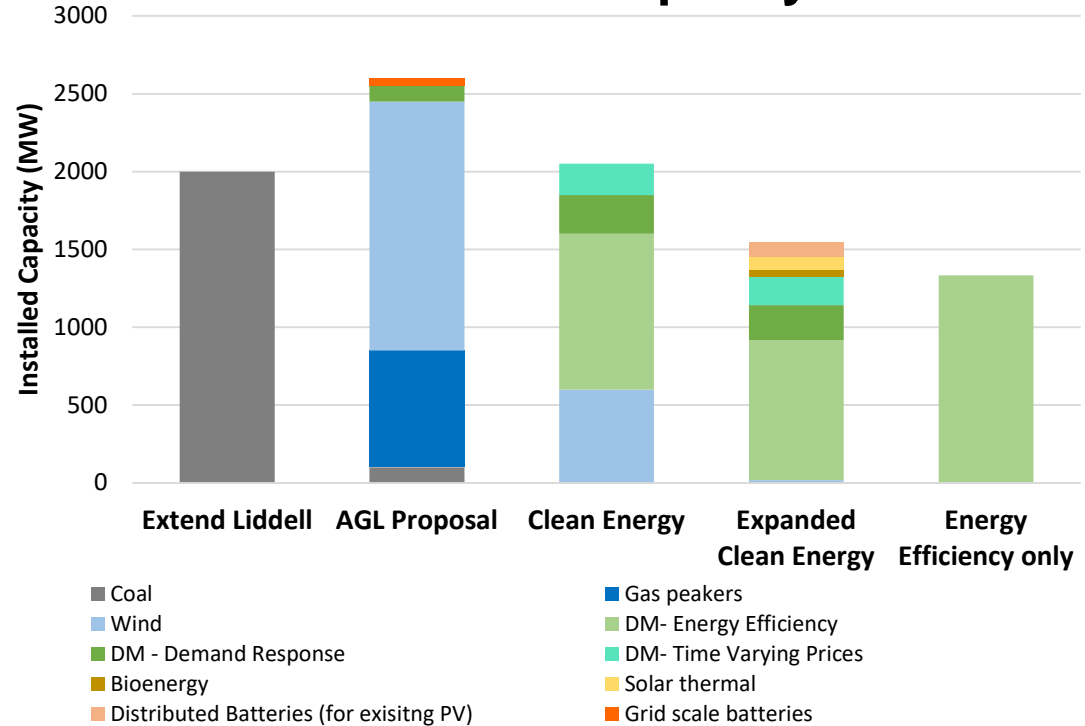


- Coal
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# Alternatives to extending the life of Liddell Power Station

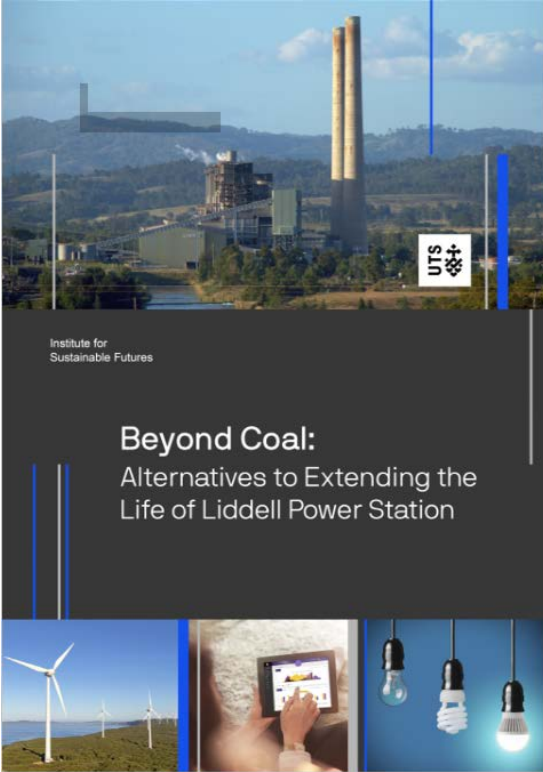
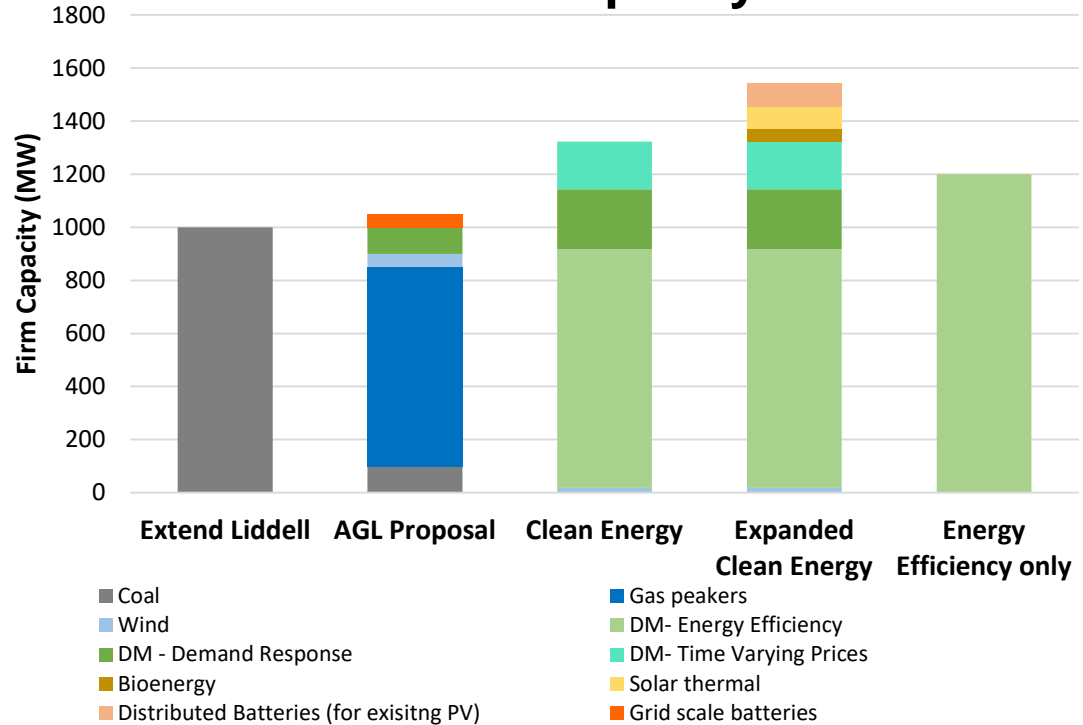
## Installed Capacity Mix



**Beyond Coal:**  
Alternatives to Extending the  
Life of Liddell Power Station

# Alternatives to extending the life of Liddell Power Station

## Firm Capacity Mix



# Conclusions:

- The Future is **RED: R**enewables, **E**fficiency and **D**emand **R**esponse the keys to our energy future.
- We need a holistic approach:
  - Supply and demand
  - Generation, networks, retail, energy services
  - Centralised and decentralised energy
  - Energy and capacity
  - Reliability, Affordability, Sustainability
  - Incentives, Regulation, Information
- “NEG could be the circuit breaker we need”. Discuss.



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**Thank you**