



Lignite Energy Council Annual Conference 2019

Where to for Lignite in Australia?

Presented by Brian Davey
Chief Executive Officer
Australian Carbon Innovation

Does anybody know this man?



Moist air exhaust – coal dryers, Coal Creek



Melbourne, Victoria



Victoria facts and figures

- Victoria:
 - 3% Australia's land mass : 87,900 sq miles
 - 25% Australian population : 6.5 million
 - 25% Australia's GDP
- Population growing ~ 1.95% pa
- Economy growing at ~ 3.3%
- Research Capacity
 - Nine universities
 - Melbourne placed as the 5th best university city in the world behind London, Paris, Boston and Tokyo

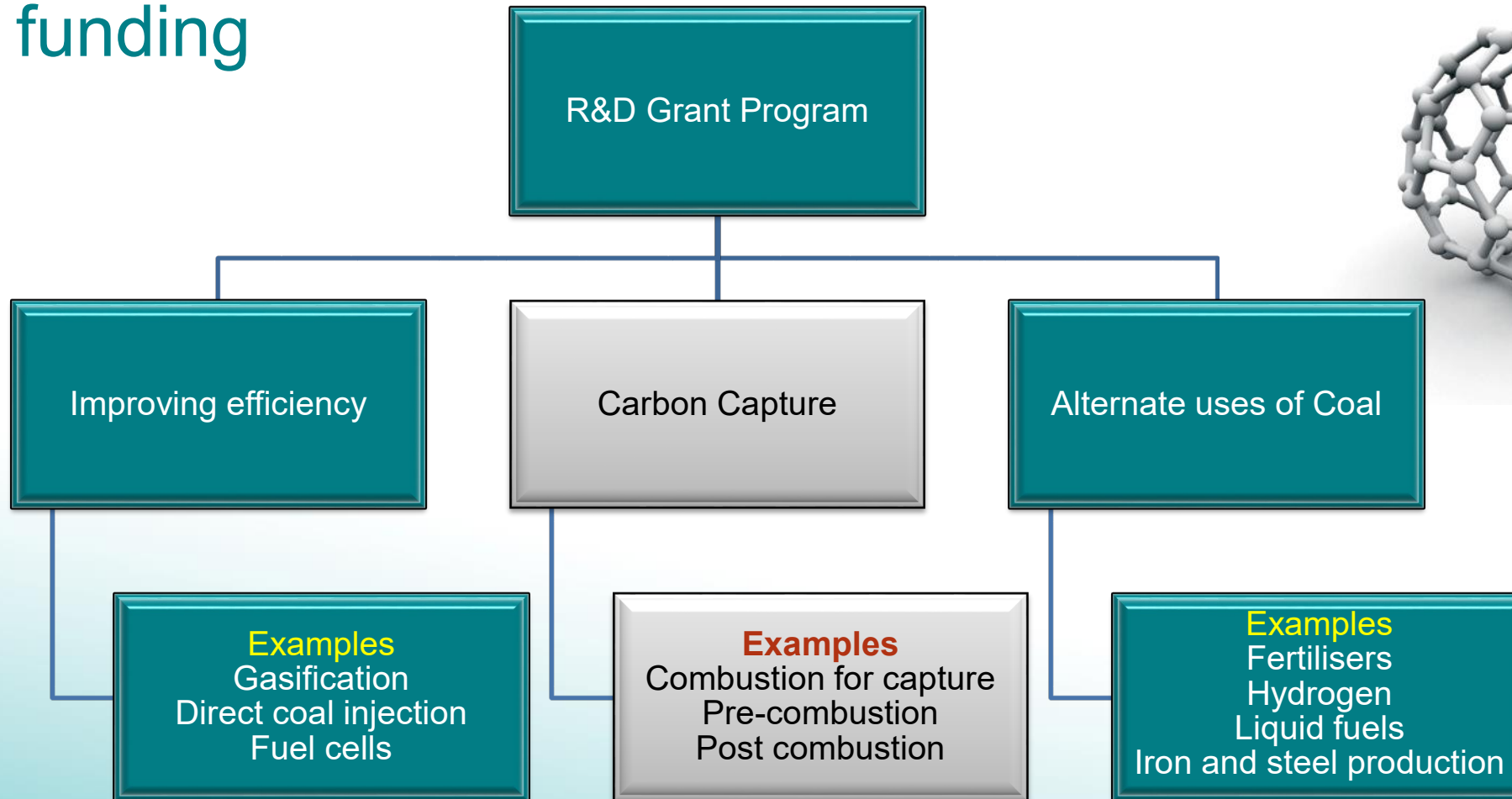
Brown Coal Innovation Australia (now ACI)

- Private, member based company
- The major funder of lignite R&D in Australia
- \$17+M direct funding / \$57+M total research program
 - Improving efficiency of power generation
 - Carbon Capture technologies
 - Alternate (non-power) uses of coal
- Commissioned research studies
 - Focus on topics of interest to BCIA members
- Skills program
 - PhD scholarships and research fellows

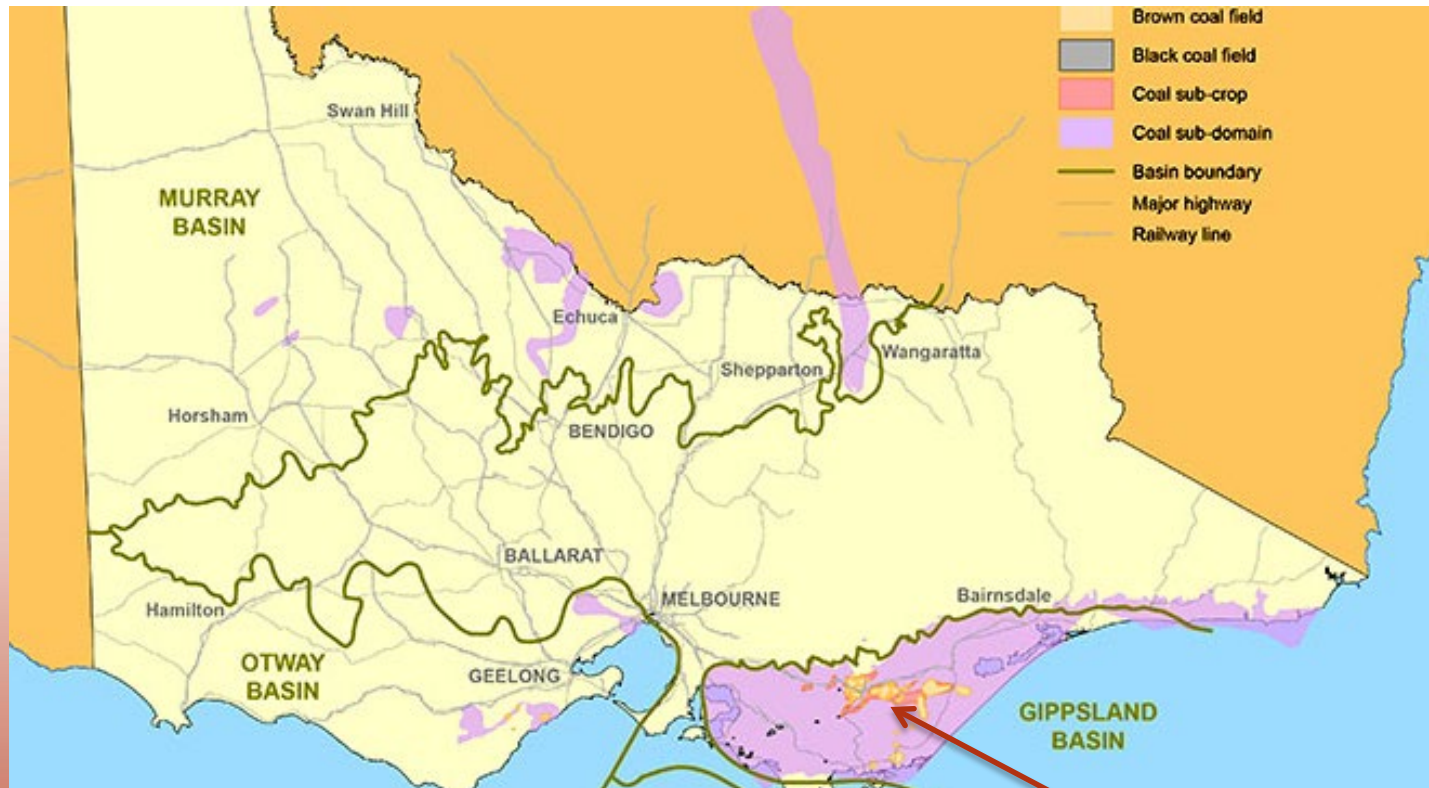




Grant funding



Lignite distribution



We are here!

Victorian CO₂ Storage potential



Figure 4: Potential carbon dioxide storage areas being investigated in Victoria.



The Coal Resource



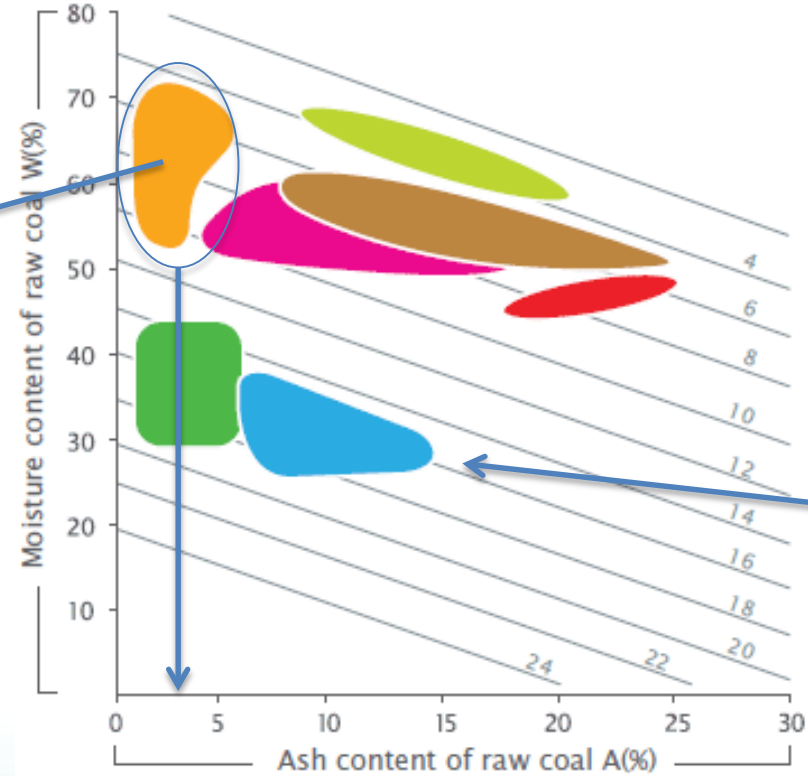
Loy Yang Mine and Dredger



People

International comparison

Victorian coal



North
 Dakota

Key

- Latrobe Valley
- Megalopolis Greece
- Ptolemais Greece
- Neurath D, Germany
- Puentes Spain
- Dakota Texas U.S.A
- Indonesian Low Bank
- Net Specific Energy=2MJ/Kg

Source: Allardice Consulting Ltd

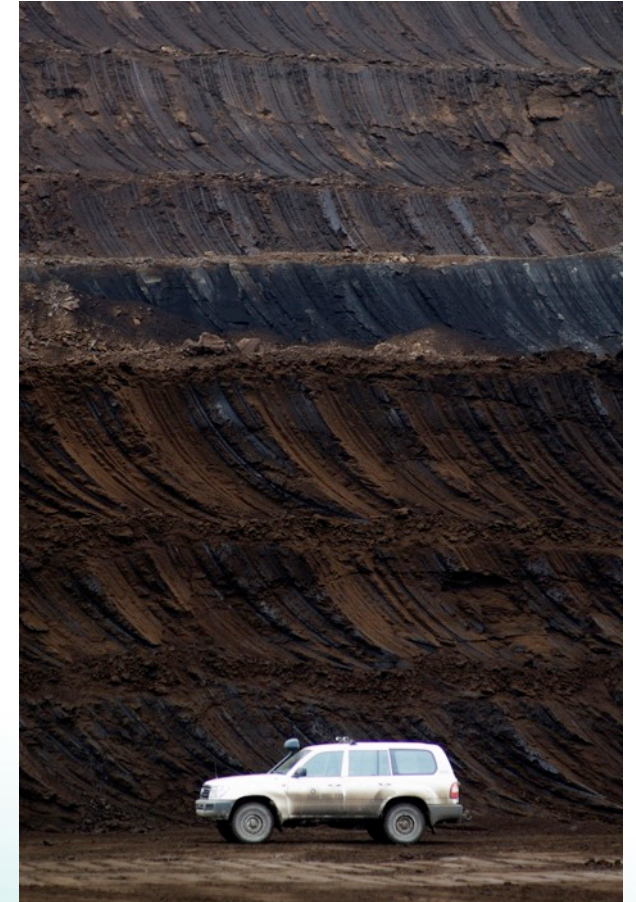
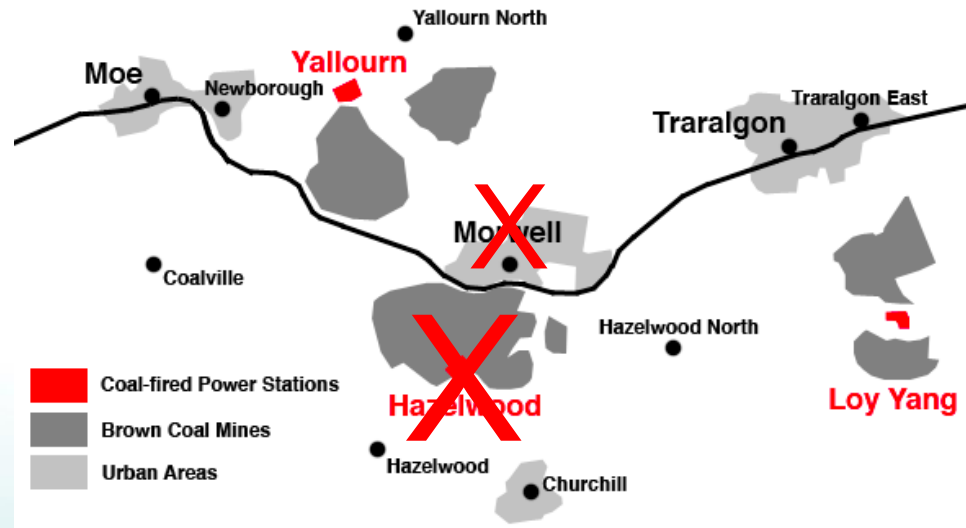
A driving force!

- Post WW1 the need for a secure reliable supply of power was essential to Victoria
- The most decorated soldier in the land was asked to develop a new industry – Sir John Monash



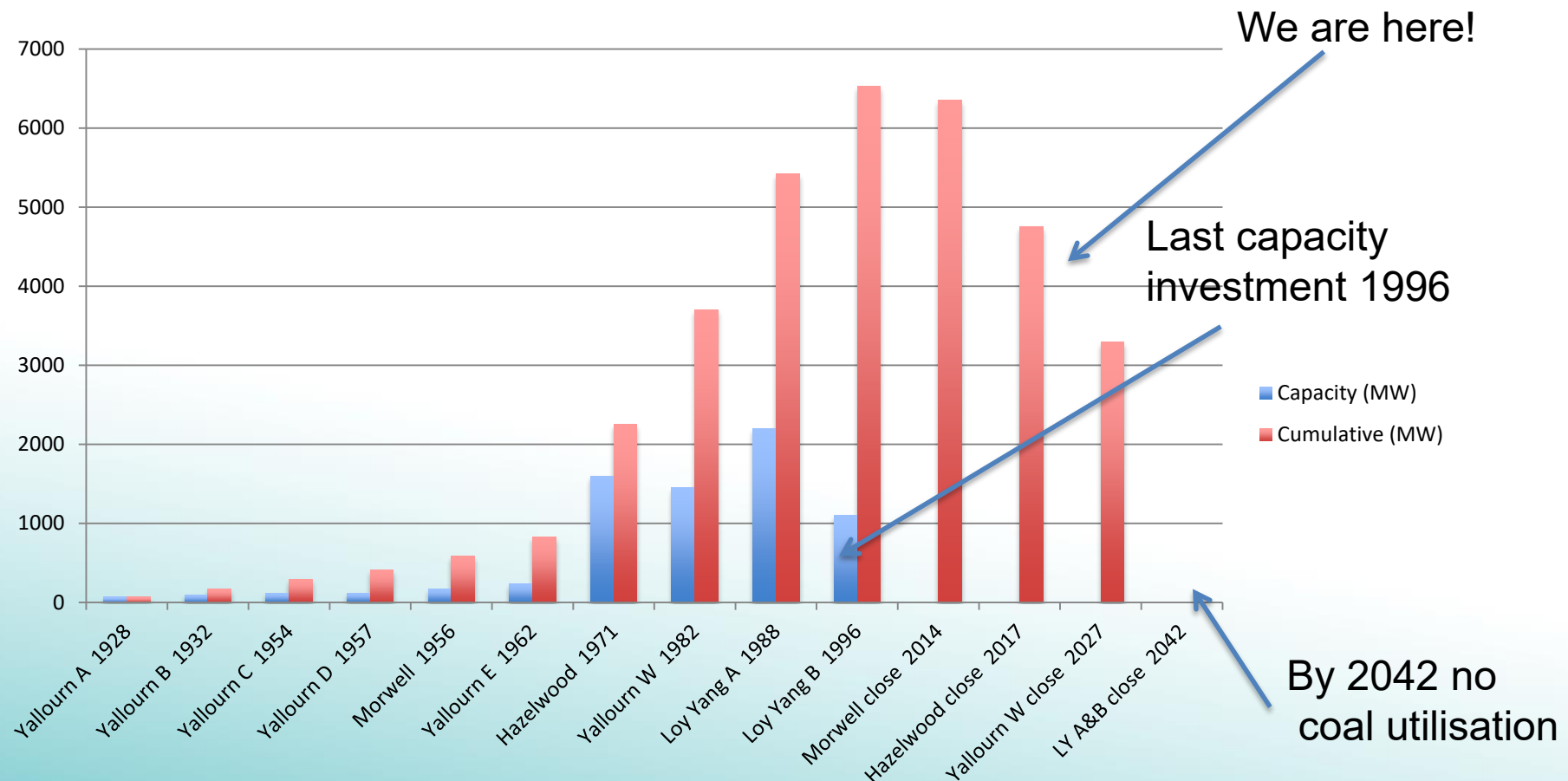
Breaking of the sod for Yallourn coal mine C1921

Latrobe valley mines and power stations





What is the current future for coal?



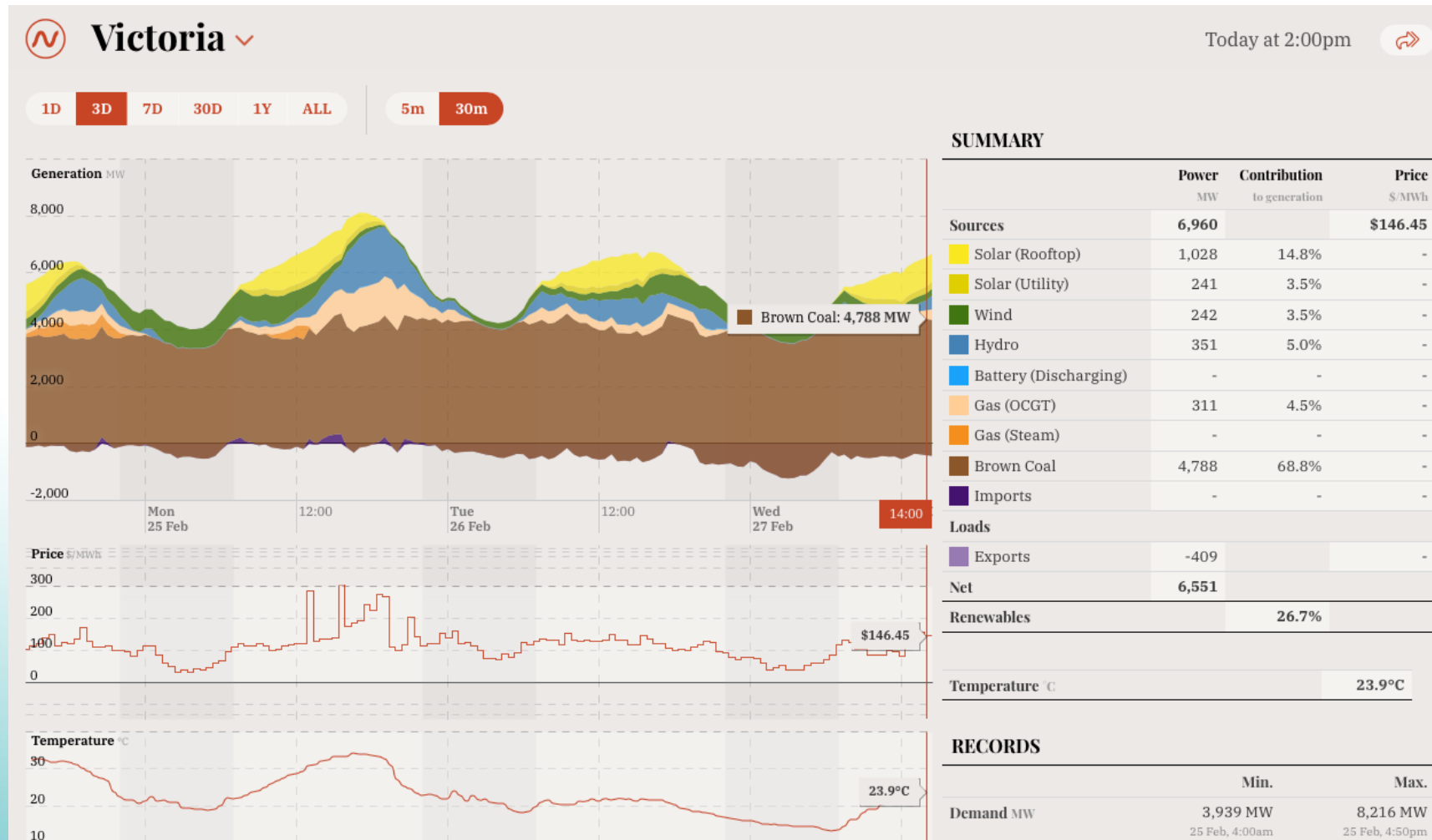
The future for existing coal power

- Yallourn W is likely to close by around 2027
- Loy Yang A & B will close in the 2030's or latest 2040's
- No new coal power stations are planned
- There is not a lot of time to transition to a new economy!

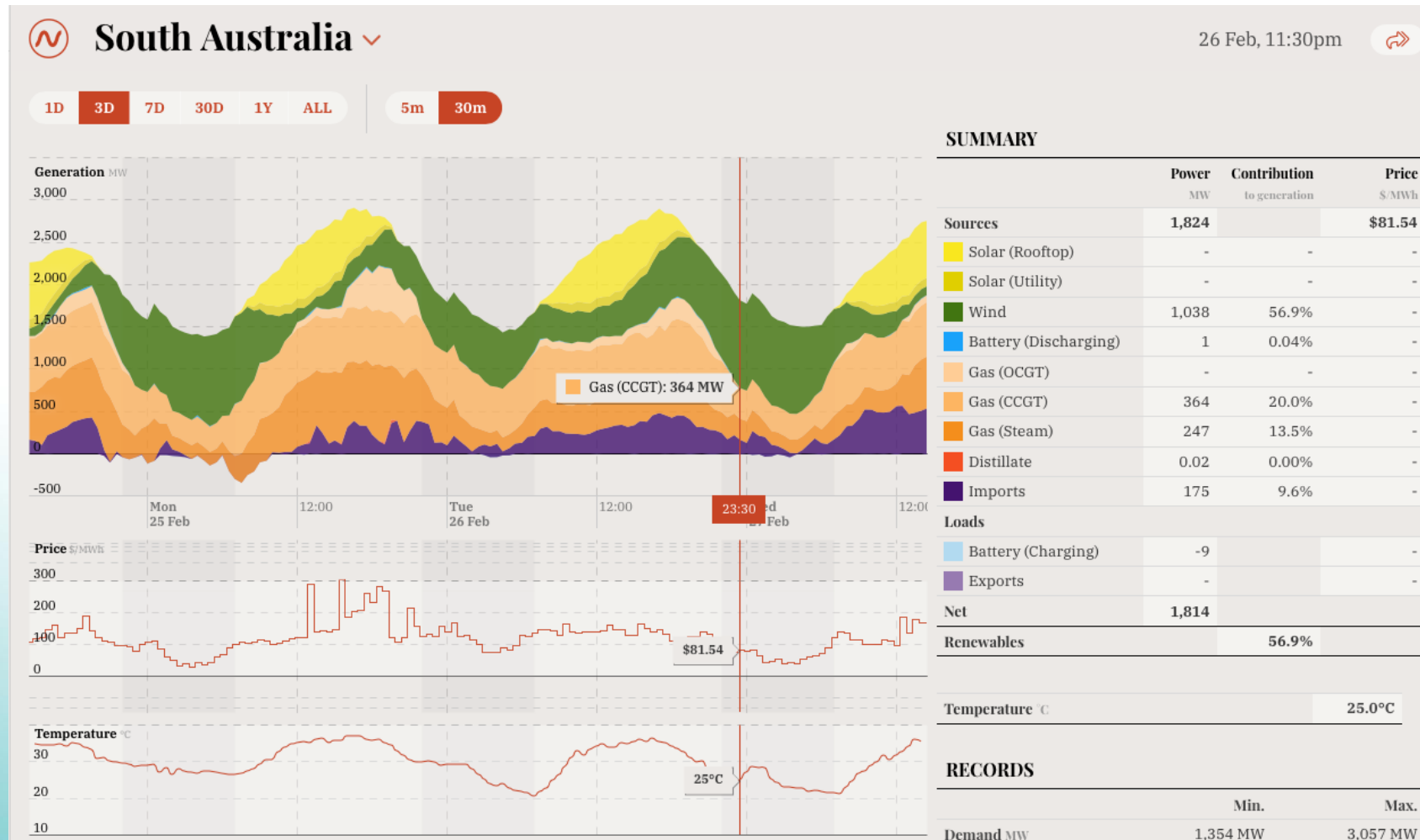


Loy Yang coal mine –
30 million tonnes per annum

National Electricity Market - Victoria

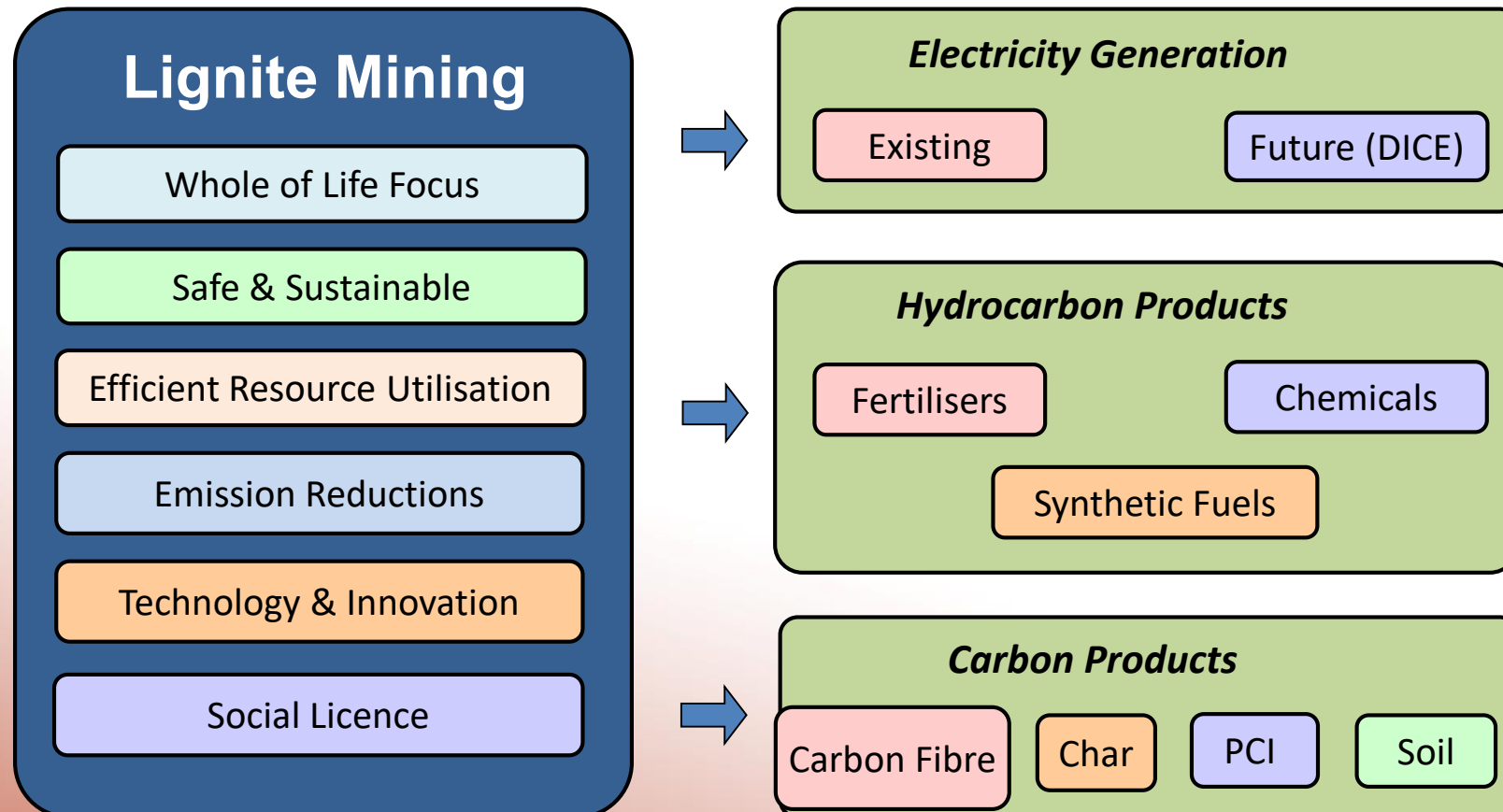


National Electricity Market – South Australia



Lignite – Product Options

Diverse range of energy products possible



Agrisector

- Deliver evidence that coal + fertiliser blends are better than fertiliser alone
 - Greenhouse and field trials



- Optimise formulations for use with a variety of crops
- Deliver evidence that improved soil productivity offsets carbon emissions from agricultural uses of coal
- Lignite is known to bind nitrogenous fertilisers, keeping them in the soil, preventing run-off and burn-off

Hydrogen from lignite



Growth Potential – Products from Lignite

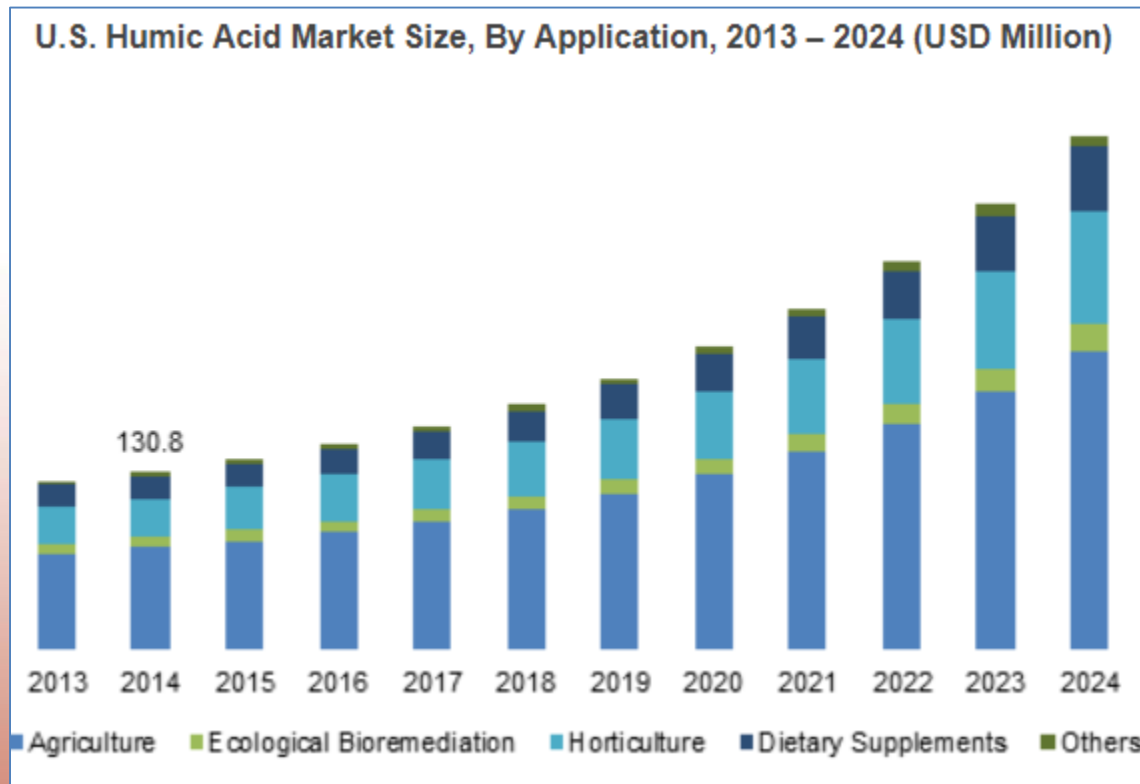


Figure 1 Forecast Humic acid market (US) growth

<https://www.gminsights.com/industry-analysis/humic-acid-market>

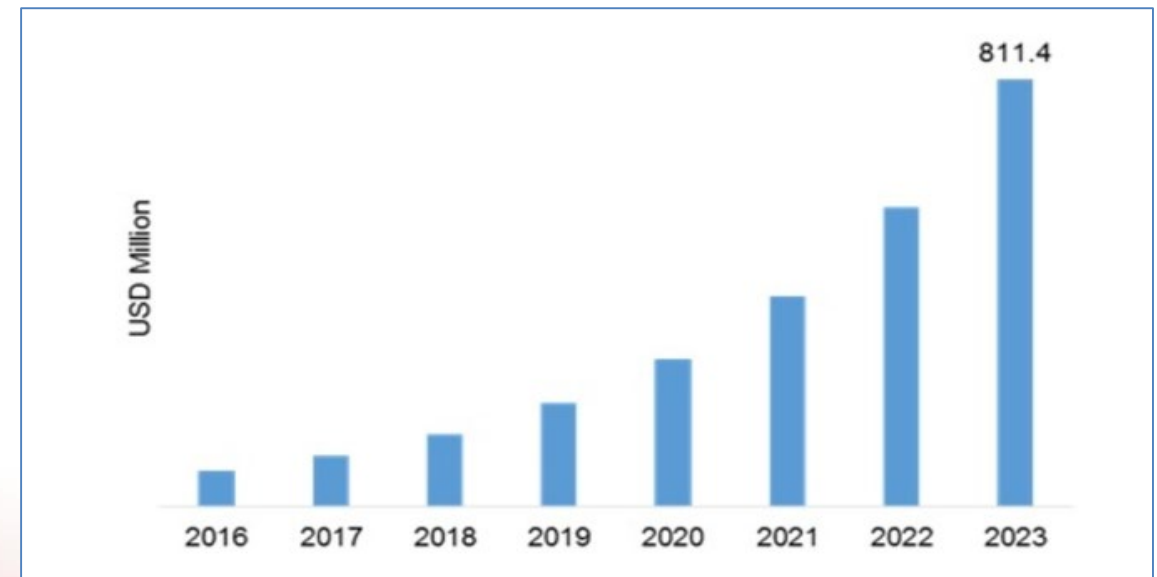


Figure 2 Forecast Graphene market (US) growth (43% CAGR)

<https://www.marketresearchfuture.com/reports/graphene-market-2987>

Growth Potential – Products from Lignite

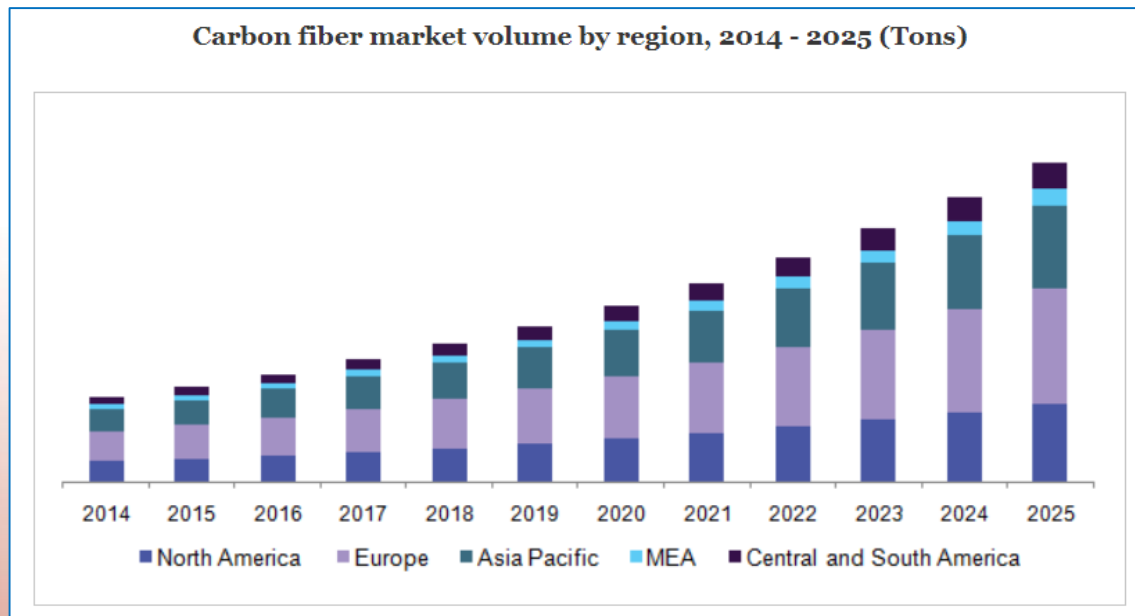


Figure 3 Forecast Carbon Fibre market growth (>10% CAGR)

<https://www.grandviewresearch.com/industry-analysis/carbon-fiber-market-analysis>

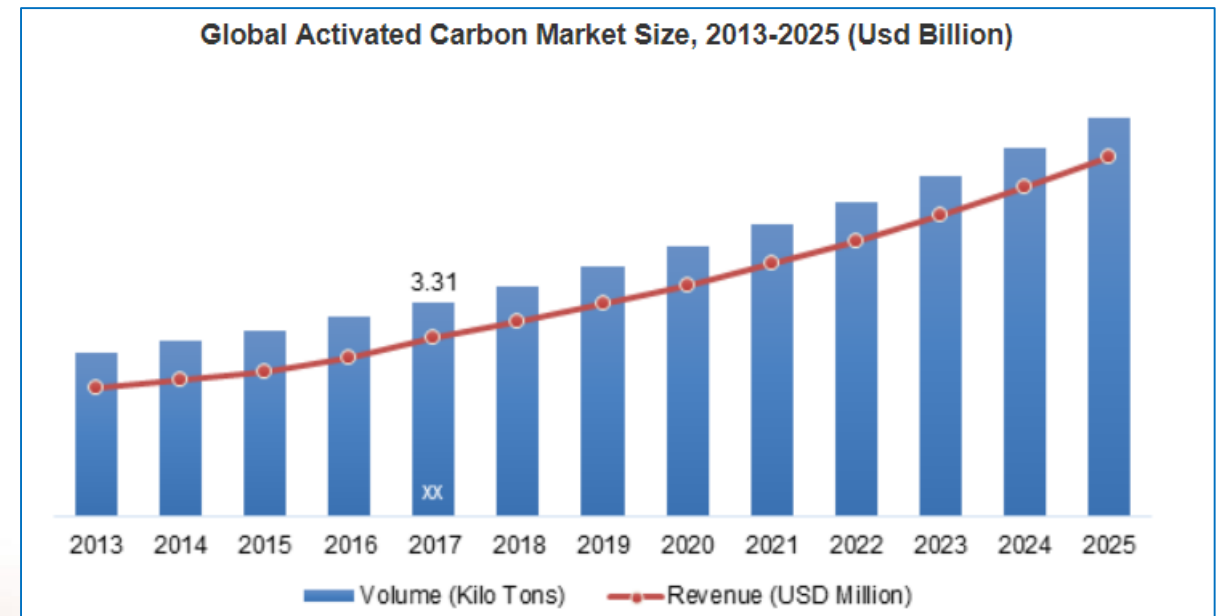


Figure 4 Forecast Activated Carbon market growth (>9% CAGR)

<https://www.adroitmarketresearch.com/industry-reports/activated-charcoal-market>

Size of the prize

Diverse range of energy products possible

10 Mtpa Coal	GSP Value/t	Gate price	GSP	Production	Investment
Raw Coal	\$ 12.75/t	\$ 10.00/t	\$ 128M	10 Mt/a	~\$ 150M
SNG	\$ 71.77/t	\$ 8.00/GJ	\$ 718M	90 PJ/a	~\$ 4,500M
Black Coal	\$ 36.19/t	\$ 90.48/t	\$ 362M	4 Mt/a	~\$ 900M
Electricity	\$ 125.77/t	\$ 103.41/MWh	\$ 1,258M	12 TWh/a	~\$ 5,000M
Diesel	\$ 107.95/t	\$ 0.69/Litre	\$ 1,080M	1560 ML/a	~\$ 3,000M
UREA	\$ 137.23/t	\$ 343.07/t	\$ 1,372M	4 Mt/a	~\$ 6,000M
Average	\$ 81.94/t*		\$ 819M*		~\$ 3,258M
Average GSP value of Victoria's 33Bt of coal =			\$ 2,704B		

* If Raw Coal sales are excluded - Average \$/t = \$95.80 and GSP = \$958M



Carbon Capture Storage CCS

- CCS is real...
 - First project (Val Verde, Texas US) started operating in 1972
 - Boundary Dam
 - Petra Nova
 - More than 21 large scale projects globally
 - IPCC/IEA says that CCS is needed to prevent global warming – most climate models cannot limit warming to 2 degrees without it



CarbonNet

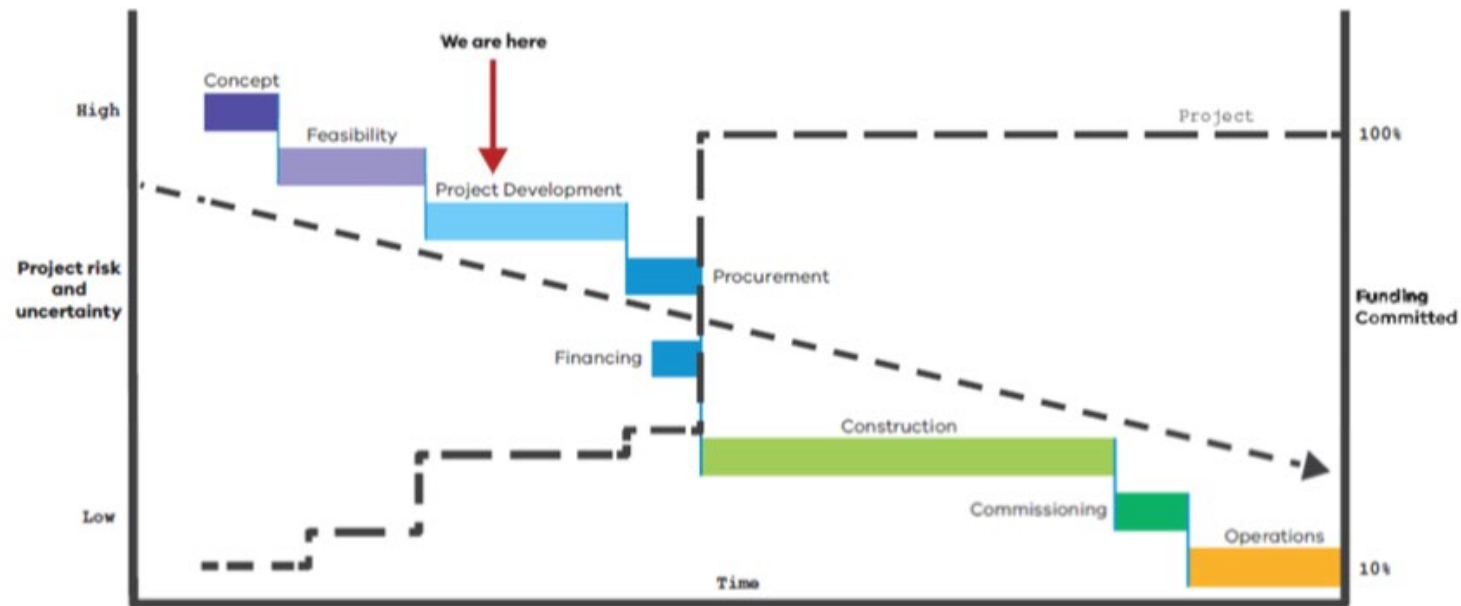
- Established in 2009
- Exploring the potential to capture and store 1-5 million tonnes of CO₂, per year in Victoria
- Received *up to \$100M* funding to address
 - Storage certainty - confirm potential of storage sites
 - Regulatory requirement
 - Business case for CCS in Victoria
 - Community / Stakeholder engagement



<http://www.energyandresources.vic.gov.au/energy/carbon-capture-and-storage/the-carbonnet-project>

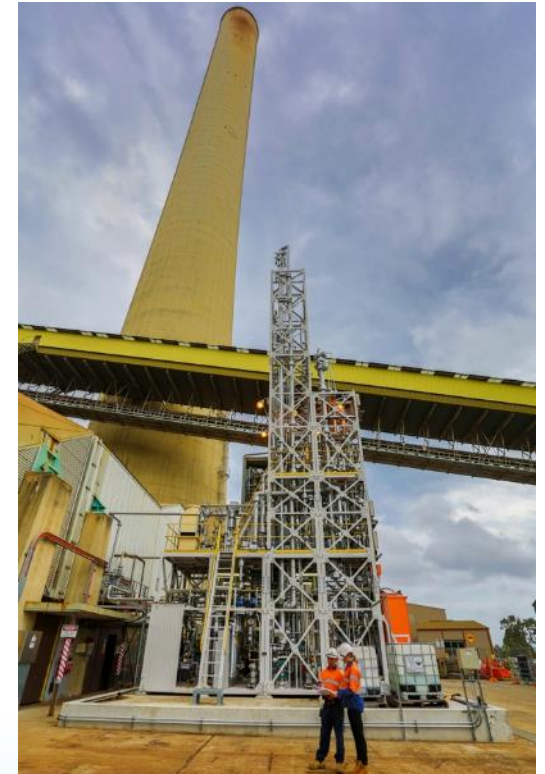


CarbonNet Business Case - Approved to progress to Stage 3



Example project – carbon capture

- AGL / IHI /CSIRO Carbon Capture Project (\$5.3M project)
- Majority funded by BCIA
 - First 24/7 operating plant in Victoria
 - IHI (lead), CSIRO, and AGL Loy-Yang
 - Aiming to significantly reduce costs of CCS



IHI

Lignite wrap



- Constitutes 20% of Australia's Fossil Fuel Energy Reserves
- Until April 2017, was the Energy Source for 85% of Victoria's Electricity
- Energy Security - Not Lignite Vs Renewables – Orderly Transition needed
- Export potential for Coal Products, Fuels, Chemicals and Fertilisers
- Indicative Annual GSP Potential: ~\$820M/10Mt of coal
- Government Support for Energy Innovation and Project Development



THANK YOU

For more information on Australian Carbon Innovation

<http://www.acinnovation.com.au>

Building 4W Federation University Gippsland, Churchill VIC 3842

Suite 420, 1 Queens Road, Melbourne VIC 3004 Australia

Tel +61 3 9653 9601 Email info@bcinnovation.com.au