



Innovations, Challenges and Opportunities Coal Combustion Products Harvesting

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Ash Development Association of Australia
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NEM RECORDS

Maximum demand record **35,796 MW** (29 Jan 2009)

Minimum demand record **11,009 MW** (29 Oct 2023)



Driven by mild weather and rooftop solar generation, which reduces demand for energy from the grid.

NEM Facts



Commenced as a wholesale electricity market in December 1998.



More than 570 registered participants, including generators, transmission and distribution network service providers, and market customers, including retailers.



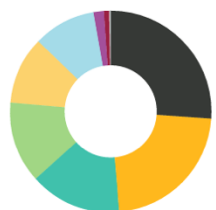
Approx 175 terawatt hours of electricity supplied to homes and businesses a year.



\$25.46 billion traded in FY22-23.

Generation capacity

By fuel type as at October 2023



- Coal 21,255 MW
- Rooftop solar 18,000 MW
- Gas 11,924 MW
- Wind 10,582 MW
- Grid solar 8,652 MW
- Hydro 7,999 MW
- Battery storage 1,413 MW
- Biomass 542 MW
- Other 214 MW

Generation supply mix

By fuel type from 1 July 2022 – 30 June 2023



Coal 57.6%



Wind 12.95%



Rooftop solar 9.96%



Hydro 7.62%



Grid solar 6.15%



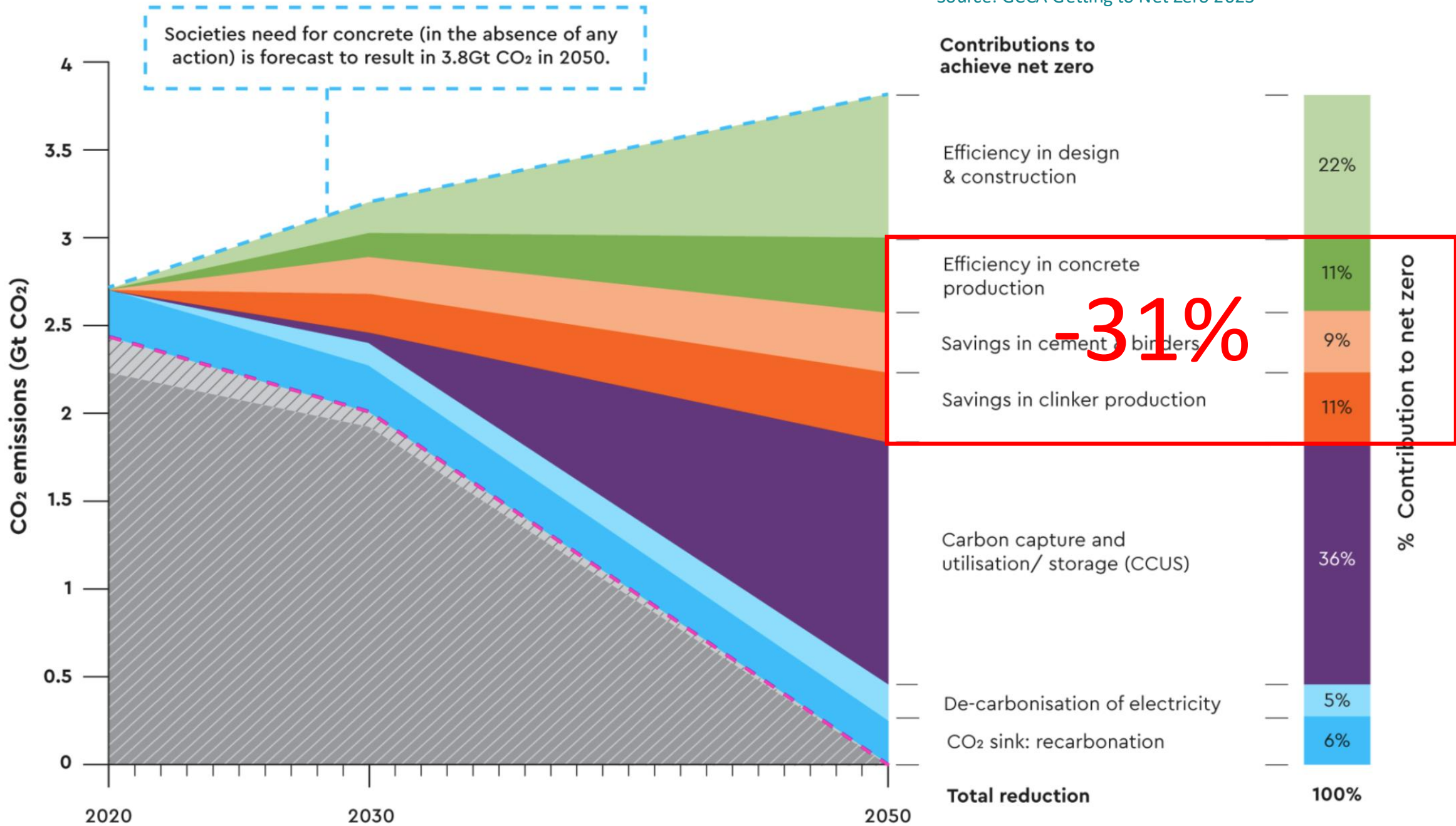
Gas 5.49%



Biomass + Batteries + Liquid Fuel 0.24%

Quick facts (2024)

- Population ~26 m (humans)
- Population ~50 m (kangaroos)
- Eastern/ South Coastal
- 5 States / 2 Territories
- AUS = 7.8 million sq Km
- USA = 9.8 million sq Km
- Network reliability 99.998%





Zero emission electricity and transport

- Promoting methods to decarbonise Australia's electricity network, whilst ensuring it remains reliable and affordable.
- Sourcing price competitive renewable power purchase agreements.
- Adopting energy efficiency measures – including artificial intelligence and sensors.
- Supporting and adopting competitive technologies and energy sources to decarbonise the transport sector.

Innovation through design and construction

- Promoting design of building and infrastructure that includes a clear focus on material efficiency, specifying lower carbon concrete and improved construction technologies.
- Ensuring structural optimisation that allows for lifetime extension, repair and reuse.

Continue to further innovate concrete

- Improving the mix design for concrete, e.g. packing density optimisation, optimised use of admixtures.
- Improving mixing technology, e.g. replacing dry mixing with wet mixing technology.
- Developing an appropriate balance between performance/descriptive approach in standards and building codes to lower clinker content in concrete.
- Lowering volumes of fresh concrete wastes.

Use of supplementary cementitious materials in concrete

- Ensuring the benefits of using SCMs in cement and concrete are understood and reflected in procurement strategies.
- Focussing strongly on embodied carbon in concrete construction to create a market pull for low CO₂ concretes.
- Changing standards and building codes that reflect the benefits of increased use of SCMs.

-20%

New CO₂-efficient cements

- Producing cements with higher content of SCMs like fly ash, GGBFS, calcined clay and unburned limestone.
- Further lowering the clinker factor in cement.
- Creating and obtaining acceptance of new innovative cements.
- Developing standards and application rules which will be required to reflect the benefits of CO₂ efficient cements and enable their use in concrete.

Use Alternative fuels and green hydrogen

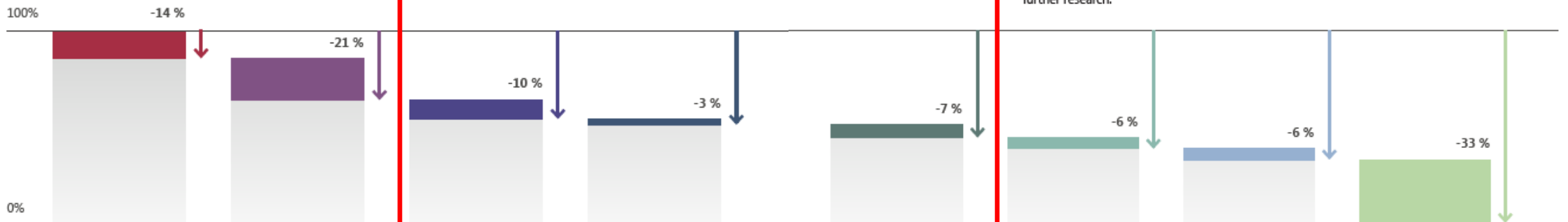
- Increasing the use of alternative fuels to replace coal and gas to heat the cement kiln.
- Using alternative fuels in cement kilns will also be beneficial for lowering the emissions from landfills, although transport costs can be a barrier to the uptake of alternative fuels.
- Applying the required preprocessing technologies.
- Utilising green hydrogen as fuel to lower the amount of fossil fuels in clinker production – substitution rates greater than 10% will require further research.

Account for concrete to uptake CO₂

- The International Panel on Climate Change (IPCC) Draft Report (2021) notes that concrete absorbs CO₂ emissions from the production of cement and concrete.
- Recarbonation occurs during the lifetime of the concrete structure and after the end of its life.

Capture remaining CO₂

- Proposed mitigation measure for CO₂ emissions that cannot be mitigated by conventional means.
- Several technologies are currently in pilot and demonstration phase.
- Australia provides good conditions for CCS and CCUS.



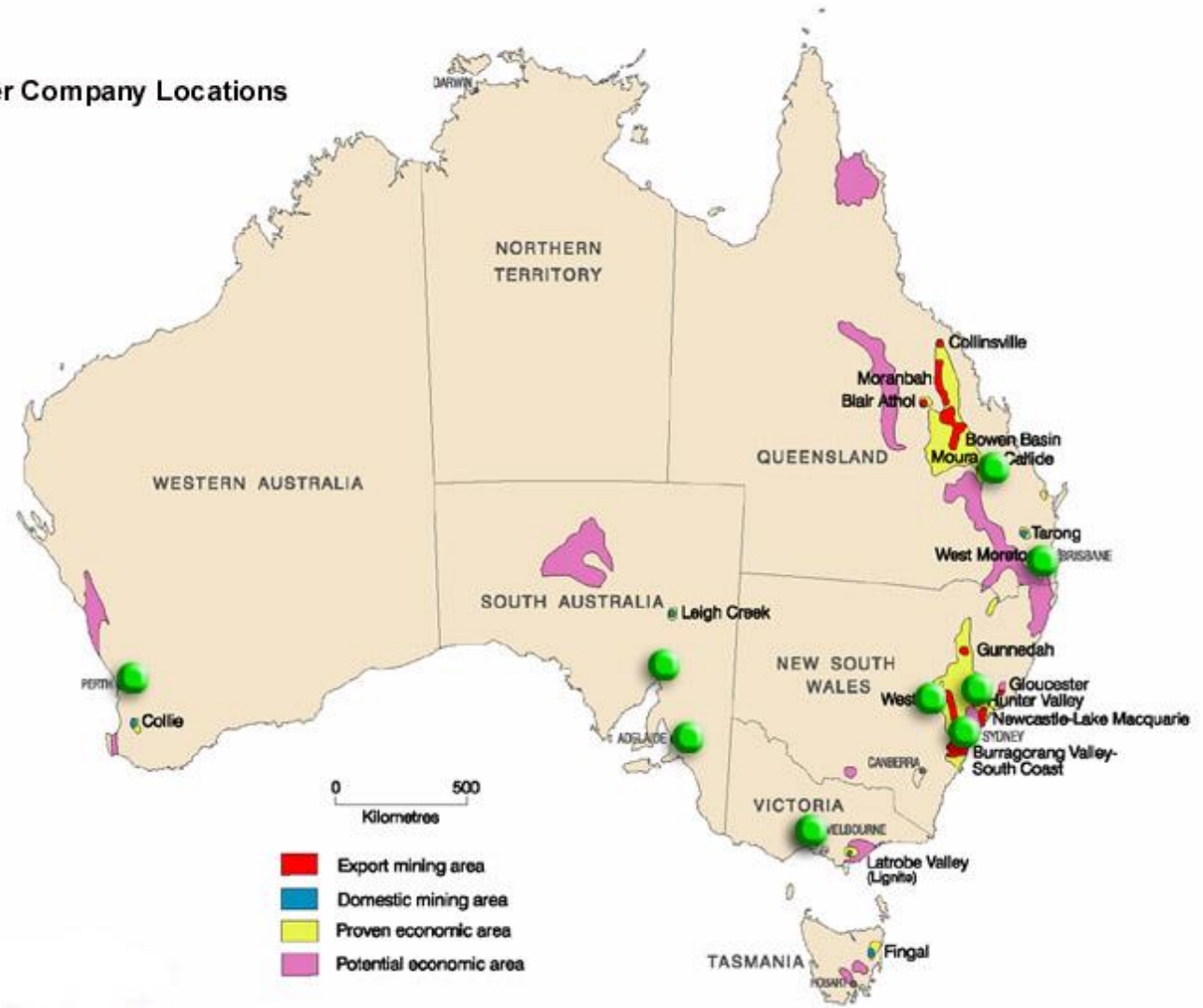


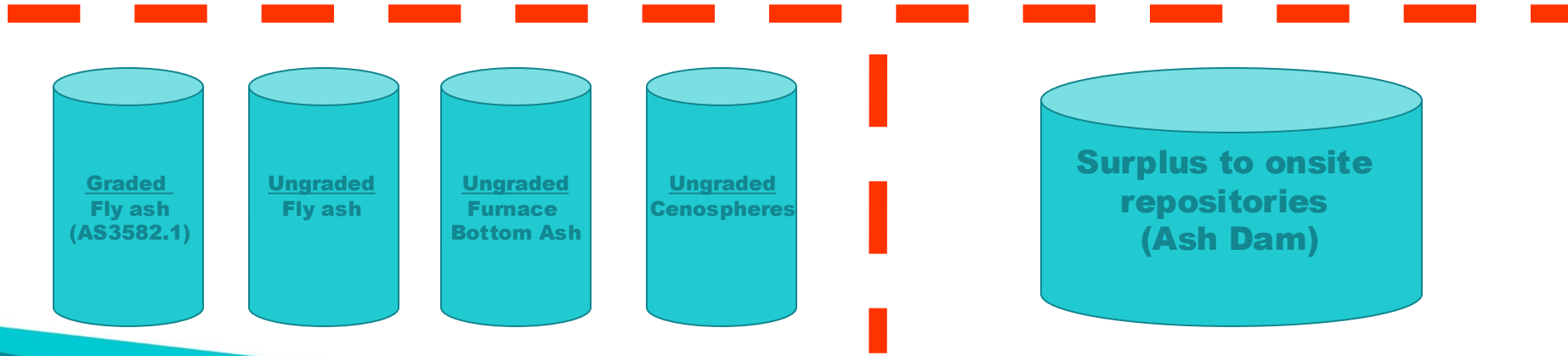
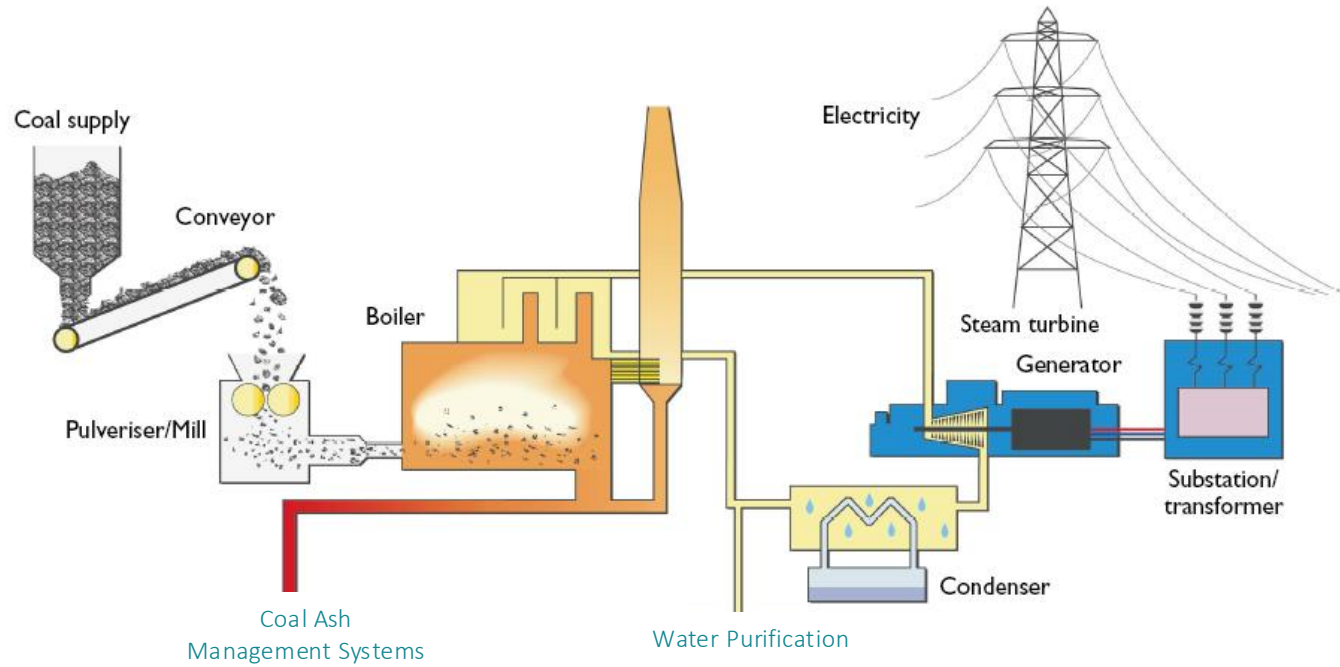
Australian context

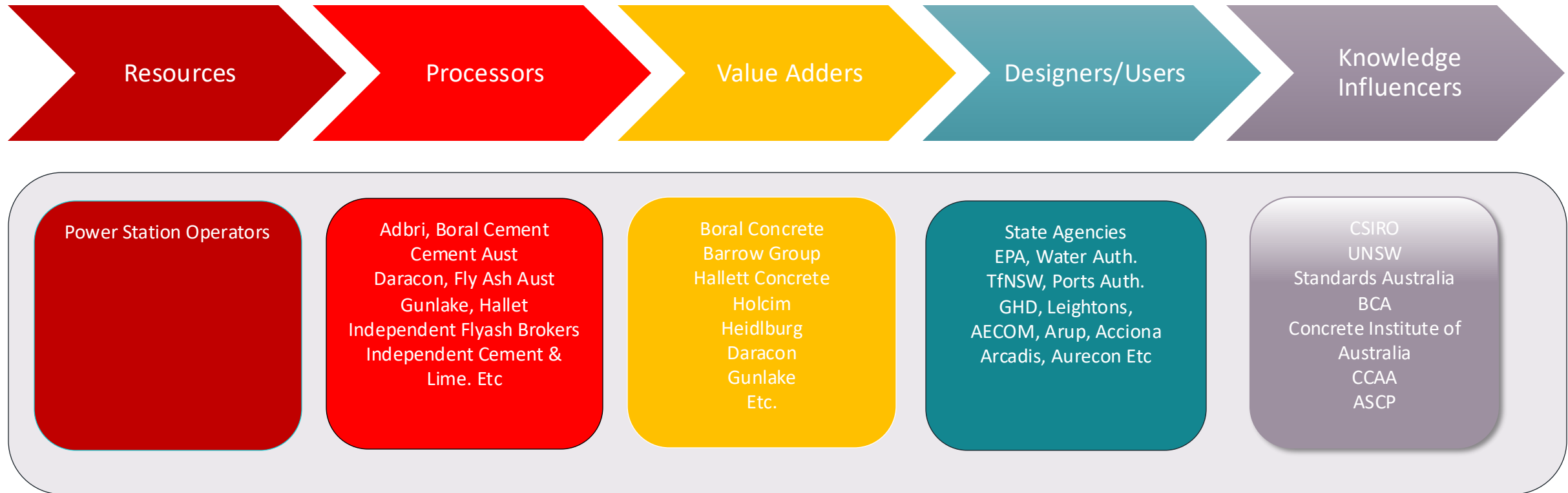


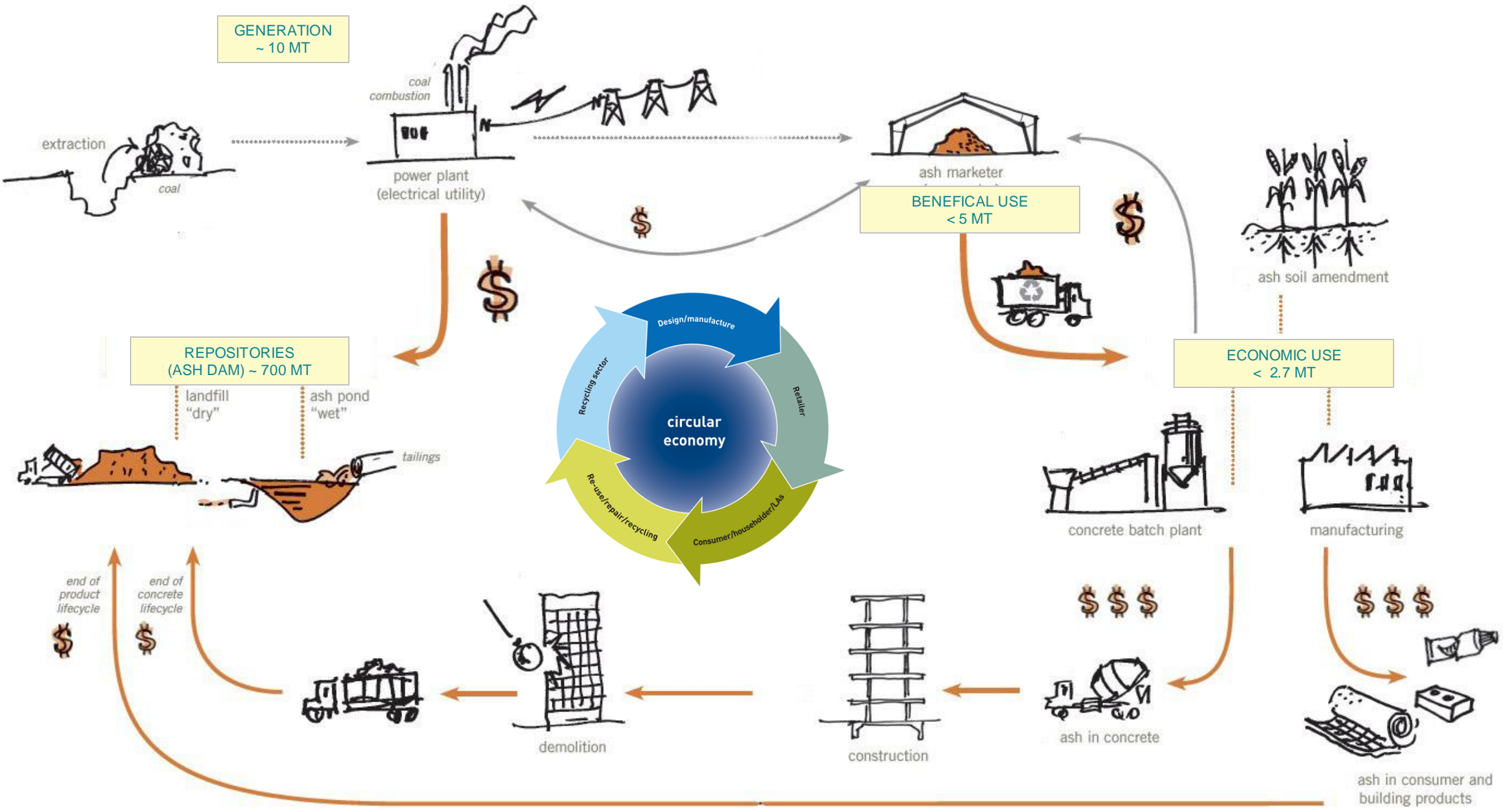
- Adbri**
- AGL Macquarie**
- BG&E**
- Boral Quarries & Recycling**
- Cement Australia**
- Consulting & Environmental Services**
- CS Energy**
- Delta Electricity**
- Daracon**
- Energy Australia**
- Flyash Australia**
- Gunlake Group**
- Hallett Concrete**
- Heeleys Consulting**
- Tremline (Hills Barker Blower)**
- Independent Cement & Lime**
- Independent Fly Ash Brokers**
- Genuity**
- Latrobe Magnesium**
- NRG Gladstone Power Station**
- Origin Energy Eraring**
- QTMR (QLD)**
- TfNSW (NSW)**
- Stanwell Corporation**
- UniqueCem**
- VicRoads (VIC)**
- Vecor Australia**

Member Company Locations











Drivers for change



Energy policy
transition
underpinned by
existing
technology...





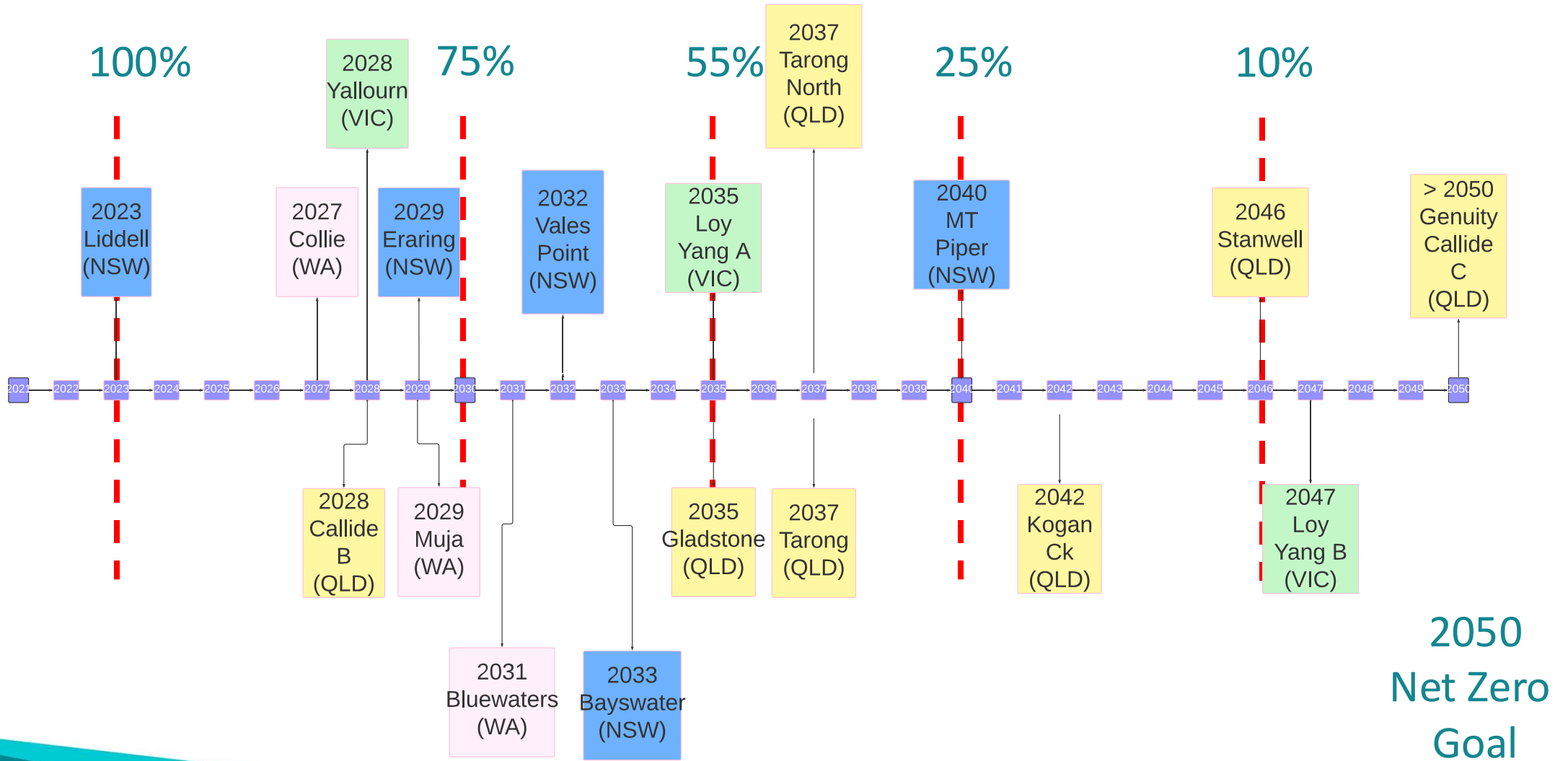
Circular economy
drivers
promoting
resources...





Supply &
distribution gap(s)
widen with CFPS
closures within
end uses...

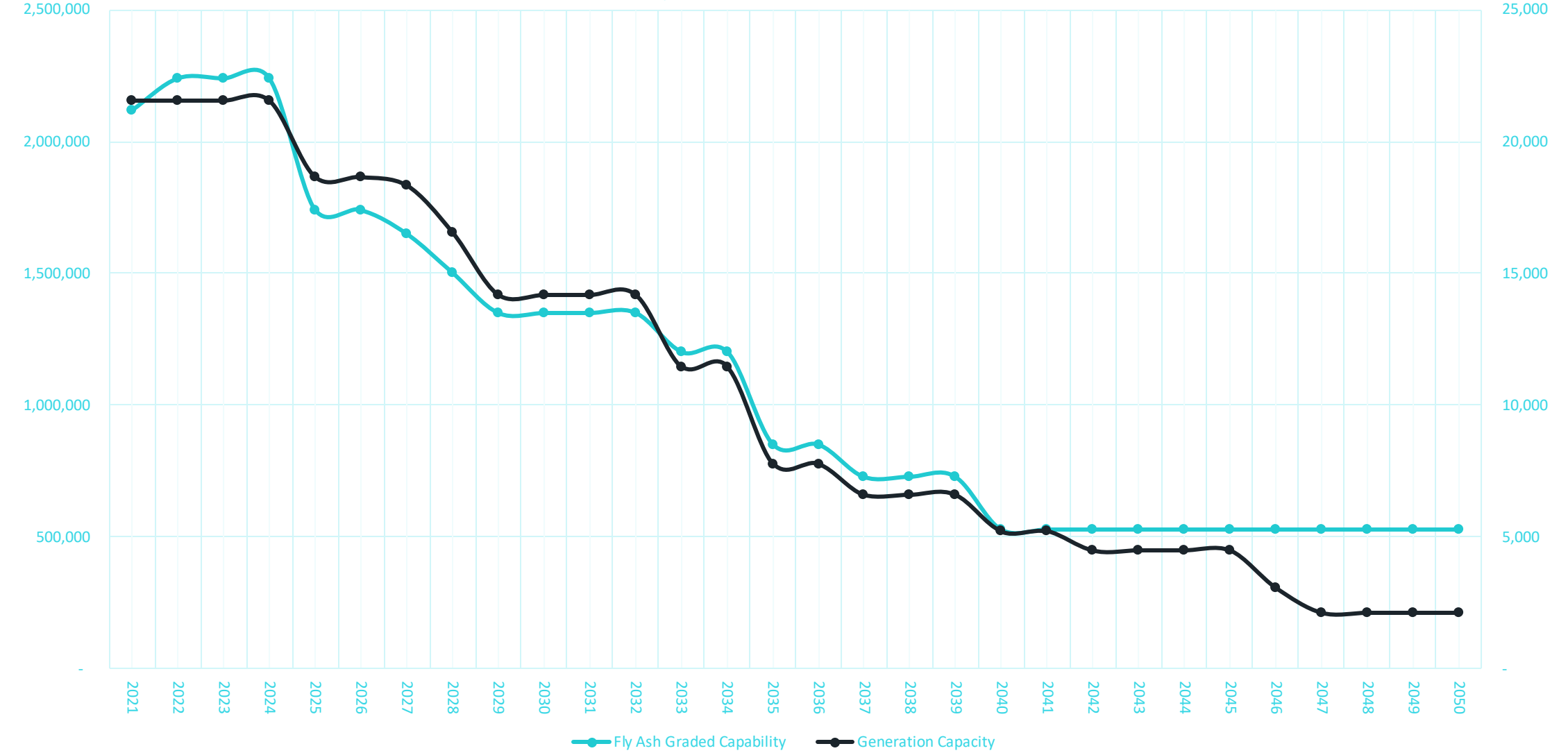




Impacts of Closures on CCPs

Tonnes

MW

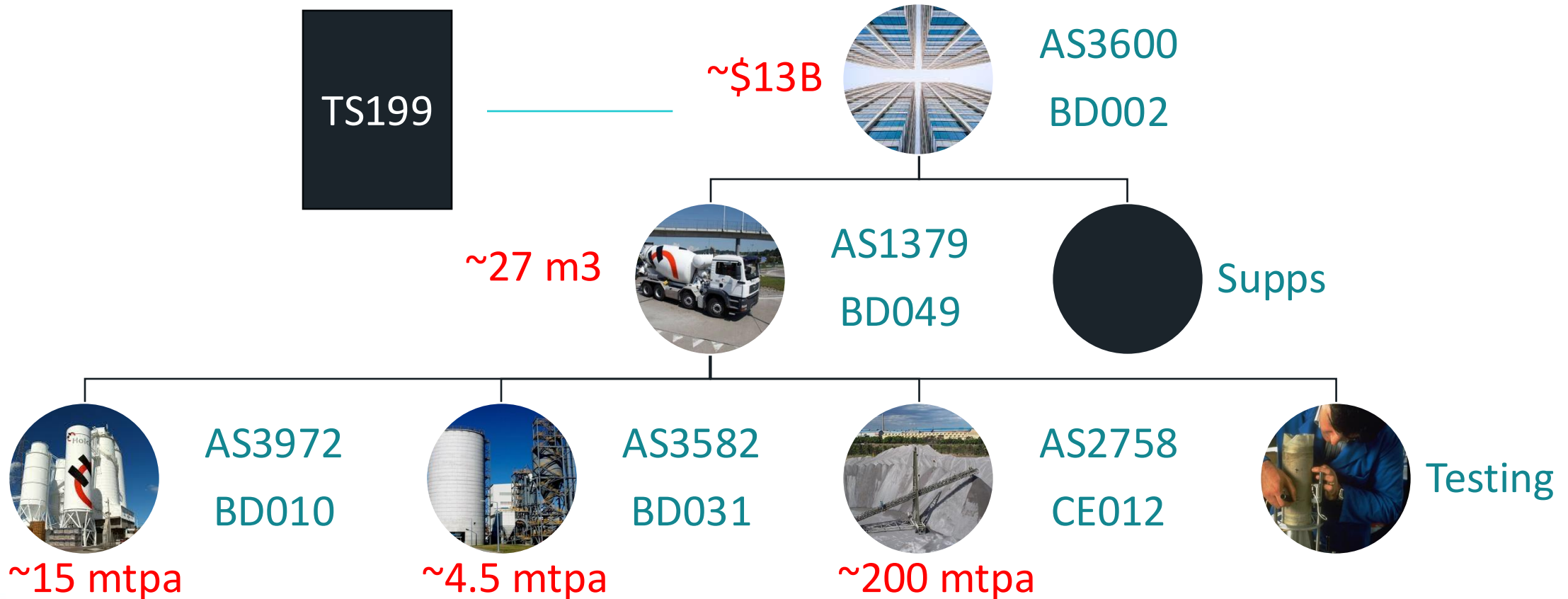




Hard won markets

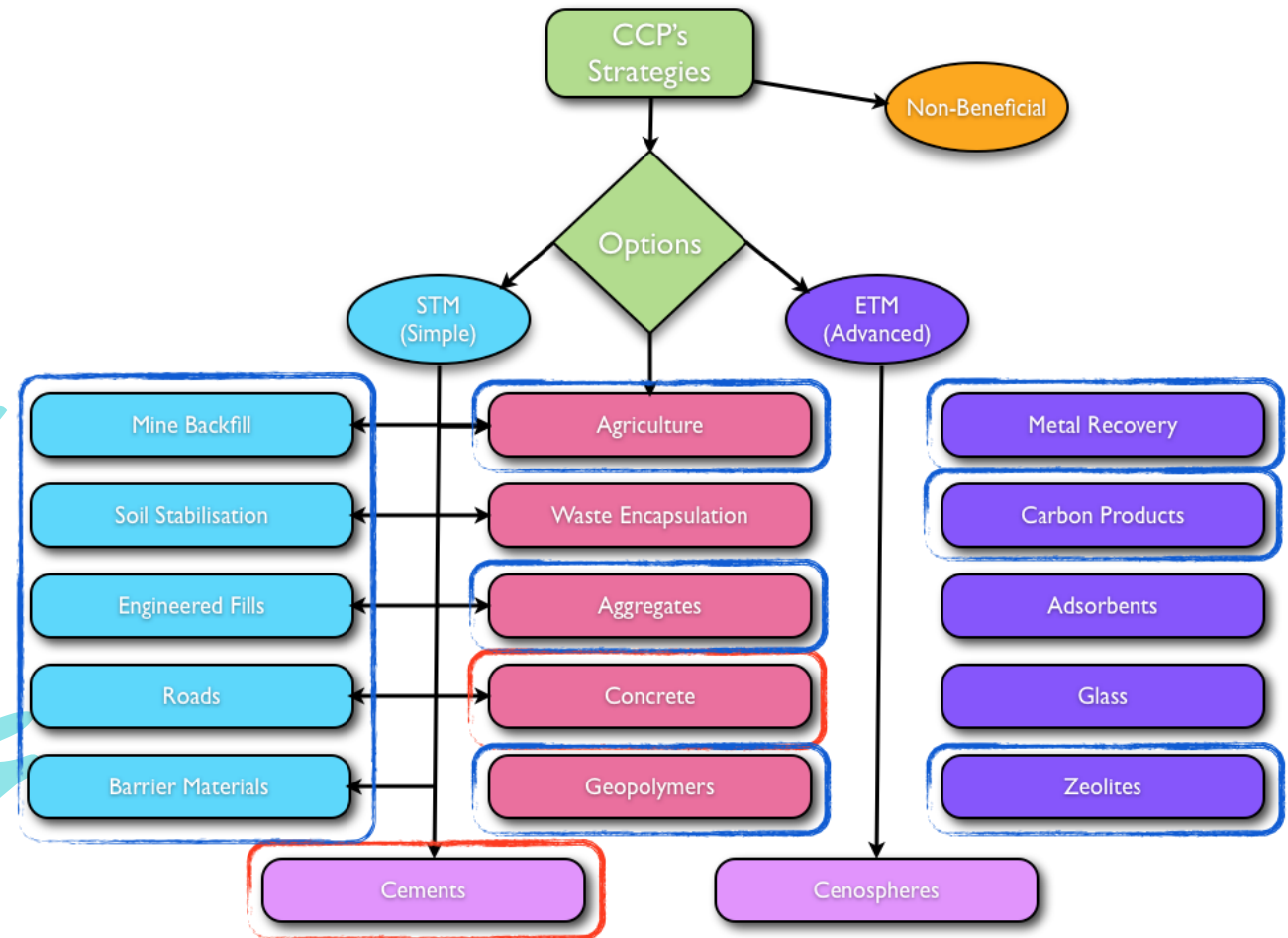


Critical Australian Standards for Concrete



Application road map... Proven v. Unproven

- STM v. ETM
- Cost of capex [investment]
- Uncertainty factors
- Social attitudes
- Sector attractiveness
- Regulation [legal certainty]







M1 Motorway: Compaction Of Bottom Ash To 95%





Finished Sub-Grade
95% Compaction
Completed Base
And Ready For AC-2
Coat Sheet





Other application/uses...



Innovations







Precast panels
using HVFA >
80% Fly Ash
creating a low
carbon
concrete
benefits





ADAA/UTS
ARC Grant
showed benefits
for soil / plants





Next steps



Heat Map

	Generator (Producers)	Processor	Marketers (Value adders)	Manufactures	Users (Consumers/Owners)
Political Energy, Carbon policy, Deregulation, Offsets, Transition					
Economic Quality, Fuel switching, Higher value add options, Security of supply, Large volume apps					
Social Increased awareness/interest in CCPs					
Technological Focus on gas, IGCC, Highly variable CCPs, Beneficiation processes, New markets (GC, Man Agg's, Ag etc)					
Environmental Low NoX burners, Harvesting storage dams, Soil condition and education for emerging markets					
Legal Environmental regulation, Increased enviro focus/performance pressures, GHG reporting					

■ High Priority
 ■ Medium Priority
 ■ Low Priority