RETROFITTING CCS: ENHANCING AUSTRALIA'S ENERGY SECURITY

2017 NETL CO_2 Capture Technology Project Review Meeting.
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Pittsburgh, PA.
USA.

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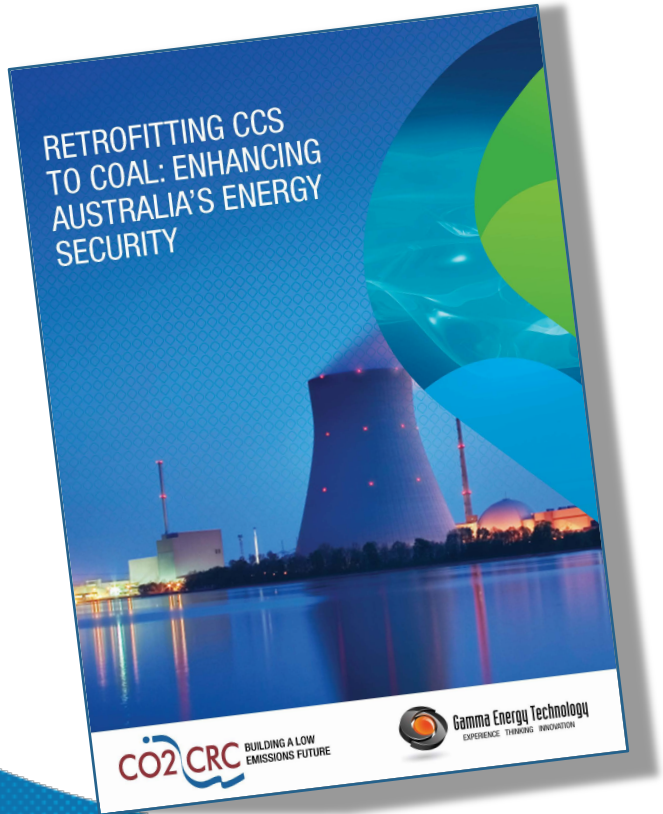
CO2CRC

Gamma Energy Technology
EXPERIENCE THINKING INNOVATION

Aims

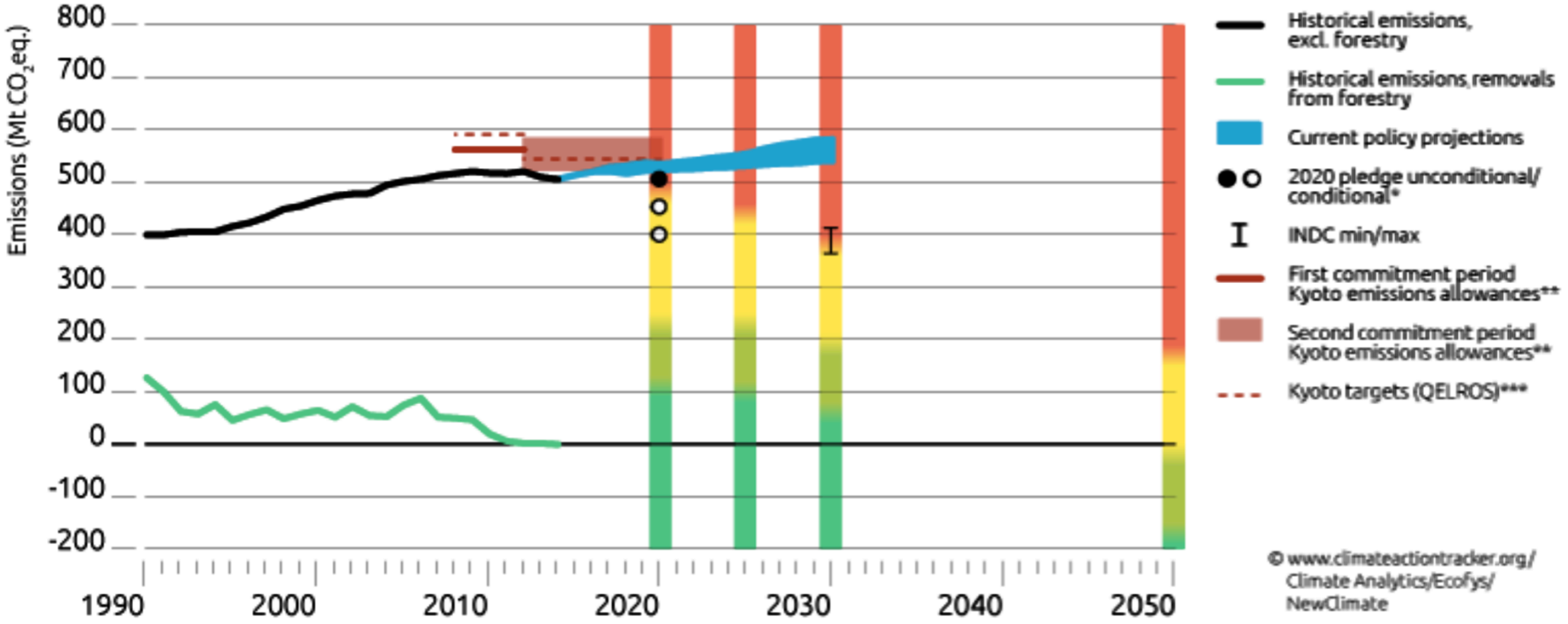
- To examine the costs and performance of retrofitting Post Combustion Capture technology
  - to existing black and brown coal-fired power plants.
  - to an existing natural gas-fired power plants
- To expand on the APGT 2015 data set.



www.powerfactbook.com.au/media/reports

Quick Scale Context

Quick Review of CO_2 Emissions



http://climateactiontracker.org/countries/australia.html

Report Context

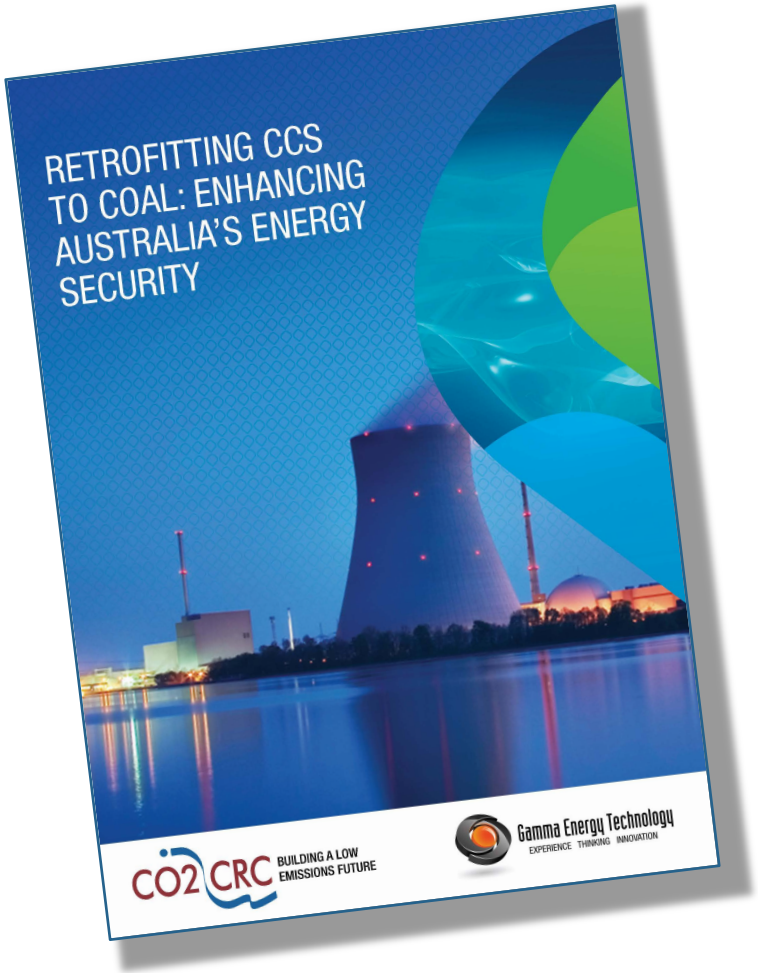
- As a signatory to the Paris Agreement, Australia has agreed to hold the increase in global average temperature to well below 2 degrees. This can only be done through the inclusion of CCS.

- Australia's energy production has traditionally been some of the cheapest in the world. Any new or replacement low emissions technology will be more expensive than the current fleet in use.

- Carbon capture and storage must commence deployment by 2030 across carbon emitting industries broadly, to achieve net zero emissions by Australia beyond 2050.

RETROFITTING CCS TO COAL: ENHANCING AUSTRALIA'S ENERGY SECURITY

Part 1



RETROFITTING CCS TO COAL: ENHANCING AUSTRALIA'S ENERGY SECURITY

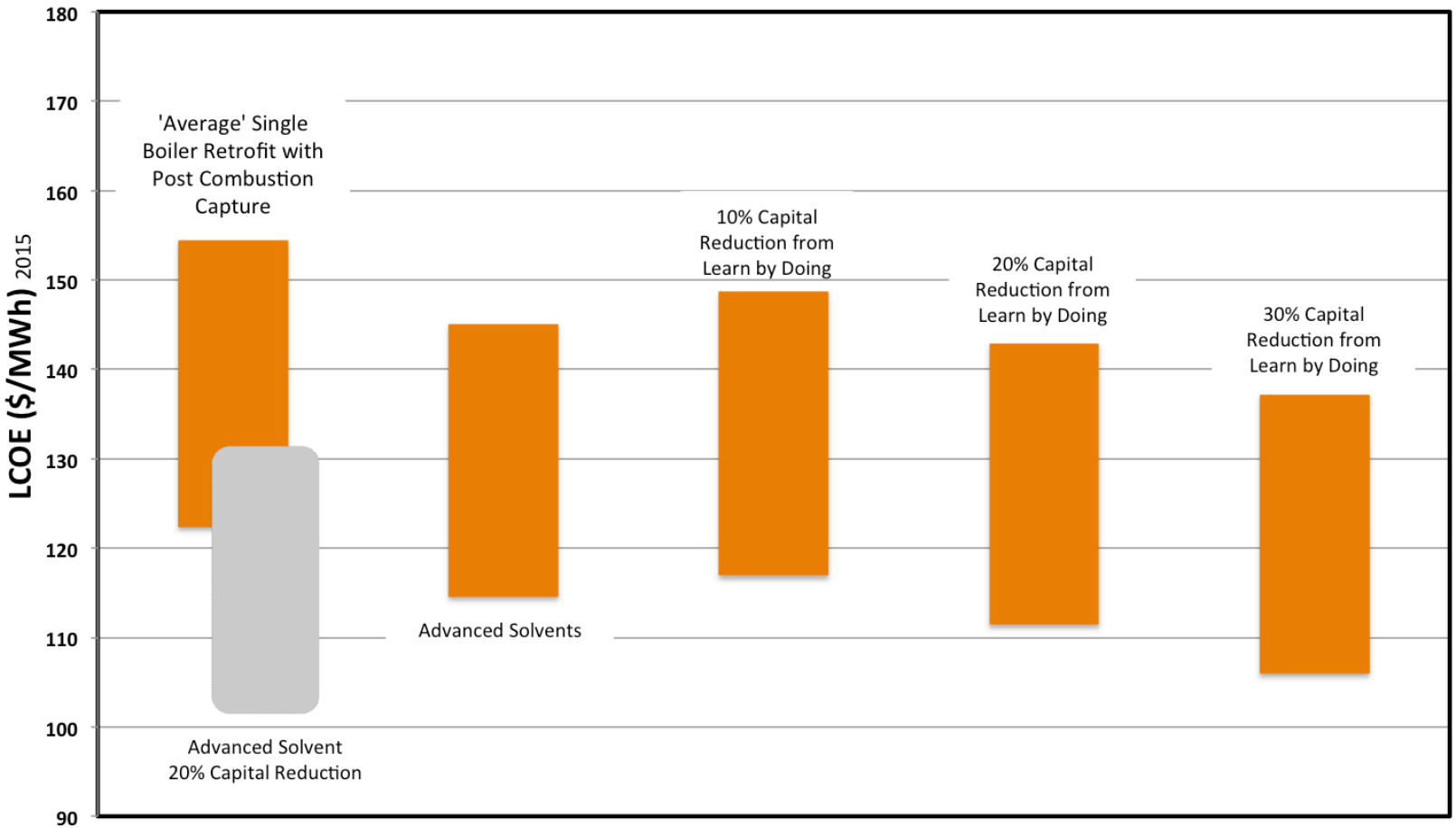
Key findings – Summary (1 of 2)

- Retrofit coal with CCS must be available on its merits to assure energy security and affordability, and to guarantee future emissions reduction targets are delivered at the lowest cost.
- A brown or black coal single boiler that has been retrofitted with CCS costs the same (or less for black coal) to build as comparable solar PV. The plant captures almost 90 percent of CO_2 and is available 24/7.
- The conservative cost of retrofitting in Australia is $2.45b for a single 500MWe boiler to as little as $1.48b with learning by doing benefits and advanced solvents used.

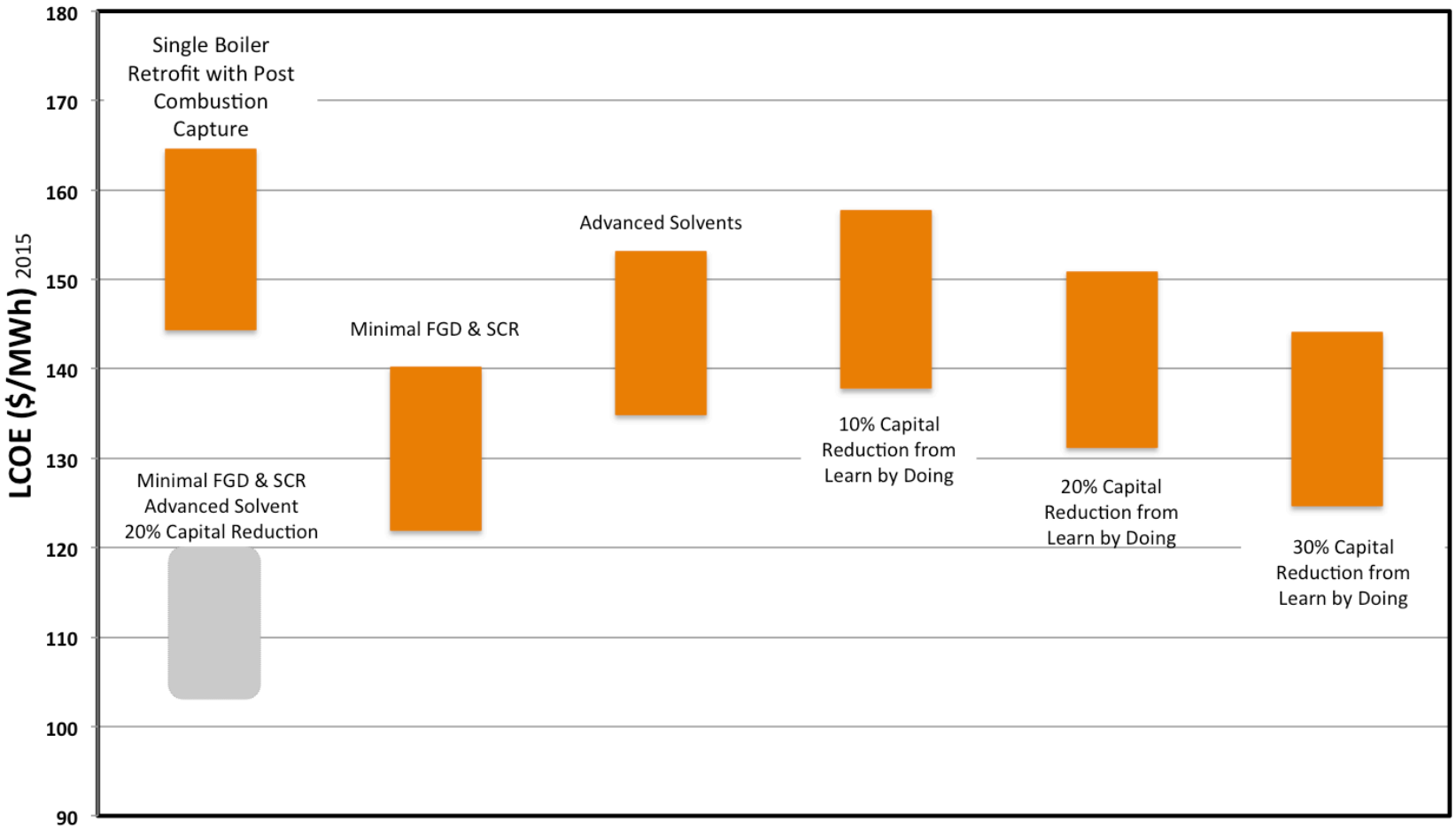
Key findings – Summary (2 of 2)

- Commercial scale CCS is expanding rapidly, with learning by doing reducing costs by 20 – 30 percent.
- New build baseload coal with CCS can use existing infrastructure.
- Oil, gas and manufacturing can be retrofitted to CCS and utilise existing transport hub and storage infrastructure.
- High value direct and indirect jobs will be created in some regions Latrobe Valley VIC, Central Coast NSW, North QLD and new jobs created for transport and storage.
- Immediate decisions need to be made now to facilitate grid scale, 24/7, reliable and available transition to clean energy.
- CCS retrofit is suitable for some coal plants and regions, but not all.

Key findings – Black Coal



Key findings – Brown Coal



RETROFITTING CCS TO COAL: ENHANCING AUSTRALIA'S ENERGY SECURITY

Part 1

RETROFITTING AUSTRALIAN GAS POWER PLANTS WITH POST COMBUSTION CAPTURE

Key findings – Summary (1 of 2)

- Secure baseload, low carbon emissions electricity will be achieved from natural gas combined cycle plants retrofitted with carbon capture and storage.
- Retrofit of natural gas combined cycle gas turbines with carbon capture and storage has capital costs significantly lower than comparable solar photovoltaic arrays and may act as an affordable step in establishing a carbon capture and storage industry in Australia.

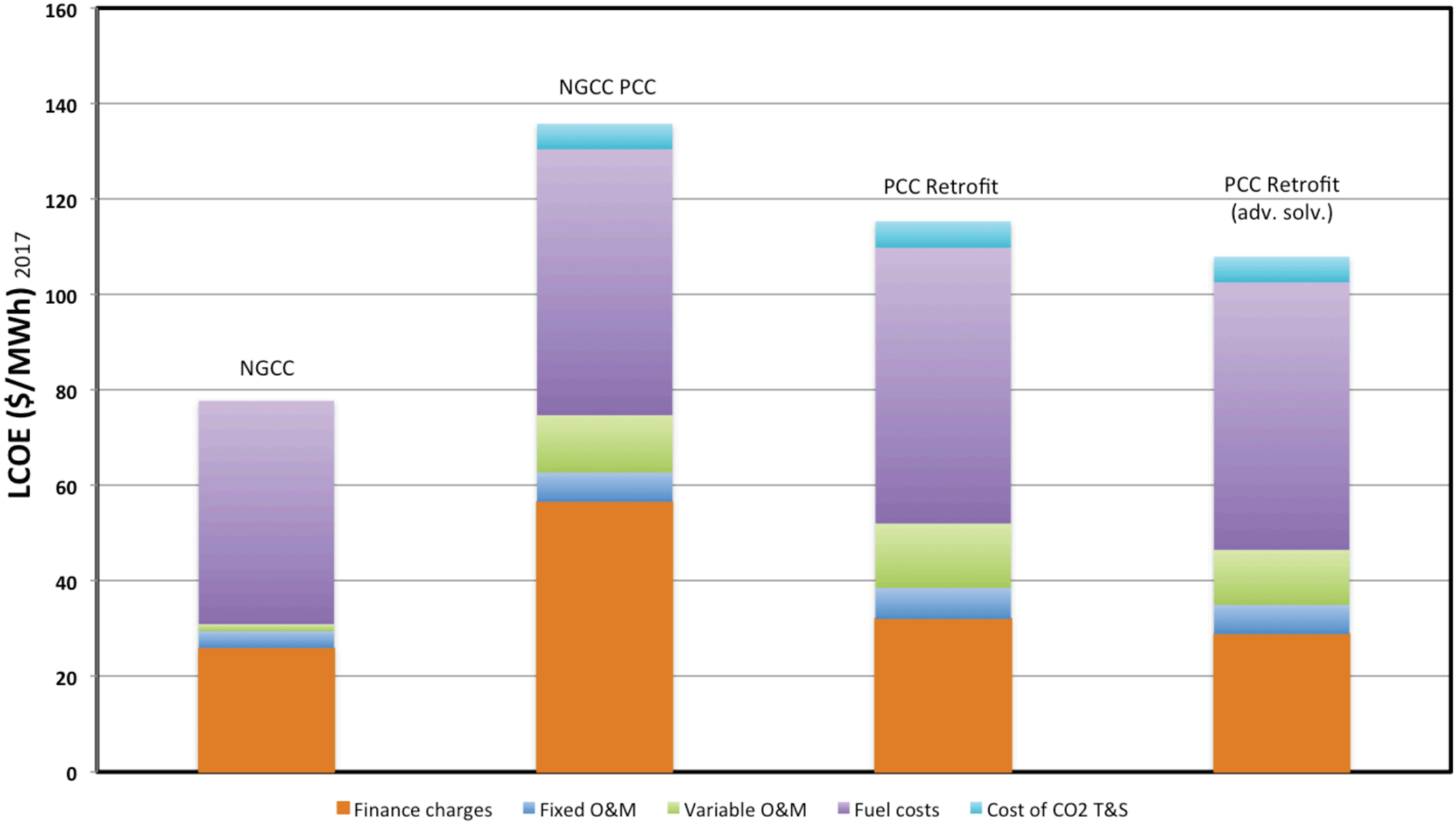
RETROFITTING AUSTRALIAN GAS POWER PLANTS WITH POST COMBUSTION CAPTURE

Key findings – Summary (1 of 2)

- A carbon capture and storage hub will represent the lowest cost pathway for natural gas and coal based electricity generation and other carbon intensive industries to begin the transition to full decarbonisation given the unique geology requirements of storage.
- All new low or zero emission technologies deployed internationally and in Australia will cost consumers more than the current electricity mix.
- High value direct and indirect jobs will be created in some regions and new jobs created for transport and storage.
- Immediate decisions need to be made to facilitate grid scale, and a 24/7 diverse electricity sector able to deliver reliable and available energy to support ongoing economic prosperity with zero emissions by 2050.

Key findings – Natural Gas

Key findings – Natural Gas



FINAL THOUGHTS

- Solvent improvements are vital
- Capital reductions need to realised
- Reductions in parasitic load continually improved
- Flexibility of operation will be valuable… and more so in time