



NCCC

National COVID-19
Coordination Commission

Manufacturing Taskforce

Interim report – DRAFT

14 MAY 2020

Manufacturing can deliver jobs and growth



85-170,000+ well paid direct jobs in energy-enabled industries, and 3-5X indirect jobs in associated industries (an additional 255-850,000 jobs)¹

****top down estimates may be conservative – bottom up view is 5x higher*



Underpin growth and prosperity through \$10-20B+ in direct GDP, with up to an 8x multiplier effect on the broader economy¹

****Does not yet include any GDP estimates for advanced manufacturing, or from lower electricity prices*



Support the **reskilling** of many of those affected by current pandemic



Build an ecosystem that supports **high value skills, engages Australia's raw materials and agriculture**



Improve resilience of the Australian economy by **diversification**

Note: GDP and jobs estimates assume 10-20% growth in overall manufacturing sector – does not include any new positions or GDP contribution¹ from advanced manufacturing – further work required to estimate those values; additional uplift may be possible as further conversations pursued (e.g., potential for growth in steel sector). 1. Based on US experience.

Source: Department of Industry (Manufacturing Performance Report, 2019), Expert interviews and analysis.

What is holding Industry back?

Observed barriers to faster growth

- Predominance of short-term solutions and misaligned incentives
- Insufficient focus of investment on areas of competitive advantage
- Limited talent pipeline and workforce capabilities

Disadvantaged by high gas & electricity prices

- Market failure means insufficient investment in new supply despite high prices, due to uncertainty & barriers
- Many heavy industrial players struggling to achieve acceptable returns even before COVID-19 impacts

Two areas for taskforce focus



Growing
advanced
manufacturing



Creating a
competitive
domestic gas
market



Growing advanced manufacturing

- ✓ Take a longer term view to create more value from our investments
- ✓ Drive rigorous implementation and measurement of impact
- ✓ Support with structural reforms, starting with skills



Creating a competitive domestic gas market

- ✓ Remove barriers to supply
- ✓ Build the bridge of supply in the near-term
- ✓ Create the market by underwriting a bookbuild
- ✓ Lower the cost of pipelines
- ✓ Complete the network of pipelines to markets
- ✓ Scale & win in the medium-term

Overview of our recommendations

The Manufacturing Taskforce's regular meetings were informed by many of Australia's leading business and government officials, as well as a number of international experts. We would like to acknowledge the particular contributions of the following individuals

Energy and Resources

Stephen Bell, Qenos
 Jack Brodo, Dow
 Alberto Calderon, Orica
 Drew Clarke, AEMO
 John Ellice-Flint, Blue Energy
 Stephanie Fahey, Austrade
 Kevin Gallagher, Santos
 Mark Gerhardy, Viva Energy
 John Grill, Worley
 Matt Howell, Tomago
 Angus Jaffray, Santos
 Jeanne Johns, Incitec Pivot
 Margi Johnson, Australian Aluminium Council
 Jonathan McCarthy, Rio Tinto
 Ken McKenzie, BHP
 John Phillips, Blue Energy
 Sunil Salhotra, Pangea Resources
 Peter Toth, Rio Tinto
 Bill Townsend, Inpex
 Tracey Winters, Santos

Government

Greg Combet, NCCC
 Stephanie Fahey, Austrade
 Tony Fraser, Department of Defence
 David Fredericks, DISER
 Michael Gunner, Chief Minister, Northern Territory
 Peter Harris, NCCC
 Mike Lawson, Department of Industry, Science, Energy and Resources
 Ian Learmonth, Clean Energy Finance Corp.
 Vivien Lim, Austrade
 Lyndall Milward-Bason, DISER
 Tim Pallas, Treasurer, Government of Victoria

Martin Parkinson, Former Secretary, PM&C
 Rachel Parry, DISER
 Hon Keith Pitt, Minister for Water, Resources and Northern Australia
 Nev Power, NCCC
 Rod Sims, ACCC
 Stephen Skala, Clean Energy Finance Corporation
 Roland Stephens, Austrade
 Hon Angus Taylor, Minister for Energy
 Bruce Wilson, DISER

Industry

Michele Allan, Food and Agribusiness Growth Centre
 Geoffrey Annison, Australian Food & Grocery Council
 Stephen Armitage, Southern Strength Agile Manufacturing Network
 Philip Bart, Bruck Textiles
 Lindsay Barton, GGBV
 Samantha Blake, Australian Food & Grocery Council
 Neville Bradbury, GGBV
 Greg Combet, NCCC
 Alex Commins, Jamestrong
 Mark De Ambrosis, Armitage Associates
 James Dick, Coastal Shipping
 Karen Dobson, Dow Australia
 John Drake, Heavy Vehicle Industry Association
 Steven Flynn, Baxter Healthcare
 Sanjeev Gupta, EPC Technologies
 Todd Hacking, Heavy Vehicle Industry Assoc.
 Martin Hay, EPC Technologies
 Brad Hordern, Dulux
 Pat Houlihan, Dulux
 Sean Infanti, AMTIL
 Megan Jeremenko, AFGC
 Warren Kirchner, GGBV

Ben Lazzaro, Australian Made Campaign Ltd
 Wayne Manners, Boral
 Peter Meurs, FMG (former)
 Richard Moore, Coastal Shipping
 Michele O'Neil, ACTU
 Steve Pelacanos, Coastal Shipping
 Sandip Ranjan, Bruck Textiles
 Charles Rignall, GGBV
 Rob Spurway, Graincorp
 Darren Thomas, Thomas Foods International
 Margi Thomson, Cement Industry Federation
 Gareth Trickey, Baxter Healthcare
 Michael Tuckman, Osteon Medical
 Denita Wawn, Master Builders Australia

Research

Professor Eliathamby Ambikairajah, UNSW
 Warwick Dawson, UNSW
 Professor Roy Green, UTS
 Merete Daniel Neilson, Cluster Excellence Denmark
 Professor Ian Jacobs, UNSW
 Christian Ketels, Harvard Business School
 Dr Ramin Shayan, Gertrude Biomedical
 Alix Ziebel, ATSE

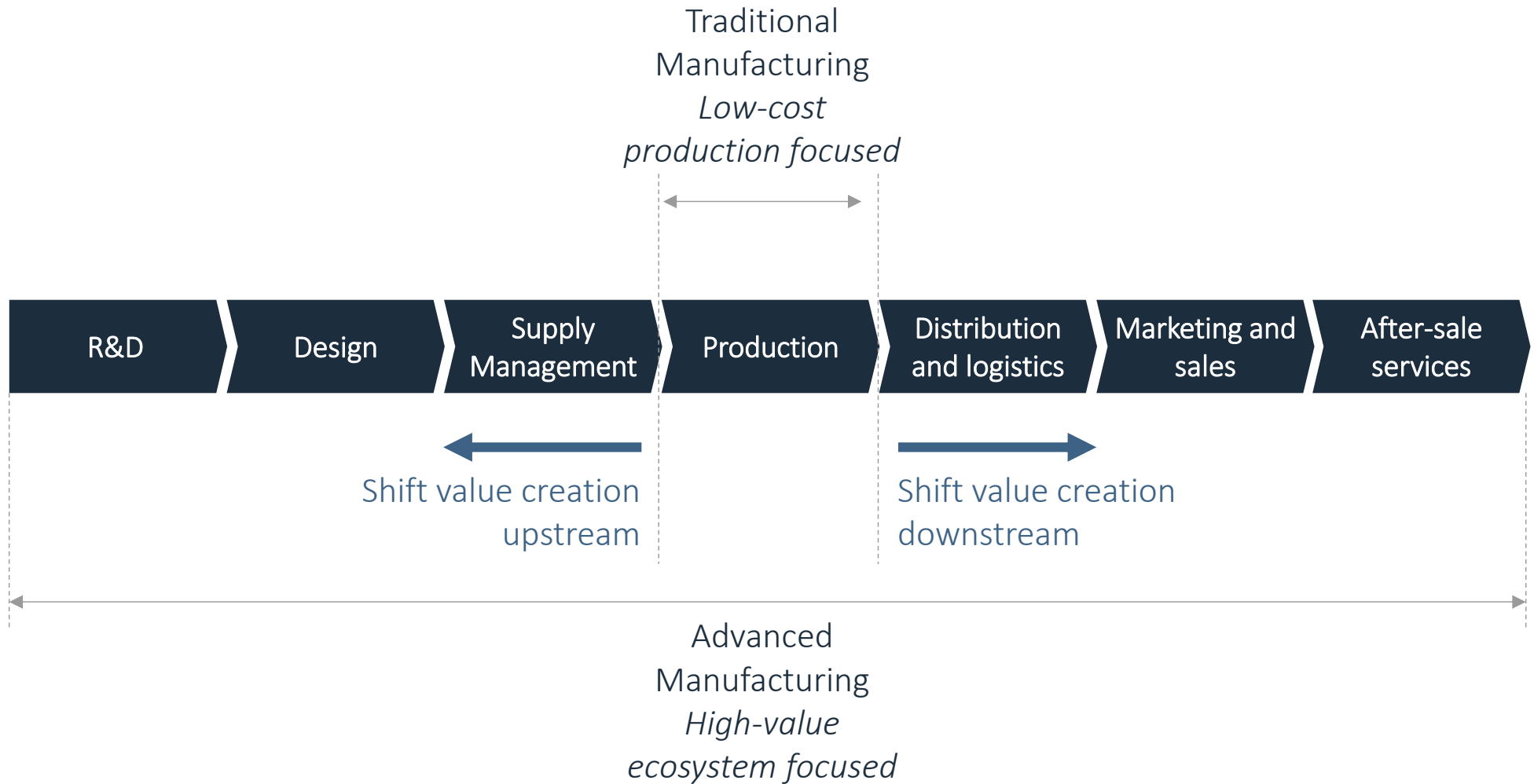
Other

Michael Gill, Dragoman
 Tom Harley, Dragoman
 Keith Hunter, Dragoman
 Craig Mickle, EY
 Ben van Delden, KPMG



Growing advanced manufacturing

Advanced Manufacturing is about high value ecosystems



Multiple barriers impede stronger growth

Barriers

Predominance of short-term solutions
rather than long term, stable strategies

Misalignment of incentives
between industry, academia and
government

Misperceptions of manufacturing careers
and opportunities for workers at all
stages of the value chain

Fragmented investment efforts
spread thinly and with insufficient focus
on areas of competitive advantage

Practical impacts for advanced manufacturing



Governance

- Fragmented policy and program landscape



Innovation and partnerships

- Grants spread too thinly, sub-scale to overall objectives
- Inefficient collaboration between academia, industry and SME to bring discovery to market and transfer capabilities



Workforce capabilities

- Poor perceptions of manufacturing industry careers and skilled jobs
- Vocational training insufficiently aligned to industry needs and real workplace requirements
- Limited focus on leadership & entrepreneurship programs



Government incentives

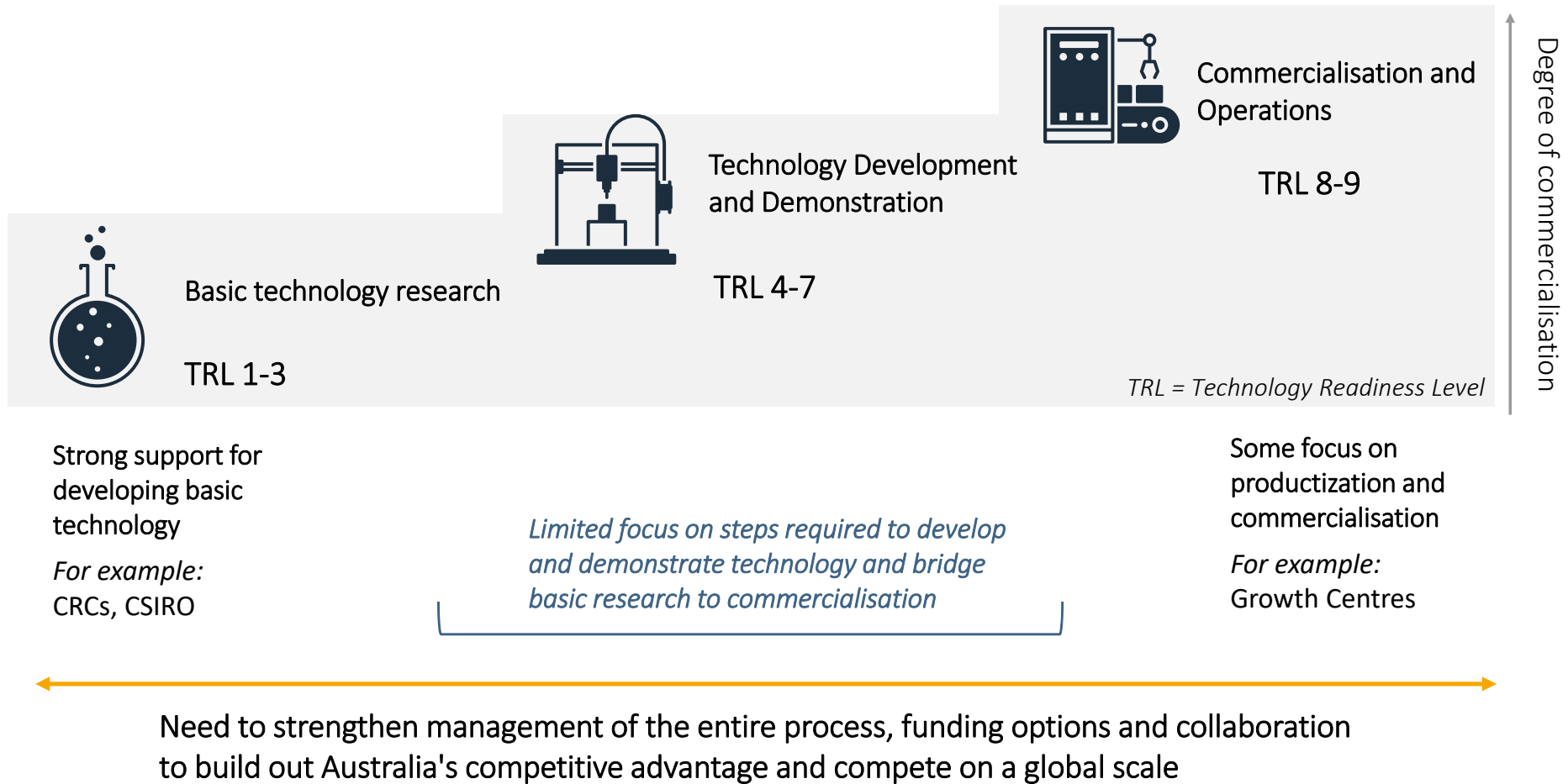
- Structures (e.g., R&D tax credits, grant programs) poorly aligned to government priorities and industry needs
- Programs lack scale and targeting to realise policy ambitions



Infrastructure and supply chain

- Significant capacity and efficiency constraints in domestic transport infrastructure driving down cost-competitiveness
- Growing nationalism & anti-competitive trade behaviours pressuring global free trade architecture

Fragmentation and misalignment resulting in weaker commercialisation of technologies



Lasting impact requires focus on implementation

The taskforce has focused on three areas of recommendation



- ✓ Take a longer term view to create more value from our investments



- ✓ Drive rigorous implementation and measurement of impact



- ✓ Support with structural reforms, starting with skills

Our strengths allow us to compete globally

We can build on existing competitive advantages ...

Fertilizers & Explosives

- 8th largest natural gas production globally; Strong opportunity to boost global cost competitiveness with cheaper domestic pricing and availability

Cement

Metals

- Produce 9 of 10 raw components of lithium ion batteries; largest global producer of Bauxite, Alumina

Healthcare

- Strong existing IP & data holdings; research & clinical capabilities

Space & Defence

- 2nd largest producer of rare-earth minerals; 3rd largest uranium producer

Food & Agritech

- 6th largest arable land-mass globally; among most efficient producers

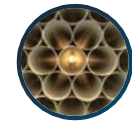
... And add value through human capital

- Enhance production efficiency through automation, digitisation and artificial intelligence design
- Generate cross sector solutions to production challenges (e.g., remote mine management expertise has applications for factories)

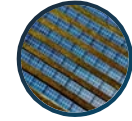
... To realise opportunities in domestic and global markets



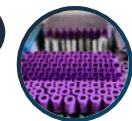
Food & AgriTech: Brand Australia quality and reputation attracts premium pricing for value-added foods



Advanced Building materials: Growing global demand for lighter, stronger, less emissions intensive materials



Energy & Renewables: Rich and diverse geography enabling strong global growth in renewable energy



MedTech: Biotech successes (e.g. Cochlear, CSL) show pathway for successful research/industry collaboration



MinTech & Rare Earths unique breadth of raw minerals and capabilities for precision engineering and minerals processing



Space: Unique southern hemisphere location for design & build of international space & defence facilities

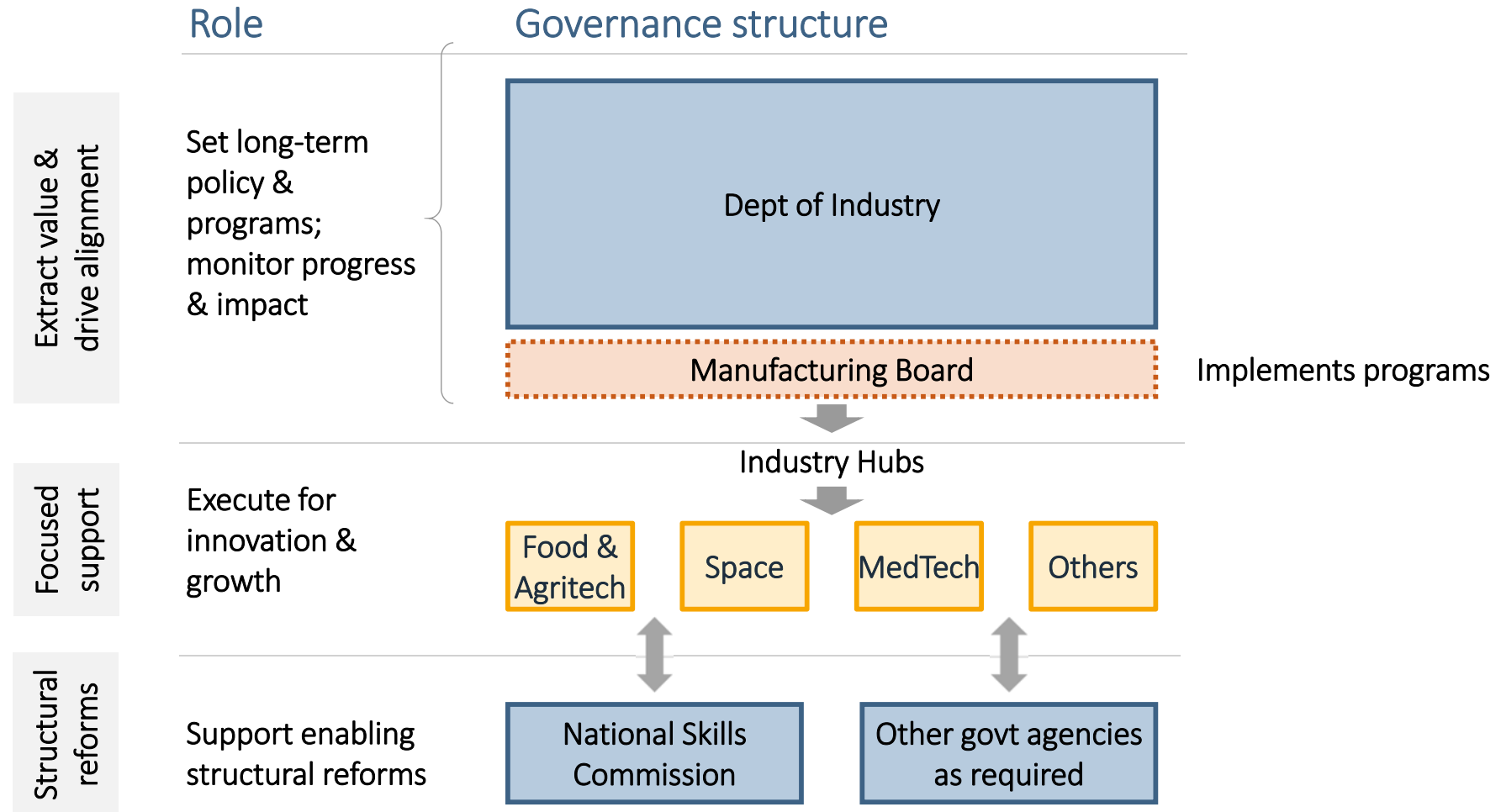


Defence: Use niche technologies to build globally competitive capabilities

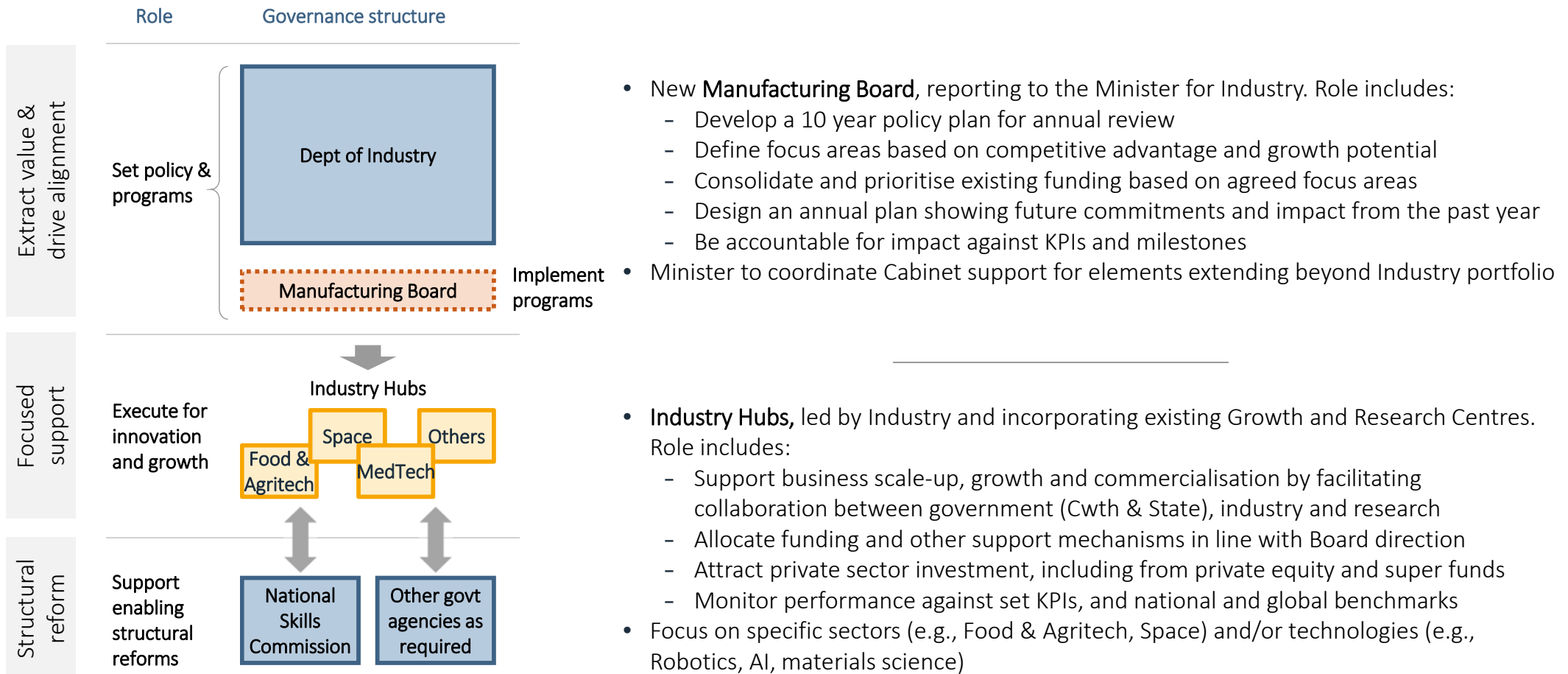
Principles of a governance structure to create more value and drive execution

- Embed a long-term, 10 year policy view, with clear accountability for impact against agreed KPIs
- Redeploy existing funds, efforts and other tools to reduce the risk of scaling
- Accelerate approval processes for projects and removal of red tape
- Focus investments and support on tightly-defined areas of competitive advantage
- Leverage existing Australian structures and exemplars where possible, and draw on global evidence base

Conceptual structure



Detailed view: Potential structure to increase impact of investment



Focus support in areas of competitive advantage



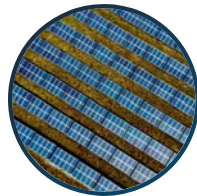
Food &
Agritech

- Among world's most efficient ag-sectors
- Brand Australia quality reputation
- Innovation in, AI livestock mgmt. & food design



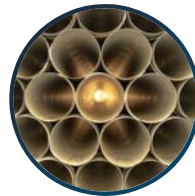
MinTech &
Rare Earths

- Largest global producer of Bauxite and alumina
- Largest non-Chinese controlled "critical minerals" resources
- 3rd largest uranium production



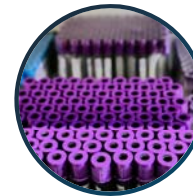
Energy &
Renewables

- Produce 9/10 raw materials of lithium ion batteries
- 5th largest solar power capacity in the world



Adv. Building
Materials

- Lighter, stronger & emission efficient materials (e.g. lightweight bricks, pre-fabricated walling)



Healthcare &
BioTech

- Existing MedTech successes (e.g., Cochlear)
- Strong existing IP & data holdings; Research & clinical capabilities



Space

- Pivotal southern hemisphere location
- Highly educated workforce
- Already in NASA's supply chains



Defence

- Core sovereign need
- Delivering world class products from expertise developed through Defence technology and growing manufacturing capability

Structural reforms are an essential input

Build the talent pipeline with essential vocational reforms

- Work with National Skills Commission and TAFEs to **implement vocational education reforms** and broader skills initiatives
 - Improve **quality and relevance of training**
 - Analyse **future skill needs** for advanced manufacturing
 - Implement **nationally consistent qualifications and curricula**
 - Accelerate qualification **completion times**
 - **Engage industry and employee representatives** more closely in curriculum design and delivery
 - Improve **apprentice retention**

Encourage productivity increases

- Work with National Skills Commission and TAFEs to identify **priorities for upskilling and retraining initiatives**
 - Support today's workforce with development of skills to meet Industry 4.0 opportunities
 - Offer pathways for mid-career redeployment into the manufacturing sector
- Scale up existing programs to **support entrepreneurship, innovation, technological development and leadership in SMEs**, to ensure businesses have access to skills required to shift towards higher value and higher productivity manufacturing

Other reforms are required, for example

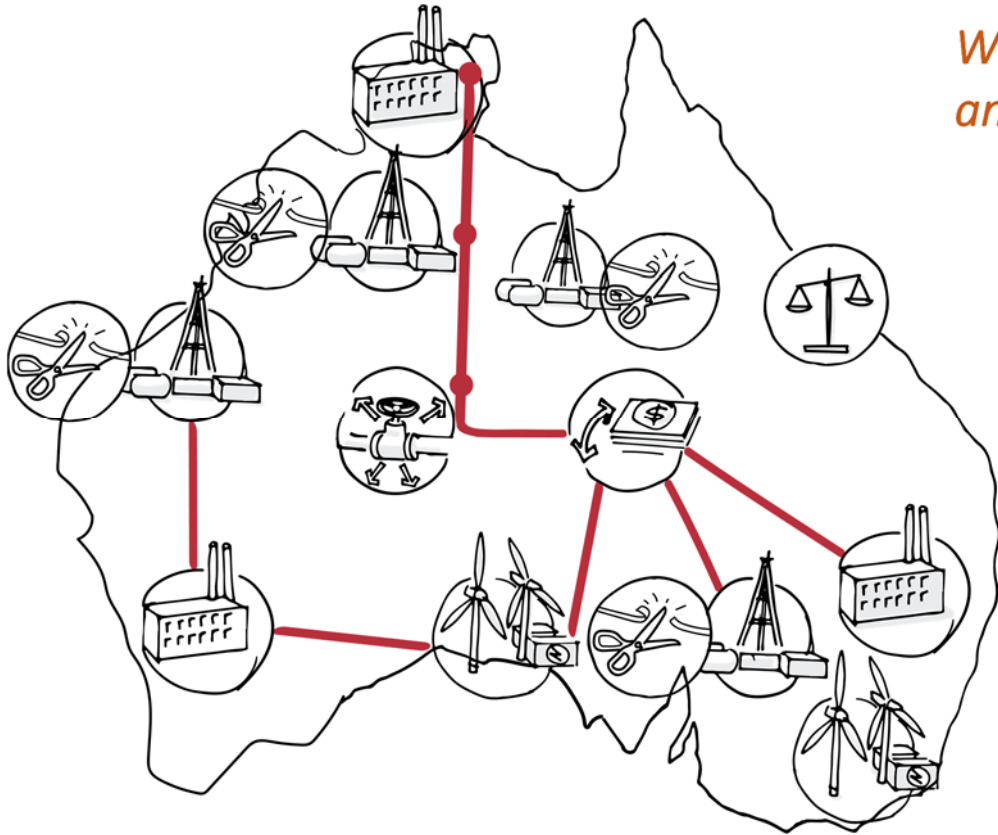
- Focus **R&D tax incentives** on activity with benefits for the whole economy (rather than individual firm benefits); ideally focused on defined areas of competitive advantage
- Introduce stronger **open data access and knowledge sharing** for Commonwealth, State and federally-funded university research; ensure balance of IP protection and commercialisation opportunity
- Update **Intellectual property laws** in line with Productivity Commission recommendations to balance access, innovation, competitiveness and international trade obligations



Creating a competitive domestic gas market

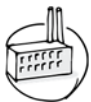






Our recommendations will create a globally competitive domestic gas market for Australians

We will create hundreds of thousands of high paying jobs, and lift GDP by \$10-20B+ via our recommendations:



- ✓ Remove barriers to supply
- ✓ Build the bridge of supply in the near-term
- ✓ Create the market by underwriting a bookbuild
- ✓ Lower the cost of pipelines
- ✓ Complete the network of pipelines to markets
- ✓ Scale & win in the medium-term

Historical experience suggest that unlocking supply is critical for supporting future demand growth

 New manufacturing
  New field
  Liquid hub
  More interconnecting pipelines
  Renewable gen with gas firming
  Supply and Demand balance
  Less red and green tape



Recommendations are a three phase journey towards sustained lower prices

~\$6/GJ

Goal: ~\$4/GJ



Phase A:

Remove barriers to supply

- Lift the moratorium in New South Wales, and the remaining moratoria in Victoria
- Initiate a rapid 'red & green tape' reduction
- Establish a global best practice gas development regulatory framework in the Northern Territory

Build the bridge in the near-term

- Enforce 'use it or lose it' provisions
- Provide support, such as low cost capital, to existing small and mid-cap market participants
- Establish a forward-looking gas reservation policy for Northern Territory and East Coast developments
- Consider accelerated developments for highly prospective opportunities – e.g., Beetaloo, Bowen, Perth Basin
- Coordinate with hydrogen development to ensure long-term demand potential (incl. avoiding demand destruction)

Phase B

Create the market

- Underwrite supply at priority supply-hubs, to 'create the market'
- Compel price disclosure and reporting of differentials

Lower the cost of pipelines

- Revisit pipeline rates of return
- Reduce excessive duplication cost of infrastructure, including through improved access

Complete the network of pipelines to markets

- Take active, participatory role in strategic pipeline developments
- Consider tax incentives for priority infrastructure

Phase C

Scale & Win in the medium-term

- Proactively attract foreign-direct investment on demand side
- Provide policy stability that enables market to thrive
- Establish an 'evergreen' taskforce between AEMO and ACCC to manage implementation and send clear market signals via aligned basin and pipeline prioritisation, published and refreshed regularly
- Work with financial service providers to create a liquid futures market
- Continue to coordinate with hydrogen

Need to act now to start creating the certainty that will deliver the growth

Underwriting new supply with government balance sheets ...



...allows upstream producers to **invest with confidence**



...and **new pipelines to be built** to get the gas to markets

Creating a hub with sufficient volume and price transparency...



...allows end-users to **contract the volumes** they need with greater certainty



...which enables **existing industry to thrive and reinvest in productivity**

Removing barriers to supply by lifting moratoria, enforcing 'use it or lose it', and introducing reservations...



...ensures the **next waves of volumes** enter the market, creating a **stable new price environment, with scale**



...which enables **new investment decisions** to be made, **adding additional demand** (industrial, power gen)

Precedents in today's energy markets show how government underwriting can work well

Significant history of major gas pipeline projects requiring government support ...

- **1970s:** The State Energy Commission of WA funded the development of Dampier Bunbury Pipeline and entered into a foundation contract with developers to purchase fixed volumes of gas over the long term, privatized in 1998
- **1990s:** Moomba to Sydney Ethane Pipeline initially supported by TPA (fed gov pipeline authority), but once de-risked sold to AGL

... Renewable projects also recently underwritten by governments, providing price certainty

- Victoria and QLD state governments have supported renewable investment by implementing **reverse auction contract-for-difference (swaps) schemes**, guaranteeing stable renewable prices for ~15 years
- Gov agrees to purchase a certain amount of electricity and asks for bids of projects to bring capacity onto grid, **incentivising generators to bid at the lowest possible cost**
- Victorian scheme (VRET) **has supported over \$1.15B capital investment in the past 2 years**

Federal government agreed to underwrite two gas-fired power stations under UNGI program in 2018

Federal government backs new gas power projects in Qld, Vic

apa project selected for government power scheme

Quinbrook Infrastructure Partners has proposed a 132MW gas generator in Gatton to provide new capacity to help meet peak periods in Queensland and NSW.

Program provides generators certainty ...

“ A number of market participants are constrained in their ability to support new investment due to being **unable to commit to long term contracts** ... they are often prepared to commit to shorter contracts, say five years, but that is typically insufficient ... the **government should operate a program under which it will enter into low fixed priced energy offtake agreements for later years (years 6-15)** ”

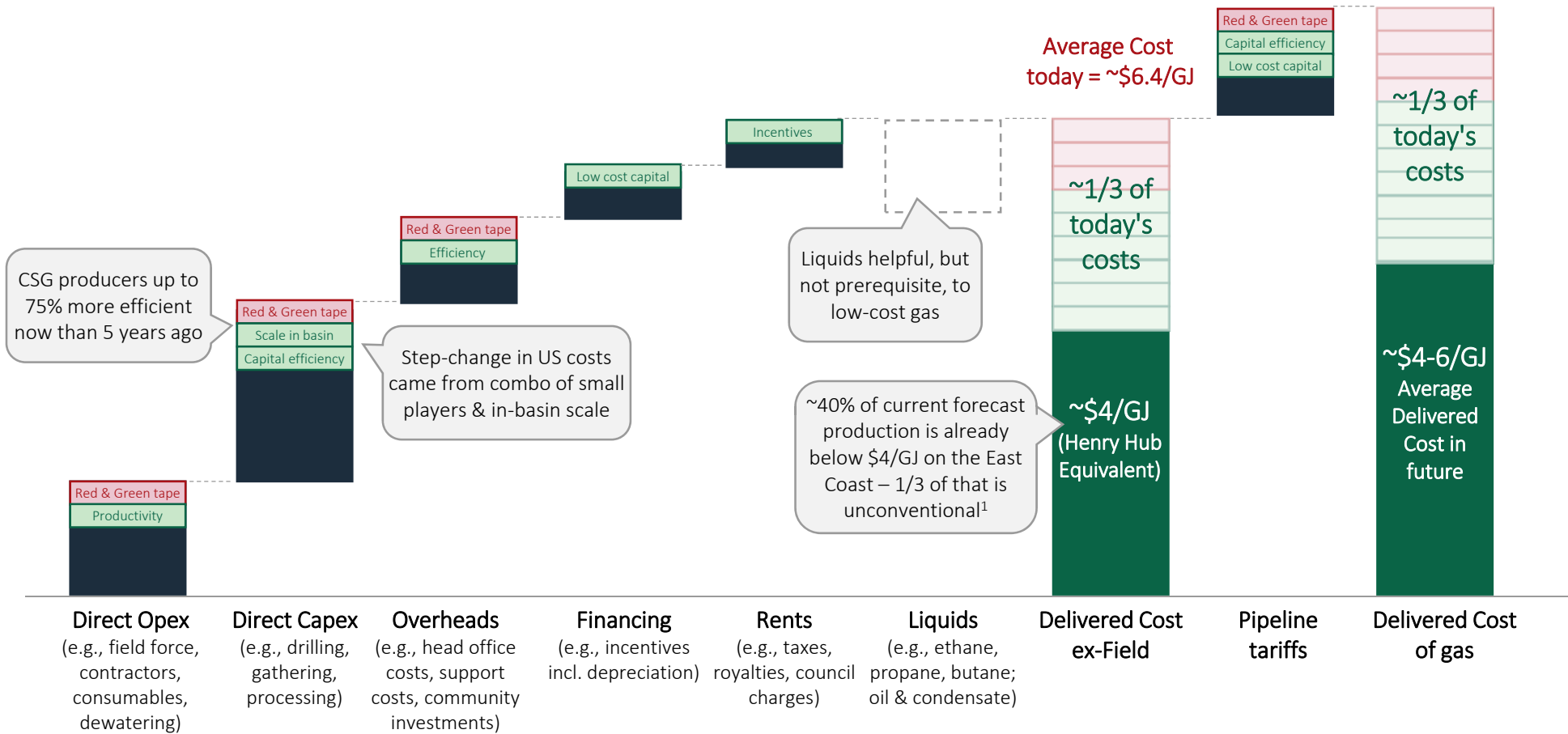
- ACCC, Retail Electricity Pricing Inquiry 2018

... And operates through various mechanisms

				
Floor price, post year 5	Small grants and loans	Contract for difference	Cap and floor contracts	Underwriting cap contracts

Our recommendations put us on a pathway towards \$4/GJ gas supply

Indicative changes to cost structure of gas developments under proposed solutions



1. Rystad production forecast, 2020-2029. 2. Includes gas fields and gas condensate fields that had production in 2019; includes all cash flows across the lifetime of an asset (i.e., exploration, development, production and abandonment). Source: Rystad Energy, Industry experience, Expert interviews

Realising \$4-6/GJ gas is a realistic goal

Current production forecasts indicate potential for low cost gas in Australia¹

Significant operational improvement potential

40%

Gas from the East Coast forecasted to cost less than \$4 per GJ (~8K PJs in next 10 yrs)

20%

Gas from Western Australia forecasted to cost less than \$4 per GJ (~8K PJs in next 10 yrs)

63%

Drop in Henry Hub pricing due to US shale market growth from 2000 to 2010, 78% drop from 2000 to 2015 (32% dry gas and 68% wet gas)²

1. Based on 2020-29 Australian gas supply curves from Rystad. 2. Dry vs wet gas split based on US gas and gas-condensate fields that has production in 2019; total production ~30.8K PJs (12.3K PJs dry gas and 20.5K PJs wet gas). Source: Rystad Energy, Bloomberg

Australia's business context is not competitive due to onerous red and green tape

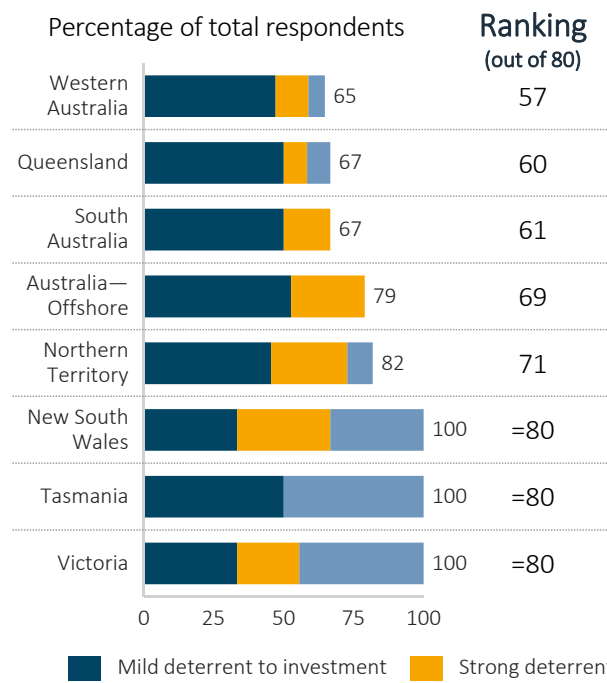
East coast states not competitive against peers for new investment

Ranking ¹	Region	Policy Perception Index Score
1	Texas	100
2	Oklahoma	96.35
3	Kansas	92.04
4	Wyoming	91.67
5	North Dakota	91.35
6	Alabama*	89.92
7	Montana	86.98
8	US Offshore—Gulf of Mexico	86.49
9	United Kingdom—North Sea	84.84
10	Louisiana	84.76
11	Mississippi	84.61
12	Oman	82.34
13	United Kingdom—Other Offshore (except North Sea)	82.20
14	Norway—North Sea*	82.17
15	Norway—Other Offshore (except North Sea)	82.01
20	South Australia	78.17
35	Western Australia	71.96
39	Australia—Offshore	69.86
50	Queensland	62.60
68	Northern Territory	51.35
73	New South Wales	40.37
77	Victoria	31.52
78	Tasmania	26.11

 Top quartile 3rd quartile
 2nd quartile Bottom quartile

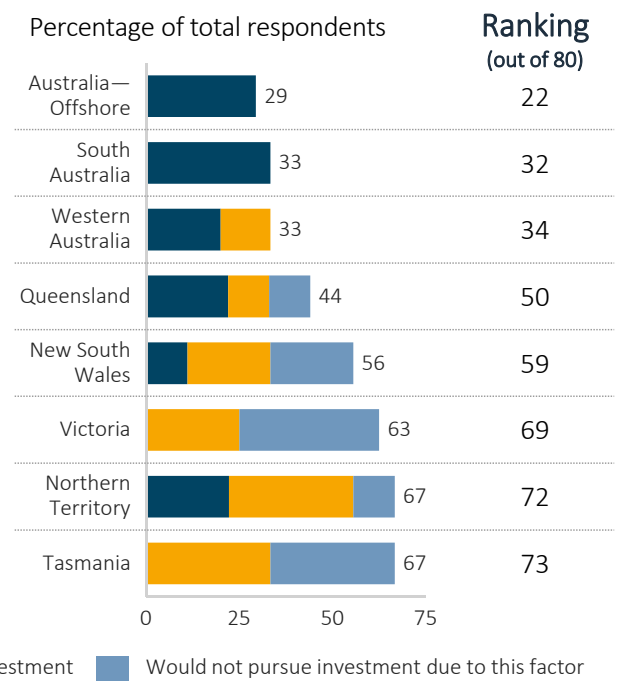
Largely driven by onerous environmental restrictions ...

Impact of environmental regulations



... and unpredictable and often duplicative legal rules

Impact of reg duplication and inconsistency



Reducing red and green tape does not mean compromising on environmental outcomes – it is about bringing Australia in line with other leading global jurisdictions

1. Survey evaluated 80 jurisdictions; 256 total respondents across jurisdictions; included jurisdictions account for 53% proved global oil and gas reserves and 68% total global production. Source: Fraser Institute, Global Petroleum Survey 2018, Expert analysis

Note: Northern Territory currently does not have a gas development regulatory policy in place – Commonwealth is in a good position to influence this

Lower cost gas will have significant benefits ...



Support the sustained competitiveness of existing energy intensive industry through lower gas & electricity prices



Attract and grow new, globally competitive value chains where Australia has a natural advantage



Support cost-efficient energy transition through both firming and baseload capacity that supports growth in renewable generation



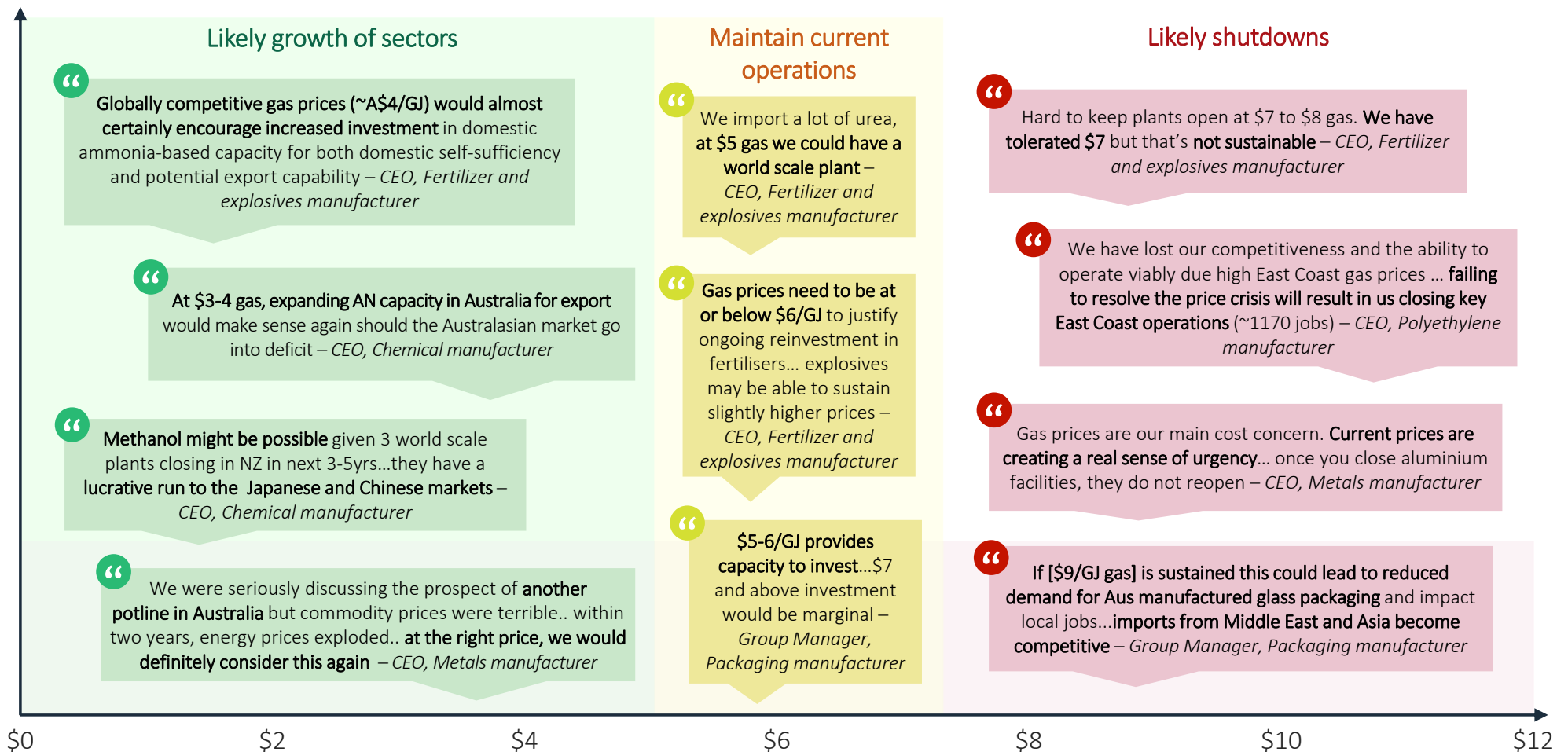
Provide a foundation for Australia to become a world leader in green and blue hydrogen at export scale



Making the equivalent of just 3% of the current LNG export volumes available domestically will unlock hundreds of thousands of high paying jobs for Australians

Without action = significant closures... ...with action = growth of our domestic industry

Impact of gas prices on long term viability of key manufacturing sectors



Lower gas prices support lower electricity prices in Australia

With lower gas prices we will...

- ✓ Lower electricity prices* by \$7.2/MWh for every \$1/GJ reduction – if we were able to reset from over \$10/GJ to \$4/GJ, that translates to ~\$5-7B in annual savings
 - ✓ Maintain and grow our existing industrial base, providing job security for existing manufacturing jobs and conservatively adding 85,000-170,000 new, high paying jobs – many of those in regional areas
- ***Does not yet include jobs from lower electricity prices*

Without lower gas prices we will...

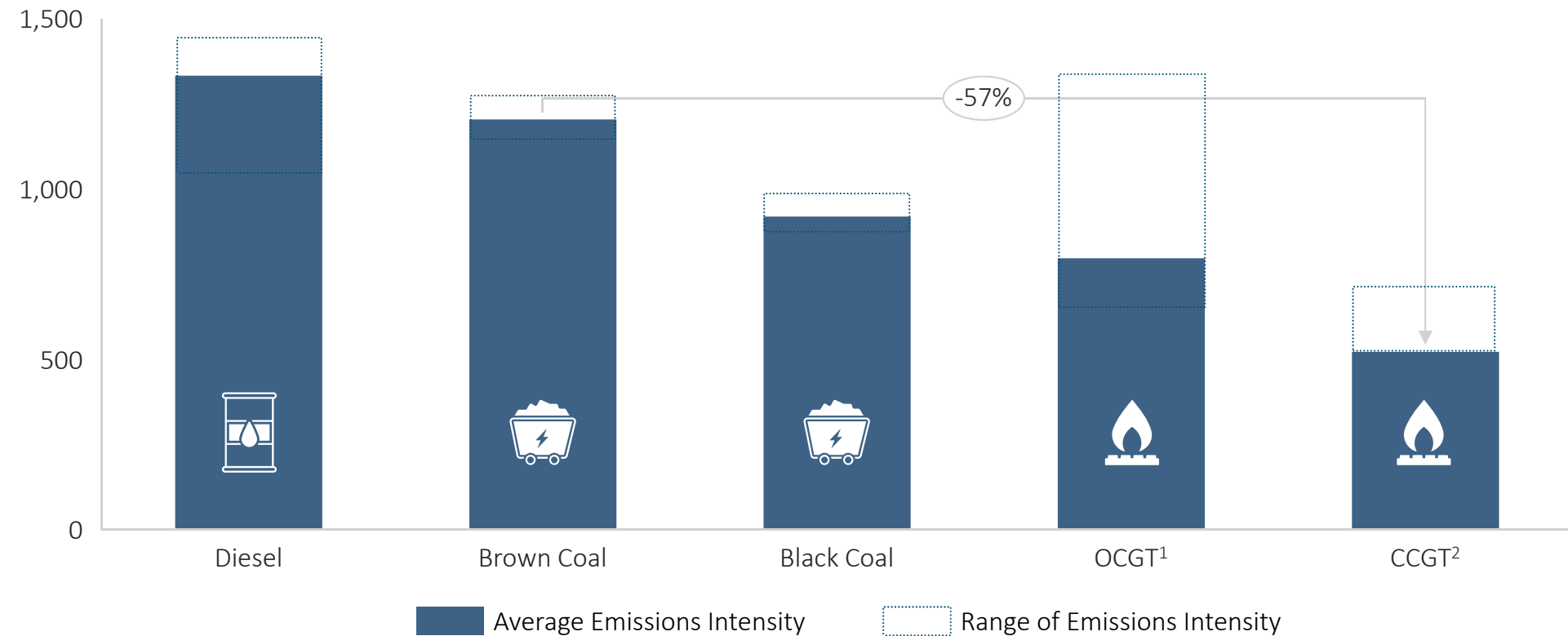
- ✗ Allow gas to continue to set a high benchmark price, resulting in a less efficient renewables sector, and higher prices for all consumers
- ✗ See major closures and declines in our existing industrial sector and deteriorating productivity, resulting in job losses and precluding us from becoming a world leader in hydrogen exports in 15-20 years time

*When CCGT is the last step in the merit order – assuming 50% CCGT efficiency, a 30-40% capacity factor and approx. 1.5x average demand during the periods where CCGT is price setting; looking only at the NEM

A higher quantity of cheap gas would drive a greener Australian future

Emissions Intensity

kg/MWh



1. Open Cycle Gas Turbine 2. Closed Cycle Gas Turbine
Source: AEMO ISP



Recap and conclusions

Manufacturing can deliver jobs and growth



85-170,000+ well paid direct jobs in energy-enabled industries, and 3-5X indirect jobs in associated industries (an additional 255-850,000 jobs)¹

****top down estimates may be conservative – bottom up view is 5x higher*



Underpin growth and prosperity through \$10-20B+ in direct GDP, with up to an 8x multiplier effect on the broader economy¹

****Does not yet include any GDP estimates for advanced manufacturing, or from lower electricity prices*



Support the **reskilling** of many of those affected by current pandemic



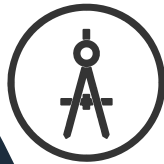
Build an ecosystem that supports **high value skills, engages Australia's raw materials and agriculture**



Improve resilience of the Australian economy by **diversification**

Note: GDP and jobs estimates assume 10-20% growth in overall manufacturing sector – does not include any new positions or GDP contribution from advanced manufacturing – further work required to estimate those values; additional uplift may be possible as further conversations pursued (e.g., potential for growth in steel sector). 1. Based on US experience.

Source: Department of Industry (Manufacturing Performance Report, 2019), Expert interviews and analysis.



Growing advanced manufacturing

- ✓ Take a longer term view to create more value from our investments
- ✓ Drive rigorous implementation and measurement of impact
- ✓ Support with structural reforms, starting with skills



Creating a competitive domestic gas market

- ✓ Remove barriers to supply
- ✓ Build the bridge of supply in the near-term
- ✓ Create the market by underwriting a bookbuild
- ✓ Lower the cost of pipelines
- ✓ Complete the network of pipelines to markets
- ✓ Scale & win in the medium-term

Overview of our recommendations



Additional reference material – challenges and opportunities

We face a difficult environment

Domestically, there are substantial impacts across the economy



69%

demand for goods & services¹



10%

unemployment projection

Globally, we can no longer assume favourable trends



Supply chain uncertainty



Decreased demand for Australian exports



Rising trade protectionism



Stalling international labour flows



Growing digitisation

Recovery offers opportunity to reposition for resilience

Grow and diversify economy

Create new, skilled jobs

Build new export markets

Close the gap on sovereign capabilities

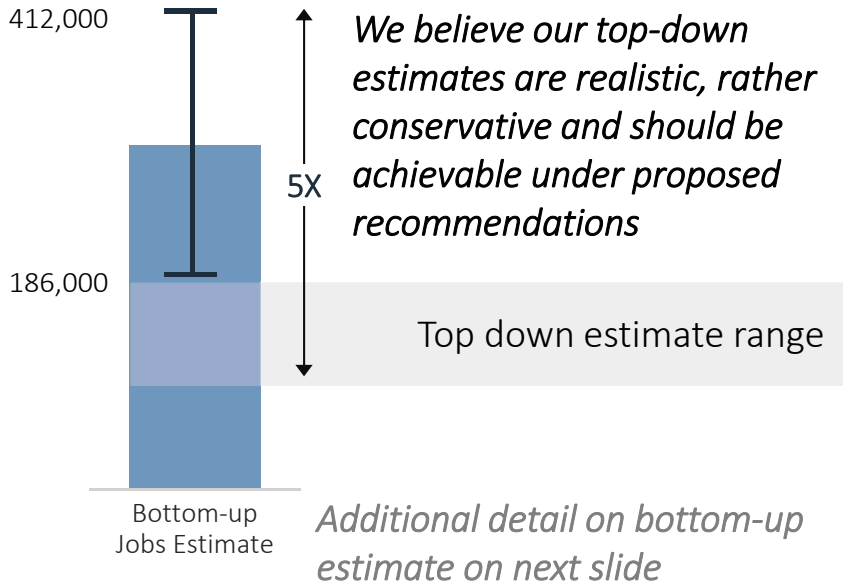
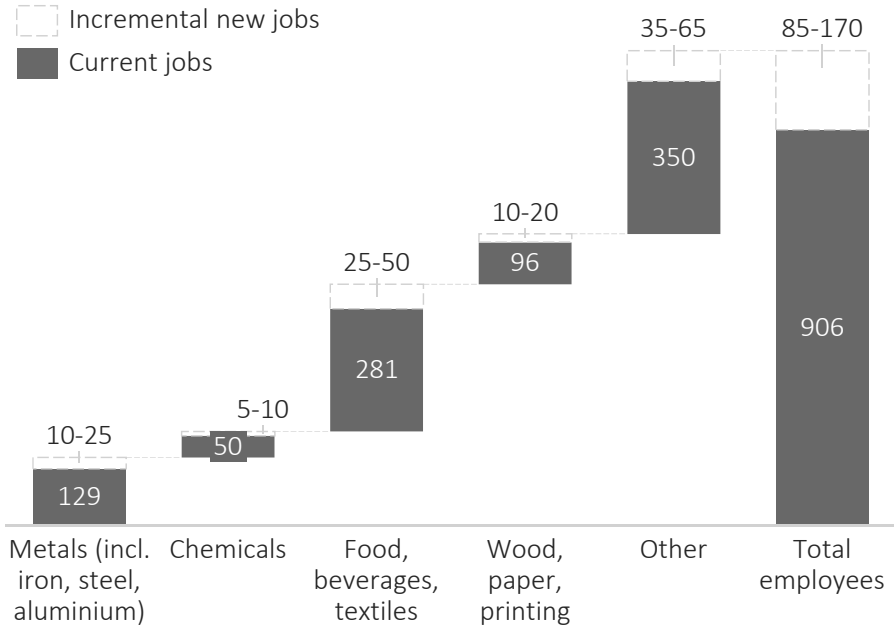
Support regional areas against impacts of lost seasonal labour and growing automation

We took both a 'top down' and 'bottom-up' view to jobs estimates

Top down: Potential for ~85-170,000 new jobs if manufacturing industry grows 10-20%¹

Bottom-up: Over 186–412,000 total direct job creation potential according to industry estimates

Number of employees by manufacturing sector, '000



1. Incremental jobs illustrative only, assumes 10-20% growth in manufacturing jobs spread evenly across all industries. Source: Department of Industry (Manufacturing Performance Report 2019), Expert interviews.



Bottom up estimates detail job growth by sector

Industry estimates show combined sector growth of 186-412,000 direct new jobs by 2030

“ *With competitive gas pricing (~\$4/GJ), additional investment in urea manufacturing is viable creating tens of thousands of jobs and requiring 40PJ of additional natural gas each year... under the status quo large east-coast domestic users will remain unable to secure competitive natural gas. This will result in the closure of [ammonia manufacturing plants] that directly employ more than 2,000 people and using ACIL Allen figures result in 30,000 jobs lost*

- CEO, Fertiliser and explosives manufacturer

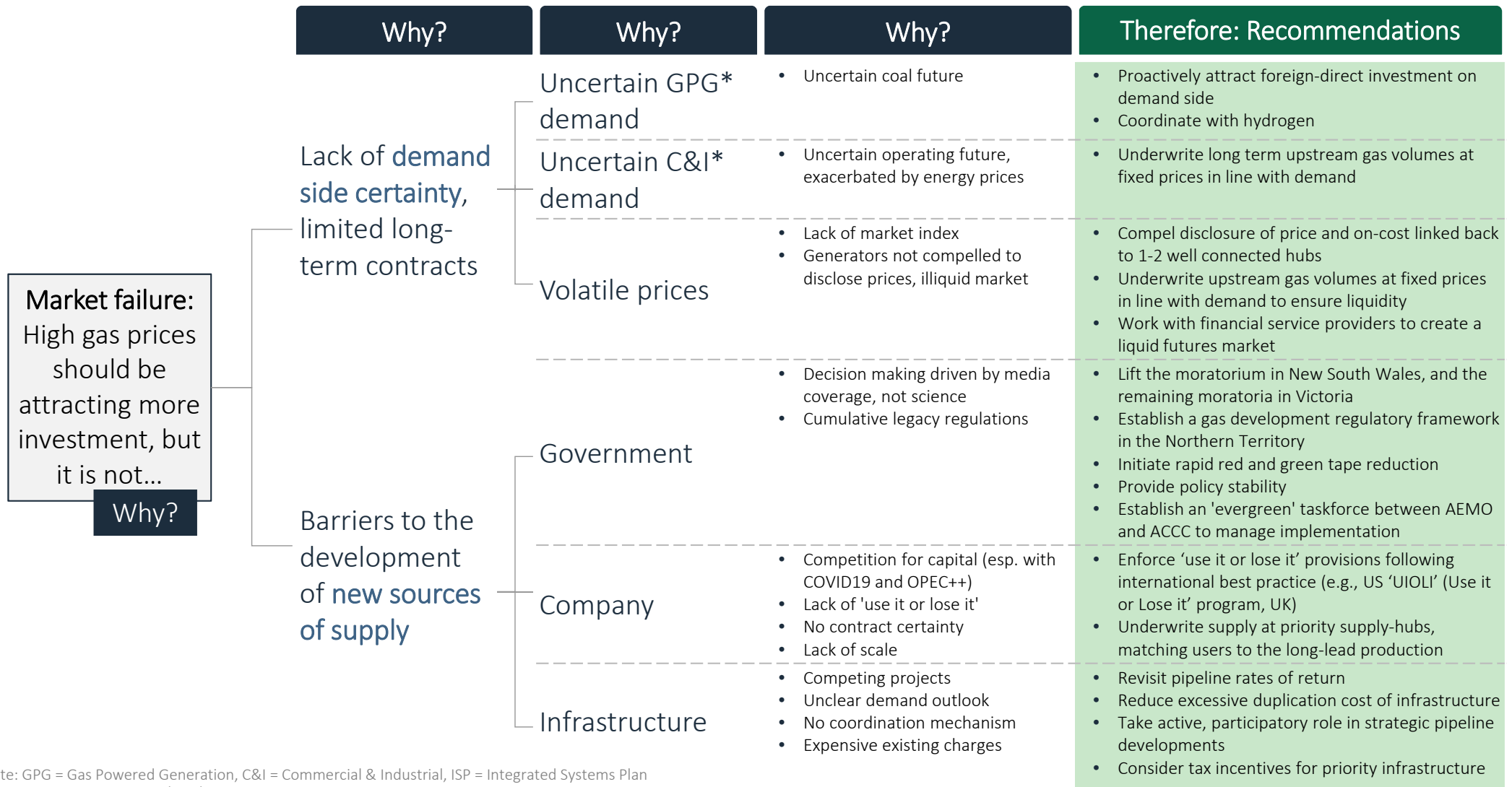
- 10-15,000 direct jobs from blue steel manufacturing, most jobs expected to be created in rural QLD and NSW due to proximity to critical infrastructure⁵
- ~100,000 direct jobs in MinTech and Rare Earths (e.g., wholesale adoption of automation technology in resources sector to create up to 80K jobs)⁹
- 15-25,000 direct jobs from petrochemicals complex (e.g., Saudi equivalent for Ethylene created 25K jobs and ~\$10B in revenues)⁶
- 22-44,000 direct jobs from urea and ammonia manufacturing⁷
- 22-147,000 direct jobs from Food & Agritech, industry estimates ~70% jobs created in regional Australia⁸
- 5-7,000 direct jobs from advanced building materials (e.g., potential 7K new apprenticeships created by Industry 4.0 adoption in construction)³
- 7-21,000 direct jobs from health (e.g., 16K jobs added since 2016 after creation of MTPConnect, Australia's MedTech and Pharma growth centre)⁴
- 2.5-25,000 direct jobs from defence (shipbuilding) and space (e.g., Joint Strike Fighter program created 2.4K jobs; 20K anticipated civil space jobs)¹
- 3-28,000 direct jobs from energy and renewables (e.g., 6K new jobs following wind and solar power boom in 2018-2019)²
- **186–412,000 total direct job creation potential** according to industry estimates (3-5X indirect jobs in associated industries, an additional 550,000-2.1M jobs)¹⁰

1. Low ABS Australian Industry 2018 (81550DO003) x10%, High Defence Industry Capability Plan, Australian Civil Space Strategy 2030 2. Low ABS as prev, High Climate Council Australia, ABS employment data 3. Low ABS as prev, High Green Building Council of Australia 4. Low and High MTPConnect 5. Based on Grattan Institute estimates of “Green Steel jobs”; Does not account for short term jobs created (e.g., in construction) or potential loss of carbon reliant workers as the economy transitions to renewables (e.g., coal miners) 6. Based on submission from Incitec Pivot Limited (analysis from Allen Chemical Industry Analysis 2019, assuming gas prices of ~\$4/GJ) 7. Aramco 8. Low ABS as prev, High Food Innovation Australia 9. METS Ignited 10. Based on US experience



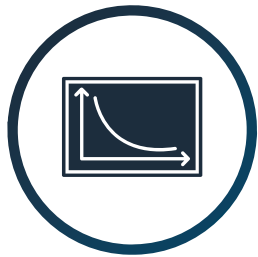
Additional reference material – gas market

Proposed recommendations will address the fundamental market failure holding us back today



*Note: GPG = Gas Powered Generation, C&I = Commercial & Industrial, ISP = Integrated Systems Plan
Source: Expert interviews and analysis

Generation investments are supported under the UNGI program through several mechanisms



Floor price

Floor set on electricity price received by project proponent, aim to ensure they recover debt from investment

Government makes payments to proponent where project's avg price drops below floor



Small grants and loans

Loans include upfront capital for projects and receive return over agreed period

Small grants largely target existing facilities (e.g., upgrades)



Contract for difference

Agreed strike price enacted after year 5 of project, aimed only at capacity that is firm or is firmed

Government pays proponent difference where spot price < strike price, proponent pays government difference where spot price > strike price



Cap and floor (collar) contracts

Agreed cap and floor prices enacted after year three of project

Government pays proponent difference where spot price < floor, proponent pays government difference where cap < spot price



Underwriting cap contracts

Aim is to reduce financial risks for generators offering cap contracts, usually sold by peaking generators

Australia is one of the few jurisdictions that does not enforce 'use it or lose it' provisions

Illustrative examples from other major gas regions



Federal and private leases have specific time limits to ensure production

Use it or lose it (UIOLI) Act (2011): Federal lease holders must ensure timely production from the field in 5 yrs – or pay \$4/acre annually after if no production occurring

Land privately held such as Permian primary term of lease can be 3-5yrs –

- Mature areas operator often required to produce well in time, or pay "shut-in" royalties to hold the lease
- Exploratory areas operator often subject to continuous drilling clauses



The 5-year rule under UIOLI led to **significant write-downs of oil and gas assets impossible to profitably extract** under current prices after 2014 oil downturn



Canada has government auctions to ensure effective use of developments

- Provincial governments own a vast majority of mineral rights for oil & gas developments and auction to highest bidders with set time limits (3-10yrs)
- Within time period, operator must take action to prove that they are "sufficiently" moving forward with drilling – or risk losing the lease
- Action could include surveying, applying for permits, exploratory drilling, etc



Regulator has significant discretion to determine what is "sufficient" and **standard may differ depending on attractiveness of acreage**, as province goal is to earn royalties from production



The UK Fallow Block initiative is a policy launched in 2003

- Encourages activity in 'fallow' fields on the UK Continental Shelf
- The act asks lease holders to ensure timely production from the field



Fallow **discoveries are given two years to be developed**. If no acceptable activity is agreed, the block is relinquished and offered for re-licensing in the next open acreage round

Other jurisdictions show how fiscal changes can be managed to stimulate upstream activity



UK stimulates investment by keeping headline tax rate flat and adding options for late-life deals

In the 2019 budget, the UK government made several decisions:

- Keep headline oil and gas tax rates flat – favouring legislative stability over short term windfalls from price volatility
- Support operators in their asset divestment through:
 - Transferrable Tax History (TTH): help buyer realise the full value of decommissioning tax relief
 - Petroleum Revenue Tax (PRT) refunds: enabling buyers and sellers access to PRTs when making deals (e.g., Majors that are looking to divest large proportion of mature fields)



- Expands the range of options available to companies to address the issue of large decommissioning costs when making deals
- **Provides certainty and potential offsets** of the large costs associated with decommissioning



Norway stimulated exploration by new entrants by providing them accelerated tax relief

Introduced exploration cost refund to level playing field for new explorers – up to 78% of E&A costs refunded

Previously, new explorers required to pay full cost of exploration and can only recover it from future income – unequal playing field with existing producers who could consolidate their upstream activities for tax purposes (i.e., deducting E&A costs and depreciation associated with new projects)



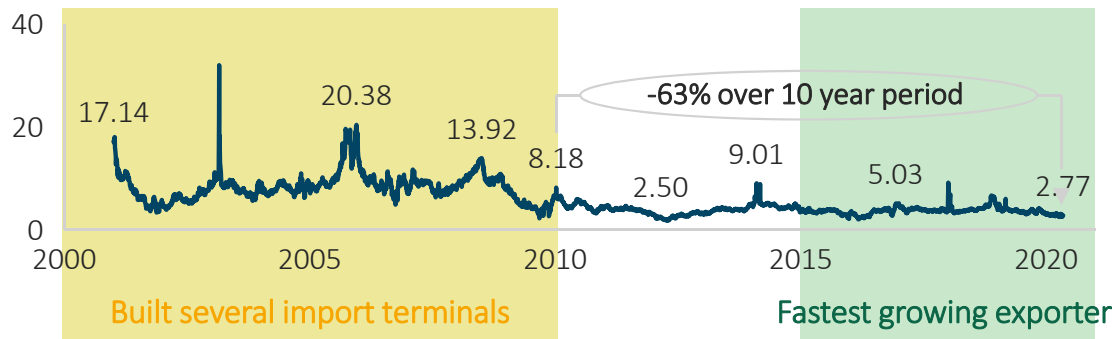
Equalised net cost of exploration resulting in:

- Number of **companies holding licenses has more than doubled from 25 to 55** (driven mainly by small and medium-sized companies)
- Exploration activity between 2005 and 2017 yielded more than **10 billion new barrels across 204 new fields, adding \$310M to Norway's upstream sector**

US shale gas market: In-basin scale helped lower costs by rapidly accelerating experience curve

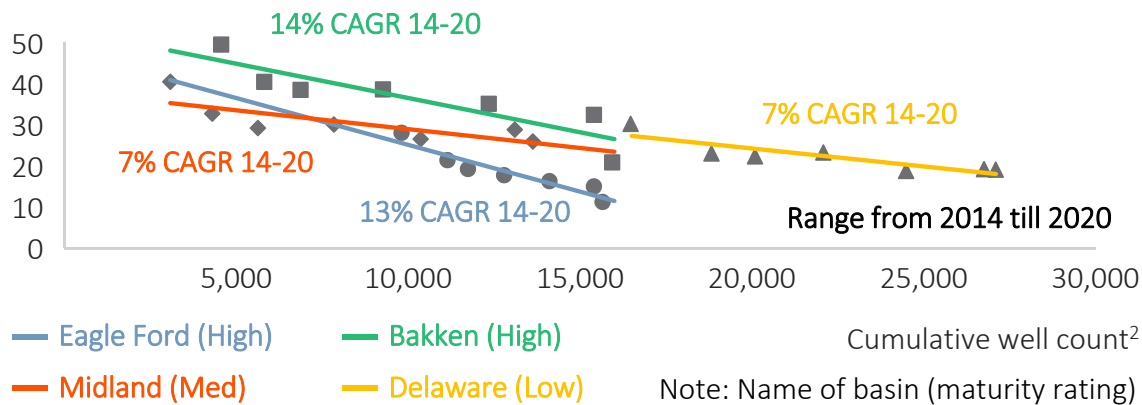
Henry Hub pricing dropped significantly due to US shale growth

Henry Hub natural gas spot price (\$AUD/MMBtu)



Operational learning curve yield more benefit as basins mature

Median drilling days/well¹



Conversely Australia currently lacks scale and strong OFS providers

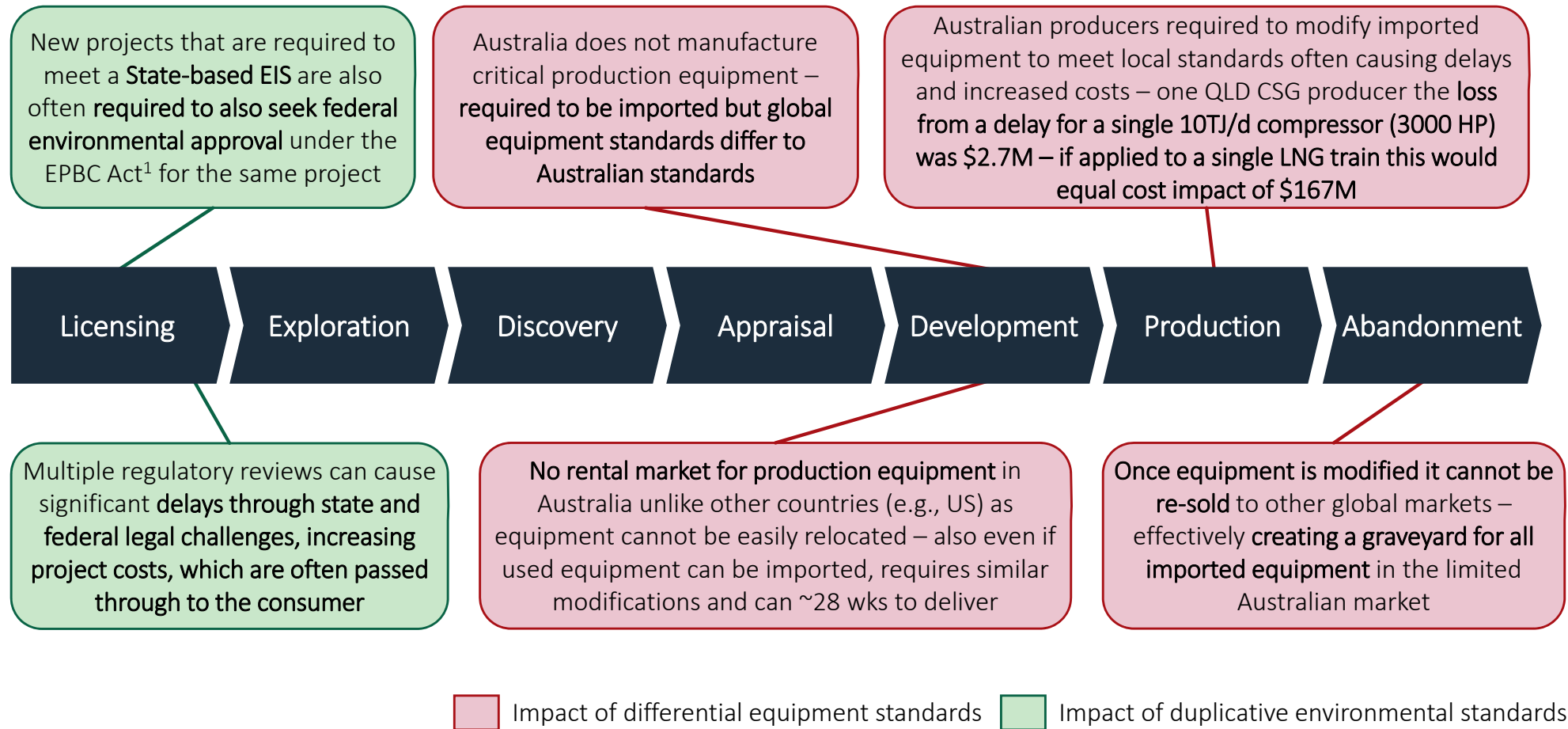


Active onshore rigs	523	26
YTD 2020 production (Tfce)	37	1.44
Total OFS companies ³	~5,000	480

1. Normalized to 20,000' well 2. Horizontal wells only 3. Cumulative wells drilled from 2010 onwards. 3. Includes all "O&G drilling", "O&G equipment and services" and O&G exploration services" companies on Capital IQ. Source: Capital IQ, Baker Hughes (Australian active rigs data as at 30 March 2020), Bloomberg, Expert analysis

Onerous red and green tape impacts all steps of the gas production value chain

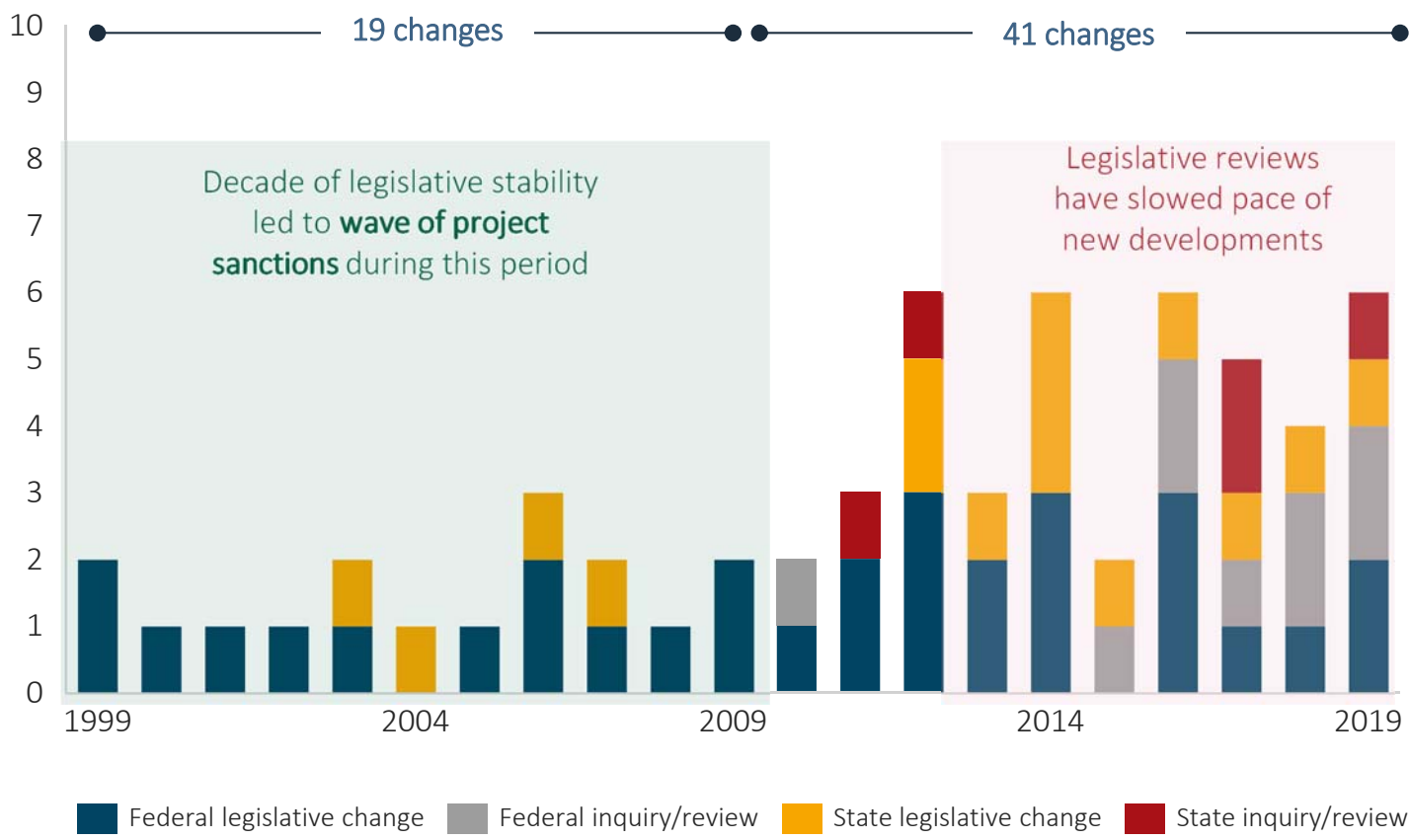
Key impacts of onerous equipment and environmental standards



1. Environment Protection and Biodiversity Conservation Act (EPBC). Source: Worley, Expert interviews

In recent years, legislative environment has added to overall investment uncertainty

Number of Australian state and federal legislative changes, inquiries and reviews into LNG exploration and development, 1999-2019



Lack of legislative stability along with emergence of new gas investment destinations such as North America and East Africa, means Australia's global competitiveness has decreased in the past decade

Reducing the volume of fiscal and regulatory change is key to Australia attracting upstream investment

There is precedent for achieving capital efficiency in the Australian context

Worley indicate need to base delivery of new pipeline infrastructure on following principles

Create a “must achieve the objective” culture by

- Setting an **ambitious fixed objective**
- Tapping into the **capability and expertise** of proven partners and organisations
- **Contracting for performance first**, risk mitigation second
- Focusing on the impact this project can have on Australia to **inspire every worker and participant**
- Ensuring **safety**
- Instituting a **flat and highly accountable** project structure
- **Reacting quickly** when things go wrong



Fortescue's 2014 FMG 155mtpa project shows how these principles can be used to deliver critical infrastructure

1 **Ambitious stretch targets**

“ The FMG 155mtpa story is a 2018 story at the earliest I just cannot see how they can get to a 155mtpa rate by 2014 or even 2015. I hope they do, but Rio / BHP reckon there is no way they can get up to that rate that quickly
 - Analyst quote, 11 May 2011

2 **Whole company focused on targets**

- T155 prioritised as most important activity
- Ops, procurement and logistics integrated

3 **Unique supplier engagement**

- Asked them “How would they do it and what would they recommend”

4 **Finding solutions to meet budget, timing**



E.g., Fourth berth surge bin built because fifth berth not approved

5 **Facilitating contractor success**



Engaged 2nd tier specialist contractors

6 **All in family approach**



Consistent and unified comms and clearly defined milestones across all levels

To successfully bring costs down, we must also address capex and labour productivity

Despite 6.4% increase in labour inputs in energy in past year labour productivity reduced -4.5%¹, MFP down -1.7%

Annual change in key productivity statistics, 2017-18

	Labour Inputs	Capital inputs	Labour productivity	Multi-factor productivity
Electricity, gas, water and waste	+6.4	+2.4	-4.5	-1.7
Mining	+3.2	+1.6	-0.4	+0.9
Construction	+7.4	+2.0	-2.4	-0.8
Mfg	-0.7	-0.8	+3.7	+3.7

The next wave of capex and opex efficiency will have a strong component of workforce productivity, including the adoption of digital and new ways of working

New capital development requires certainty of investment to be supported

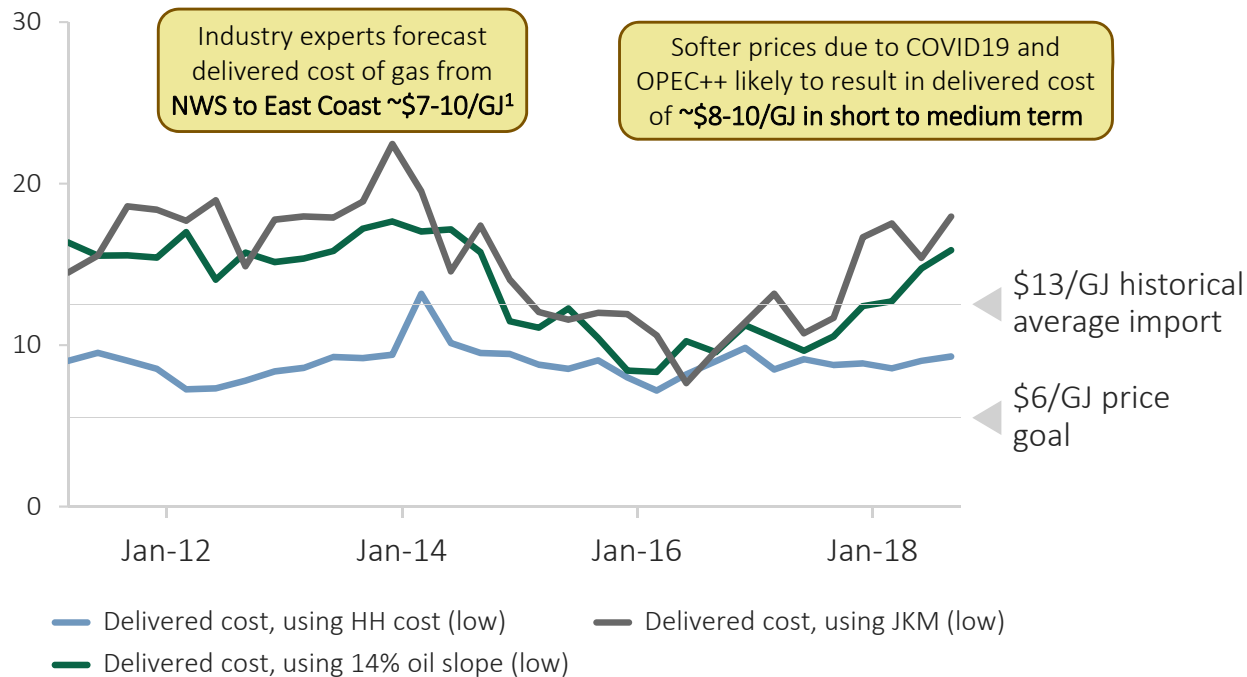
Therefore, improved labour and capex productivity key to ensuring future of gas and energy developments

1. Labour productivity growth is the growth in output less the growth in labour inputs; labour inputs refers to the number of hours worked per industry; multi-factor productivity compares amount of output from sector vs. total amount of inputs needed. Source: Productivity Commission (PC Productivity Bulletin, May 2019), Expert interviews

Import terminals may actually be counter productive to creating viable gas market

Delivered cost of gas from import terminal frequently higher than \$10/GJ AUD based on historical estimated landed-cost

Estimated delivered gas cost from global markets to East Coast² (\$AUD/GJ)



May be counter productive because...

- 1 The actual price linkage is to JKM, not HH – which has historically been higher and more volatile
- 2 The delivered cost prices that underpin the contracts on offer today are at \$8-10/GJ, which manufacturing players have rejected out of hand
- 3 Does not promote the long term goal of creating a competitive price environment in the East Coast – i.e., importing higher cost higher cost molecules would crowd out investment in indigenous supply

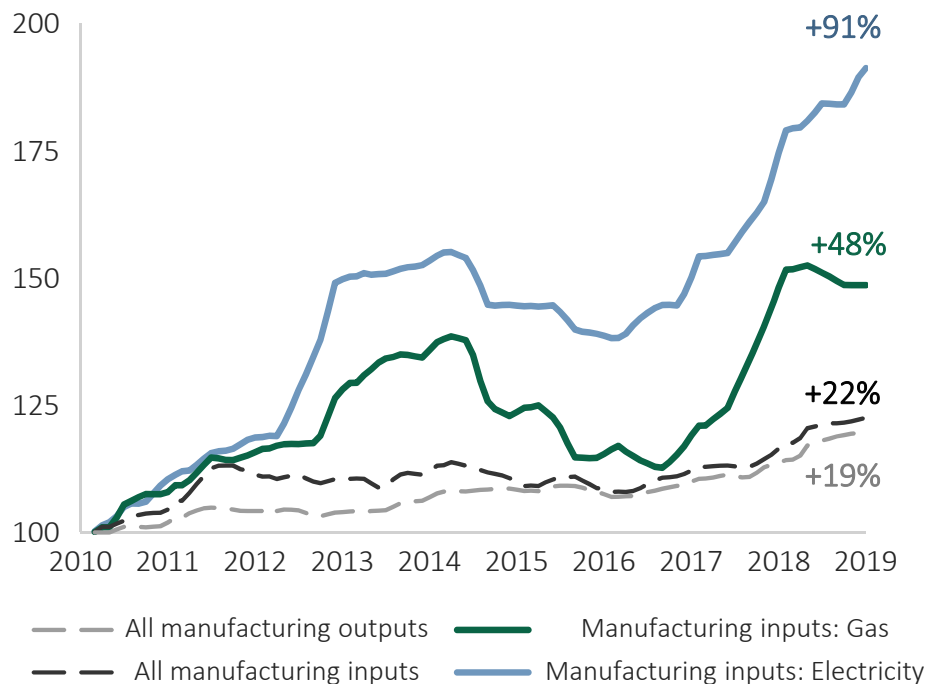
Note: Delivered costs does not account for transportation costs from LNG import terminal to demand centre. 1. Assumes LNG price of \$4-5.50/GJ, shipping costs of \$1-1.50/GJ, regasification costs of \$1.30-1.50/GJ, per expert interviews. 2. Global delivered cost estimates calculated using cost plus method; HH assume 15% tariff to transport to West Coast USA, \$2-4/GJ shipping to Aus, \$1.5-2.50/GJ liquefaction, \$1.30-1.50/GJ regas; Oil slope estimate assumes \$1.30-1.50 regas; JKM estimate \$1.1-2.3 shipping, \$1.30-1.50 regas. Source: Bloomberg, AEMO, Bloomberg, Expert interviews and analysis

Note: Used low end of range in all estimates; does not take into account potential challenges in transporting any Australian-sourced cargoes between two Australian ports due to maritime legislation

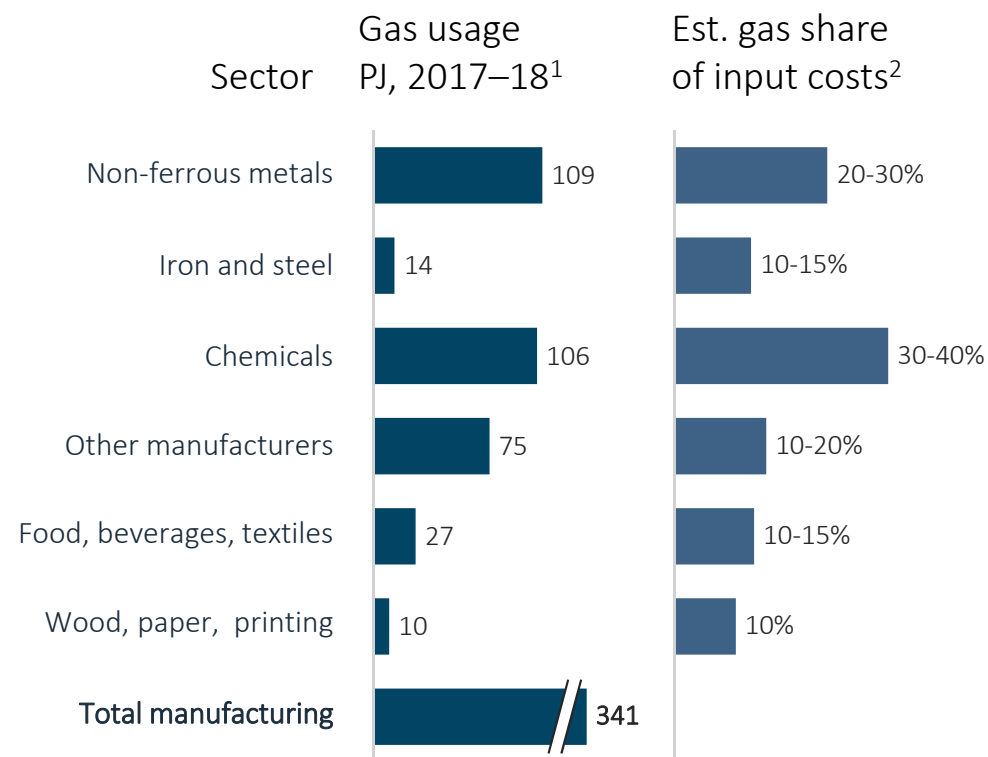
Manufacturing sector was already under threat due to rising costs of gas and power

Rising gas and electricity prices are the main drivers for increases in manufacturing costs

Manufacturing gas and electricity price indexes, cumulative change (Indexed to Mar 2010 = 100), 2010-19



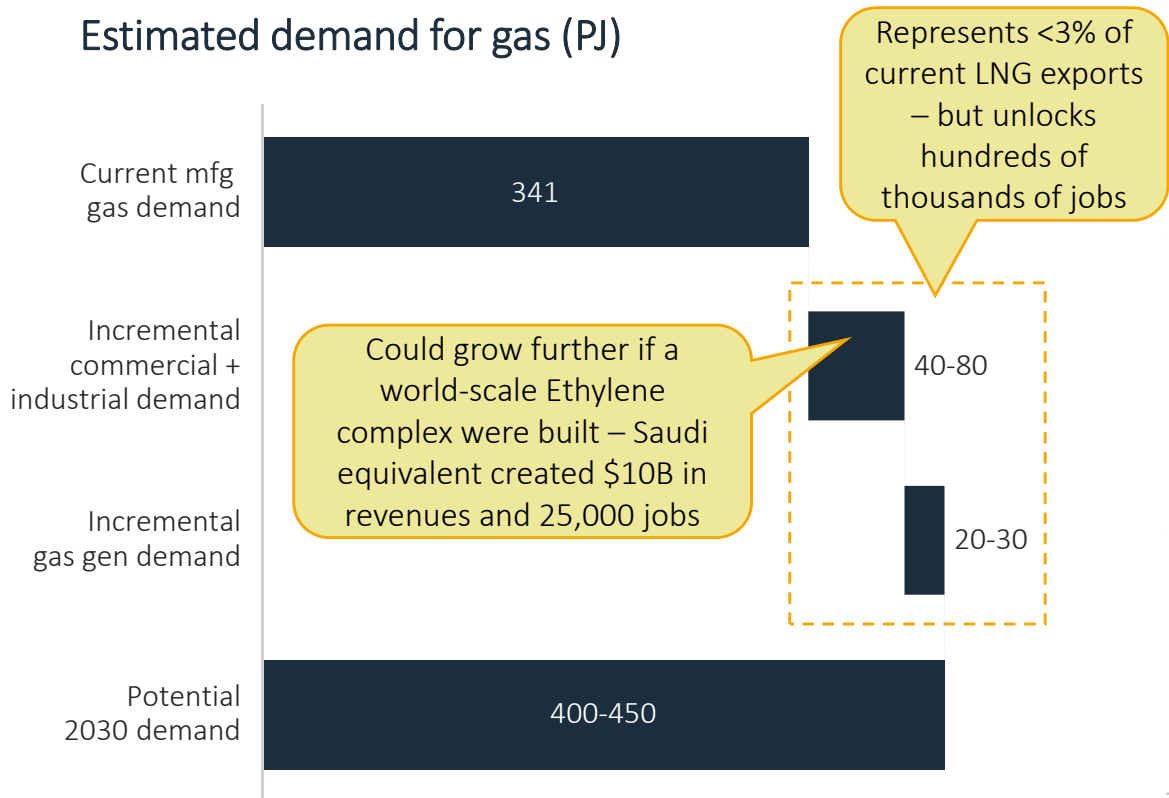
Manufacturers exposure to changing gas prices varies by sector



1. Sector gas usages number estimated using ABS total manufacturing estimate split by sector using APPEA 2016 Australian Energy Statistics. 2. Ranges indicative only, based on interviews with industry experts and global benchmarks. Source: ABS (Energy Use and Electricity Generation Statistics packet, 2017-18), AEMO, ACCC gas inquiry (July 2019 and Jan 2020 Interim Reports) AI Group, ABS (Producer Price Index, Mar 2019), Expert interviews and analysis.

Incremental supply required represents less than 3% of exports, but unlocks significant jobs

Estimated demand for gas (PJ)



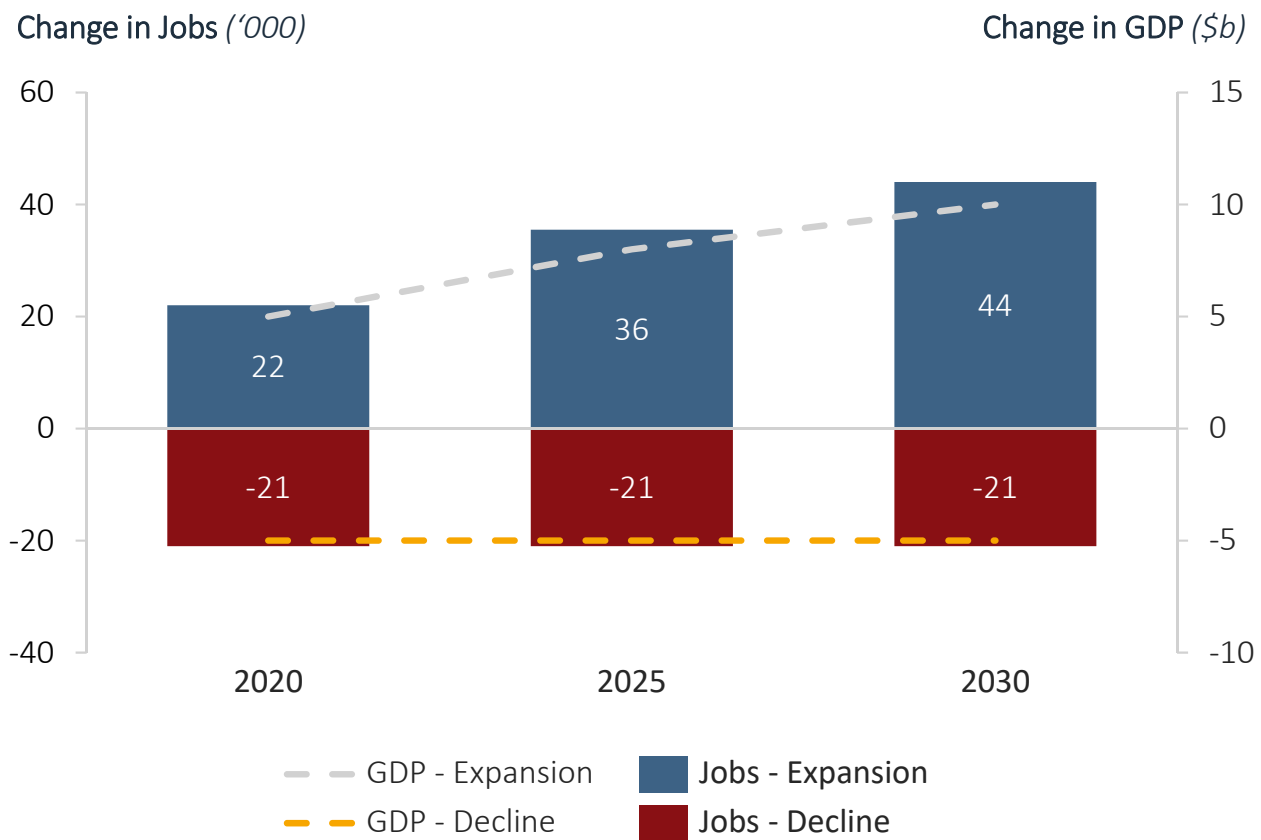
Key assumptions

- Current demand holds – estimate based on 2017-18 ABS numbers from the Energy Use and Electricity Generation Statistics packet
- No major demand destruction (e.g., industrial facility closures)
- Assume 10-20% demand growth due to lower prices due to increased investment in existing operations and growth across all sectors
- Examples of potential investments from interviews:
 - New urea, ammonia and methanol production to serve local and export markets like at ~\$4/GJ gas price
 - Investing in a new aluminum potline
 - Shifting locally produced vs. imported cement ratio from 60/40 (current) to 75/25: 2M tons more cement produced
- Total potential demand 0-180PJ based on Liddell & Yallourn replacement
 - OCGT ~10GJ/MWh = 10PJ/TWh
 - Liddell = 8TWh. Max 80PJ
 - Yallourn = 10TWh Max 100PJ
- Assume 10-15% from gas required to firm renewables. With Snowy 2, additional interconnection and new renewables, the upper bound of 180 PJs is going to be hard to hit

The estimates above on Commercial & Industrial have been built top-down, and then validated bottom up via input from industry – strong indications that they may be very conservative estimates

Chemicals sector alone could deliver 44,000 new jobs, ~\$10B GDP uplift with \$4/GJ gas prices

Forecasted impact of gas price scenarios on jobs/GDP for gas feedstock chemicals sector (e.g., fertilizer, explosives)



Gas-based chemical manufacturing provides significant GDP uplift (\$127M per PJ of gas) and employment (527 people per PJ)

The 2030 broader growth and expansion scenario (assuming ~\$4/GJ gas price) would create 44,000 jobs domestically and ~\$10B GDP

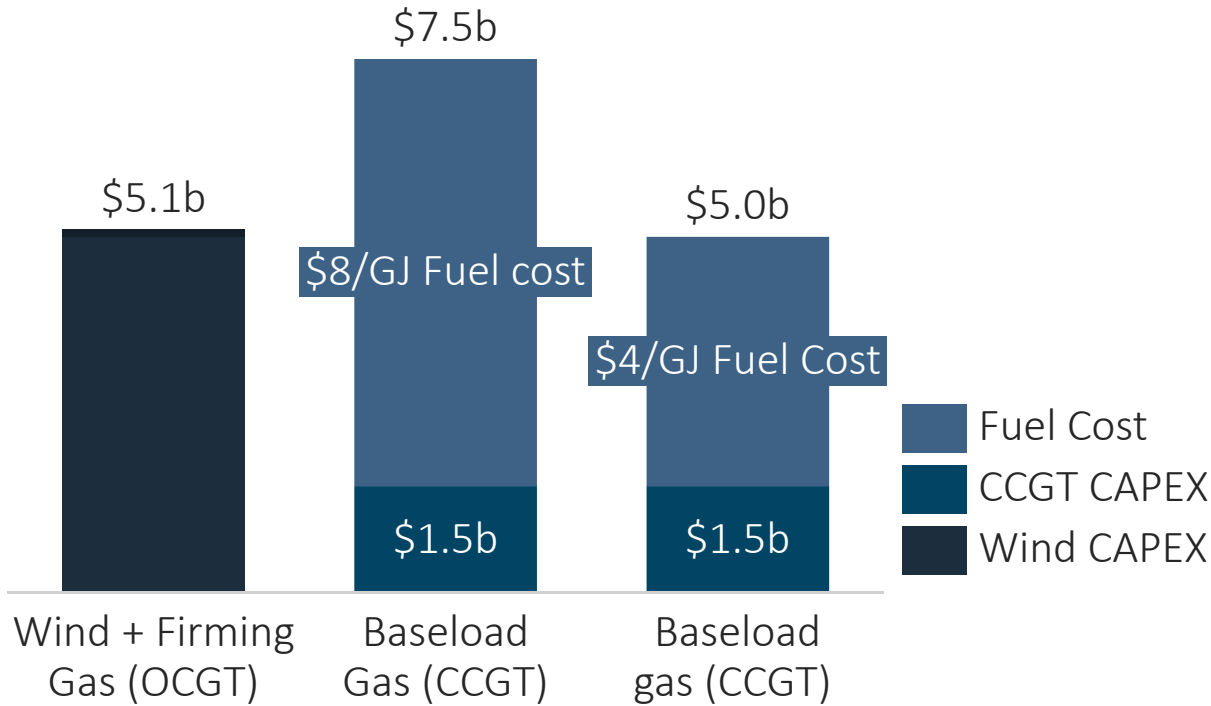
A decline in manufacturing (assuming current gas prices) capacity will likely result in a loss of 21,000 jobs and declines in GDP of ~\$5b

In a preserve scenario (assuming ~\$4-6/GJ gas prices), no significant shifts to GDP or jobs would eventuate

New base gas generators will not be built unless long term gas prices fall to ~\$4/GJ

Current gas prices are not going to incentivise new baseload generation to replace 1GW of coal capacity¹

CCGT is also facing other political and economic challenges



Long term GSAs are difficult to procure and increase the risk profile of CCGT investment



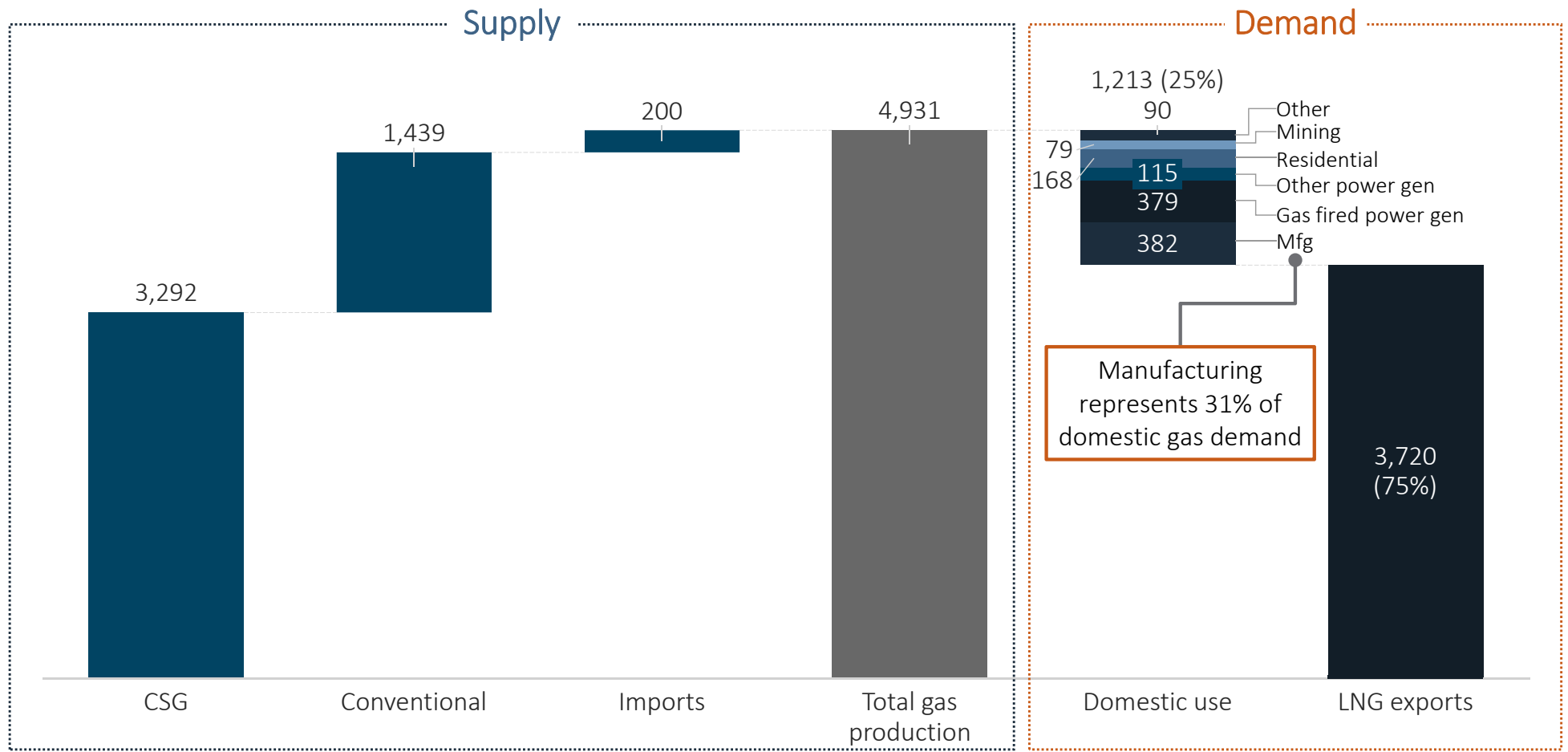
State governments further subsidize renewable capacity (VRET & QRET)



CCGT units do not need to procure large volumes of gas to provide firming

¹ Coal replacement assumes 80% capacity factor or ~7TWh of energy
 Note: Wind assumed to be 2.5GW at a ~32% capacity factor with 100MW OCGT firming. OCGT capex assumption of ~\$100M. CCGT capex based on 1GW plant running at 80% capacity factor.
 Source: AEMO, Expert analysis

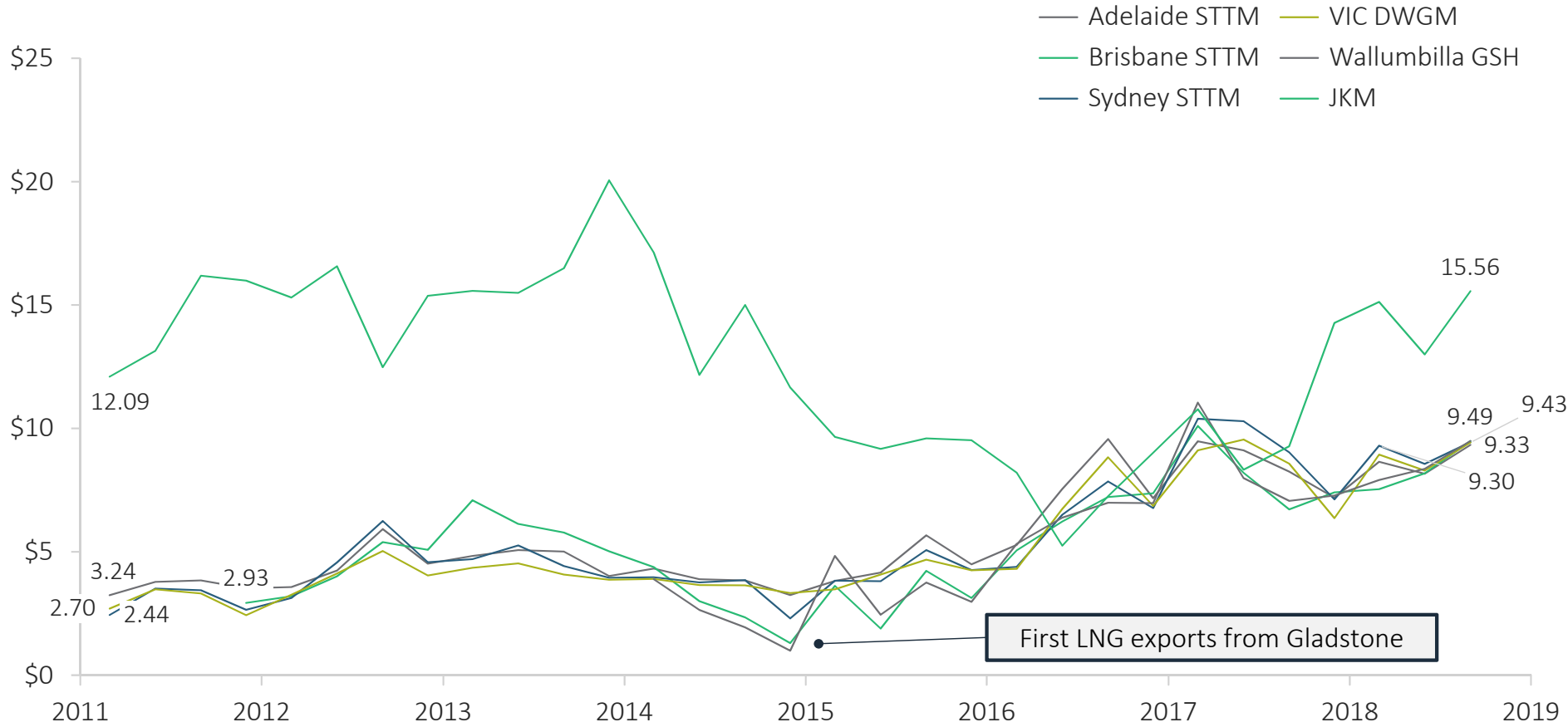
Majority of Australian gas goes to export



Source: Australian Energy Update 2019 (Sep 2019, Australian Government)

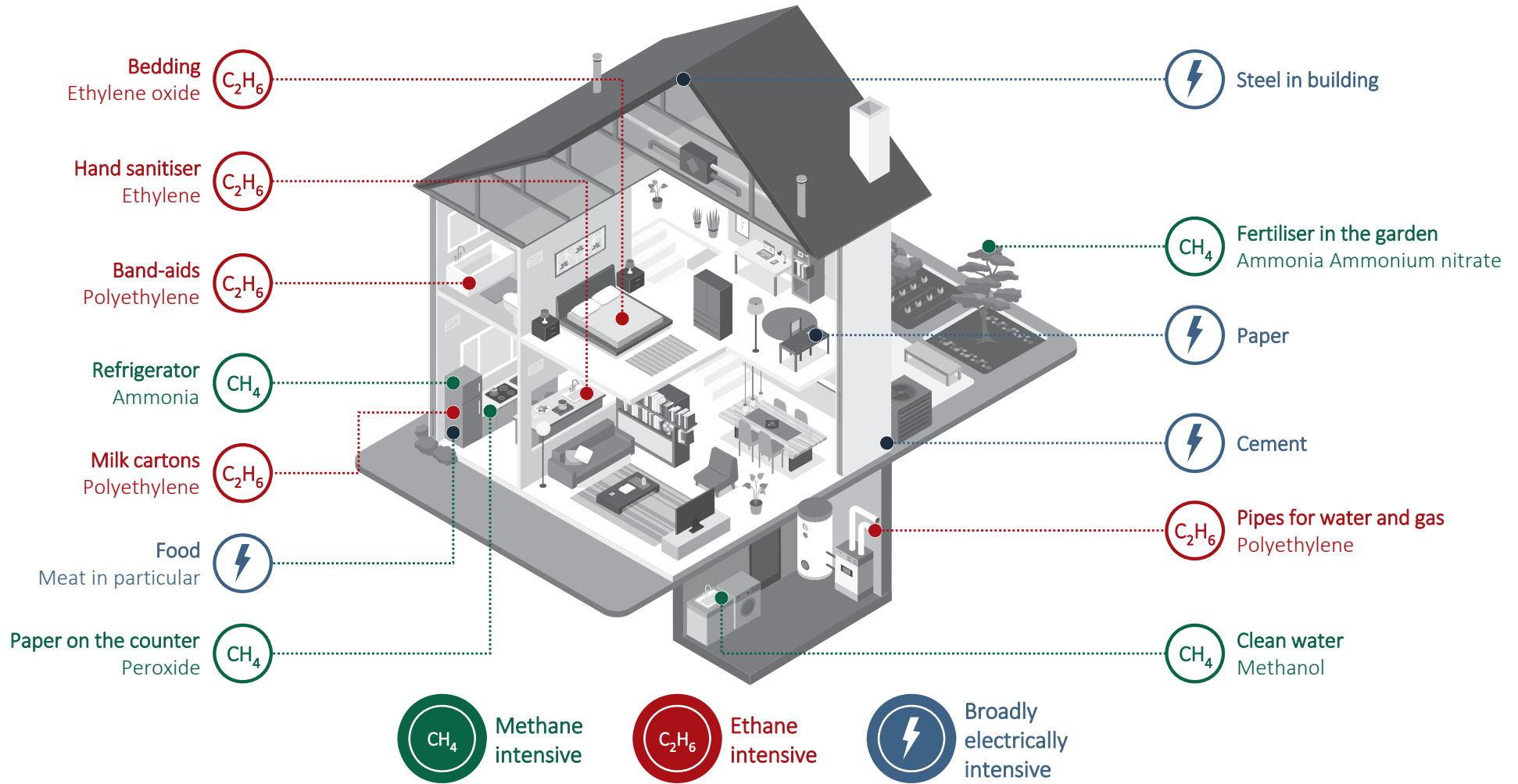
LNG export markets have linked East Coast gas to global prices, tripling prices in since 2014

Gas price AUD/GJ



Source: AEMO, ACCC gas inquiry (July 2019 and Jan 2020 Interim Reports) AI Group, ABS (Producer Price Index, Mar 2019)

Gas feedstock is critical to chemical mfg and the creation of many everyday items

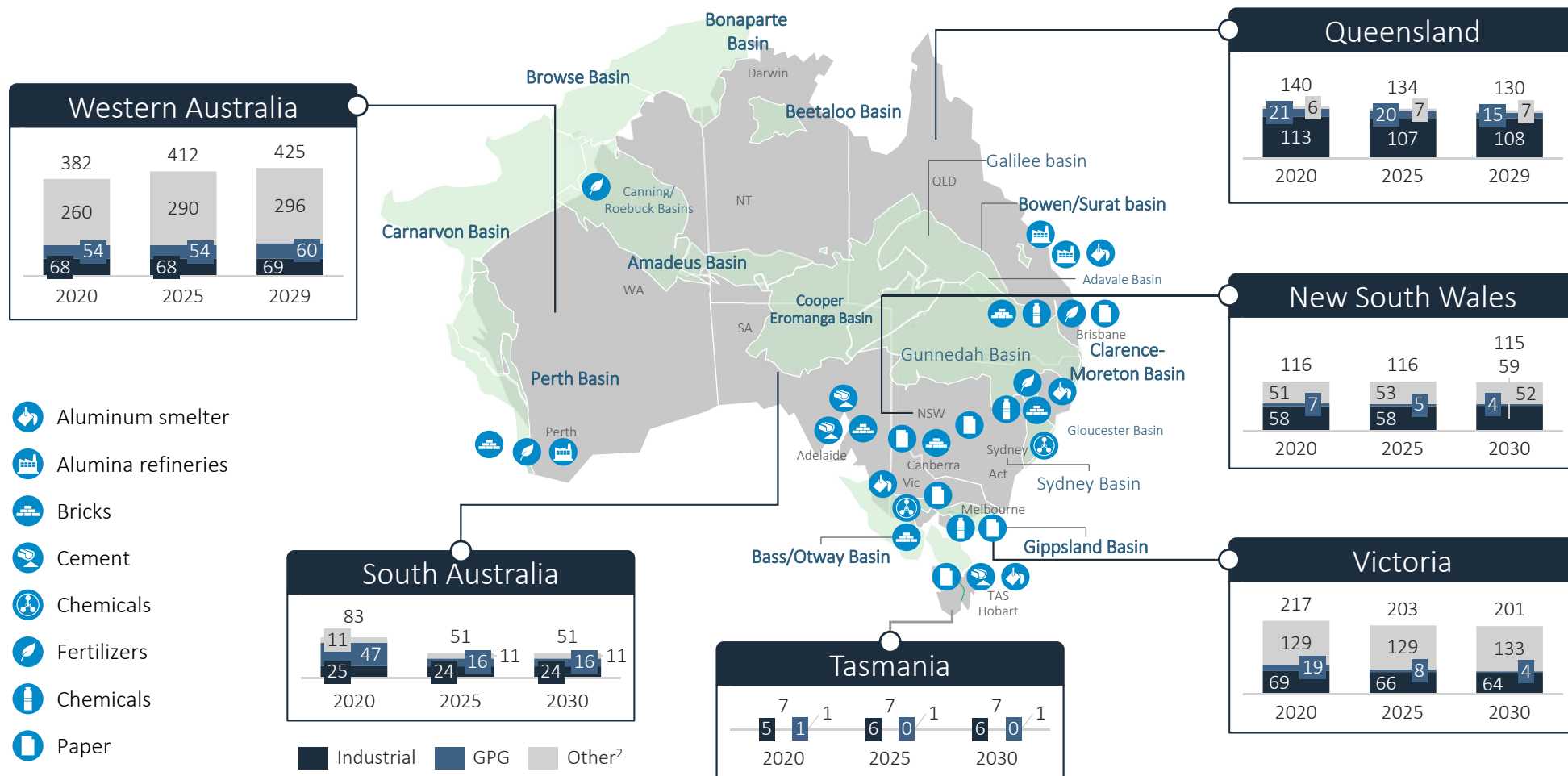


Source: United States Studies Centre, "It does not have to be this way: Australia's energy crisis, America's surplus" (12 December 2018)



Current demand largely concentrated in East

Current forecasted domestic gas demand (PJ) and map of mfg clusters heavily reliant on gas¹

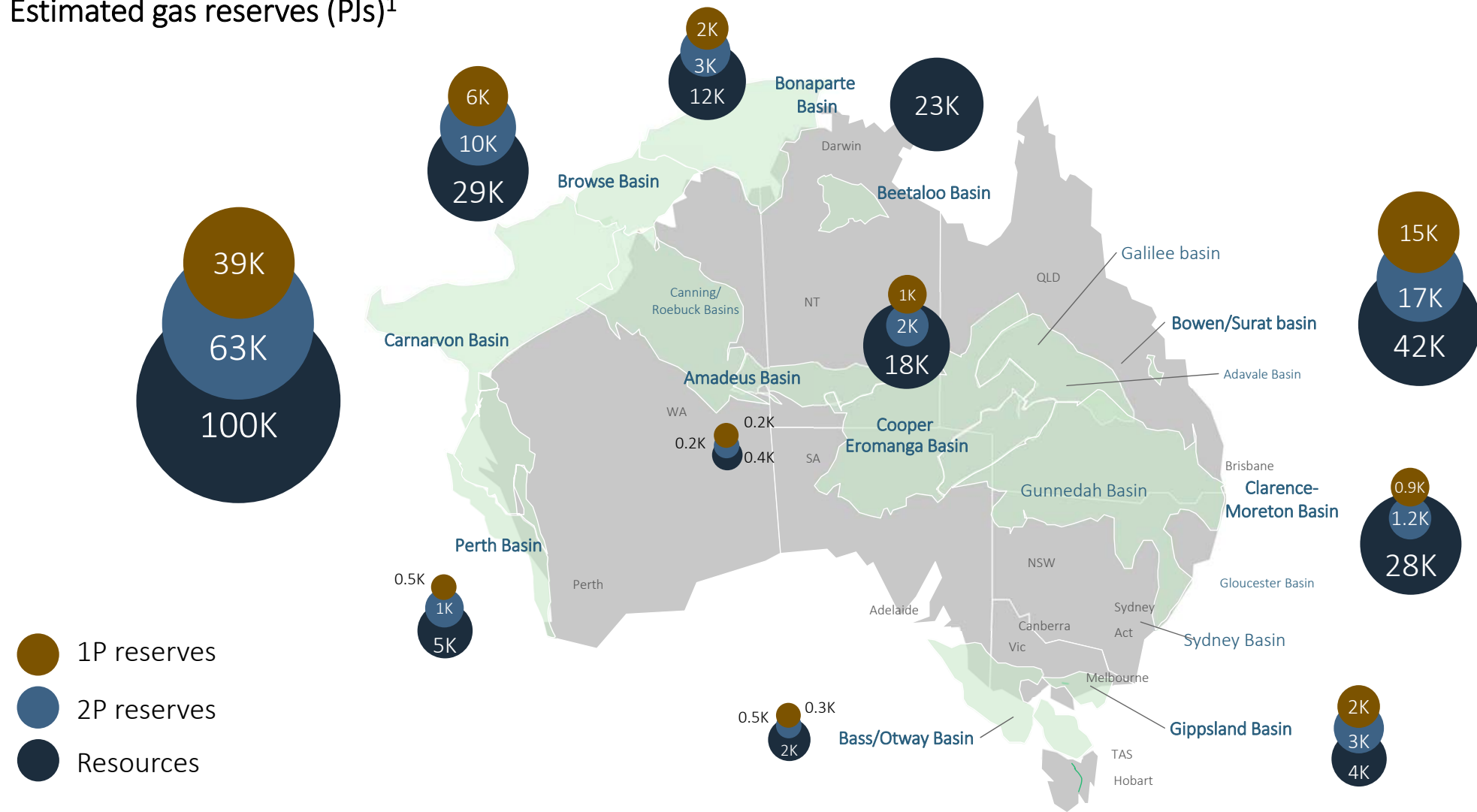


Note: Forecast includes current AEMO demand forecasts, does not account for potential demand creation due to lower gas prices. 1. Mfg clusters based on APPEA report in December 2016. 2. East coast other includes residential and commercial, Western Australia other includes mining, mineral processing and distribution. Source: AEMO GSOO 2020, AEMO WA GSOO 2019, APPEA



Current view of reserves and resources

Estimated gas reserves (PJs)¹



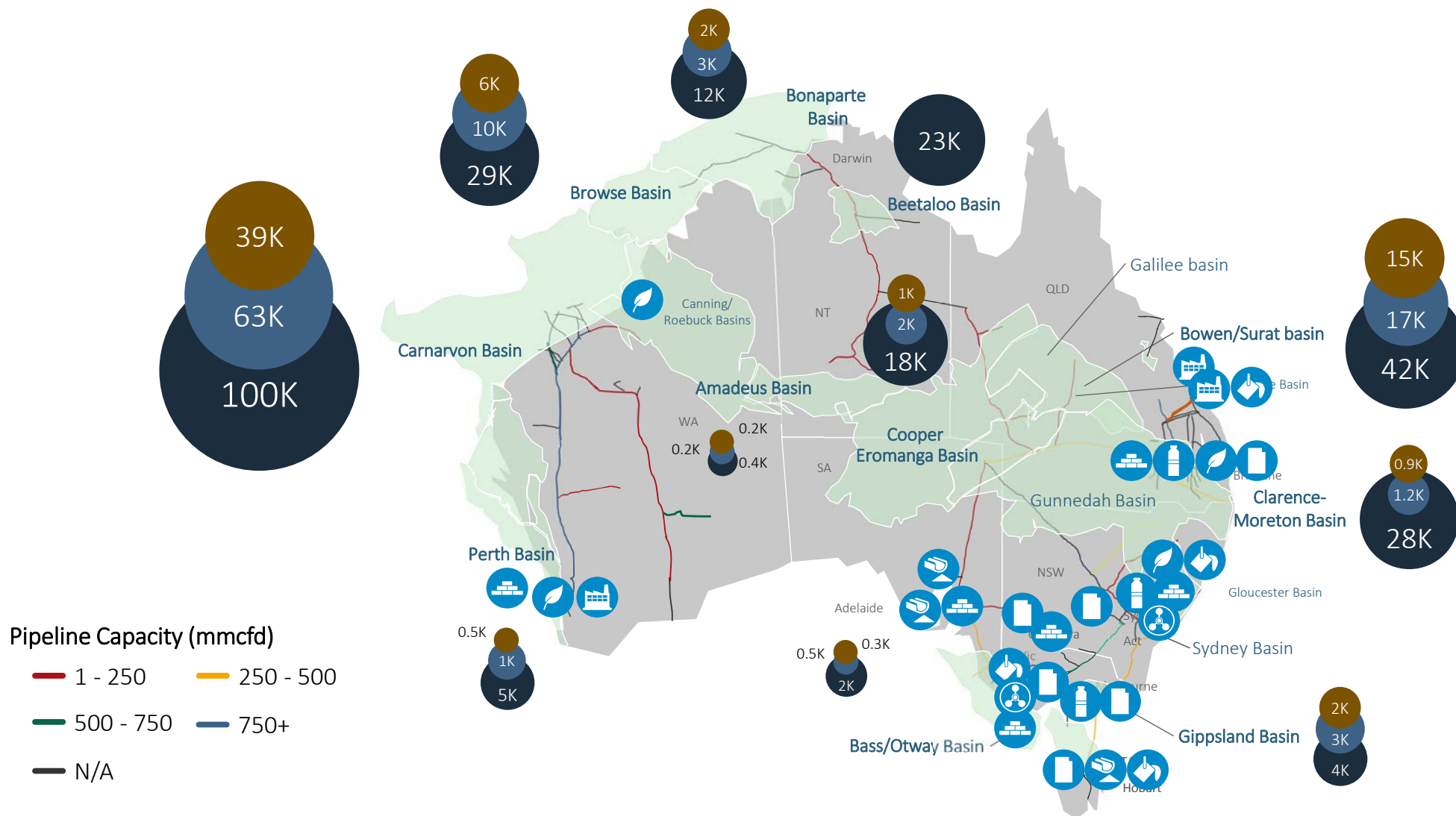
Note: Major basins only. 1. Supply estimates from Rystad Energy as at 1 Jan 2020, only includes gas not condensate or NGL; rounded to nearest 1000
Source: Rystad energy, Expert analysis





Current pipeline proximity to supply and demand

Estimated gas reserves (PJs)¹ and mfg clusters heavily reliant on gas²

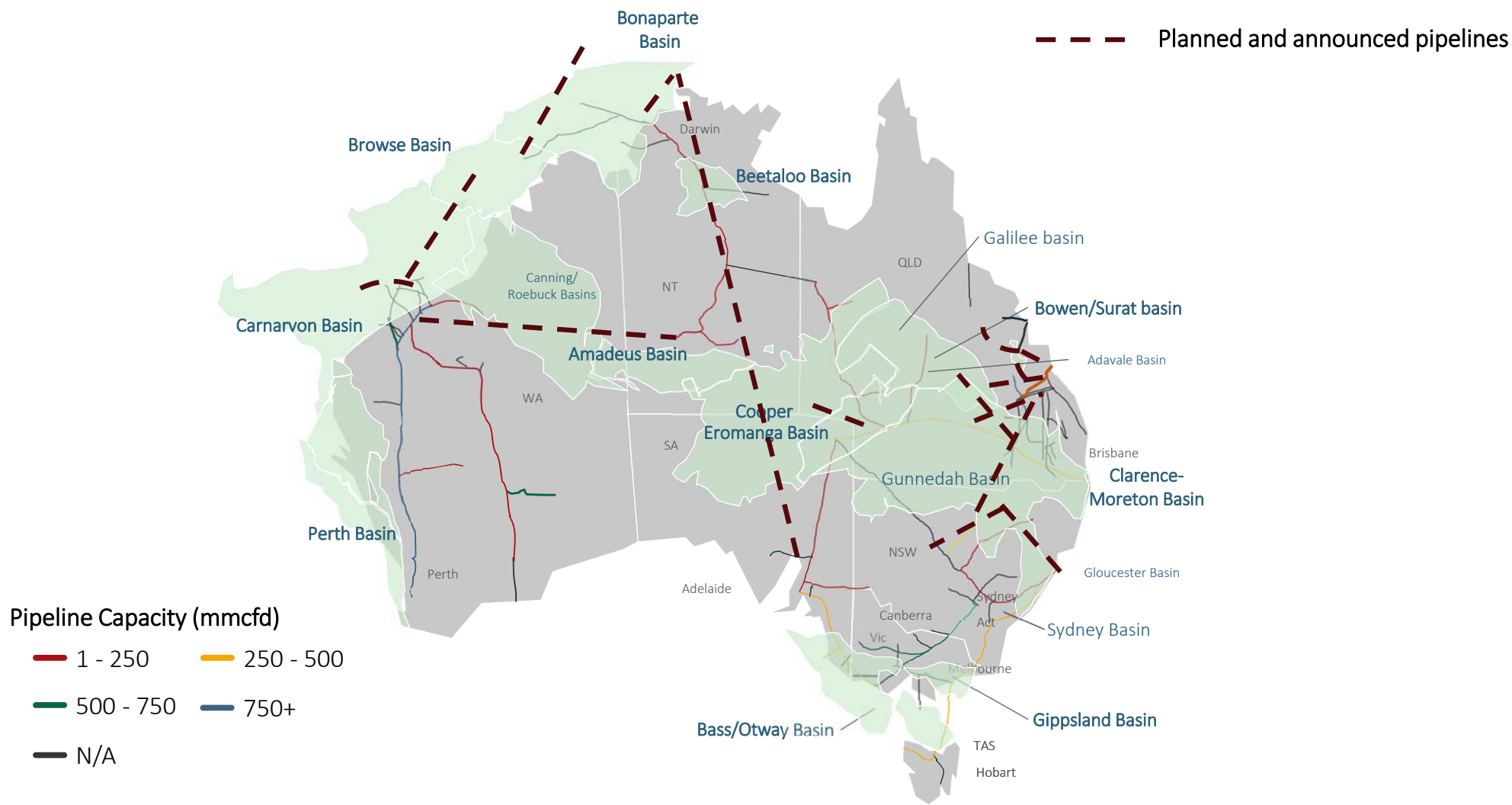


Note: Major basins only. 1. Supply estimates from Rystad Energy as at 1 Jan 2020, only includes gas not condensate or NGL; rounded to nearest 1000. 2. Mfg clusters based on APPEA report in December 2016. Source: APPEA, AEMC Gas Pipeline Register, GlobalData, Rystad energy, Expert analysis





Potential solution pathway for national pipeline infrastructure connecting supply and demand



Source: AEMC Gas Pipeline Register, GlobalData (as at 16 October 2019)





Overview of candidates for proposed market hub



1 Wallumbilla gas supply hub



2 Moomba gas supply hub

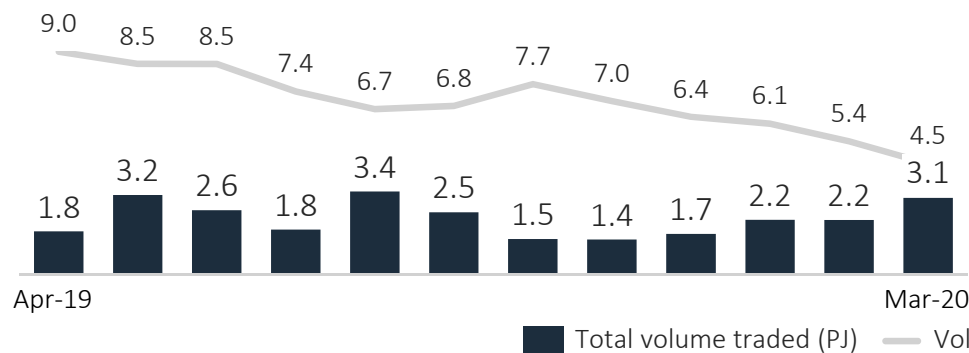
Gas transmission pipelines

- Roma–Brisbane*
- South West Qld (WAL to Ballera)*
- Queensland (WAL to Rockhampton)*
- Wallumbilla–Comet Ridge (WAL to Narrabri, loop to Fairview)
- Reedy Creek Wallumbilla (WAL to Reedy Creek)
- Berwyndale–Wallumbilla (Berwyndale to WAL)
- Silver Springs (Silver springs to WAL)
- Kincora–Wallumbilla (Kincora to WAL)

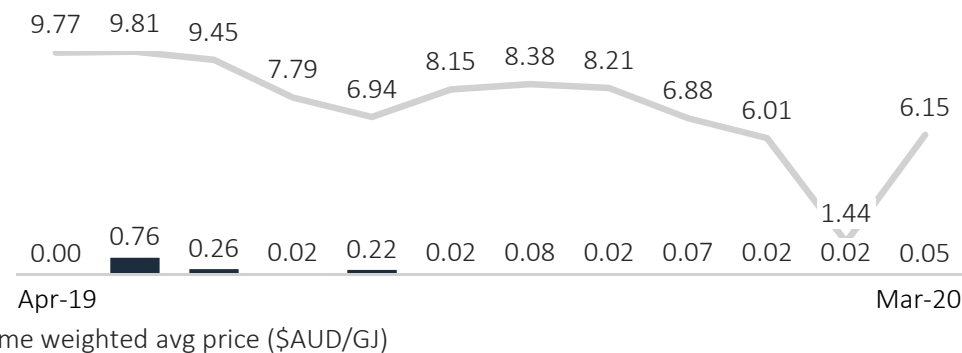
Gas transmission pipelines

- Moomba–Adelaide (Moomba South to Adelaide)*
- Moomba–Sydney (Coopers Creek to Wilton)*
- South West QLD–QSN3 Expansion (Ballera to Moomba)

Traded volume and average price



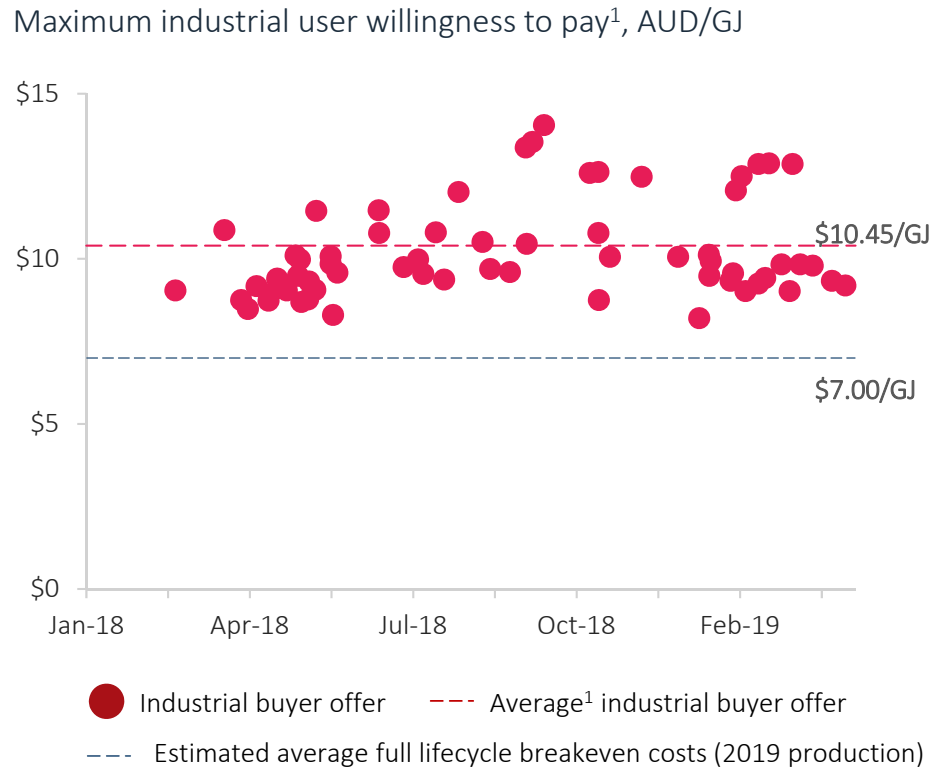
Traded volume and average price



* Significant gas pipelines that allow trades through AEMO. Source: ACCC, AEMO, GlobalData (Pipeline data as at 16 October 2019)

Current East Coast pricing is not transparent, and attempts at creating a Hub have struggled

East Coast industrial buyer offers are above the marginal cost of supply today



Attempt at Hub creation at Wallumbilla lacked teeth & volumes to be effective to-date

Timeline of key events

- **Mar 2014:** AEMO implemented a gas supply hub (GSH) in Wallumbilla - participants trade standardised, short-term physical gas products at 3 pipelines connecting at the hub
- **June 2016:** Trading location in Moomba established for participants in Southern states
- **Q1 2020:**
 - 8 PJs traded through GSHs (~2% of total east coast demand of 429 PJ)
 - Prices roughly consistent with bilateral supply contract but not yet converged
- Pre-conditions to create an effective gas supply hub (e.g., strong infrastructure connections, high liquidity, market making) not yet met, impacting effectiveness

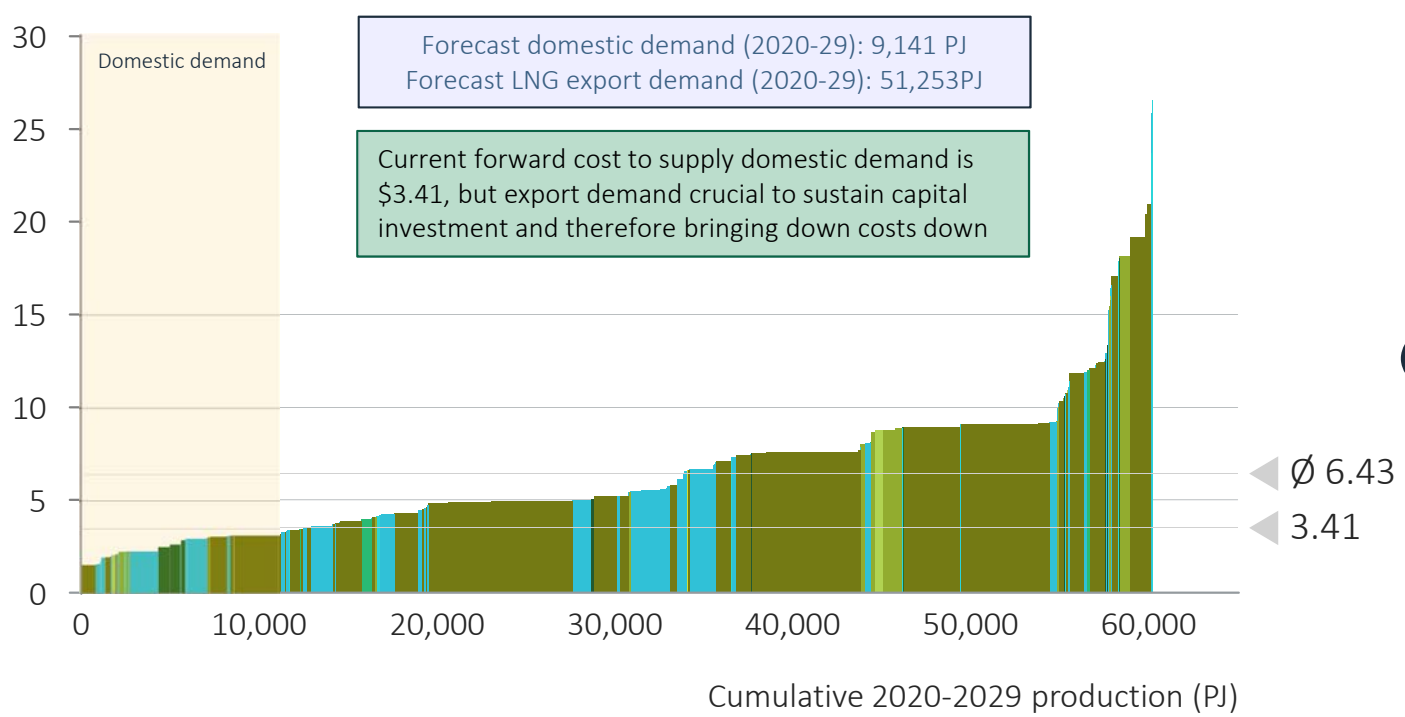
“ It is important to note that the gas price traded at **Wallumbilla** represents a small proportion of domestic gas sales and is not yet accompanied by the range and diversity of financial products and hedging opportunities that is seen at somewhere like the Henry Hub

- Department of Industry, Review of ADGSM (Jan 2020)

Source: AEMO, ACCC Gas Inquiry (July 2019 Interim Report), Rystad Energy, Department of Industry

Our average cost of gas is over \$6/GJ today, roughly double current Henry Hub prices

Full cycle BE (\$AUD/GJ)



Current average forward cost of supply is more than double current Henry Hub prices (\$2.5-3.5/GJ AUD)

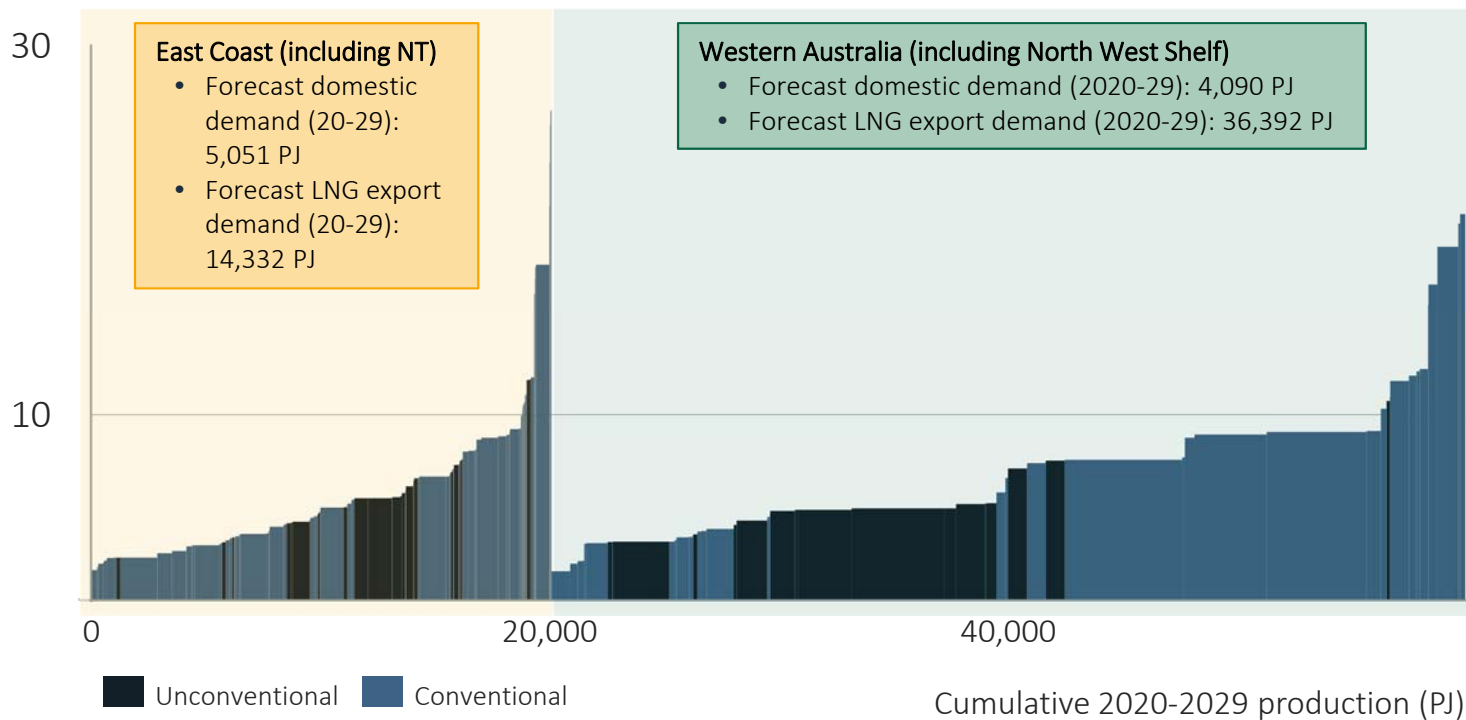
- Timor Sea
- Northern Territory
- New South Wales
- Bass Strait
- Queensland
- Victoria
- Great Australian Bight
- Western Australia
- North West Shelf
- South Australia

Note: Includes Gas fields and Gas-Condensate fields, which had production in 2019; Includes all cash flows along the whole lifetime of the asset (exploration, development, production and abandonment); Excludes outliers with BE value >\$30AUD (e.g., fields with an award year in 1940-60s meaning nominal present day value distorted by inflation rate).
Source: Rystad Energy, AEMO GSOO 2020, AEMO WA GSOO 2019, Expert analysis



Cost profile of both East and West Coast production forecasts are similar

Full cycle BE (\$AUD/GJ)



Not a large production cost differential between markets, but large size differential

Indicates potential for a nationally integrated view (e.g., the development of an ISP for the gas market similar to electricity)

Note: Includes Gas fields and Gas-Condensate fields, which had production in 2019; Includes all cash flows along the whole lifetime of the asset (exploration, development, production and abandonment); Excludes outliers with BE value >\$30AUD (e.g., fields with an award year in 1940-60s meaning nominal present day value distorted by inflation rate). Source: Rystad Energy, AEMO GSOO 2020, AEMO WA GSOO 2019, Expert analysis

LCOE of gas fueled power gen comparable with firmed variable renewable gen

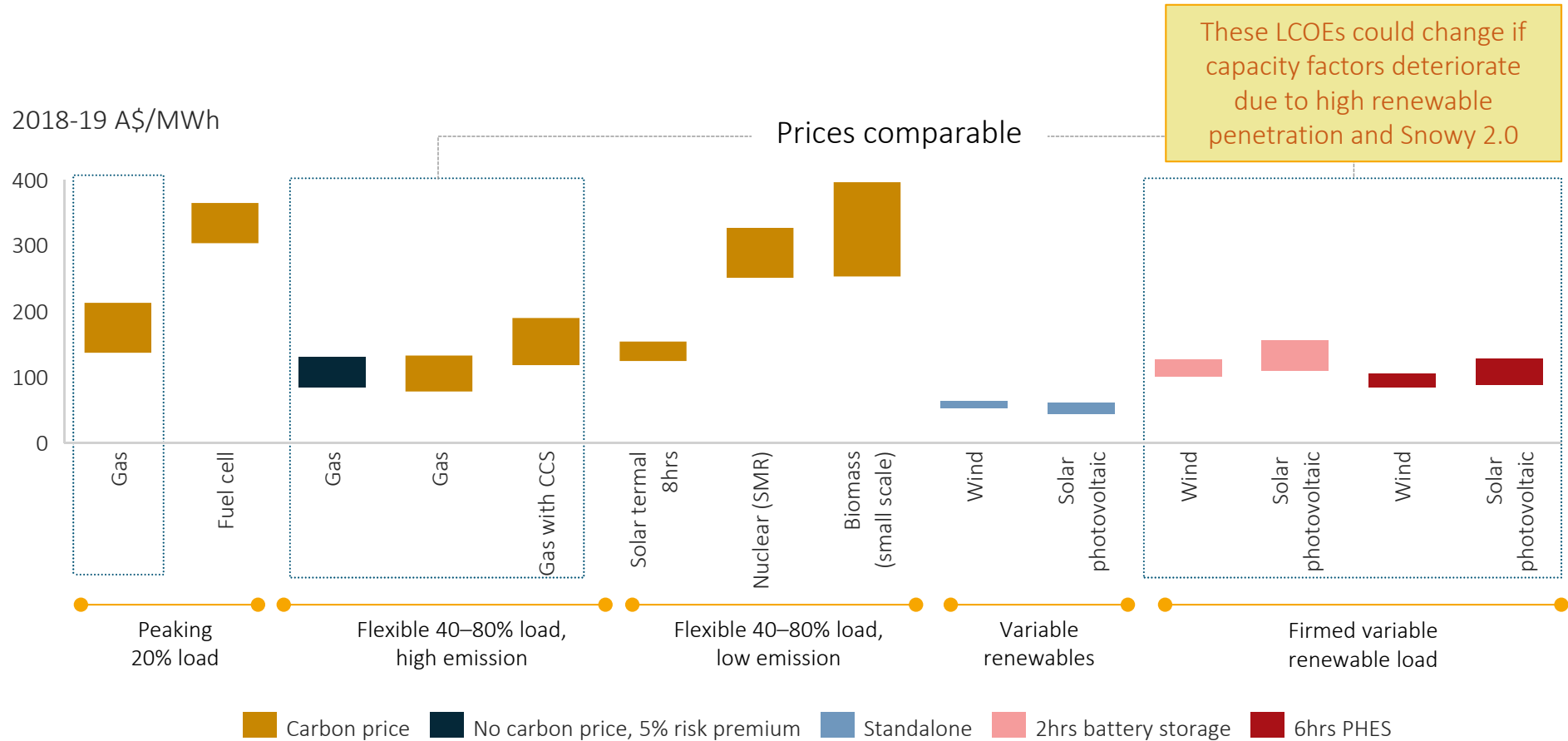


Figure 4-2 CSIRO GenCost 2018: Calculated LCOE by technology and category for 2020.

Notes: These LCOEs could change if capacity factors deteriorate due to high renewable penetration and Snowy 2.0.

Ranges are primarily based on differences in carbon prices, capital costs, fuel costs and capacity factors (see Apx Table B.2 in Appendix B). PHEs is pumped hydro energy storage; CCS is carbon capture and storage; SMR is small scale modular reactor. The gas peaking technology is an open cycle turbine, other flexible gas refers to a combined cycle gas turbine. Flexible coal refers to a supercritical pulverized fuel plant.



NCCC

National COVID-19
Coordination Commission

