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Challenges facing the Australian Gas Industry: Real, Imagined or Inevitable?

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- RISC has no pecuniary interest or professional fees receivable for the preparation of this presentation, or any other interest that could reasonably be regarded as affecting our ability to give an unbiased view.
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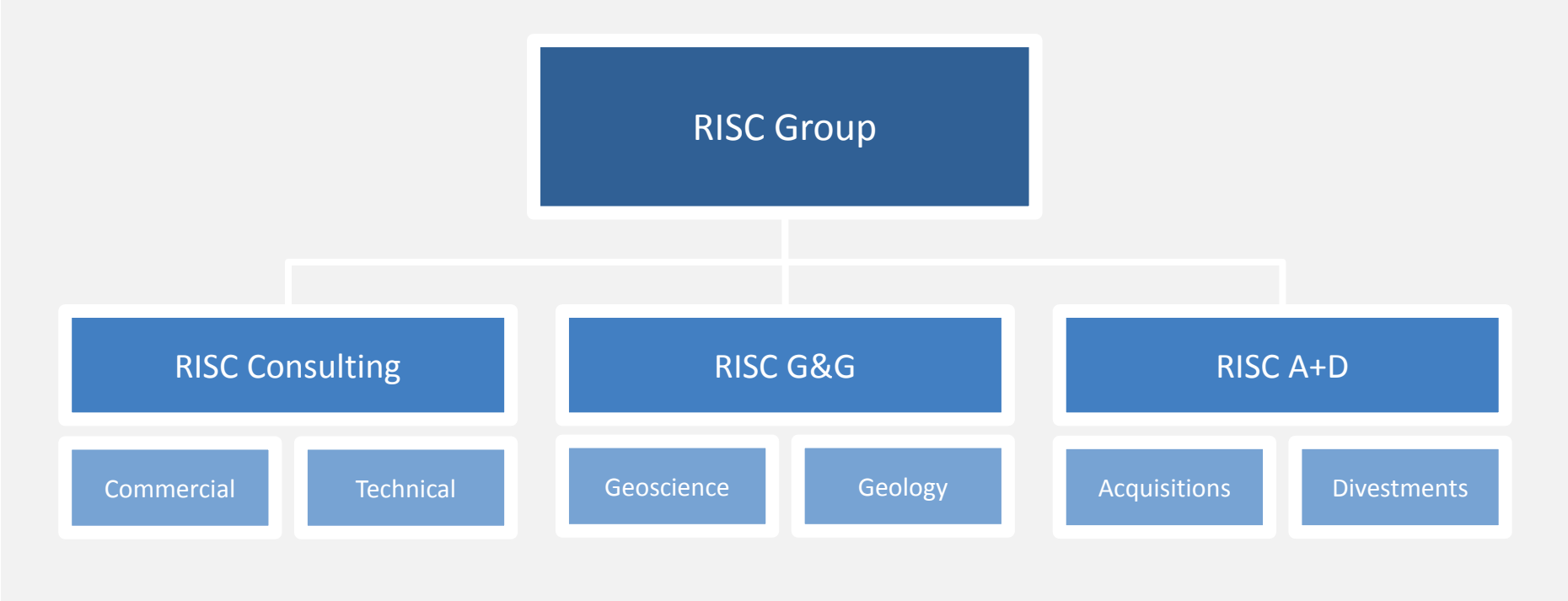
Agenda

- About RISC
- The significance of the Australian gas industry
  - Conventional vs unconventional gas
  - Size of the prize
- Industry competiveness
- Strategic decisions and their impact
- Opportunities and challenges

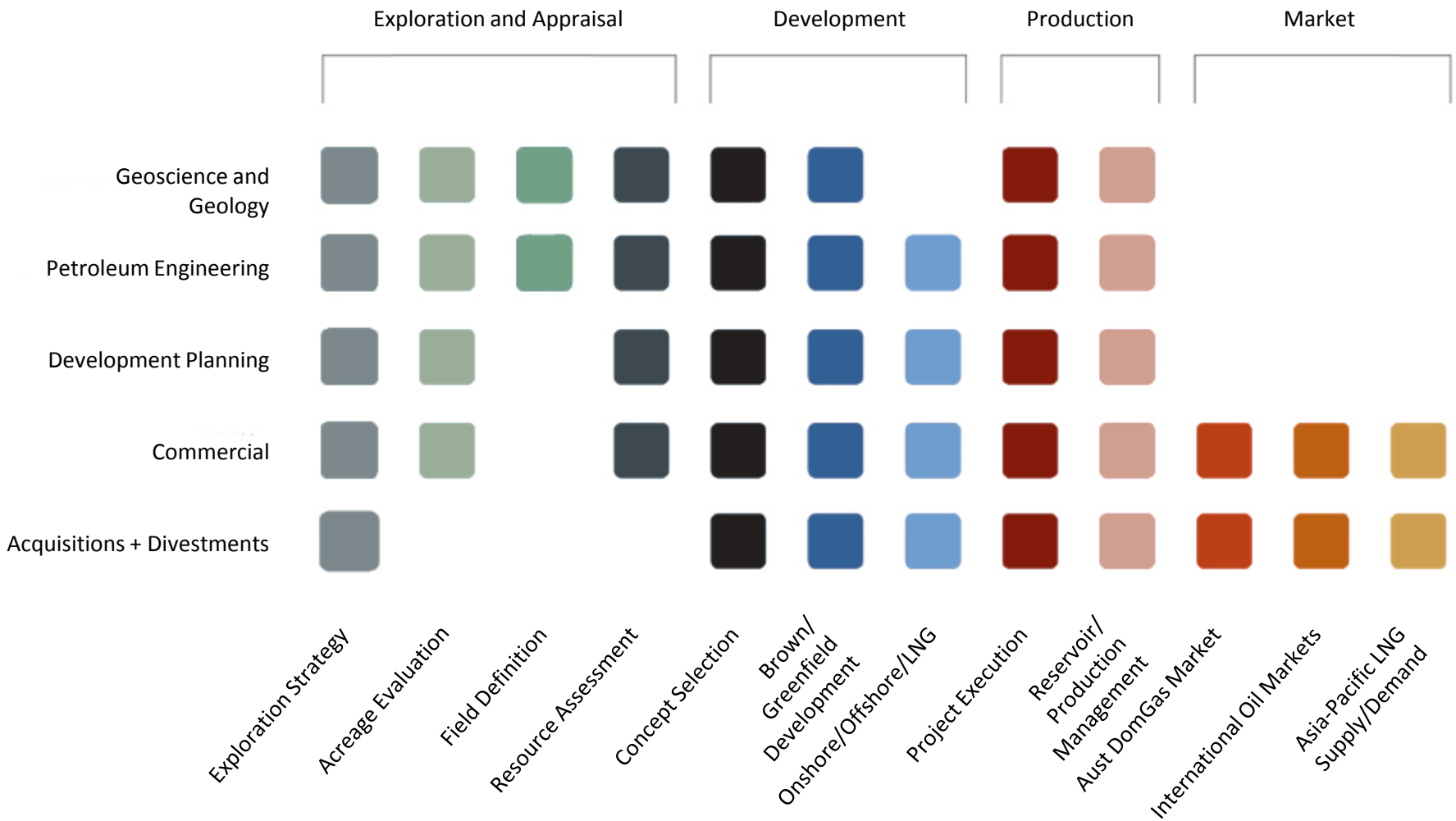
RISC Group

- Founded in 1994, independent upstream oil and gas advisory firm with broad range of technical, commercial and A&D services across the entire oil and gas lifecycle
- Our mission: to assist our clients to make *decisions with confidence*



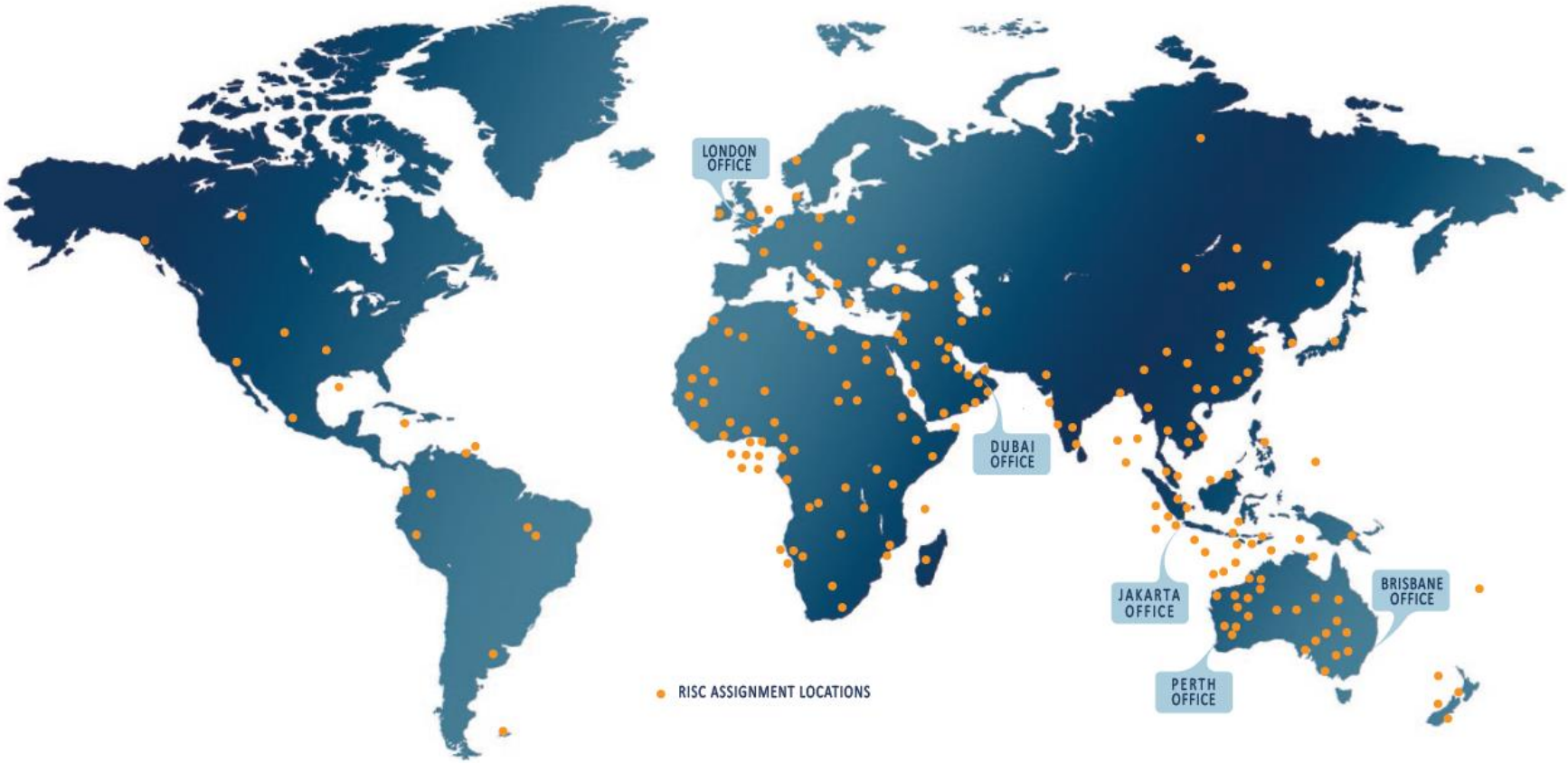
RISC advantage

The highest level of technical, commercial and strategic advice across the value chain.



Global Reach

- Global reach with offices in Perth, Brisbane, London, Dubai and Jakarta
- We have completed 2,000+ assignments in more than 90 countries for over 500 clients and have grown to become an international oil and gas consultant of choice



Significance of the Australian Gas Industry

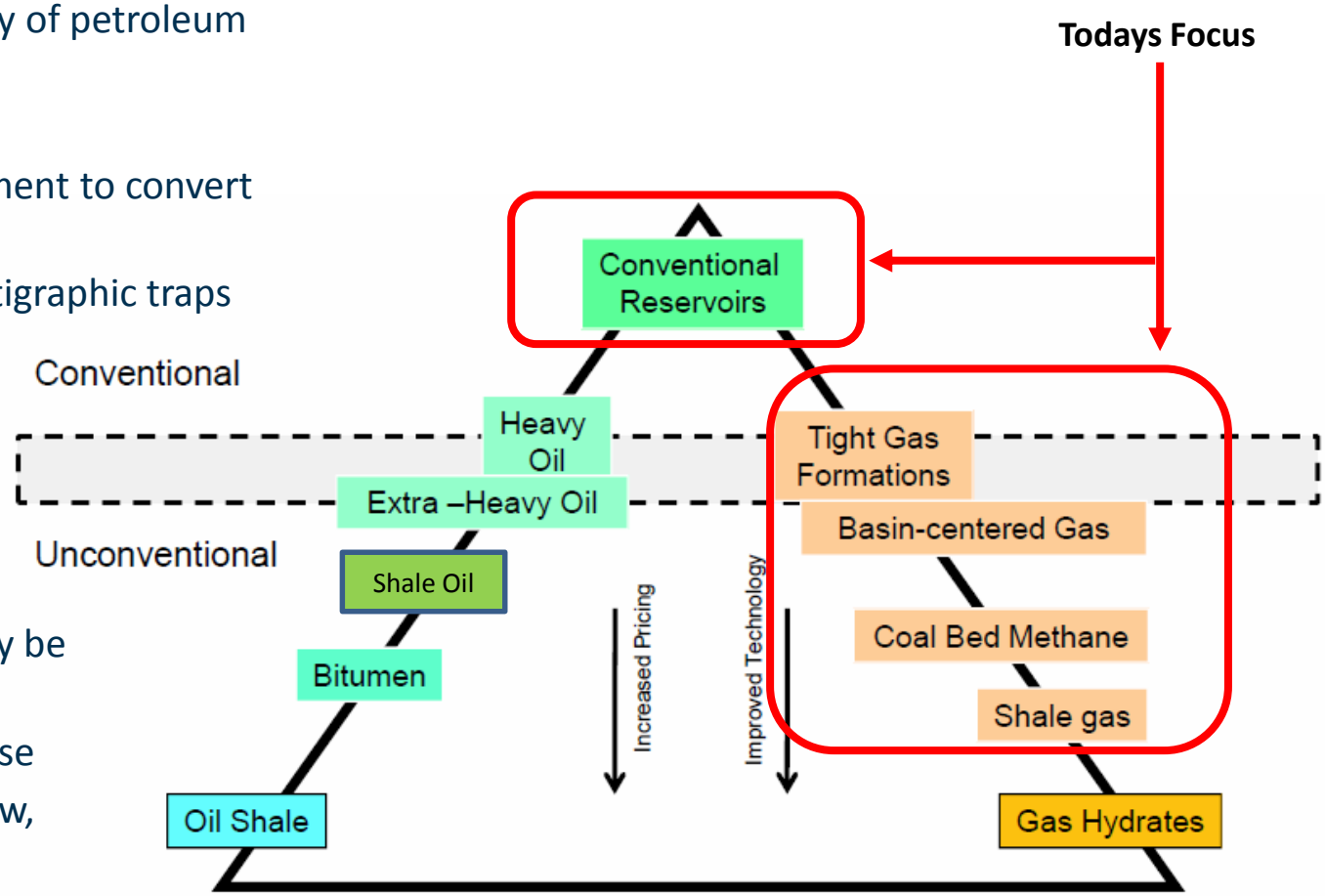
There are lots of different types of petroleum

Conventional Petroleum

- Trapping affected by buoyancy of petroleum in water
- Exists in gas or liquid phase
- No special processing/refinement to convert to saleable hydrocarbons
- Confined to structural or stratigraphic traps

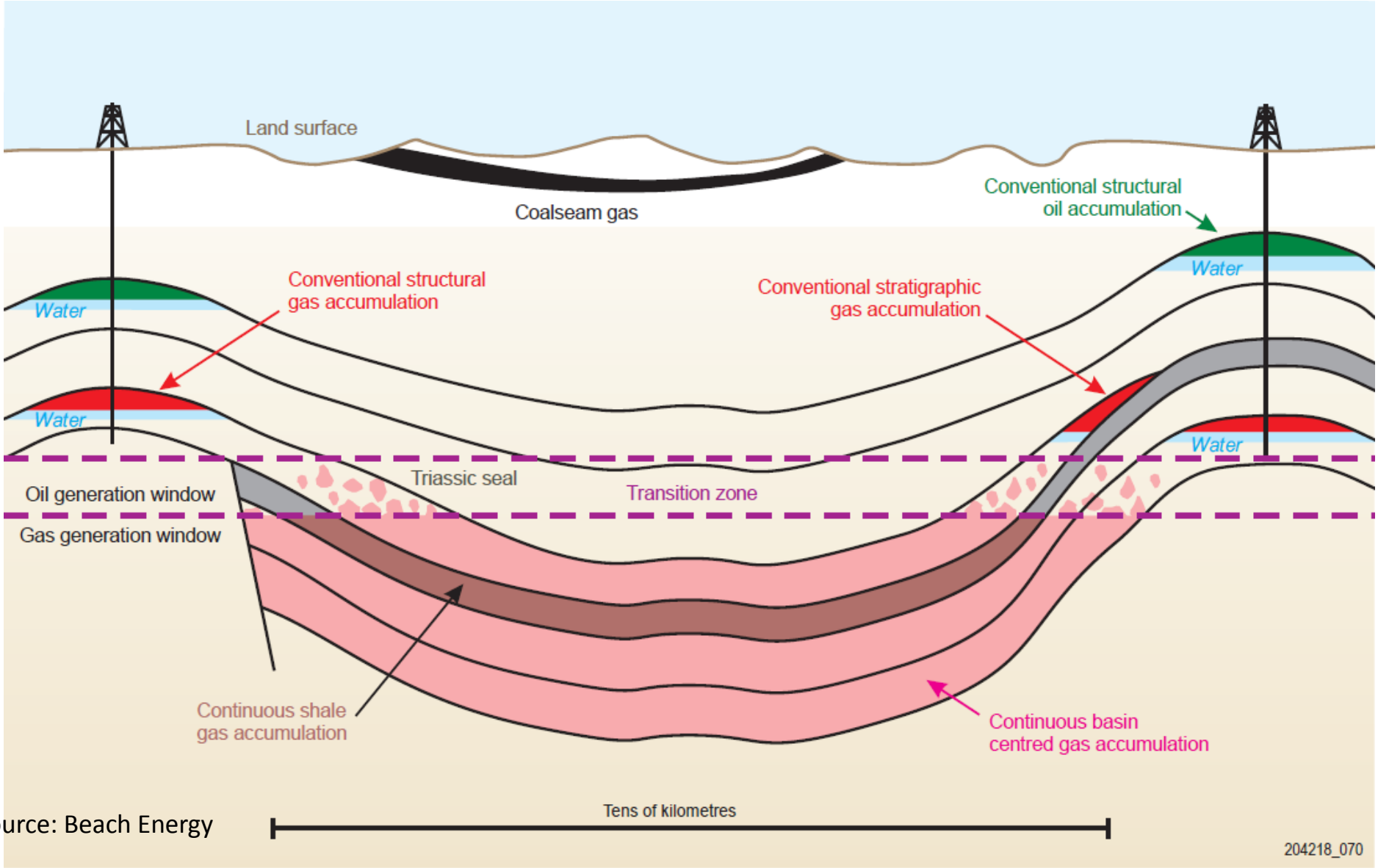
Unconventional Petroleum

- Not affected by buoyancy, may be adsorbed in organic matrix
- Exist in solid, gas or liquid phase
- May require stimulation to flow, e.g. fraccing, heating
- May require special processing/refinement
- Pervasive over large areas



(modified from Holditch, JPT Nov. 2002)

Conventional vs Unconventional Petroleum



Source: Beach Energy

What is shale gas?

Commercial shale gas is found in organic-rich fine grained sedimentary rocks that are:

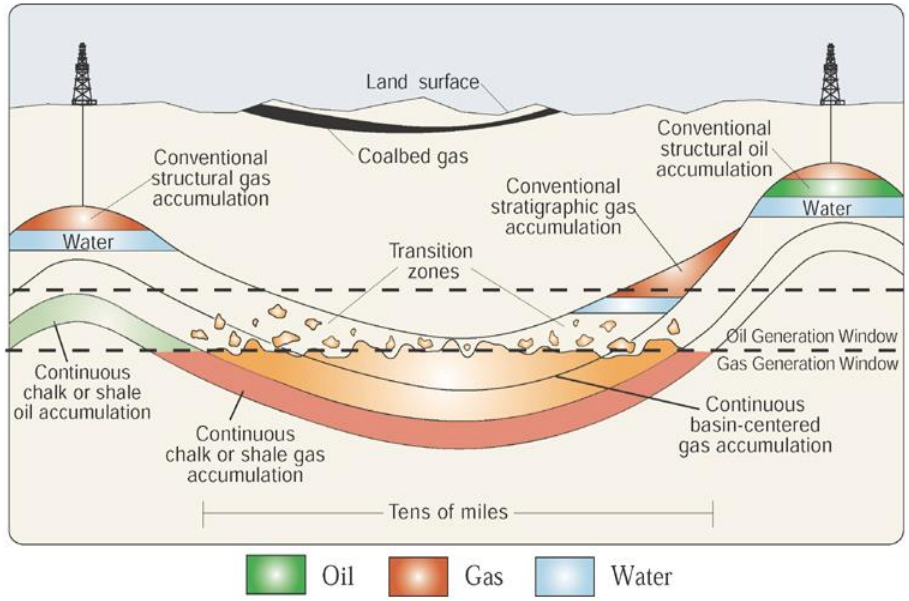
- Thick, typically over 20m
- Generally widespread in distribution
- High in TOC (total organic content), 1-20% i.e. source rocks
- Low porosity, typically 2-8%
- Ultra low permeability, typically >500 nano-Darcies
- Clay content <30% (needs some brittleness for fracturing)

Gas Sources:

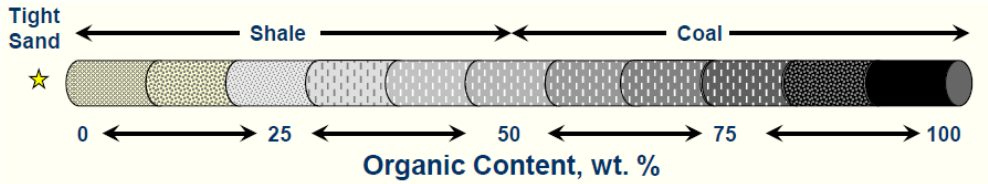
- Gas is generated from organic material in the rock
- Free Gas contained within gas filled porosity
- Adsorbed Gas within organic material
- Produced from thermogenic or biogenic sources

Gas Production:

- Requires hydraulic fracture stimulation to flow commercial quantities



Pollastro et al, 2003



Source: Weatherford Laboratories 2009

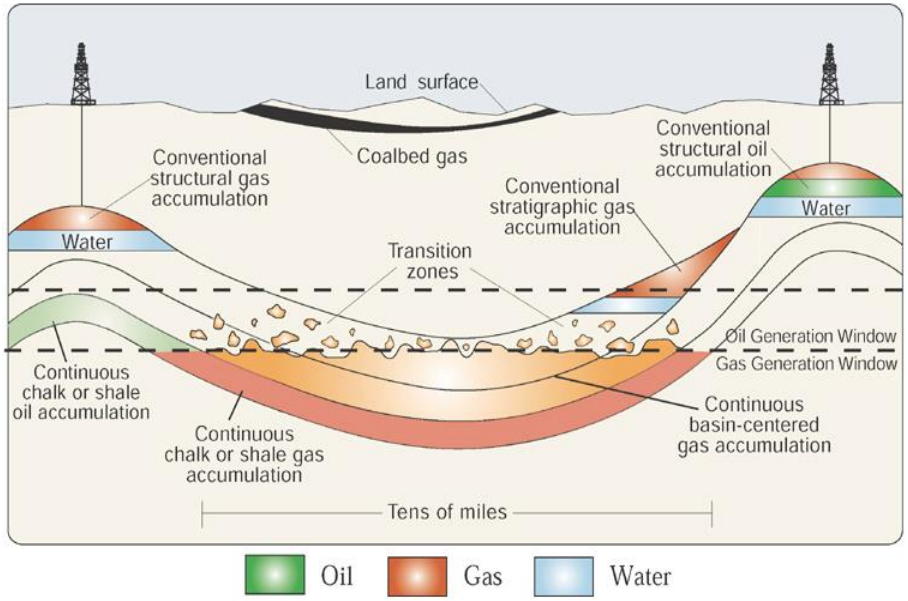
What is Tight and Basin Centred Gas?

Tight Gas

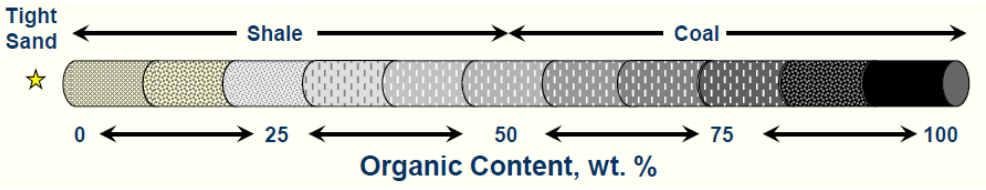
- Conventional trap
- Low permeability < 0.1 milli-Darcy (mD) in USA
- Typically discontinuous reservoirs
- Requires hydraulic fracture stimulation to flow commercial quantities

Basin Centred Gas

- Trapping may be stratigraphic and/or capillary dominated
- Low permeability << 0.1 mD
- Overpressured
- No down-dip water leg
- Continuous gas saturation over long intervals
- Requires hydraulic fracture stimulation to flow commercial quantities



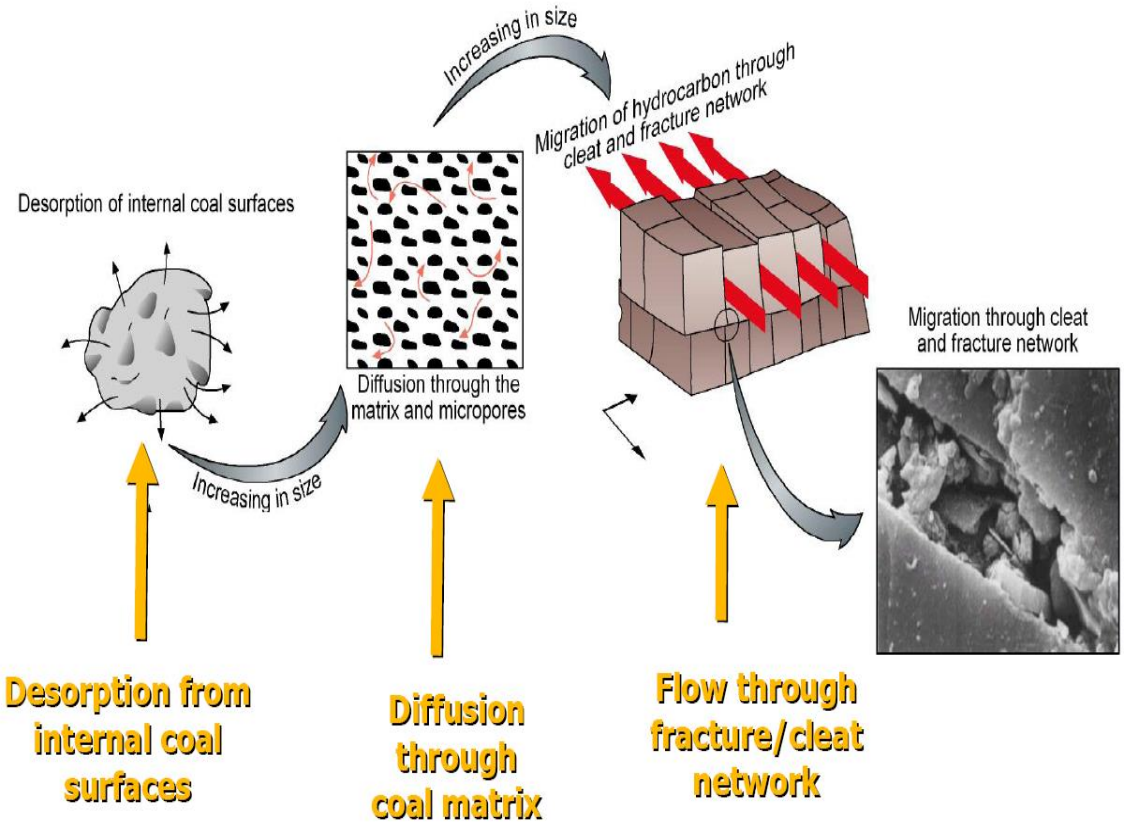
Pollastro et al, 2003



Source: Weatherford Laboratories 2009

What is Coal Seam Gas?

- Gas contained in coal seams
- Gas is adsorbed onto coal surfaces
- Usually shallow 200-1000 m
- Water usually fills pore/fracture space
- Permeability is provided through naturally occurring cleats (fractures)
- Coal has to be de-watered to enable gas to be de-sorbed and produced by wells



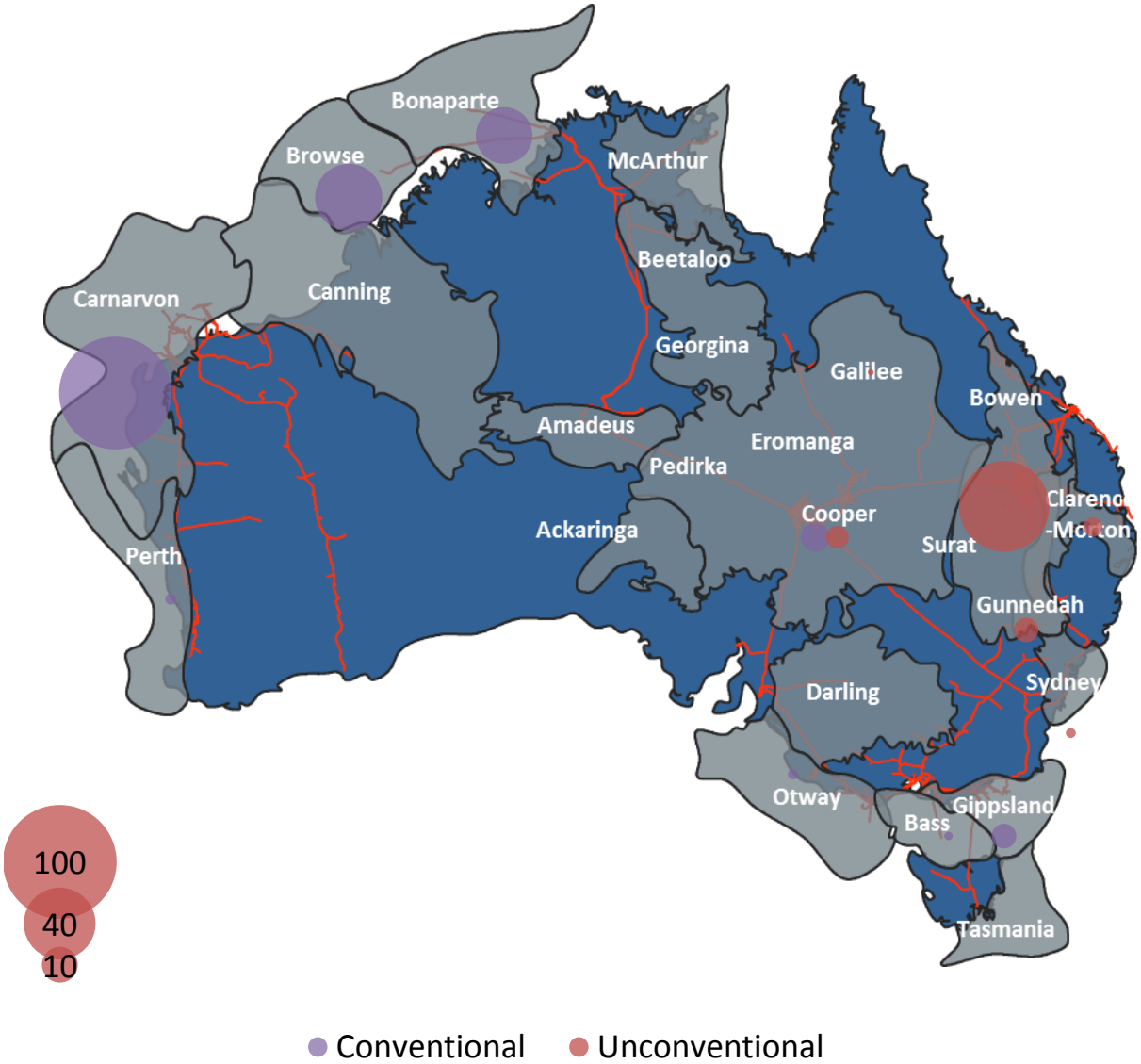
Conventional and Unconventional Discovered Resources, (Tcf)
(1 Tcf = 1 trillion (10^{12}) standard cubic feet, 28.3 x 10^9 sm3)

172 Tcf conventional gas
76 Tcf unconventional gas
248 Tcf total 2P+2C

- Unconventional is predominantly coal seam gas
- Separate E. Coast, W. Coast and NT markets

2P = Proved + Probable reserves i.e. best estimate of commercial recovery

2C = best estimate of currently non-commercial discovered resources



Source: Geoscience Australia, BREE & RLMS, RISC

Unconventional Prospective Resources (Tcf)

- 415 Tcf unconventional prospective resource i.e. undiscovered potentially recoverable
- Predominantly tight/shale/BCG gas
- Huge potential, high costs, can it make be commercialised?

Infrastructure

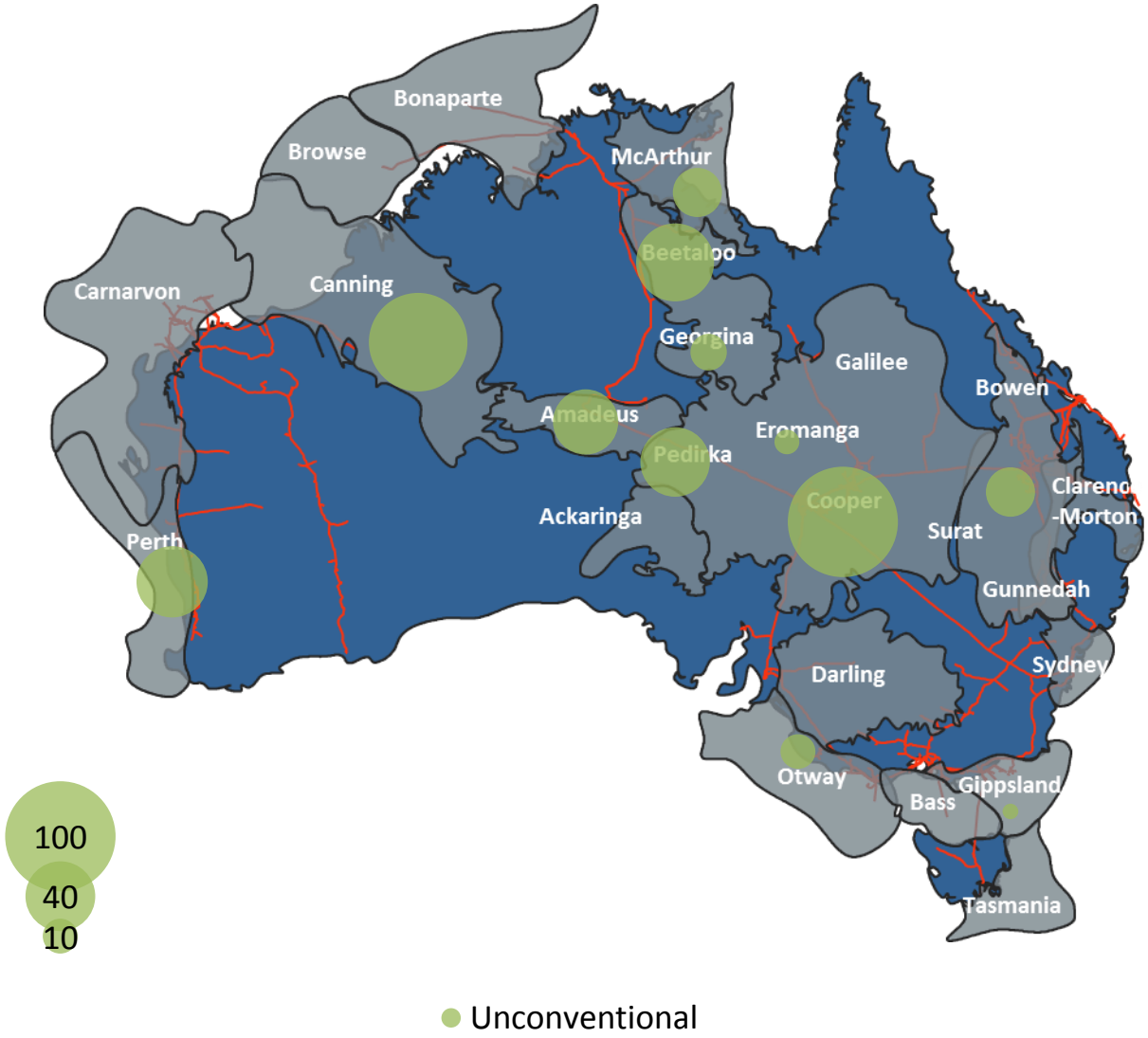
- Perth, S. Bowen/Surat, Cooper/Eromanga, Gippsland and Otway Basins close to good production infrastructure

Liquids

- Approximately 40% gas considered to be liquids prone which is important for commercialisation
- Areas of Canning, Perth and McArthur Basins stand out

Politics

- Vic and Tas closed for business?
- NSW problematic in the absence of bipartisan support
- WA, NT, QLD and SA Governments supportive
- Traditional Owner and regulatory approval issues in WA causing significant delays and overheads



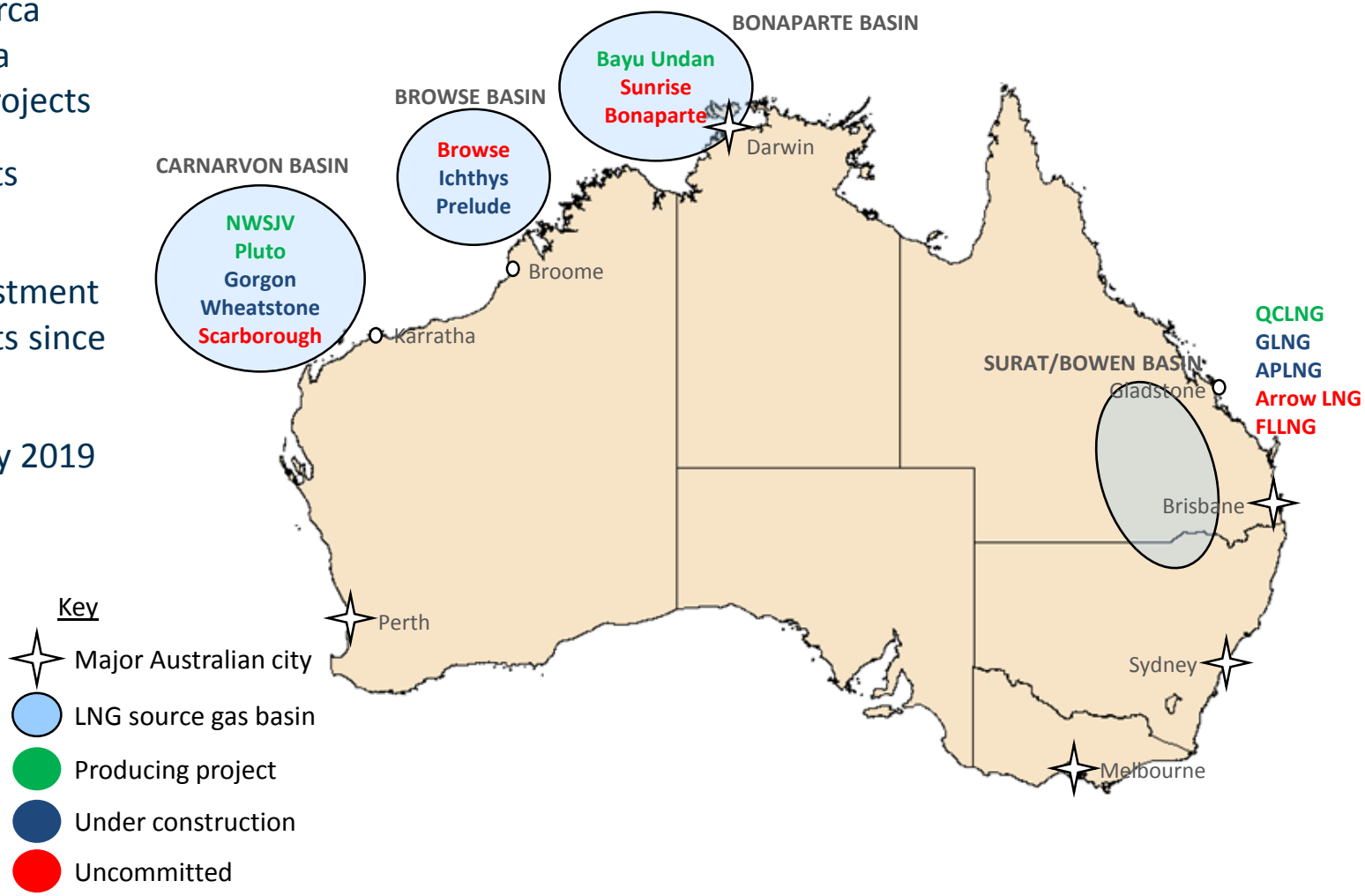
Source: RISC analysis

We have unconventional gas (and liquids)

Source: Company websites and RISC analysis

Australia's Liquefied Natural Gas Industry (LNG)

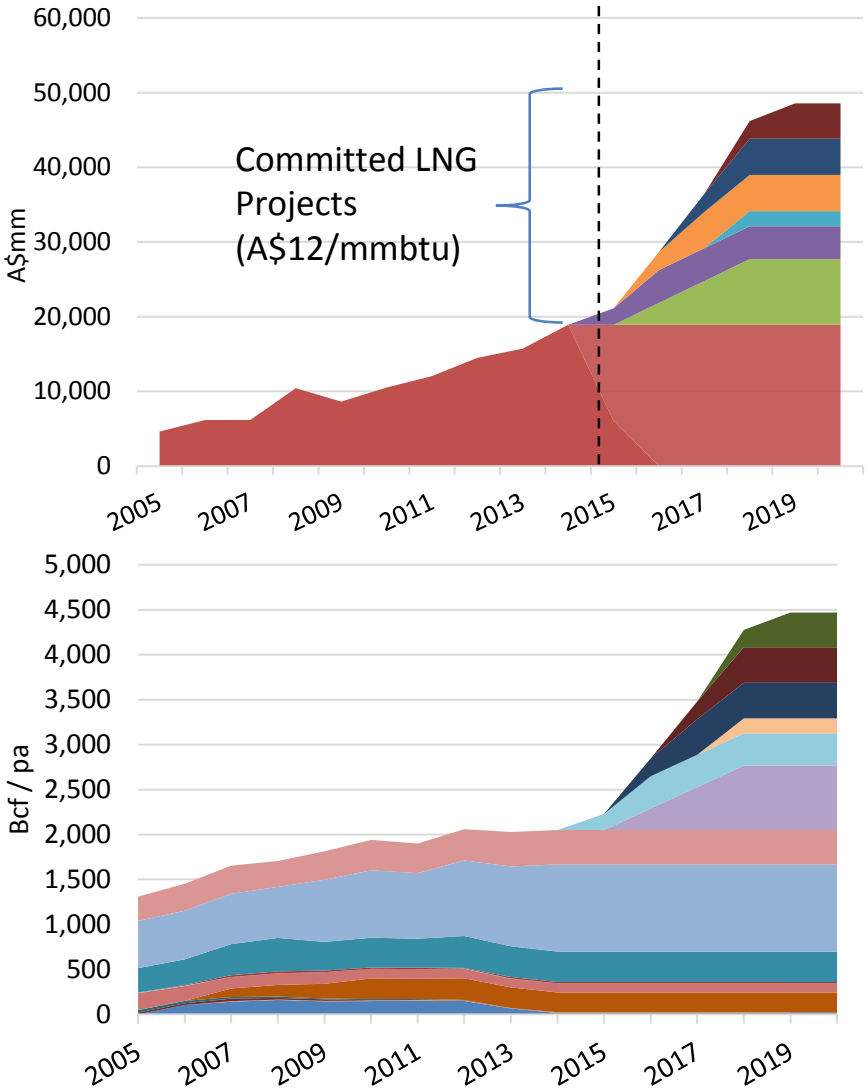
- Current production installed capacity circa 30 million tonnes pa (Mtpa) from four projects
- A further six projects under construction
- US$220 billion investment in eight new projects since 2007
- Forecast 85 Mtpa by 2019



Source: Department of Mines and Petroleum, RISC research and analysis

Australian Gas Market Value

- 2014 revenue A$ 18.9 billion, over 60% from LNG
- Gas production will more than double by 2019
- Committed LNG projects will bring total exports to 85 Mtpa
- Australia will be largest LNG exporter in the world
- LNG pricing from Australia is oil-linked, as is some domestic gas pricing
- Gross Revenue will increase to approximately A$50 b pa (assuming US$70/bbl)
- LNG will be the second highest value Australian export commodity behind iron ore

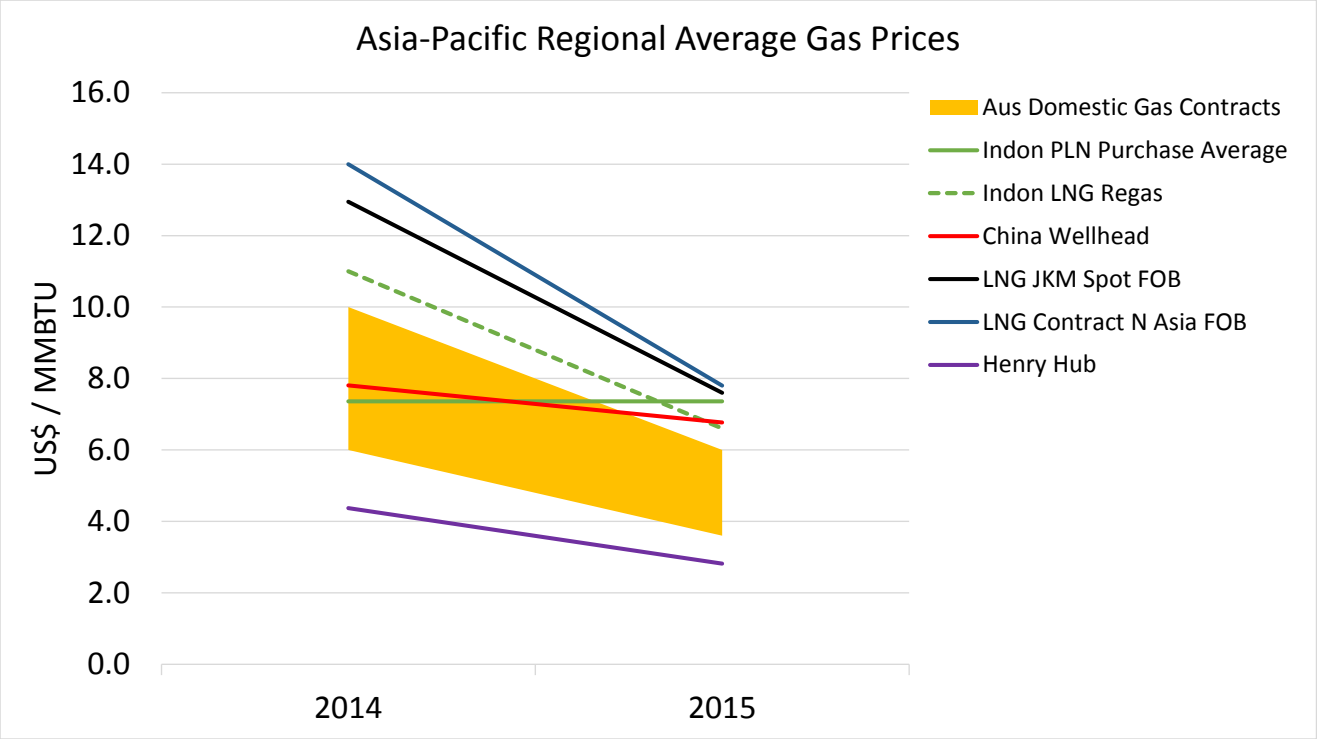


Source: ABS, RISC analysis

Industry Competiveness

Gas Pricing

- LNG pricing in the region traditionally oil-linked
- Australian domestic gas is predominantly sold on a contract basis
  - Trend towards oil price linking for this also
- Significant decline seen in US$ terms prices
  - Oil price moving from $100/bbl in 2014 to $60/bbl in 2015
  - In A$ terms, partially offset by declining US$ FX 1.0 to 0.75
- Domestic gas pricing is competitive with the regions
- Regional gas prices significantly higher than US Henry Hub
- This creates a threat to Australian LNG markets



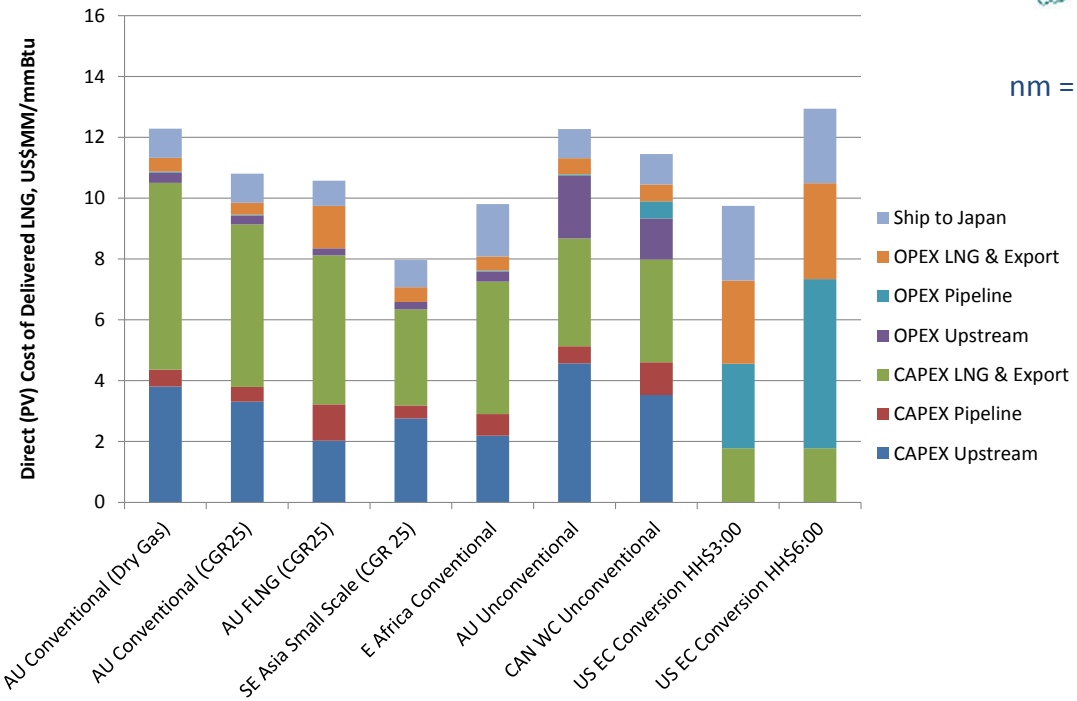
MMBTU = million British thermal units
1 MMBTU is approximately 1,000 standard cubic feet (28.3 sm3)

Source: RISC analysis, Platts, NYMEX

Australian LNG Competitive Advantage (1)

- Australian LNG has to compete internationally
- Although it has an advantage in being closer to markets and hence shipping costs are lower, the costs of development can be higher
- US gas delivered to Asia has an advantage when Henry Hub prices are low

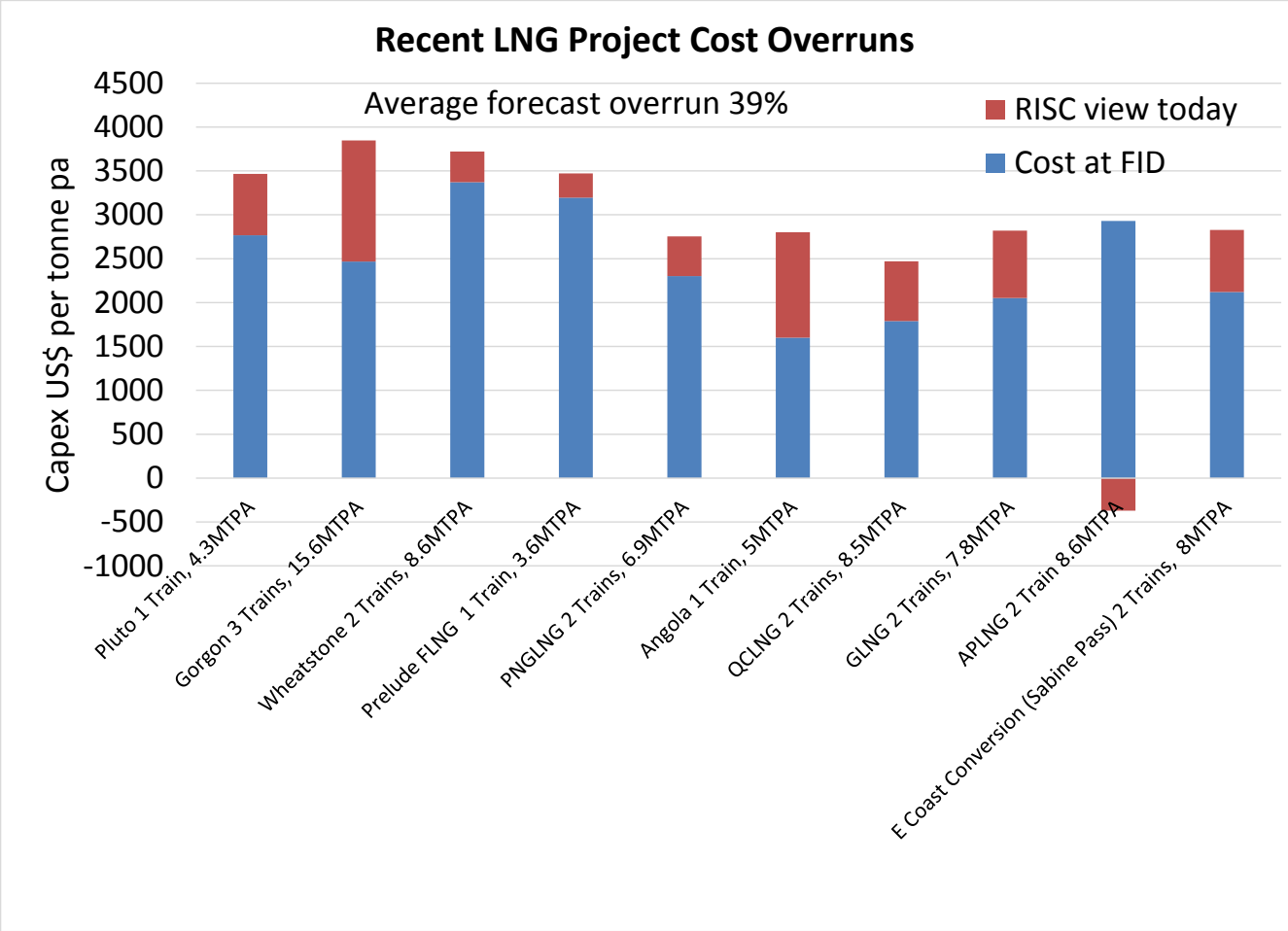
nm = nautical mile, 1.85 km



Source: RISC analysis

Australian LNG Competitive Advantage (2)

- Australian has a reputation as a high cost country for oil and gas projects
- RISC's analysis shows that globally, large oil and gas projects have a history of poor project management
- Hence the perception of Australia as a high cost destination is only partially true
  - e.g. 20% rise in Australian labour costs results in 5% project cost increase
- There are also underlying strategic decisions have a much more material impact

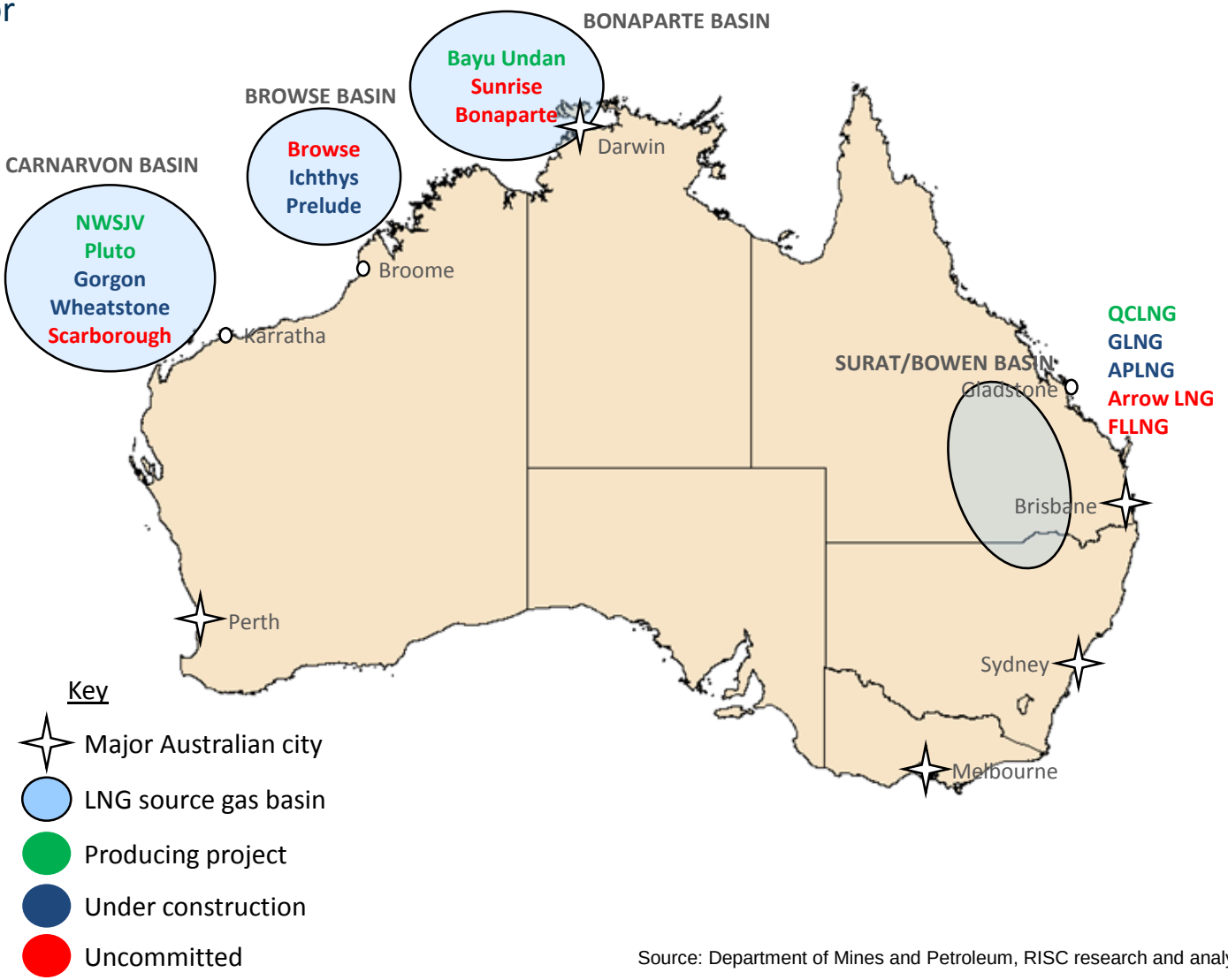


Source: RISC analysis

Strategic decisions and their impact

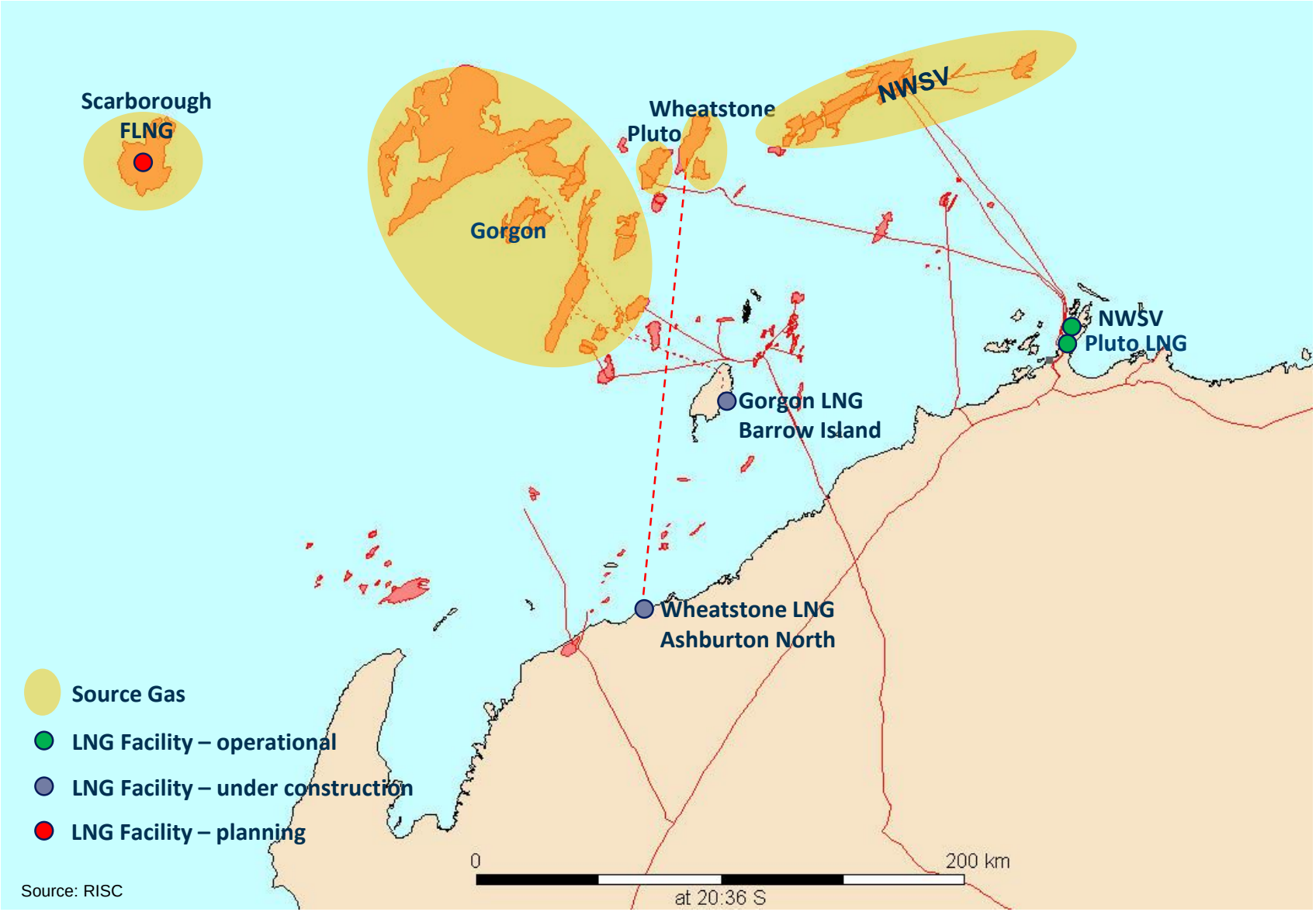
Strategic Decision # 1: proliferation vs cooperation

- 10 projects in operation or under construction
- All with separate, stand alone LNG production infrastructure
- Capital cost US$220b + since 2007
- Why?
- What is the cost/benefit?



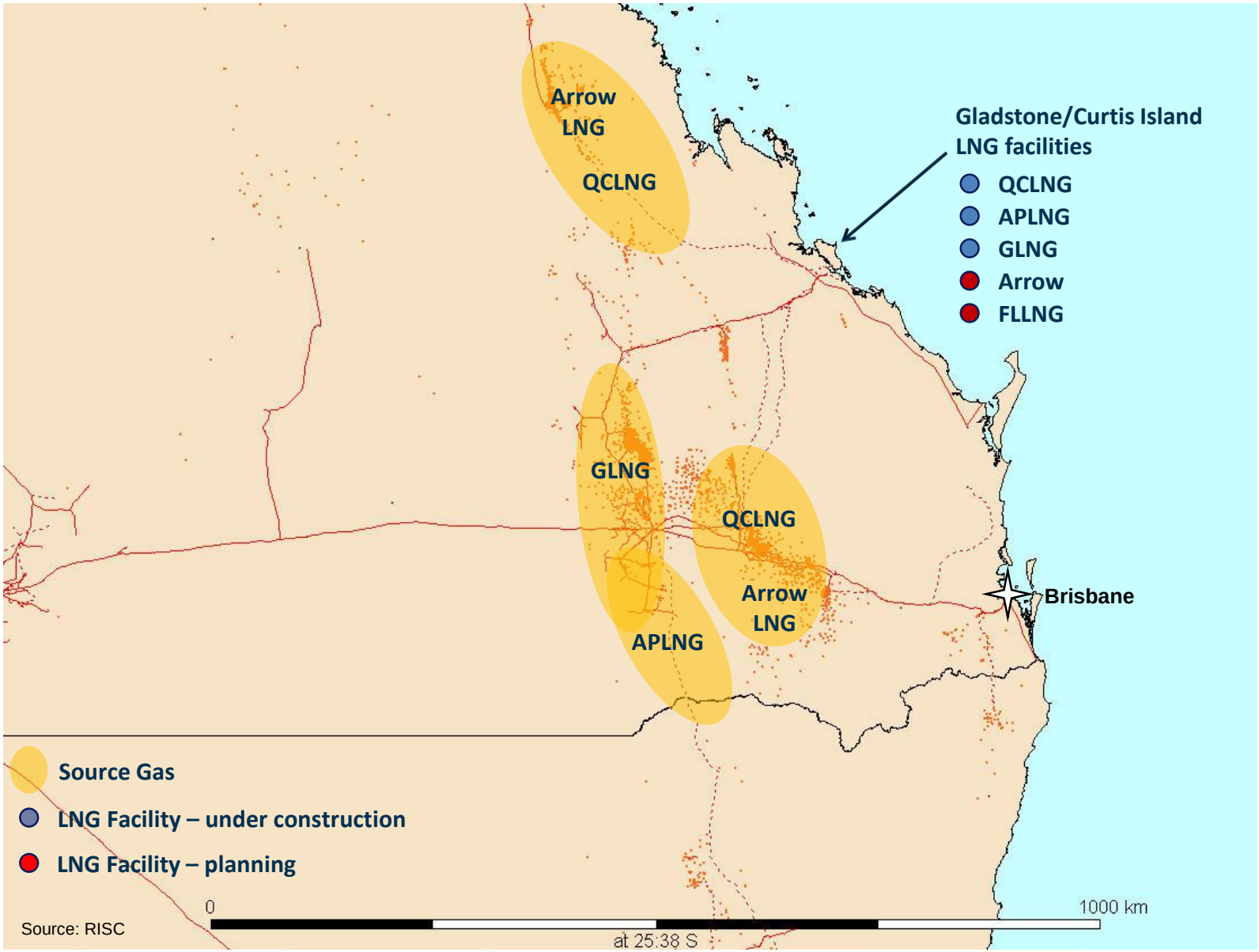
Source: Department of Mines and Petroleum, RISC research and analysis

Carnarvon Basin LNG



Source: RISC

Surat/Bowen Basin CSG-LNG

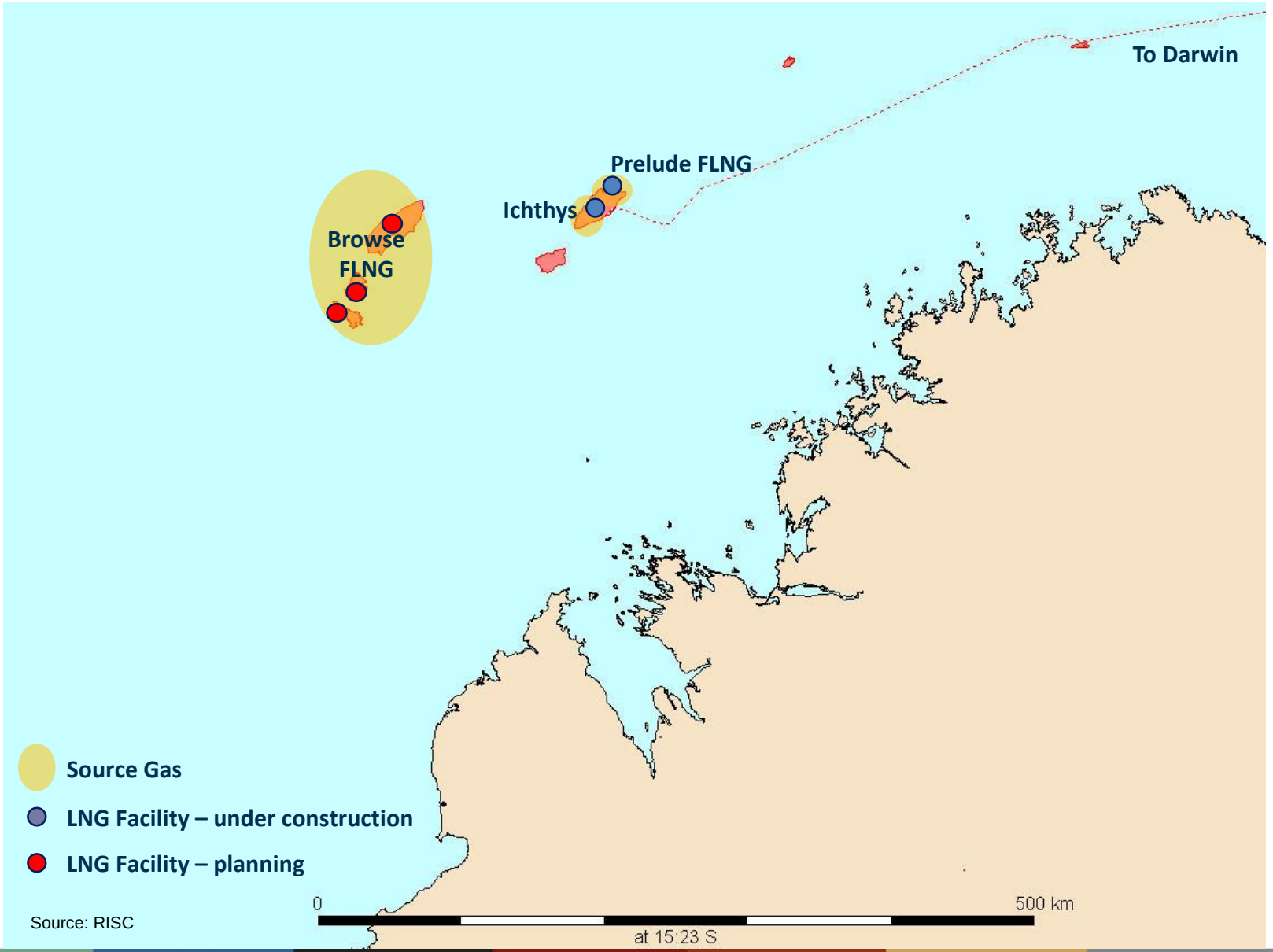


Source: RISC

Current and proposed CSG-LNG facilities at Gladstone

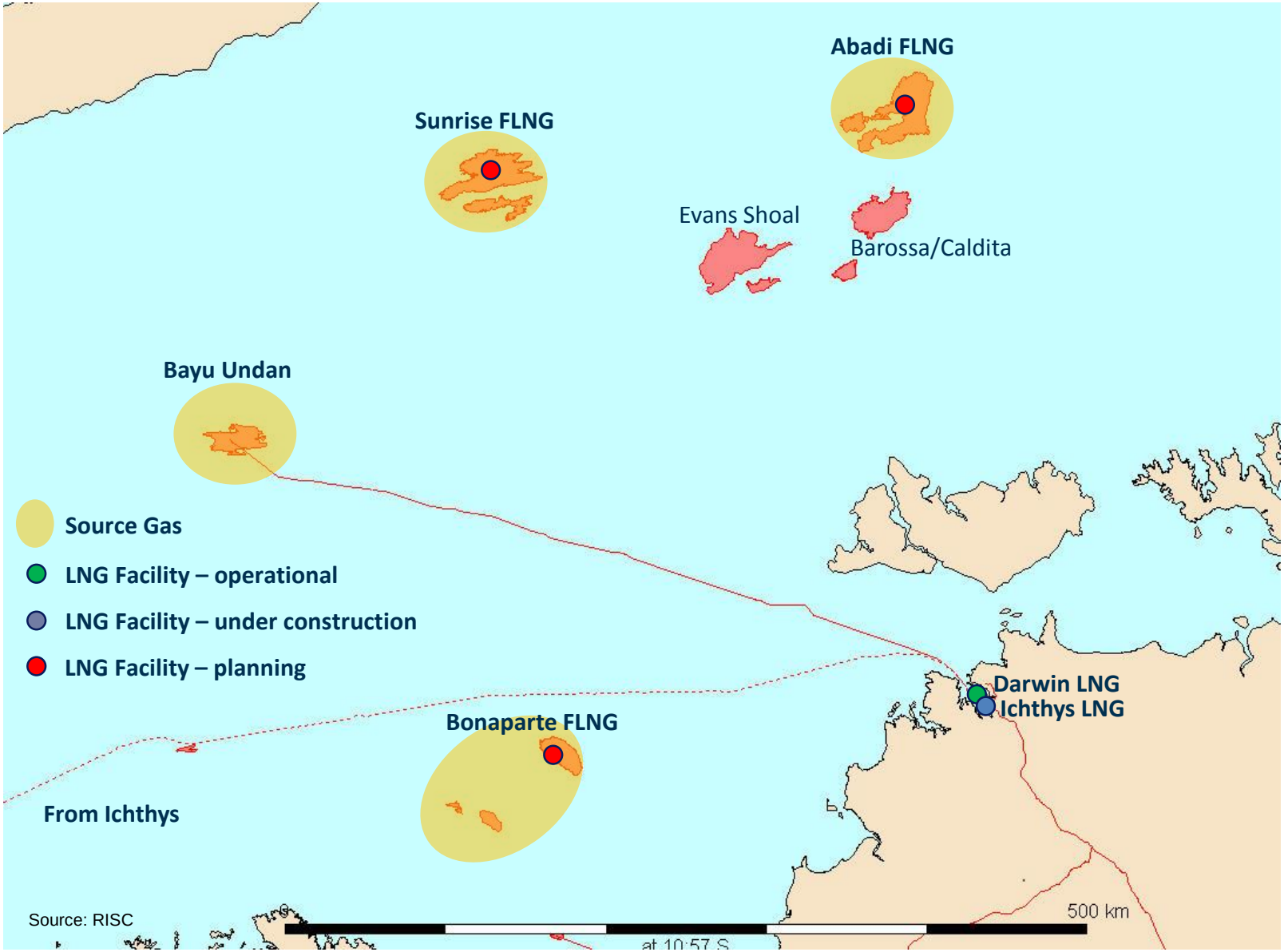
Sources: EIS submissions, RISC estimate for Arrow

Browse Basin LNG



Source: RISC

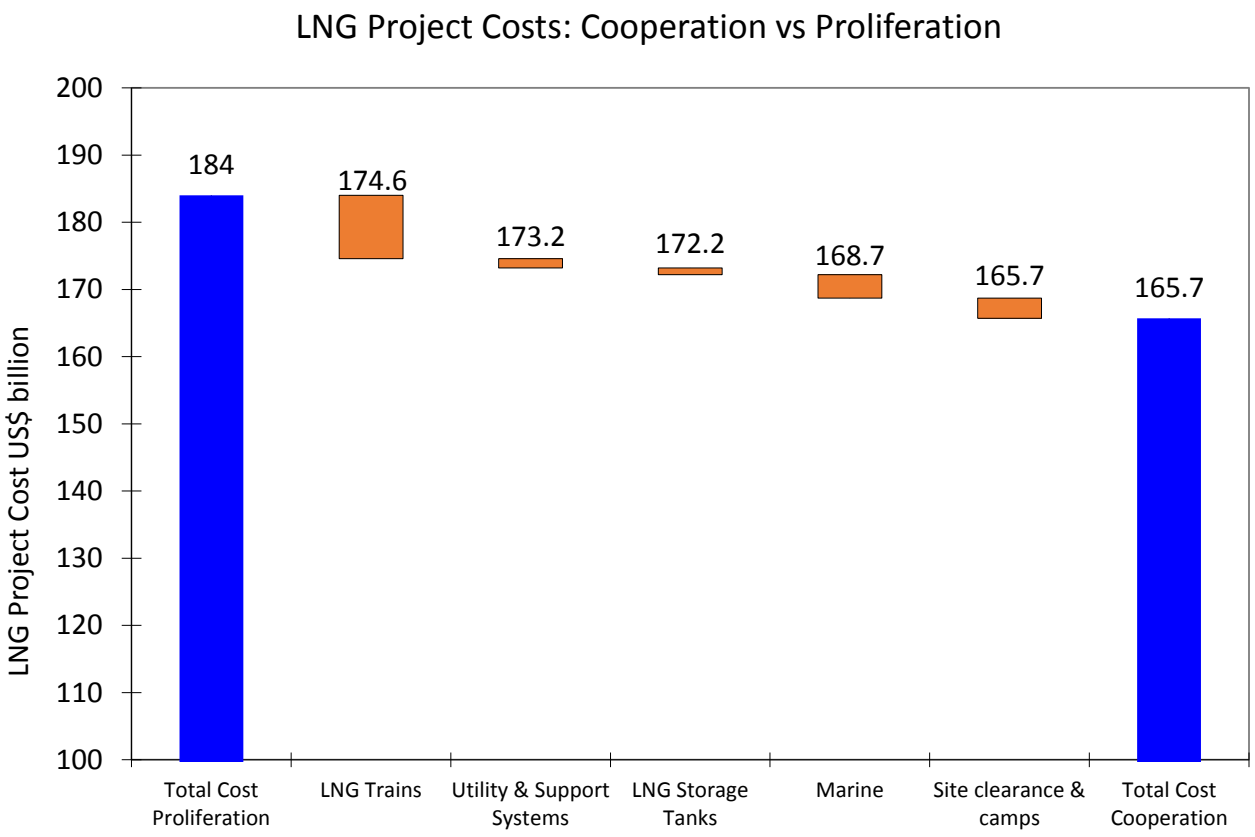
Bonaparte Basin LNG



Source: RISC

Strategic Decision # 1: proliferation vs cooperation

- What if projects in Carnarvon Basin and Gladstone used common LNG facilities?
- RISC estimates total costs US$184 billion in these two areas using proliferation strategy
- Estimate potential savings of over US$18 billion if cooperation strategy pursued
- Excludes any potential synergies in field development and upstream infrastructure



Source: RISC research and analysis

Strategic impact # 2

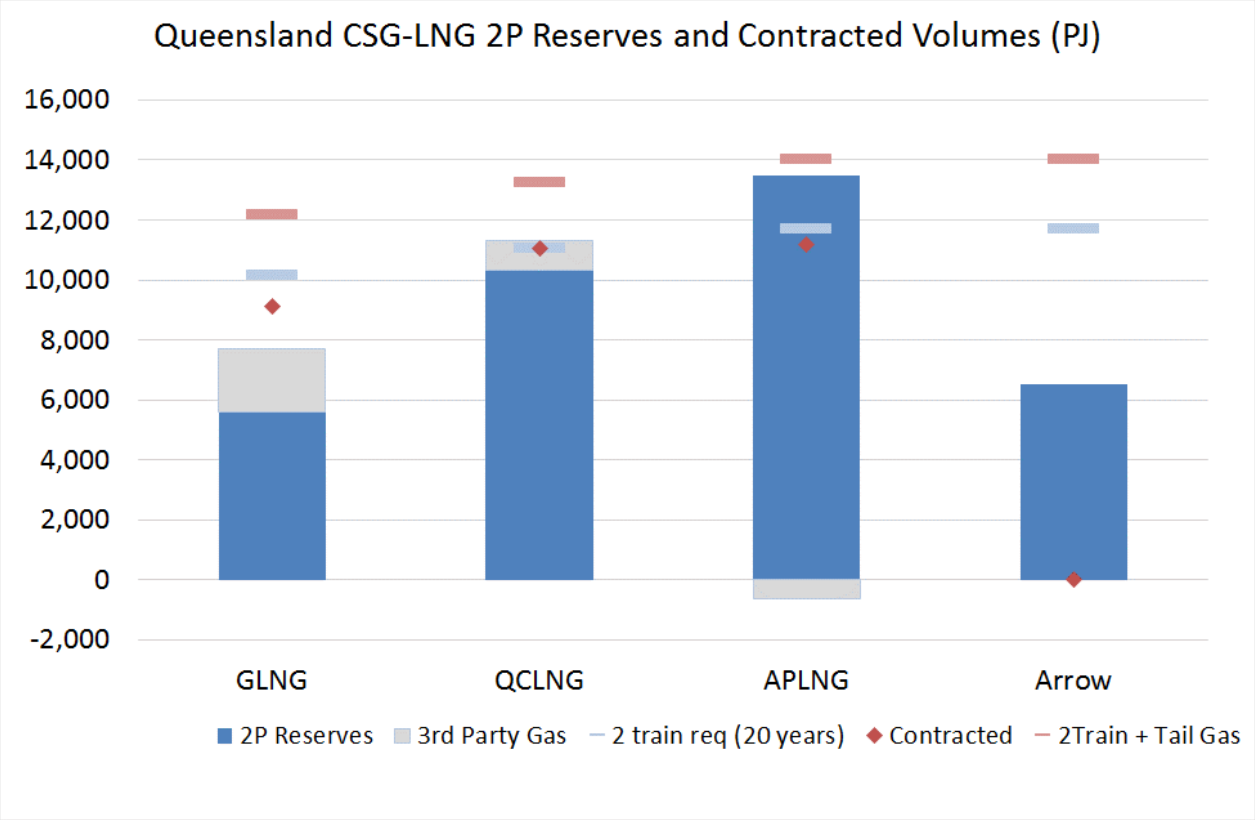
RISC

Project performance

- RISC estimates aggregate cost overruns of $ 70 billion in global LNG projects since 2007
- 2013: Woodside abandons James Price Point onshore option in favour of FLNG
- 2014: oil prices fall from US$100 to US$60/bbl
- 2015:
  - BG writes down US$6.8 billion in their QCLNG project
  - Arrow (Shell/Petrochina) announced cancellation of project

Reserve base

- On a 2P reserve basis, all CSG-LNG projects will require additional resources to secure 20 years supply
- GLNG in particular will be reliant on 3rd party supply
- How were decisions made in respect of the project size vs reserve base?



1 PJ = 1 Petajoule = approx. 1 Bcf

Source: RISC analysis

Opportunities and challenges

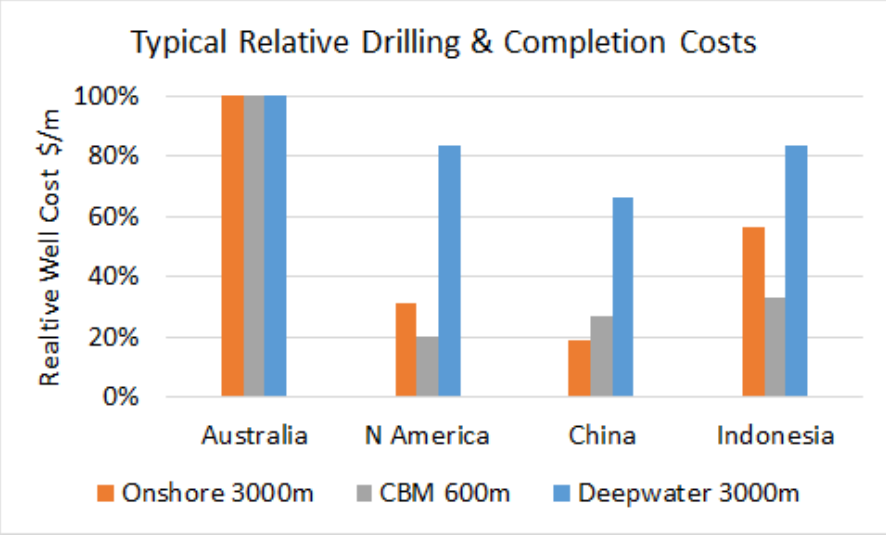
How to commercialise Australia's vast potential?

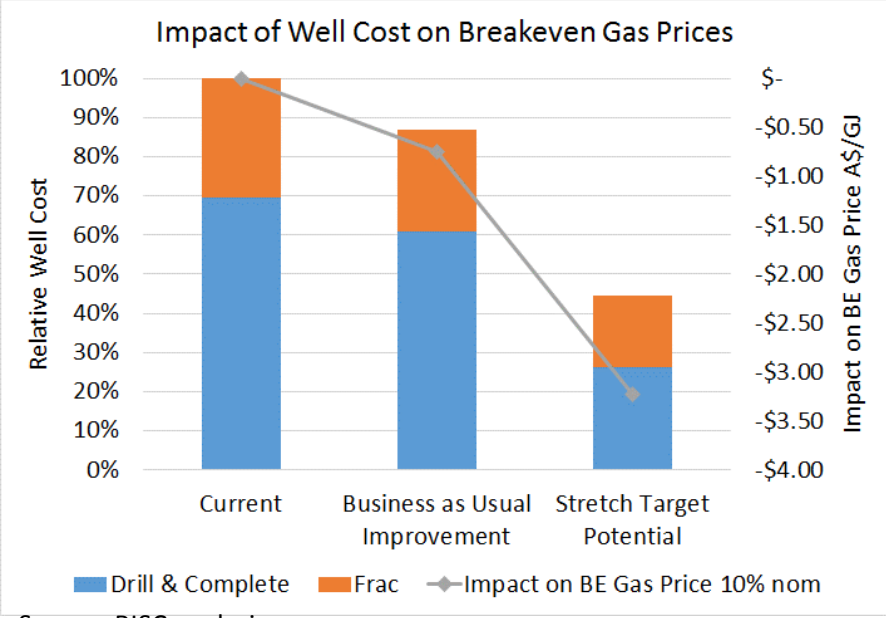
Source: Company websites and RISC analysis

Challenge: Well Costs

- In unconventional projects, well costs may be up to 90% of total costs
- For comparable scope, Australian well costs are typically higher than in other regions. Factors which influence this are:
  - Ageing drilling rigs
  - Limited competition
  - Inefficient practices
  - Regulation
  - Lower activity levels
  - Higher labor costs
  - Remote operations
  - Lack of infrastructure

- The higher costs directly affects profitability
  - Savings of $0.75/GJ nominal after tax assuming normal improvement expected from 15-20% reduction in a typical vertical tight gas well campaign
  - Potential to increase this saving to over $3/GJ if a more aggressive and structured approach is taken to cost reduction
- A well cost reduction target of 50% is not only feasible but necessary to monetise the substantial potential that exists





Source: RISC analysis

Challenge

- Australia has vast natural resources
- How can we make the Australian gas industry more competitive?
- How can we improve cooperation amongst projects to get the best result for all?
- Why is Australian iron ore amongst the lowest cost in the world, but our petroleum is amongst the most expensive?
- What role should governments, management and shareholders play in these strategic issues?

Final thoughts

- Despite rumours to the contrary, the oil and gas industry is not dead
- Great opportunities for innovative thinkers in the oil and gas industry
  - Data and knowledge management - embryonic
  - Automation – barely begun
  - Decision making – clearly remedial
  - Environment/Sustainability – it's your world

"Heavier-than-air flying machines are impossible"

Lord Kelvin, British mathematician, physicist, and president of the British Royal Society, 1895

"I think there is a world market for about five computers"

Thomas J. Watson
Chairman of IBM, 1943

"The oil and gas industry has no future"

the speaker's best friend in year 12, 1972 when discussing career options

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