Developing a robust domestic gas price marker

4 May 2021

EY Port Jackson Partners
Strategic Advisory

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Developing a robust domestic gas price marker

EY Port Jackson Partners was engaged to answer the following question: given the current and future structure of the Australian and global gas industry, what is an independent and robust domestic gas price marker that best meets the needs of the Australian gas market? This work, based on the research performed[1], is intended to inform industry understanding and discussions about the future of the Australian gas market. We were not asked, nor did we seek to address policy issues associated with the concept of a domestic gas marker, including assessment of any potential consequences regarding use of this marker to set gas prices in Australia. This report was also not specifically prepared for submission to the ACCC LNG netback price series review, which commenced on 18 March 2021.

Much of the market commentary and monitoring in Australia focusses on measuring Australian domestic gas prices based on a 'short run net back' price relative to the JKM gas price marker. This price is calculated by subtracting the short-run marginal costs of exporting gas into the Asian market from the JKM price marker, an estimate of Asian LNG gas prices provided by Platts.[2]

Our analysis of Australia's current and alternative domestic gas price marker mechanisms suggests that three changes should be made to this calculation, and that doing so would benefit the Australian gas industry.

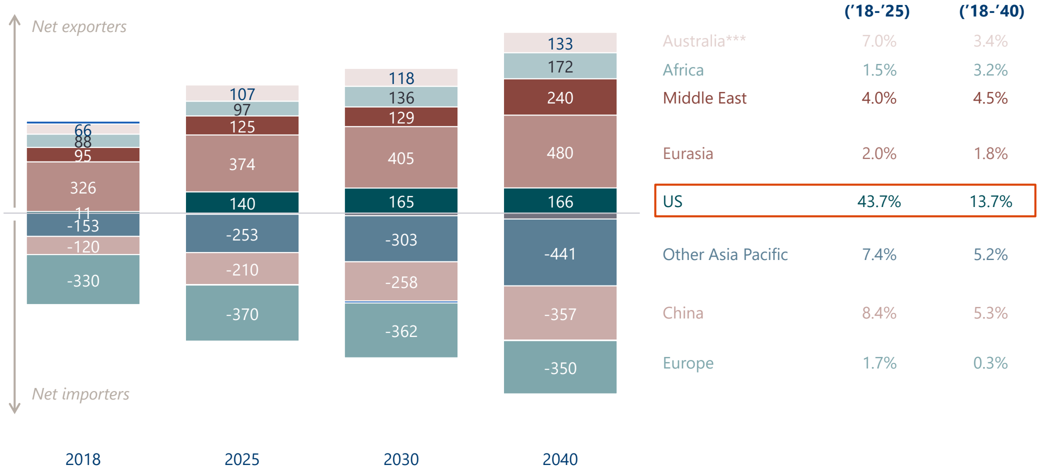
The changes are:

1. **Henry Hub, the leading global gas marker, should be used instead of JKM as the basis of an Australian netback price, after adjusting for export and transport costs into the Asian market.** Henry Hub pricing is likely to be a better indicator of globally competitive gas prices over time. The US is forecast to continue its rapid growth trajectory as a net exporter of gas across global regions (see Exhibit 1). As a result, the US is emerging as the price setter globally, given the US industry's size and low-cost position on the supply curve (see Exhibit 2).

[1] Including analysis and research based on publicly available information into costs along the gas production and export value chain; alternative international gas pricing benchmarks; and industry structure and trends in relevant markets.
[2] For example, see ACCC (October 2018), Gas Inquiry 2017-2020 Guide to the LNG netback price series

Exhibit 1

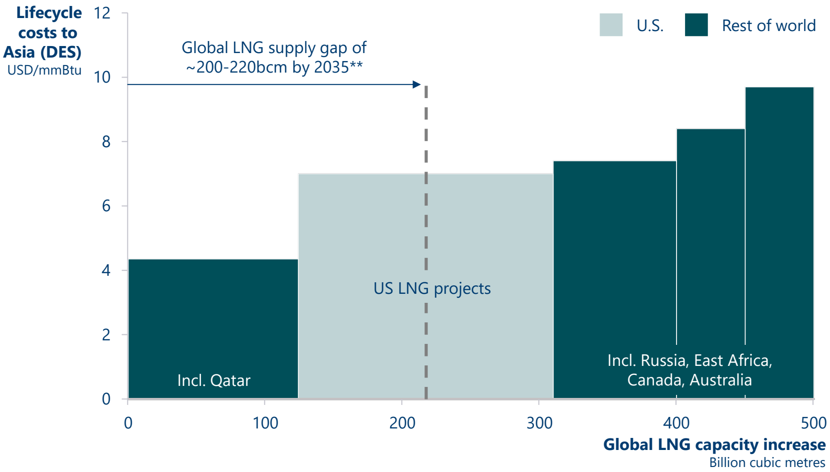
GLOBAL GAS BALANCES – STATED POLICIES SCENARIO*,**
Billion cubic metres



* Balances calculated as total gas production minus total gas demand
** Scenario incorporates policies and measures that governments have already put in place, as well as the effects of announced policies, as expressed in official targets and plans
*** Australian demand data extracted from the GSOO's "Central" scenario and converted at a rate of 35.17 MJ/m³
Source: IEA World Energy Outlook, 20120 Report; 2021 Gas Statement of Opportunities

Exhibit 2

GLOBAL LNG COST CURVE OF THE FUTURE*



Extracts from industry reports:

"The large block of US projects is expected to be the marginal supply… the long-term market clearing price for LNG reflects full cost of supply from US projects"[1]

"The US Henry Hub price … serves as a global reference price [for natural gas] due to a large LNG export industry actively seeking arbitrage opportunities"[2]

"The abundance of shale volumes being produced and exported from the US has made Henry Hub a global gas price reference."[3]

* Includes only pre-FID projects selected in the funnelling process; Based on nameplate capacity x 50% in year 1 of operations and x 95% thereafter
** Based on expected demand minus available post-FID and existing LNG capacity in 2035 (reference case +/- 5%)
[1] Energy Insights 'Global gas & LNG outlook to 2035' (H1 2019) (also basis of cost curve chart)
[2] IEA World Energy Outlook 2019
[3] IGU 2020 World LNG Report

In addition, beyond matters of price, the Henry Hub price has ample market sophistication and depth. This is because, compared with JKM, Henry Hub has more liquidity, is set by actual trades rather than a relatively shallow market survey, is easy to access for all participants, and is monitored by an independent competition regulator not a private company. Henry Hub also provides a deep futures market which assists all market participants to manage their price risk and exposure.

Aligning to a Henry Hub marker would therefore support Australia's gas hub at Wallumbilla to develop, enabling exporters and domestic users to trade or hedge their positions, and the industry to more appropriately manage excess or spot LNG sales when offered to the domestic market.

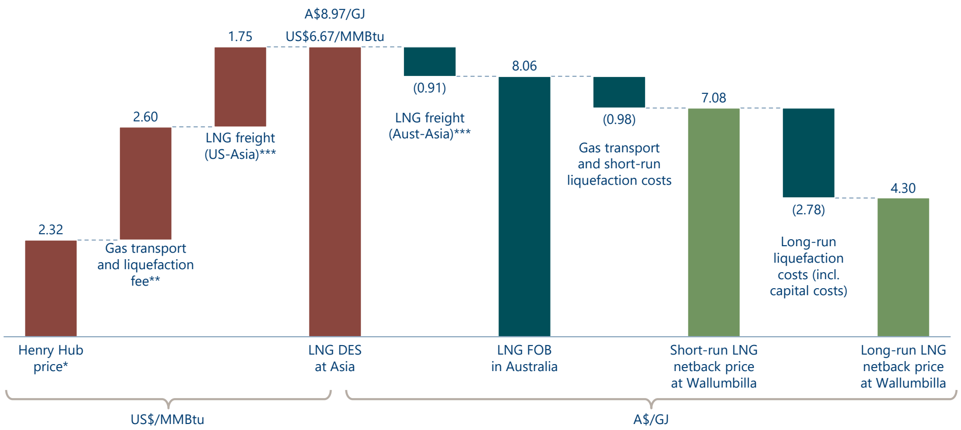
2. **Netback pricing calculations should be based on the long run cost that reflects a competitive gas market.** Long run netback prices subtract the cost of the capital investment and fixed costs required to export gas, not only the short run marginal costs. Our estimate of this calculation based on a Henry Hub price marker is illustrated in Exhibit 3, and results in an estimated long run LNG netback price at Wallumbilla of A$4.30/GJ, based on average monthly prices for 24 months to April 2021[3]:

   - The LNG delivered ex-ship (DES) price in Asia is estimated at US$6.67/MMBtu based on a Henry Hub price of US$2.32/MMBtu, to which is added operating and capital costs to source and liquefy the gas of US$2.60/MMBtu and US$1.75/MMBtu to transport the LNG from the US to Asia

   - From this delivered LNG price in Asia, freight costs of A$0.91/GJ are deducted, in addition to gas transport and short-run liquefaction costs of A$0.98/GJ, as well as long-run liquefaction capital and operating costs of A$2.78/GJ

Exhibit 3

HENRY HUB-BASED LNG NETBACK PRICE CALCULATION*
US$/MMBtu, A$/GJ



* Average monthly price / cost for 24 months to April 2021
** Including both opex and capital costs (based on Oxford Energy midpoint estimate of total liquefaction costs for new US LNG projects, but consistent with ranges published by other sources)
*** Includes carrier charges, gas used by carrier, boil off and port fees
Source: Bloomberg; ACCC; McKinsey; publicly available information from Origin and Santos; Oxford Institute for Energy Studies; Macquarie Research; Core Energy; AER

The assumptions used in this calculation (all of which are listed in Exhibit 3) arise from publicly available sources, including previous industry reports and market disclosures by industry participants.

Long run netback prices are closer to that required in a competitive gas market. Long run netback prices:

- Ensure export capital is recovered through export sales, not through sales to domestic customers

- Provide globally competitive gas for domestic users, particularly in trade exposed industries

[3] Averaging over 24 months removes short-term volatility; a different average period would provide a different result

- Provide the right incentive price for new LNG growth capital investment

In other markets, including the US, a different market structure means that capital needed to export is paid for by tolling arrangements for export facilities, while gas prices for consumers, producers and exporters alike reflect long-run competitive gas-on-gas pricing.

Moving to a long run netback calculation would result in a lower domestic marker price, as illustrated in Exhibit 4. Notwithstanding this, our analysis of Federal Government-commissioned estimates of Australia's gas reserves – including but not limited to reserves owned or contracted by LNG exporters – suggests that these prices would be sufficient to incentivise production and development of 2P reserves. For example, Exhibit 5 illustrates that:

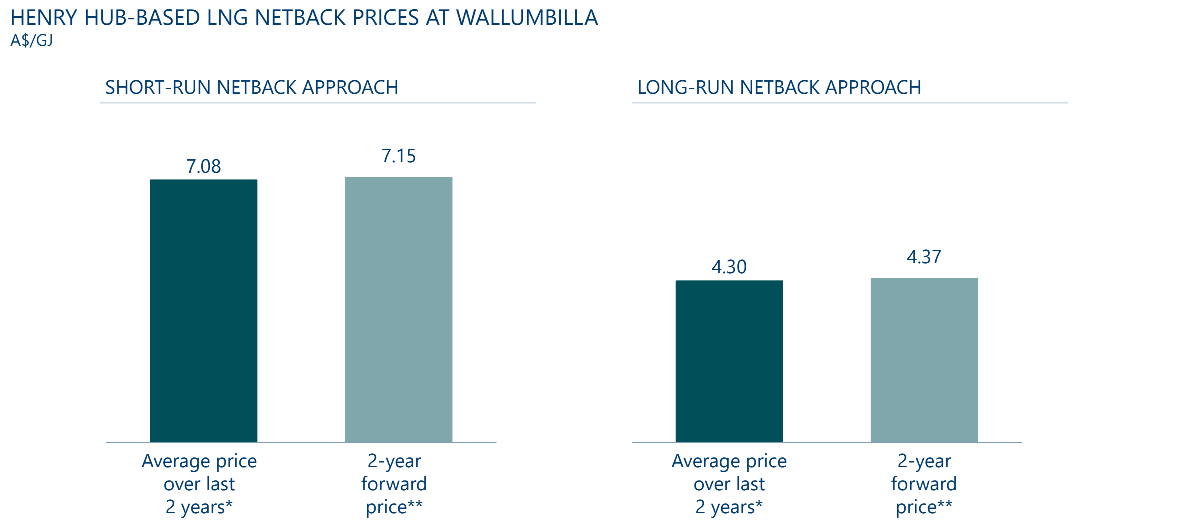
- ~15,000 PJ of gas could be brought on at current Henry Hub-linked long run netback prices of A$4.30/GJ

- ~26,000 PJ could be brought on at long run netback prices of A$5.52/GJ, representing 1 standard deviation above historical Henry Hub-linked long run netback prices

These quantities are many times larger than the annual volume of domestic gas consumption, representing approximately 25 to 40 years' worth of annual east coast consumption.

Furthermore, it is estimated that a long run netback calculation has only a minor impact on the returns of current LNG producers (based on analysis of public information only).

Exhibit 4

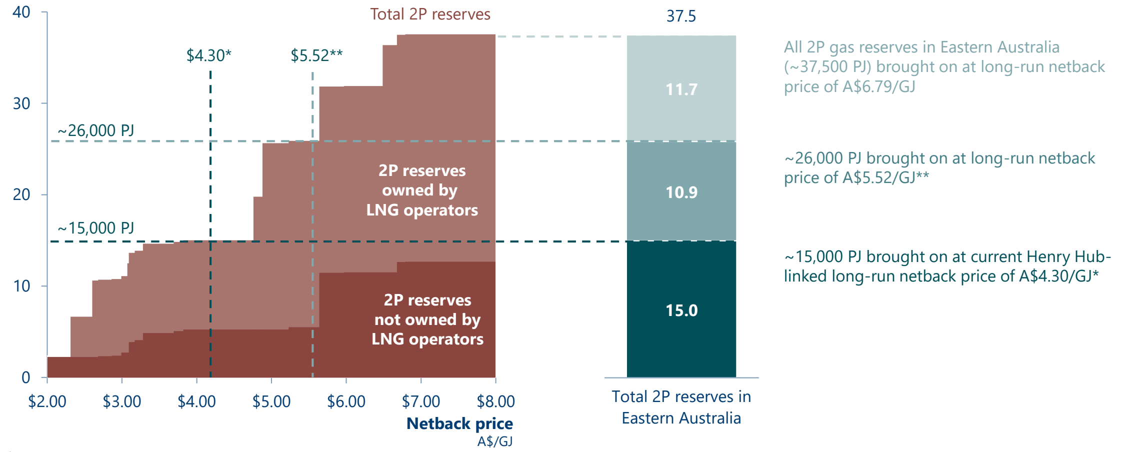


* Based on Henry Hub 2-year average to April 2021 of US$2.32/MMBtu
** Based on Henry Hub 2-year forward price of US$2.35/MMBtu (as at 7 April 2021) and linear regression of last 2 years of Henry Hub prices against calculated netback prices
Source: Bloomberg; CME Group; U.S. Energy Information Administration; EY PJP analysis

Exhibit 5

POTENTIAL ECONOMIC EAST COAST GAS PRODUCTION VS. NETBACK PRICING LEVELS (AT WALUMBILLA)***

Thousand PJ of 2P gas reserves in Eastern Australia offering economic returns on capital



* A$4.30/GJ represents 2-year historical Henry Hub-linked long-run netback price
** A$5.52/GJ represents 1 standard deviation above 2-year historical Henry Hub-linked long-run netback price
*** Based on buyer's alternative pricing per ACCC framework

Source: "Gas Reserves and Resources and Cost Estimates, Eastern Australia, NT", Nov 19 Core Energy & Resources; "Gas Inquiry 2017-2025, Jan 2021 Interim Report", ACCC

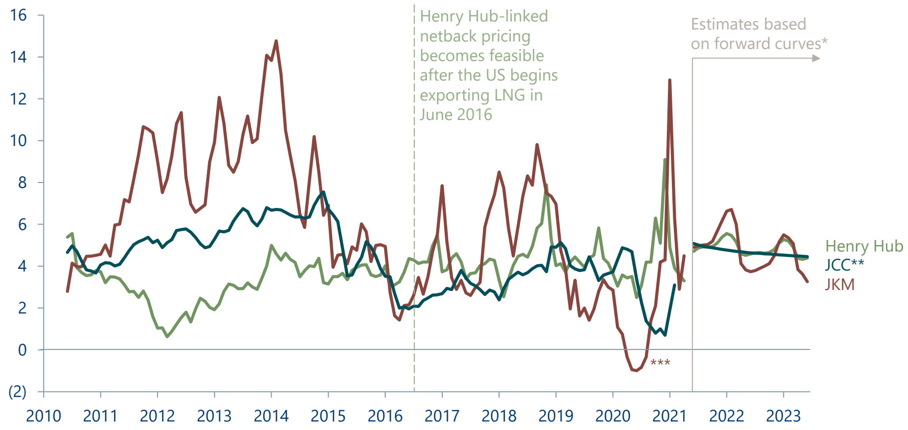
3. **Production and transport cost assumptions should align with up-to-date, reliable published numbers.** Many published estimates of netback prices do not use more recent assumptions, including latest estimates for LNG plant efficiencies and pipeline transport costs where available (rather than, for example, 2017 figures). Shipping costs should also use Henry Hub, rather than JKM prices to be consistent.

   These changes are estimated to lower netback price calculations by ~A$0.30/GJ compared to the ACCC published netback.

Based on these three changes, Exhibit 6 compares the Henry Hub-based long run netback gas price at Wallumbilla with a marker based on JKM and JCC (Japan Crude Cocktail). This illustrates that these netback prices have been converging since the US began exporting LNG in June 2016, and that current forward curves imply that Henry Hub remains at the higher-end of alternative price markers.

Exhibit 6

ESTIMATED LONG-RUN NETBACK PRICE AT WALLUMBILLA
A$/GJ



* Based on forward prices as at Apr 7 2021 and linear regression of last 2 years of Henry Hub prices against calculated netback prices
** S-curve adjustment for oil-linked price marker applied (kink points applied constantly at US$40/bbl and US$65/bbl, while annual slope of central section ranged from 11.1%-14.6% based on data from the International Gas Union with outer slopes set at 50% of the central slope); JCC freight assumed equal to JKM freight based on historical correlation
*** JKM hit a historic low of US$1.86 /MMBtu in May 20 due to impact of COVID-19 on demand, followed by a price spike in Jan 21 due to cold weather and supply issues in Asia
Source: Bloomberg (historical); CME Group (forward curves); ACCC; publicly available information from Origin and Santos; Oxford Institute for Energy Studies; Macquarie Research; Core Energy; AER; EY PJP Analysis

Combined, the three changes would deliver a domestic gas price marker that:

- Is compatible with future global industry structure, both upstream and downstream
- Allows for appropriate returns along the entire value chain
- Is easy to monitor

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