



Submission Appendix

This appendix to Qenos' submission to the ACCC Netback Price Series Review is based on independent research commissioned by Qenos and jointly supported by Incitec Pivot Limited and Orica Limited to help broaden discussion on global gas trends and an Australian Domestic Netback Price series.

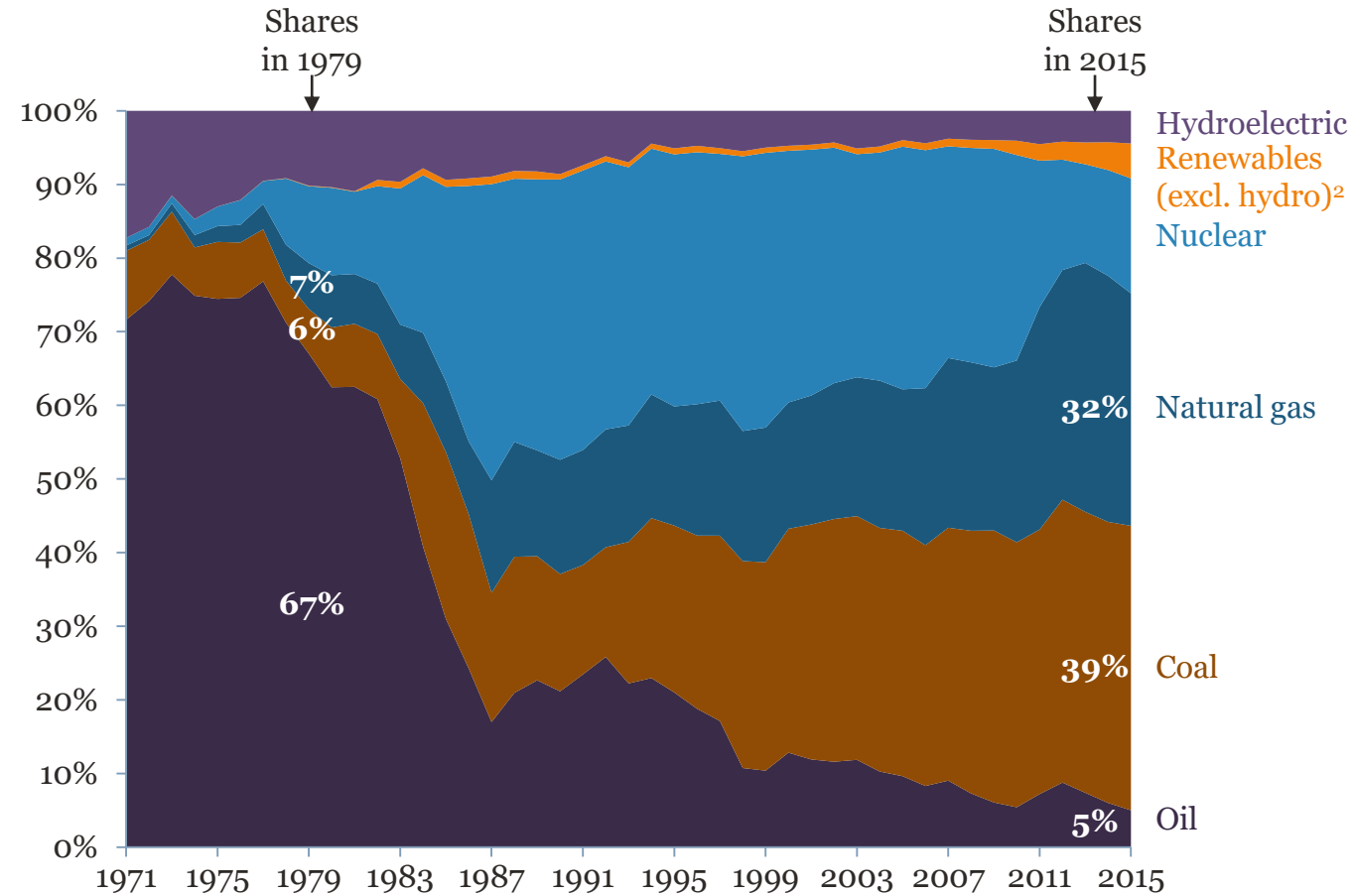


Incitec Pivot Limited
INNOVATION ON THE GROUND

ELECTRICITY SHARE BY FUEL SOURCE – JAPAN & KOREA¹

Long-term oil-indexation is now much less relevant for the supply of LNG gas in East Asia

Percentage of total electricity production



¹ Simple average of Japanese and South Korean energy data

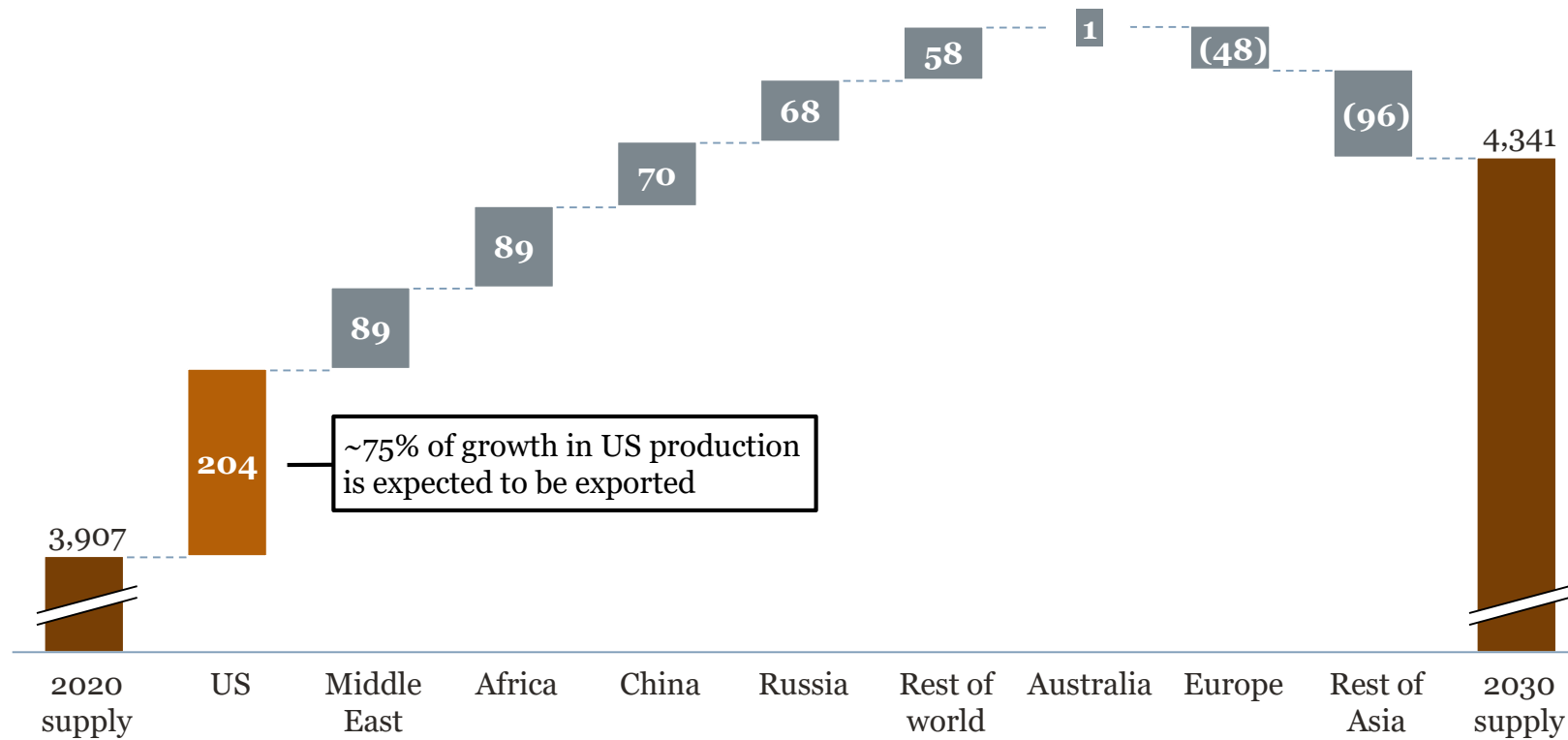
² Other renewables include biomass, wind, solar, geothermal, and marine power

Source: IEA via Our World in Data; "Trends in LNG Supply Contracts and Pricing Disputes in the Asia Pacific Region", Oil, Gas & Energy Law Intelligence, May 2020; GIIGNL Annual Reports 2008-2020

FORECAST OF GLOBAL GAS SUPPLY GROWTH BY REGION

The US is forecast to provide almost half of global gas supply growth by 2030

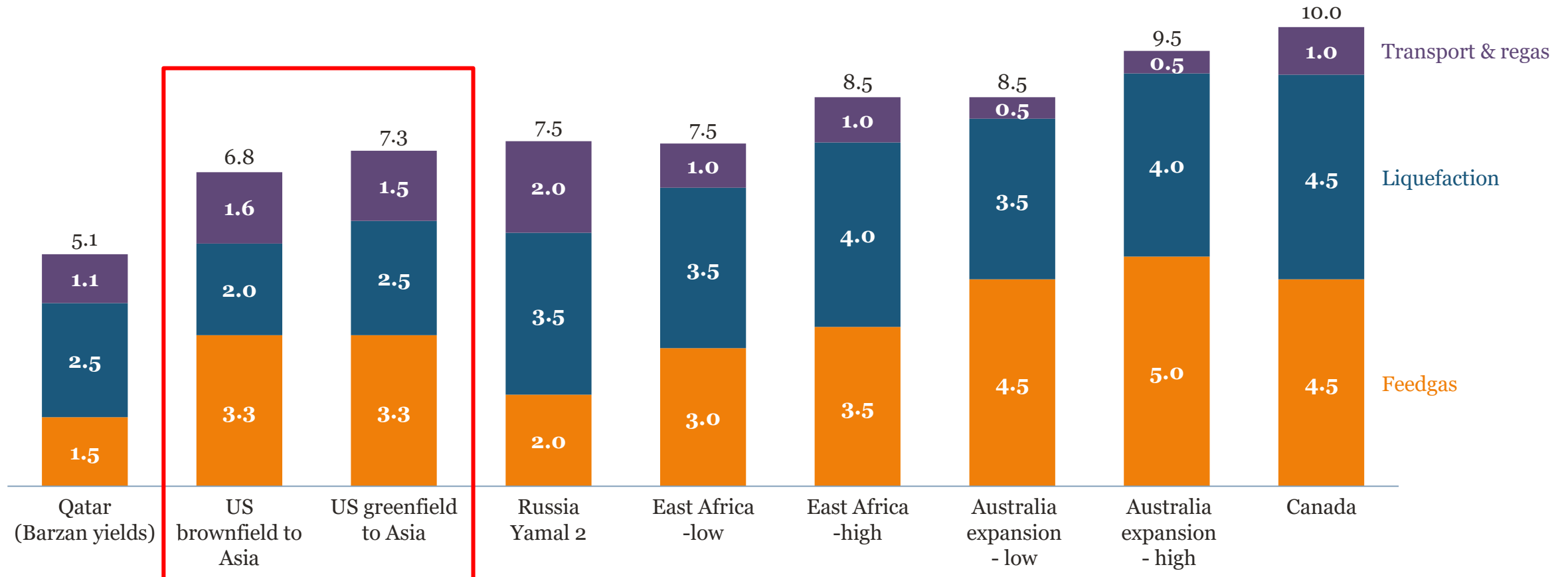
Total supply or growth in supply, billion cubic metres



ESTIMATED COSTS OF NEW LNG PROJECTS, 2017

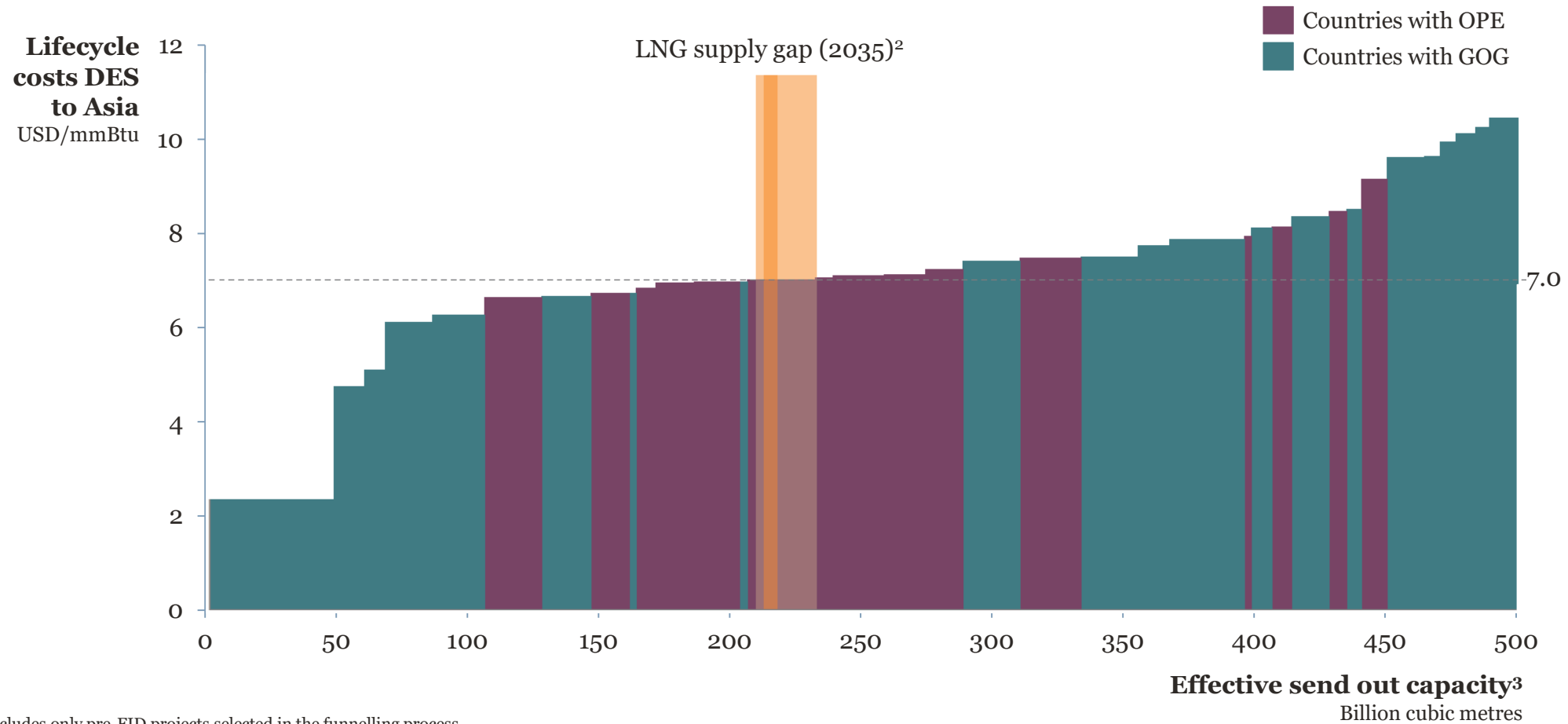
The growth in US exports is underpinned by low-cost shale gas production and lowest-cost liquefaction costs

US\$/MMBtu



GLOBAL LNG COST CURVE OF THE FUTURE¹

Large blocks of US supply are expected to set the long-term market clearing price for LNG globally



¹ Includes only pre-FID projects selected in the funnelling process

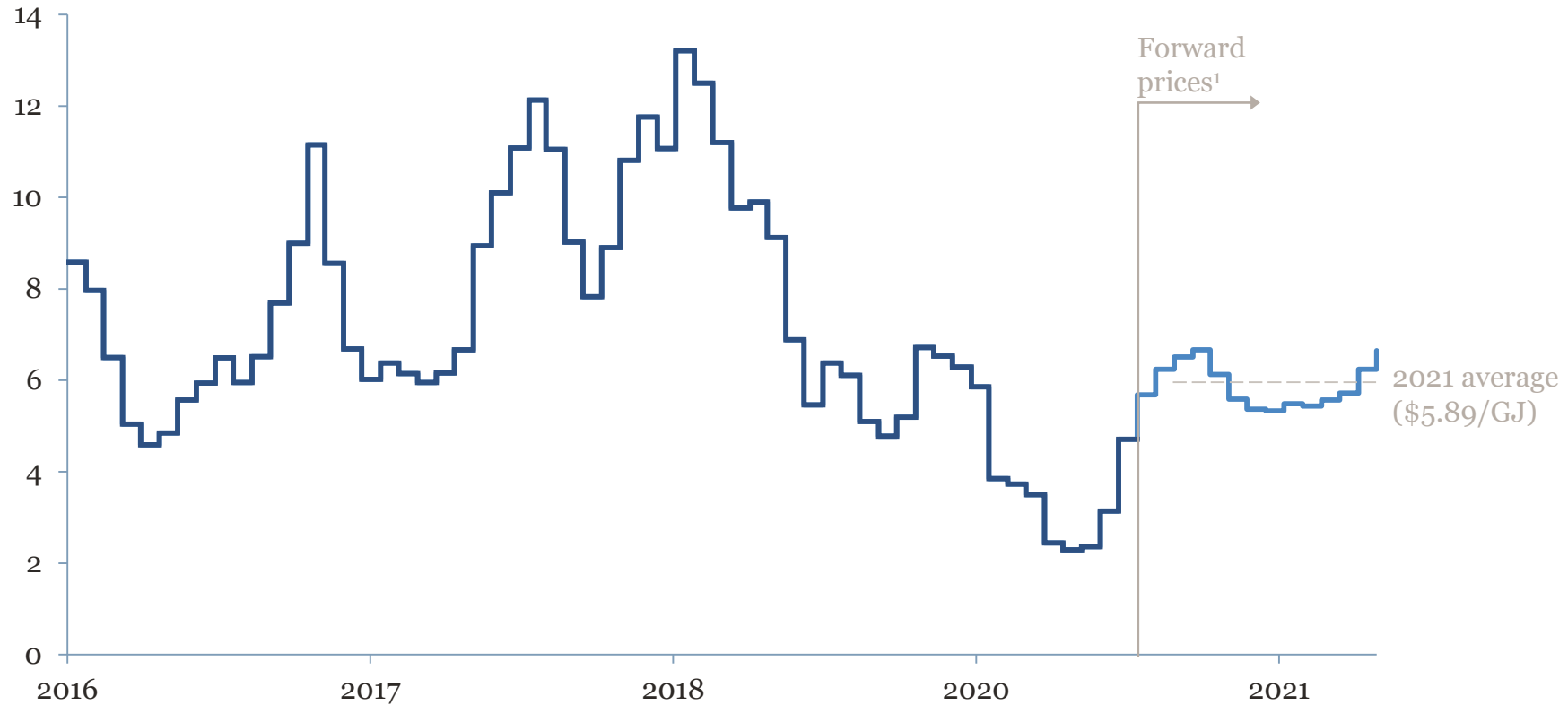
² Based on expected demand minus available post-FID and existing LNG capacity in 2035 (reference case +/- 5%)

³ Nameplate capacity x 50% in year 1 of operations and x 95% thereafter

Source: Energy Insights 'Global gas & LNG outlook to 2035' (H1 2019)

ACCC'S LNG NETBACK PRICE SERIES

The ACCC's forward LNG netback prices are expected to average ~A\$5.89/GJ in 2021
A\$/GJ



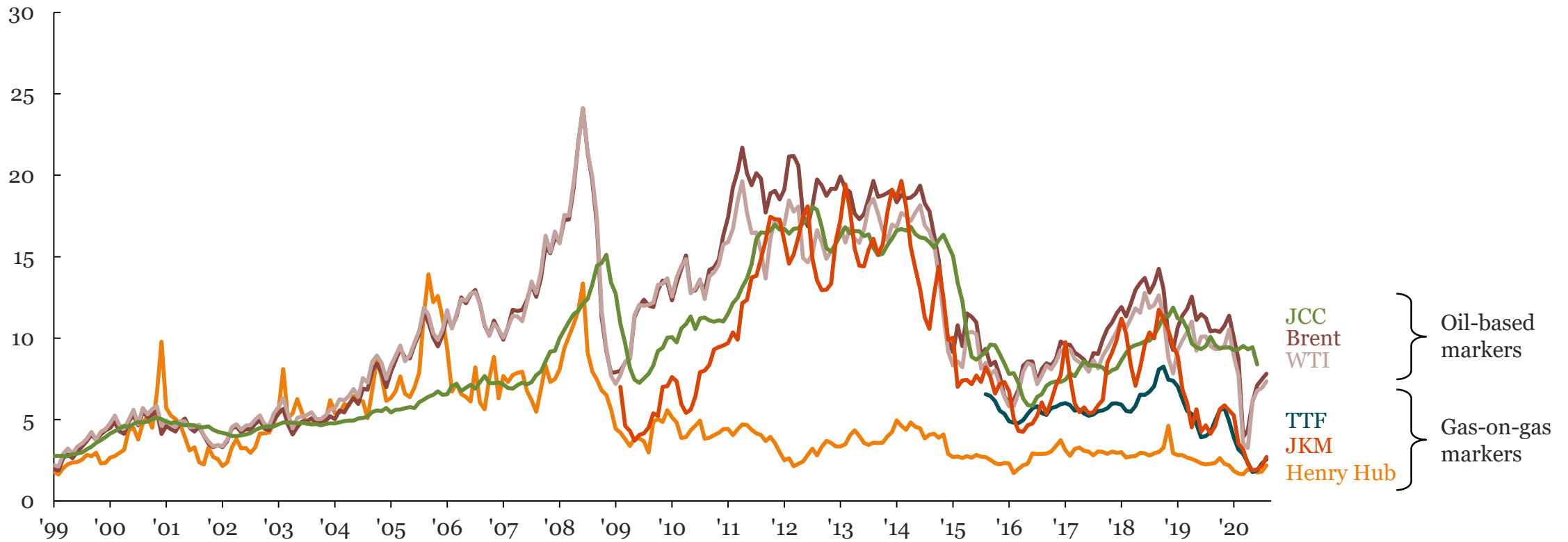
¹ At 30 Sep 2020

Source: ACCC Gas inquiry 2017-2025 LNG netback price series (1 Oct 2020)

SPOT PRICE OF ALTERNATIVE PRICE MARKERS^{1,2}

Henry Hub is a gas-on-gas price marker that has remained below and de-linked from other markers for over a decade

AU\$ per MMBtu



¹ HH: Henry Hub; TTF: Title Transfer Facility; WTI: West Texas Intermediate; JCC: Japan Customs-cleared Crude

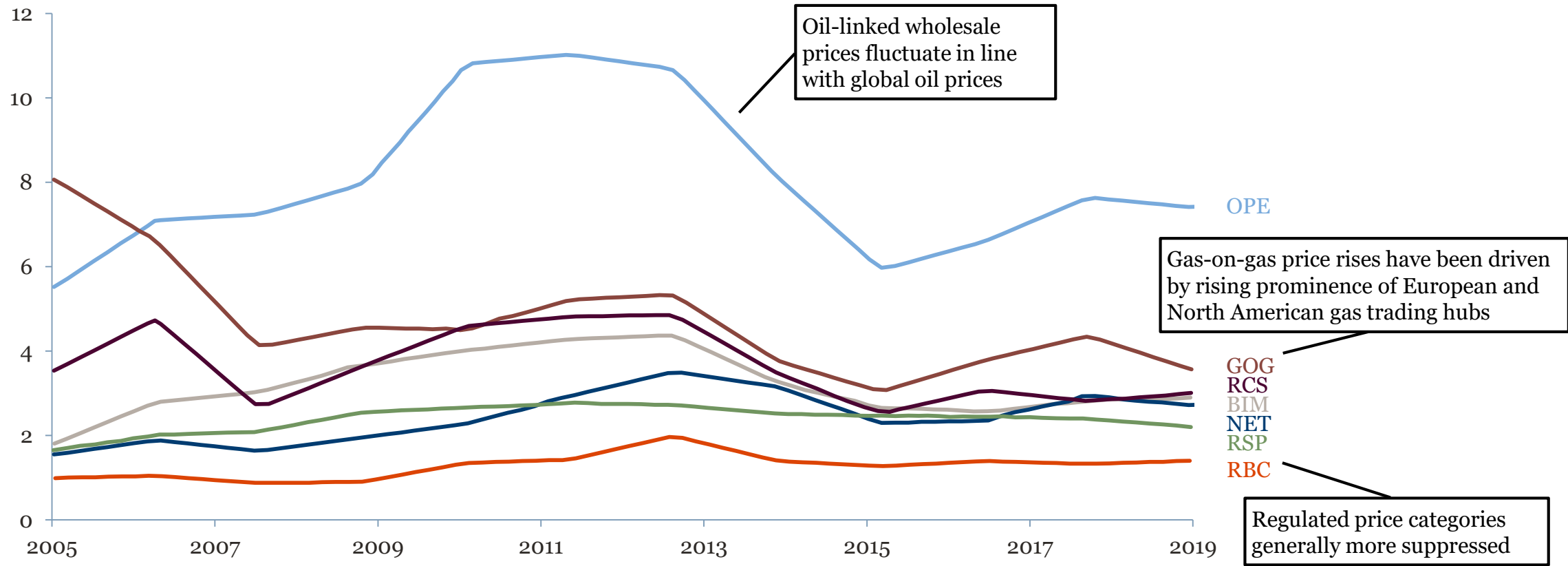
² Historical monthly exchange rate between AUD and USD was obtained by averaging the RBA's daily rate

Source: Bloomberg; Argus Media; CME Group; S&P Capital IQ; S&P Global Platts; Reserve Bank of Australia

WHOLESALE PRICE LEVELS BY PRICE FORMATION MECHANISM

Oil-linked prices are showing a disconnect with the rest of the global gas market

US\$ per mmBtu



Note: OPE = oil price escalation, GOG = gas on gas competition, BIM = bilateral monopoly, NET = netback from final product, RCS = regulation: cost of service, RSP = regulation: social and political, RBC = regulation: below cost, NP = no price

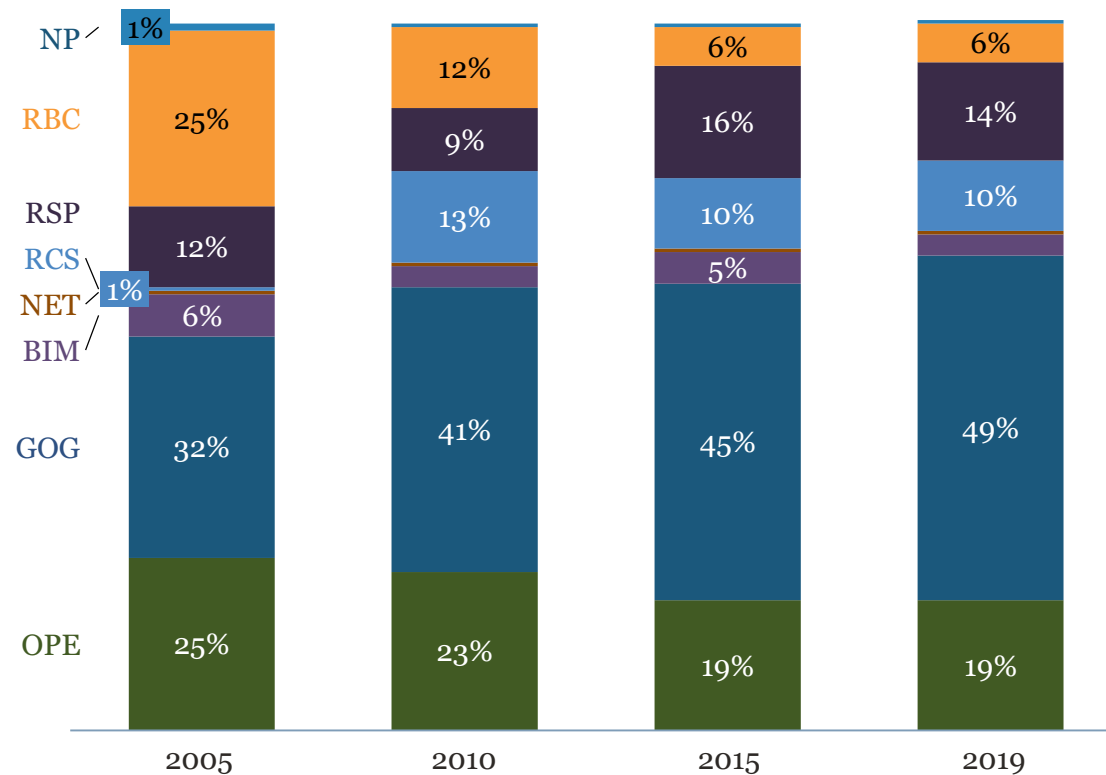
Source: IGU Wholesale Gas Price Survey 2020 Edition (Jun 2020)

GROWTH OF GOG¹ PRICE FORMATION

As global markets have become more liberal, hub/market-based gas pricing (GOG) has grown while oil-linked indexation pricing (OPE) has declined

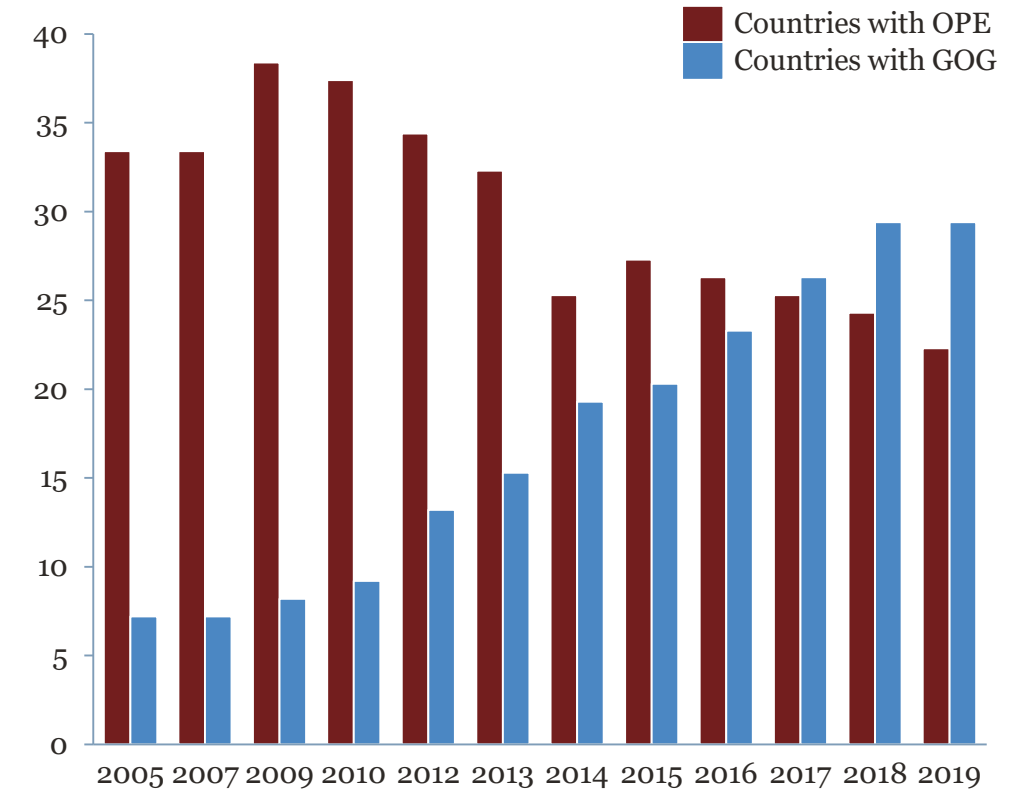
WORLD PRICE FORMATION¹ – TOTAL CONSUMPTION

Percentage of total consumption²



USE OF OPE¹ VS GOG¹ AS MAJORITY MECHANISM

Numbers of countries



¹ OPE = oil price escalation, GOG = gas on gas competition, BIM = bilateral monopoly, NET = netback from final product, RCS = regulation: cost of service, RSP = regulation: social and political, RBC = regulation: below cost, NP = no price

² May not sum to 100% due to rounding

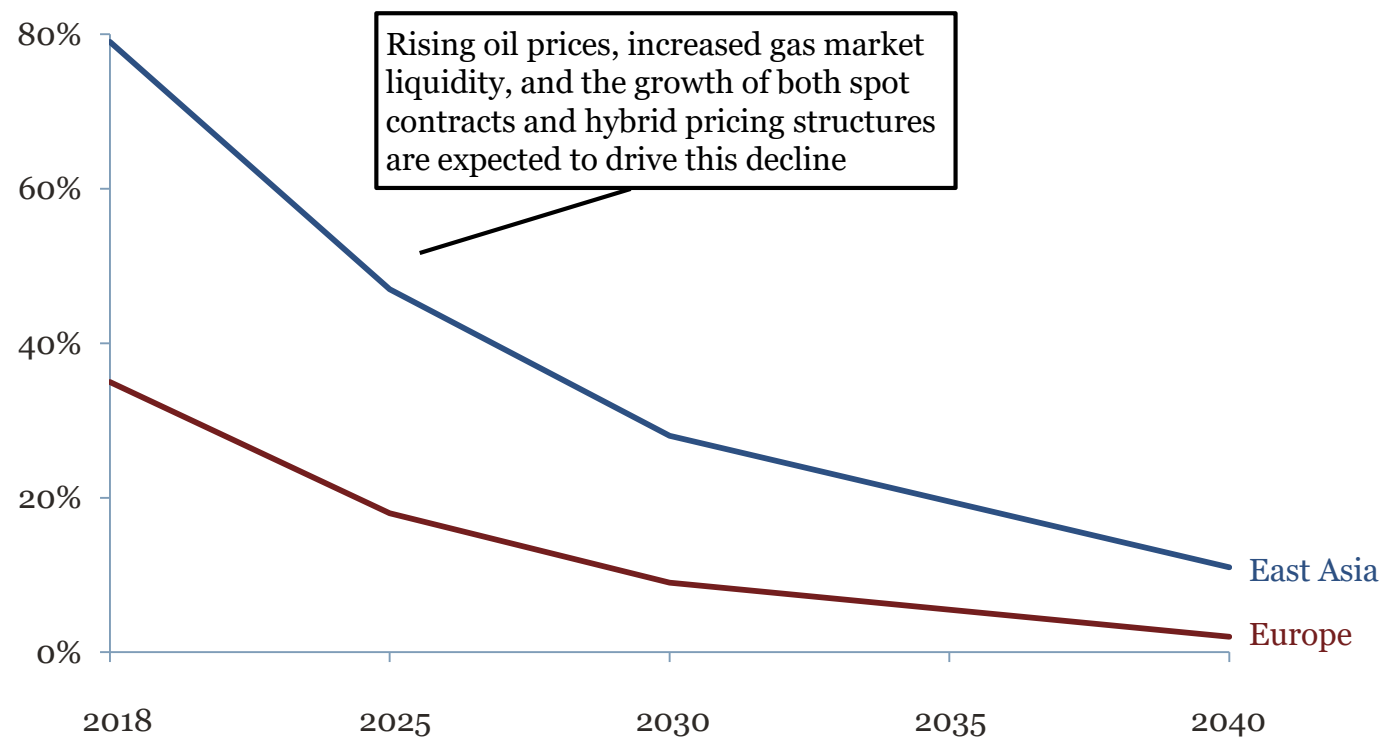
Source: IGU Wholesale Gas Price Survey 2020 Edition (Jun 2020)

FORECAST PRICE FORMATION IN LNG CONTRACTS – STATED POLICIES SCENARIO¹

Pure oil indexation is expected to decline rapidly in new LNG contracts

PURE OIL INDEXATION IN NEW IMPORT CONTRACTS²

Percentage of regional contracts



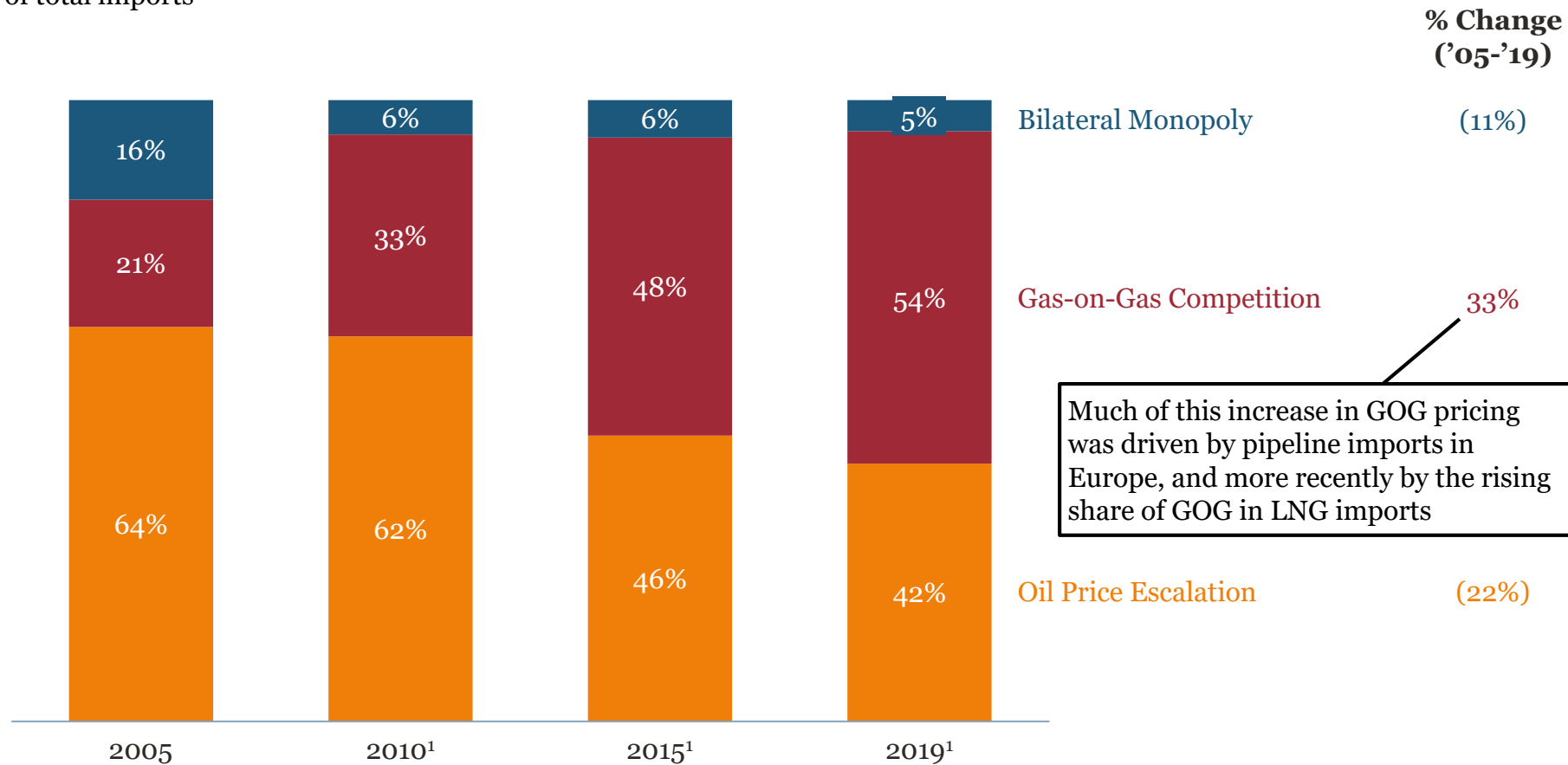
¹ Scenario incorporates policies and measures that governments have already put in place, as well as the effects of announced policies, as expressed in official targets and plans

² Pure indexation occurs when >80% of the price of gas sold under a sales contract is determined through a linkage to the price of crude oil or oil products

GLOBAL GAS PRICE FORMATION

Gas-on-gas pricing has increased as a proportion of total global gas imports while oil-linked pricing has declined

Percentage of total imports



¹ Excludes a negligible proportion of Regulation: Cost of Service pricing on the Nigeria to Ghana pipeline

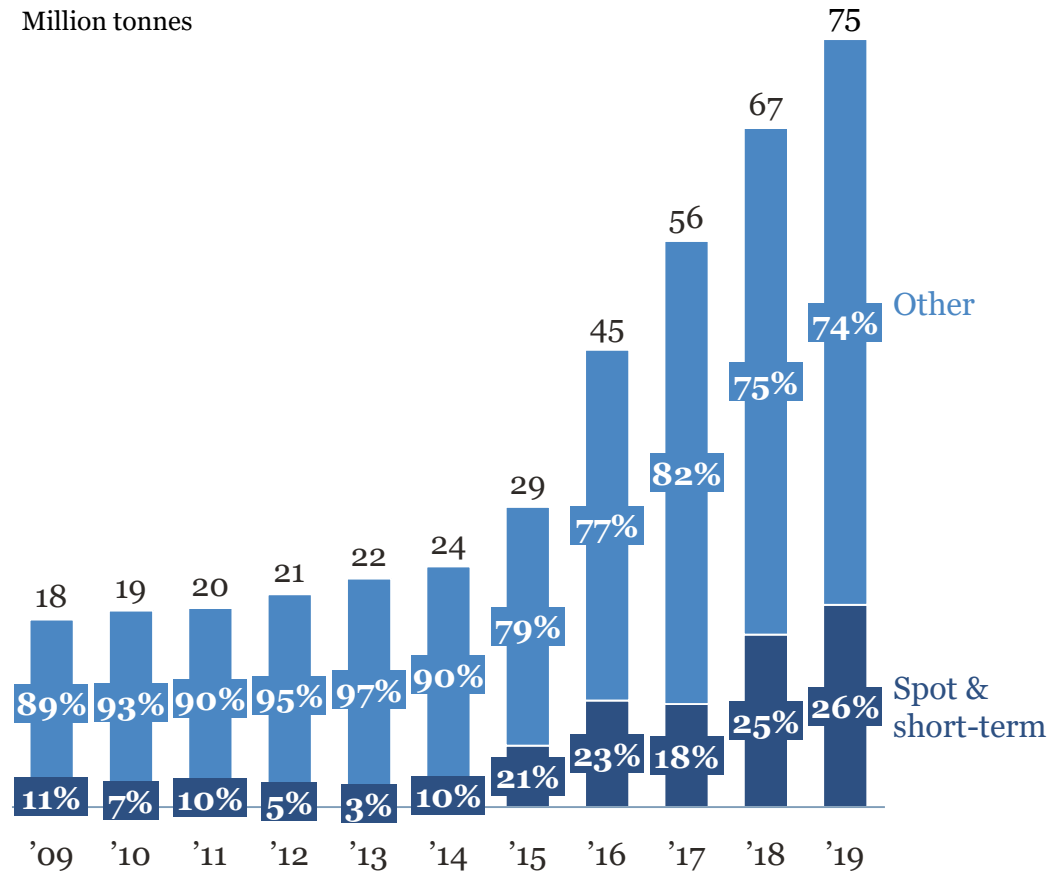
Source: IGU Wholesale Price Survey 2020 Edition

LNG TRADE BY TYPE

The trend towards gas-on-gas competition has been reflected in the growth in spot and short-term transactions

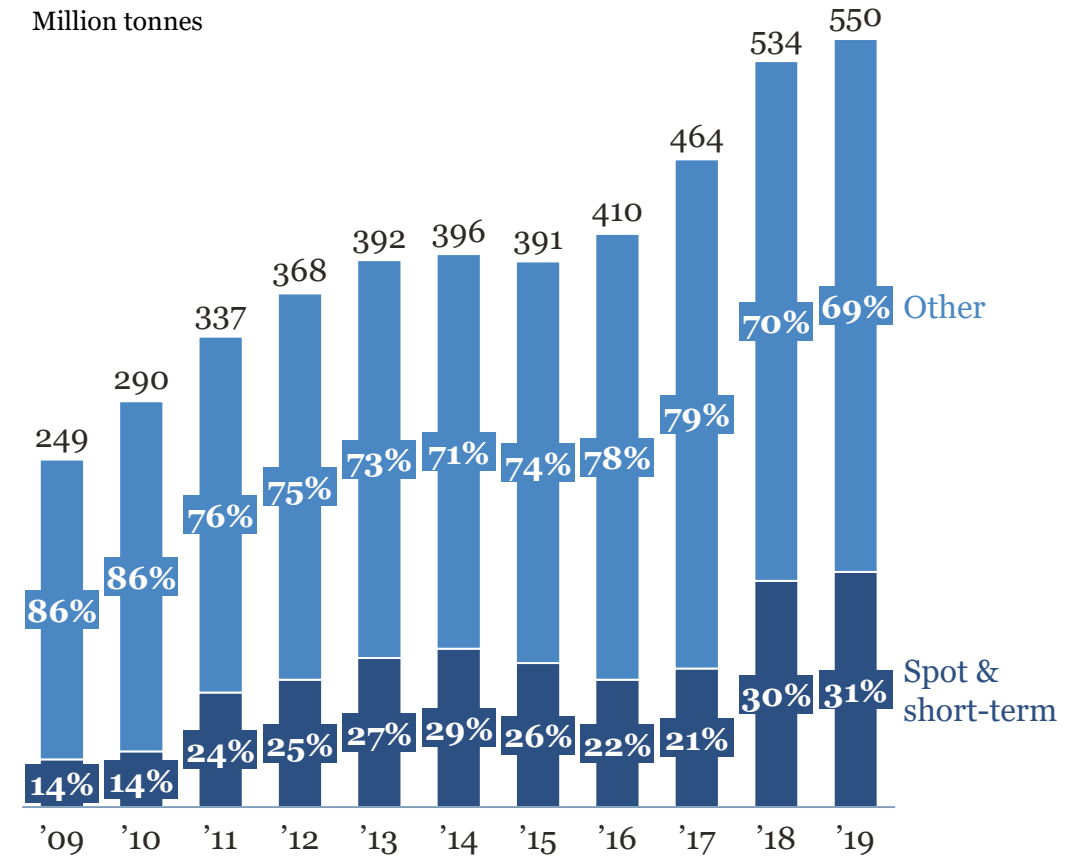
LNG EXPORTS FROM AUSTRALIA¹

Million tonnes



ASIA LNG NET IMPORTS¹

Million tonnes



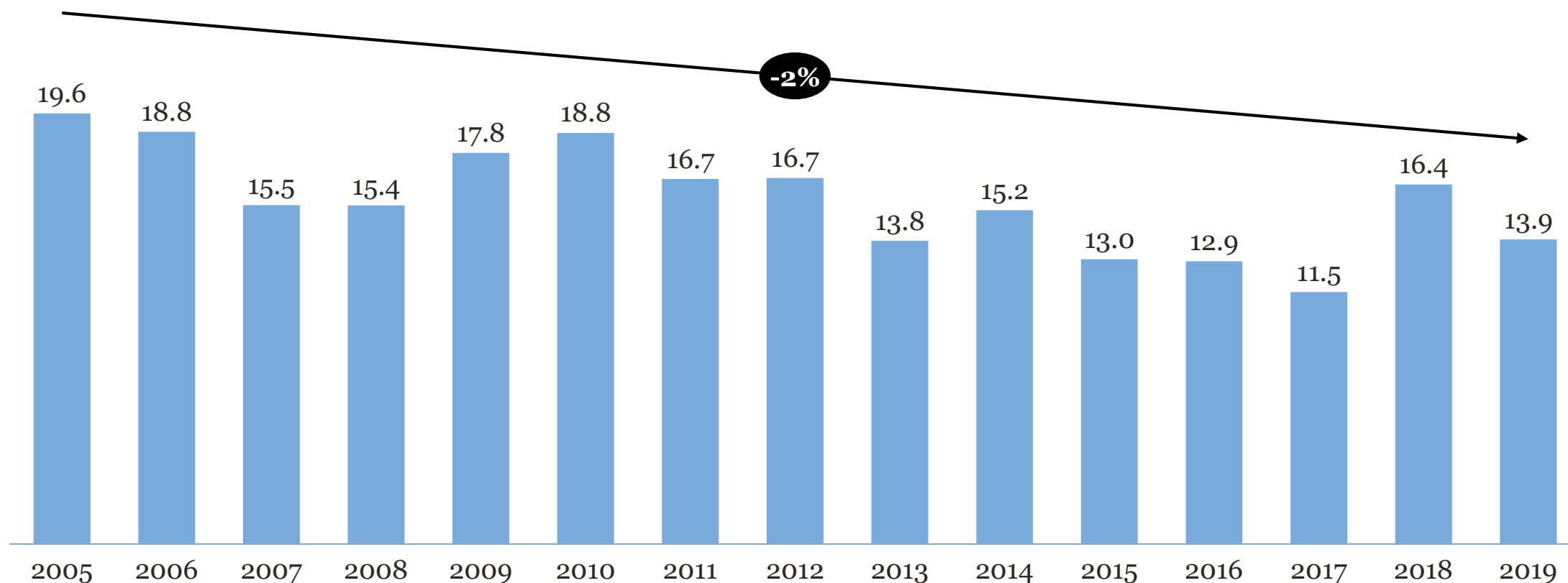
¹ Spot and short-term quantity as a percentage of total quantity was calculated based on cubic meter liquid data for 2009 and 2010, and million tonne data from 2010 onwards

Source: GIIGNL Annual Report 2008-2020

AVERAGE DURATION OF CONCLUDED LONG AND MEDIUM TERM¹ LNG CONTRACTS

The duration of longer term LNG contracts has decreased over the last 15 years

Number of years



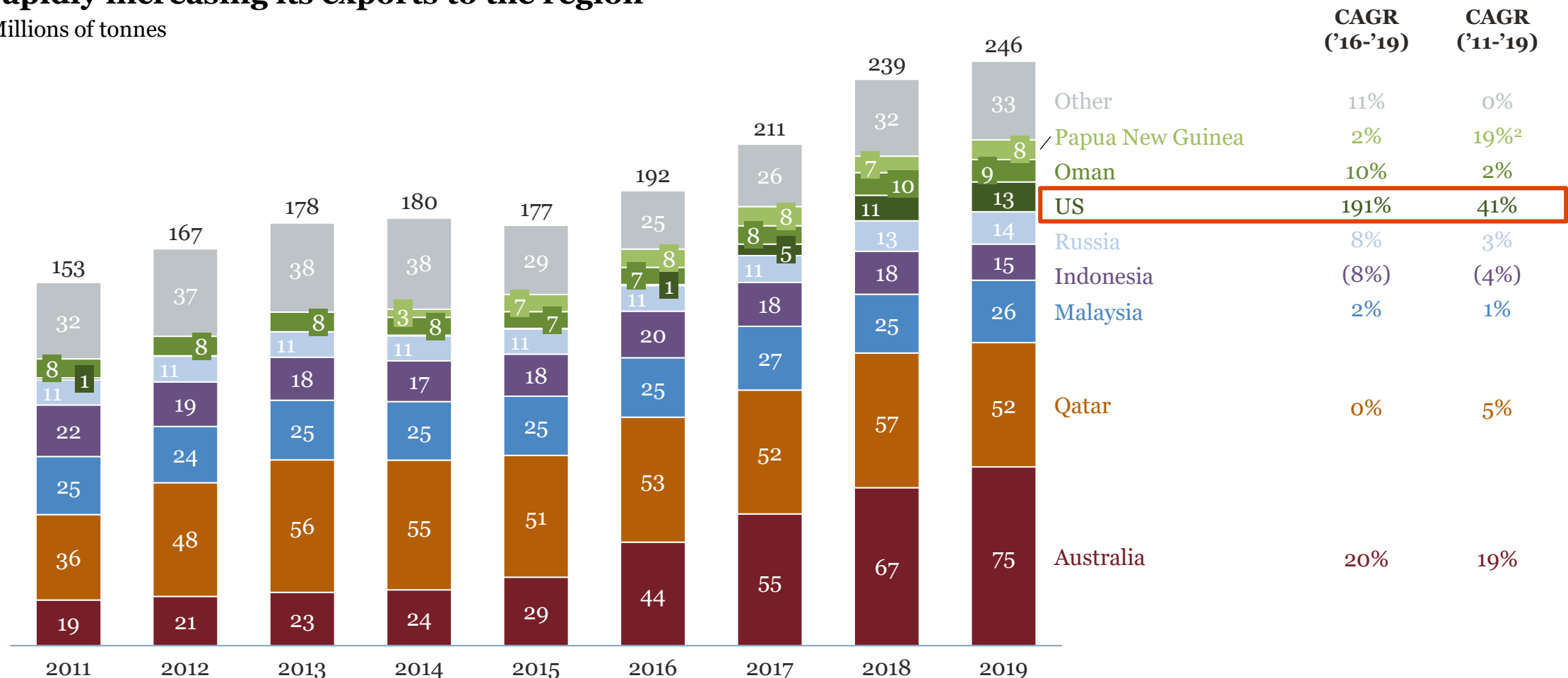
¹ Long and medium term contracts are categorised as those longer than 4 years

Source: GIIGNL Annual Reports / Publications, 2004-2020

NET LNG EXPORTS TO ASIA BY SOURCE¹

While Australia has been the largest growing supplier of LNG to Asia in recent years, the US has been rapidly increasing its exports to the region

Millions of tonnes



¹ Volume of loaded re-exports netted out of total imports

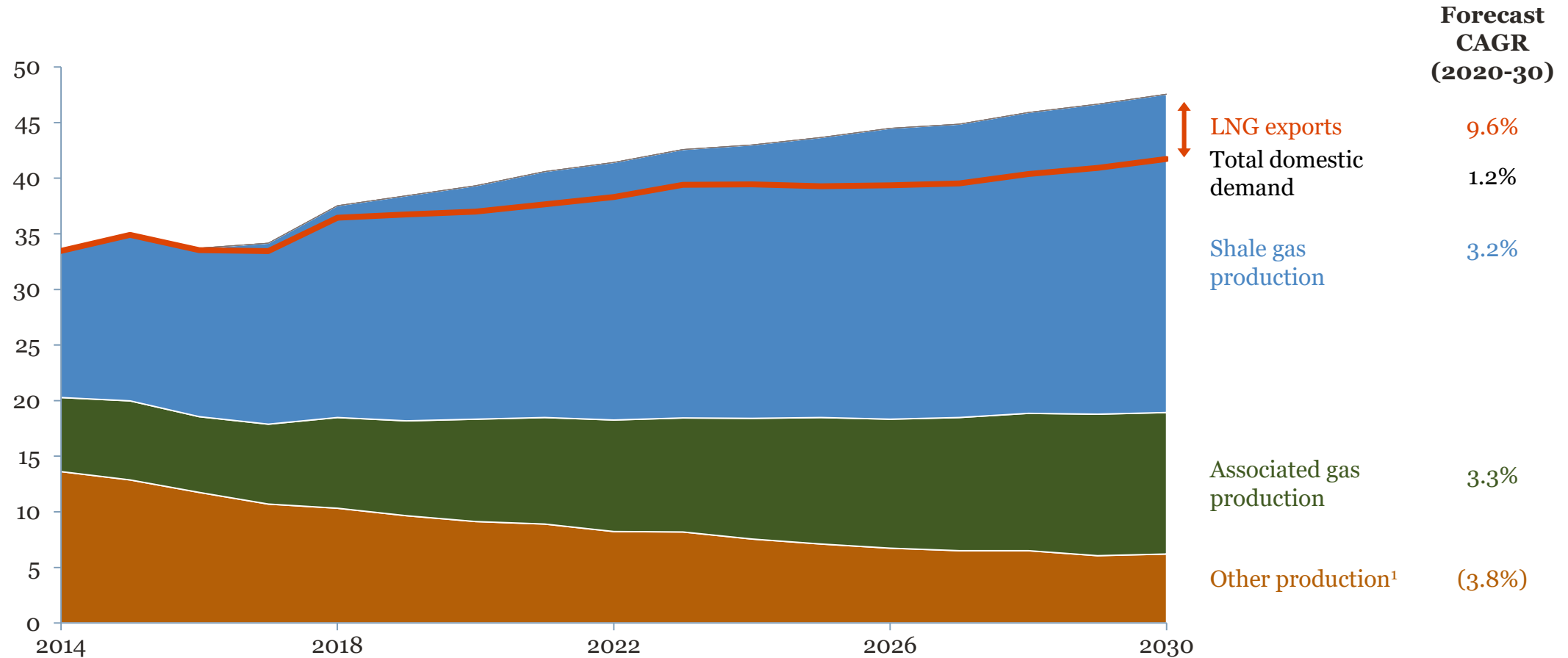
² CAGR from 2014 due to unavailable data prior to 2014

Source: GHIGNL Annual Reports / Publications, 2011-2020

U.S. GAS CONSUMPTION VS. PRODUCTION BY TYPE

LNG exports are forecast to absorb most of the growth in shale and associated gas production in the U.S.

Trillion cubic feet per year

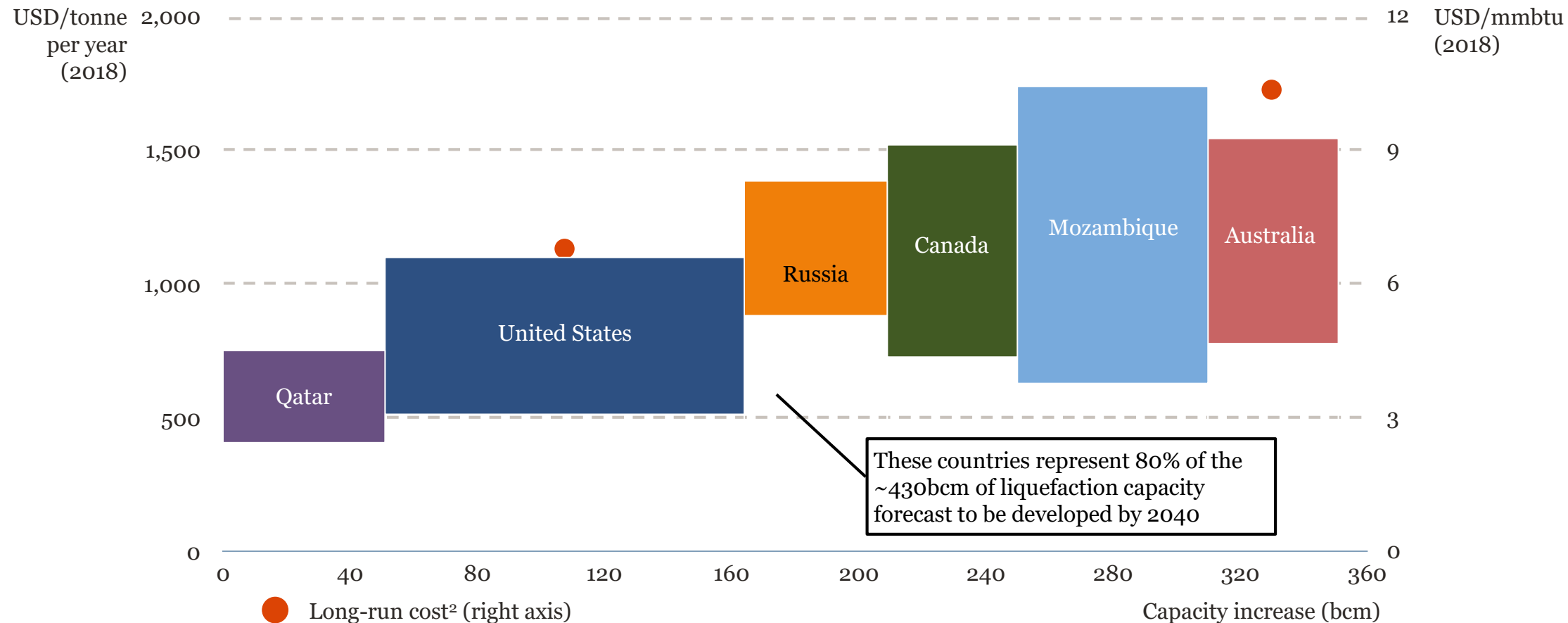


¹ Includes tight and CBM production, conventional gas basins, and production offshore and in Alaska

Source: U.S. Energy Information Administration; McKinsey's North America Gas Outlook to 2030 (H1 2019)

INVESTMENT COST RANGES FOR LIQUEFACTION CAPACITY – STATED POLICIES SCENARIO¹, 2018-40

Australia’s long-run cost of LNG supply is forecast to exceed the costs of other nations investing in major LNG export capacity



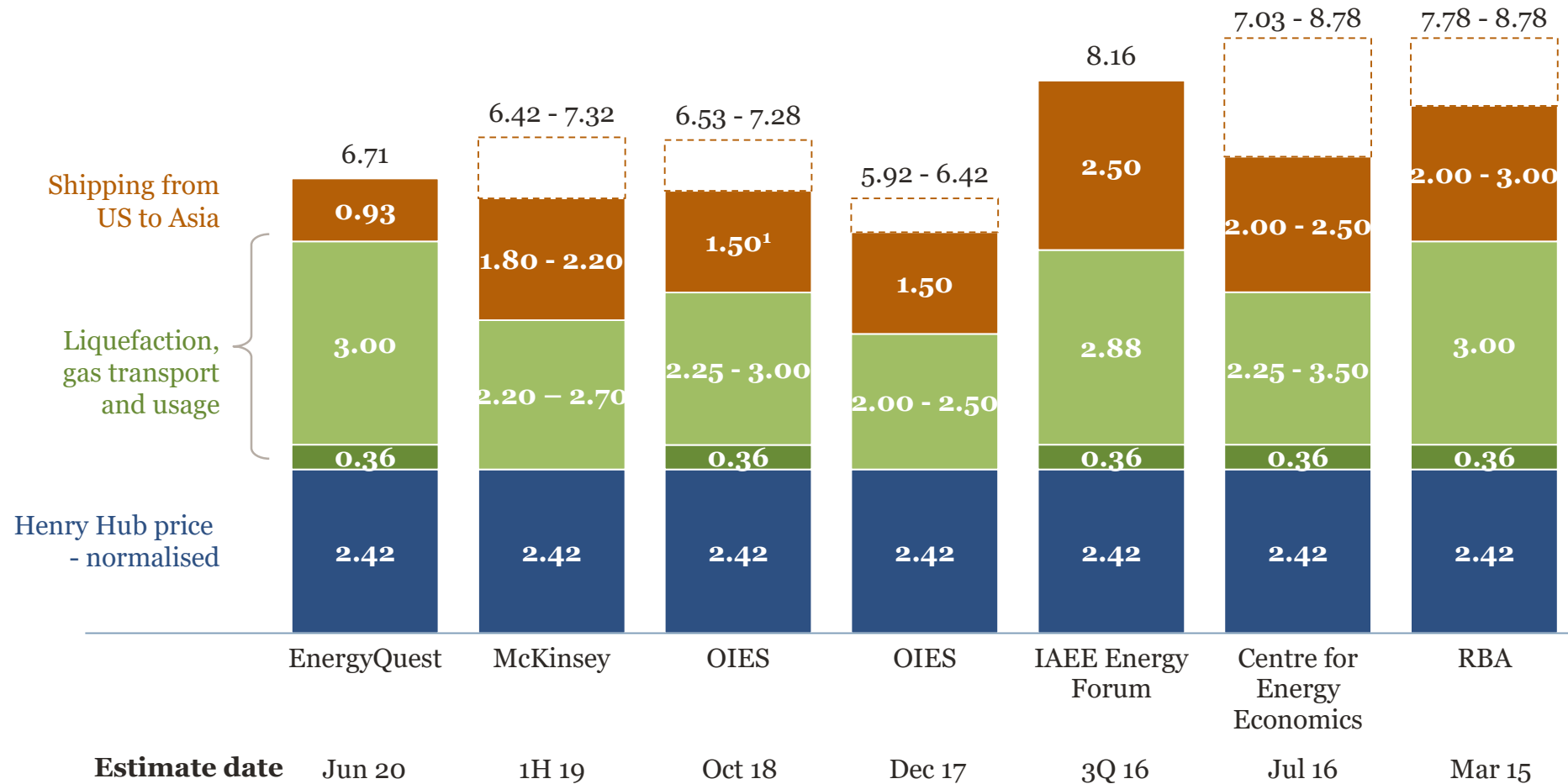
¹ Scenario incorporates policies and measures that governments have already put in place, as well as the effects of announced policies, as expressed in official targets and plans

² Long-run cost equals the weighted average costs in each country of developing gas resources, building liquefaction terminals and shipping the total LNG volumes delivered over the projection period, and assumed asset lifetime is 30-years with a cost of capital in the range of 5-10%

HENRY HUB DES IN ASIA ESTIMATES

The assumptions for Henry Hub gas delivered in Asia sits within the range of estimates from other recent sources

USD per mmBtu



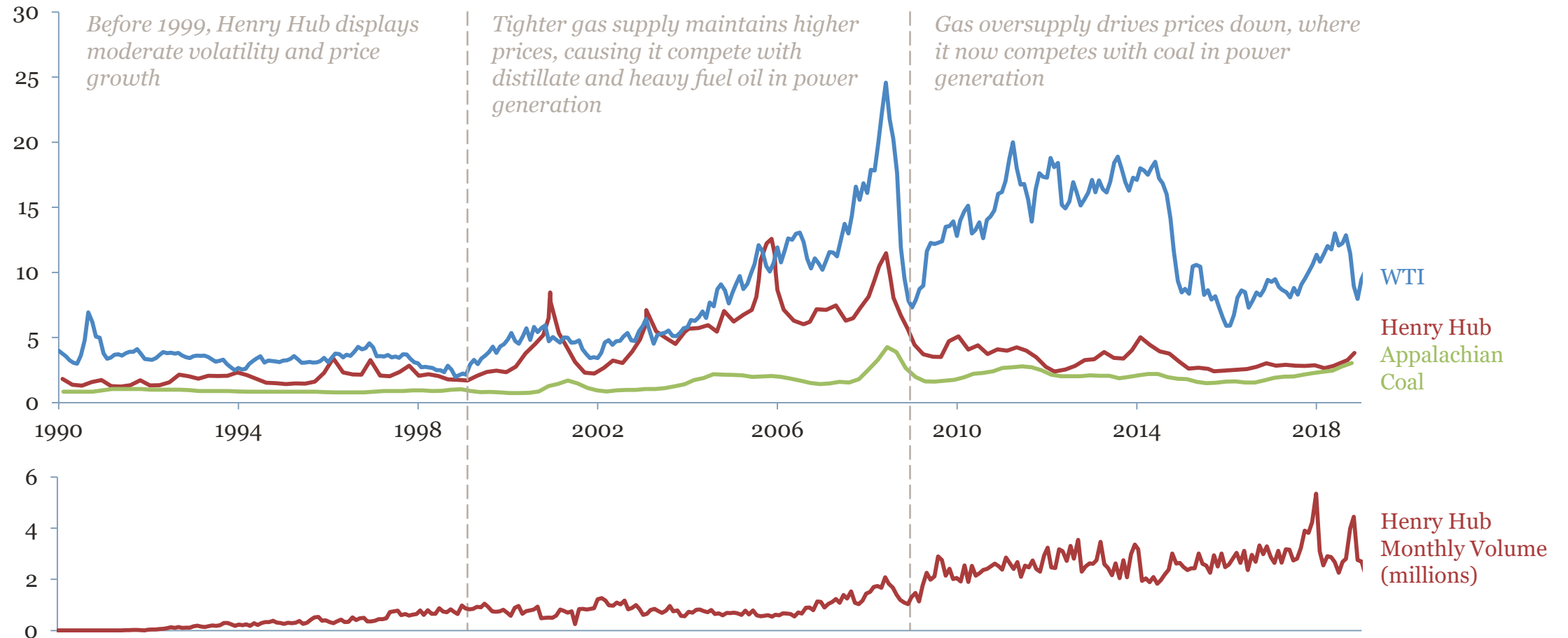
¹ Assumes same shipping cost as Dec 17 OIES report

Source: EnergyQuest; McKinsey; Oxford Institute for Energy Studies; International Association for Energy Economics Energy Forum; Centre for Energy Economics; RBA

U.S. FUEL PRICE COMPARISON

Henry Hub prices are no longer correlated with oil, and significantly less volatile

USD per million Btu

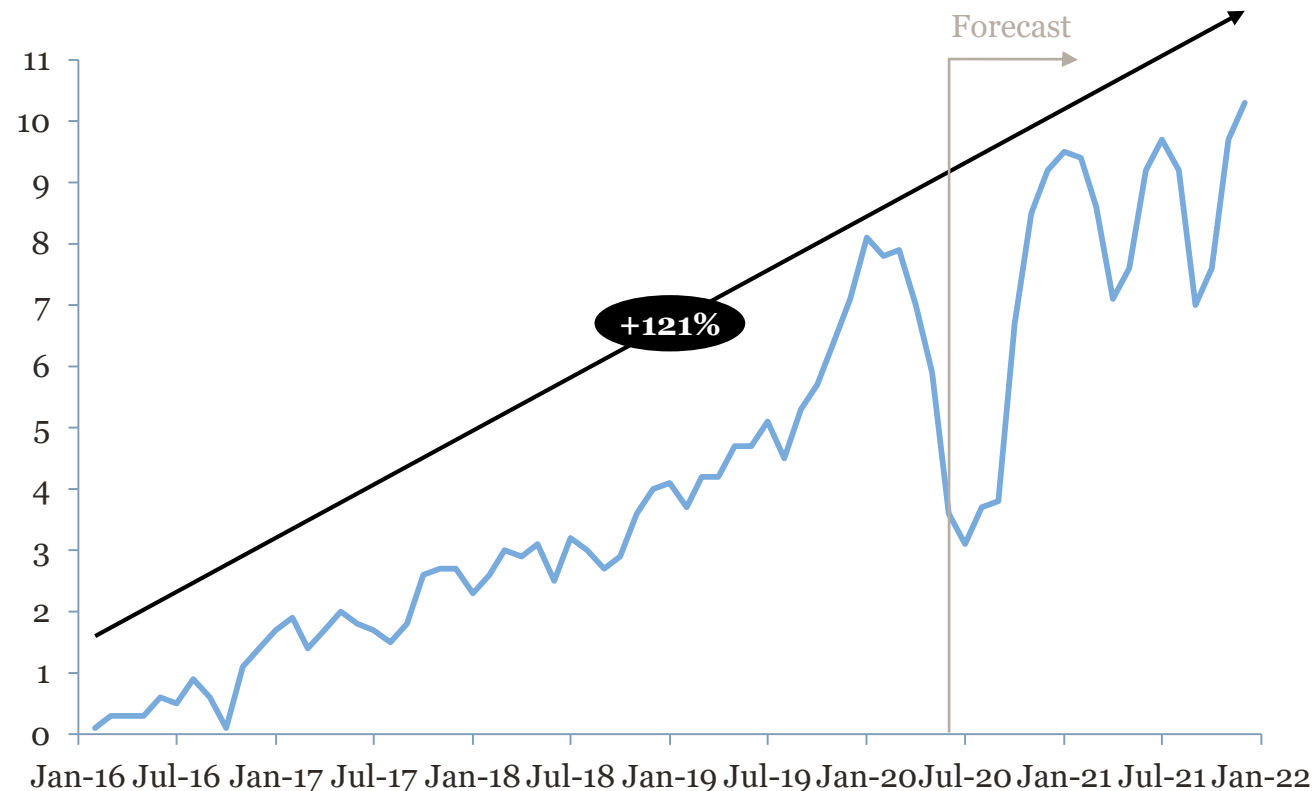


SEASONALITY OF U.S. LNG EXPORTS

Though U.S. LNG exports display some seasonality, it does not appear significant enough to depress the industry's strong ongoing growth

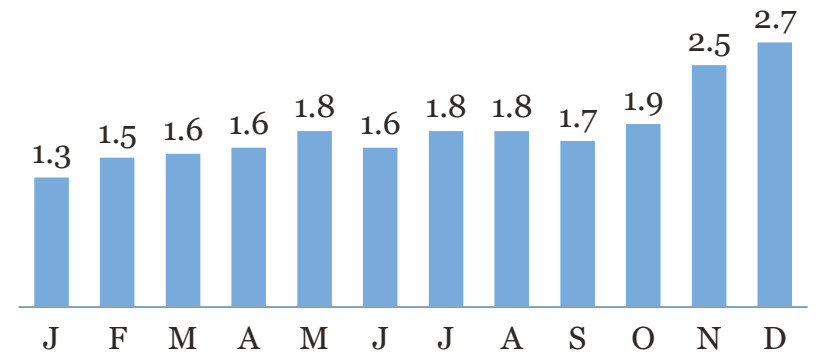
Billion cubic feet per day

MONTHLY LNG EXPORTS



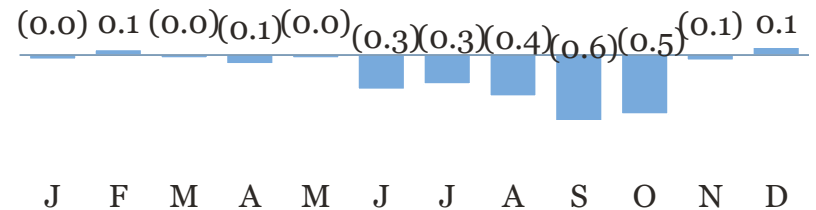
AVERAGE MONTHLY EXPORTS

2016 - 2018



GROWTH-ADJUSTED AVERAGE MONTHLY EXPORTS¹

2016 - 2018



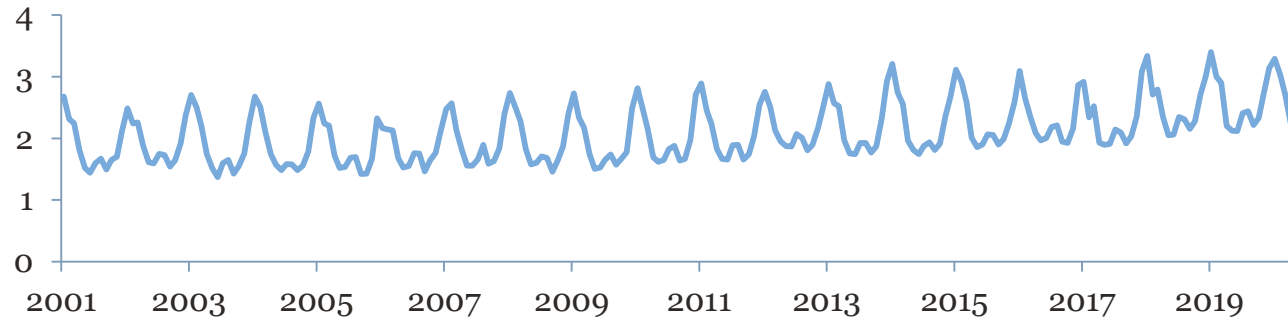
¹ Calculated as average monthly deviation from straight line growth between Jan-16 and Dec-18

U.S. GAS PRODUCTION AND CONSUMPTION – SEASONALITY

The pronounced seasonality of U.S. gas consumption has no apparent correlation with domestic production

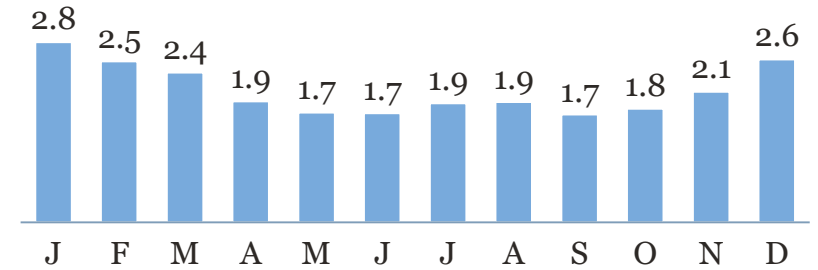
U.S. DOMESTIC GAS CONSUMPTION

Trillion cubic feet



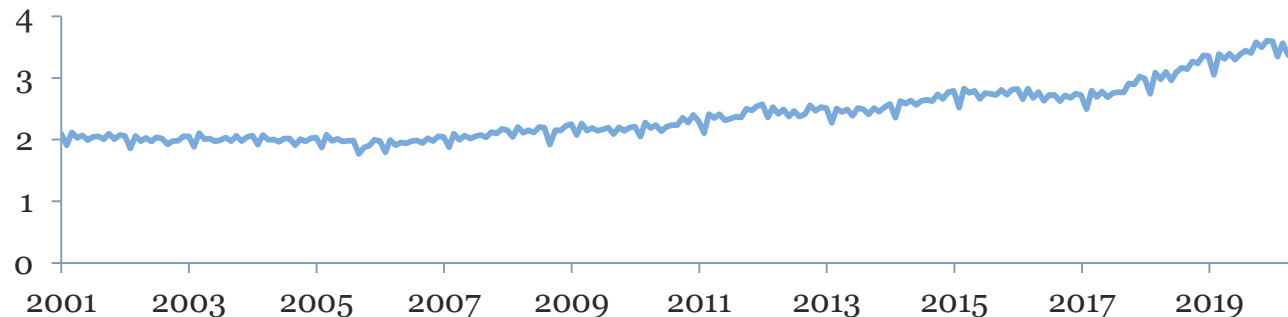
AVERAGE MONTHLY CONSUMPTION

Millions



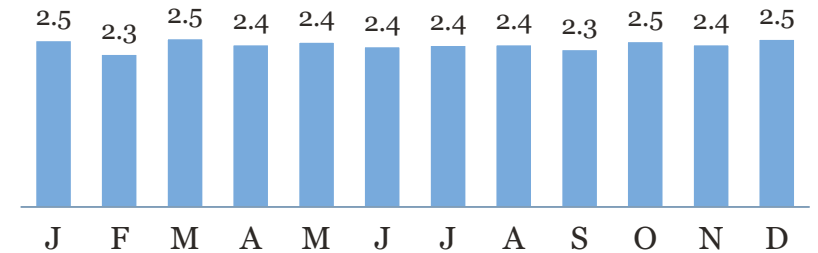
U.S. DOMESTIC GAS WITHDRAWALS

Trillion cubic feet



AVERAGE MONTHLY WITHDRAWALS

USD/mmbtu

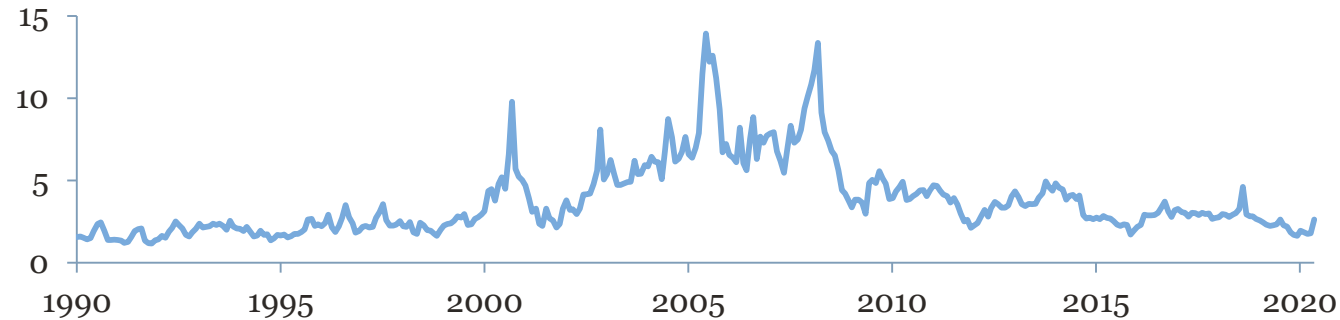


HENRY HUB PRICE AND VOLUME – SEASONALITY

Henry Hub gas prices and traded volumes display minimal seasonality

HENRY HUB PRICE

USD/mmbtu



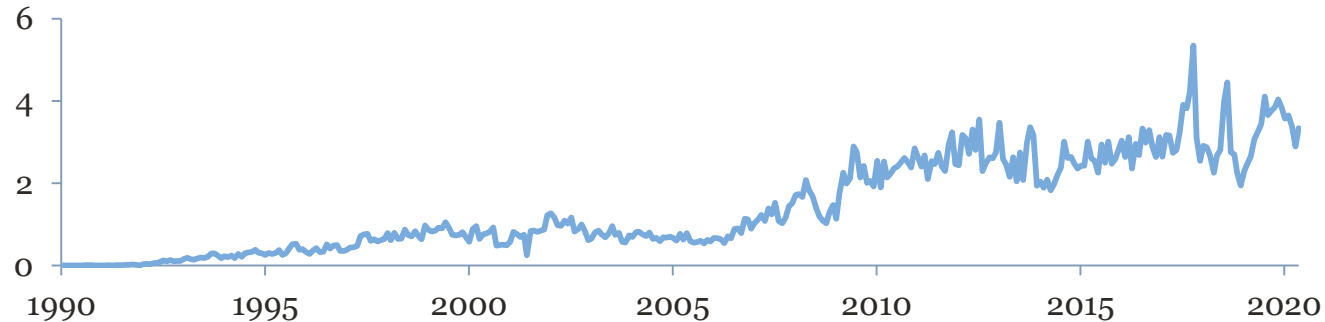
AVERAGE MONTHLY PRICE

USD/mmbtu



HENRY HUB VOLUME

Millions



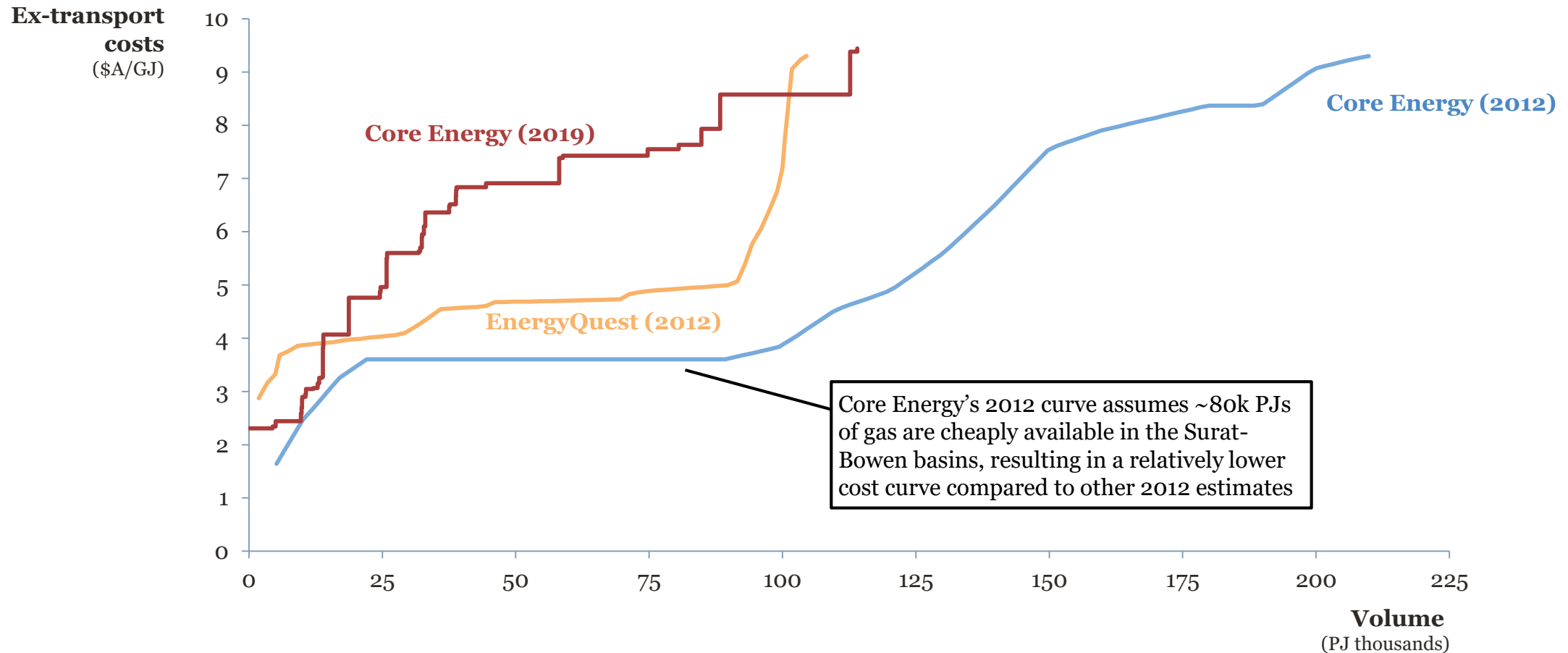
AVERAGE MONTHLY VOLUME

Millions



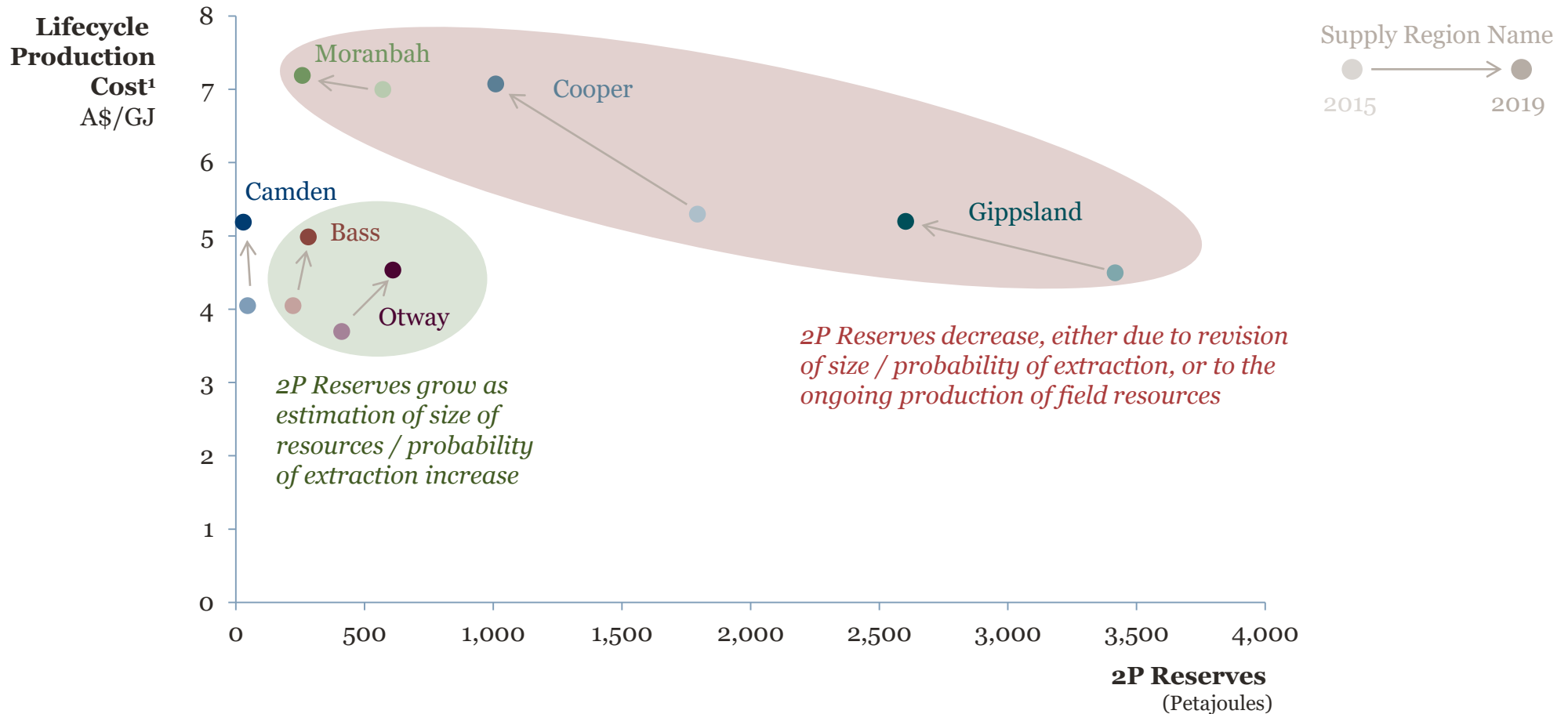
EASTERN GAS MARKET SUPPLY CURVES

The gas supply curves in Eastern Australia have risen rapidly over the last decade and will only grow in the absence of technological advancements or resource discoveries



CHANGES IN EASTERN GAS RESERVES AND PRODUCTION COSTS, 2015-19

Costs have increased over the last 5 years, while reserves in major basins in the southern states have reduced significantly



¹ Lifecycle costs reflect the breakeven gas price for a supply region's total predicted cash flows. Core Energy's methodology includes a 10% real return on capital

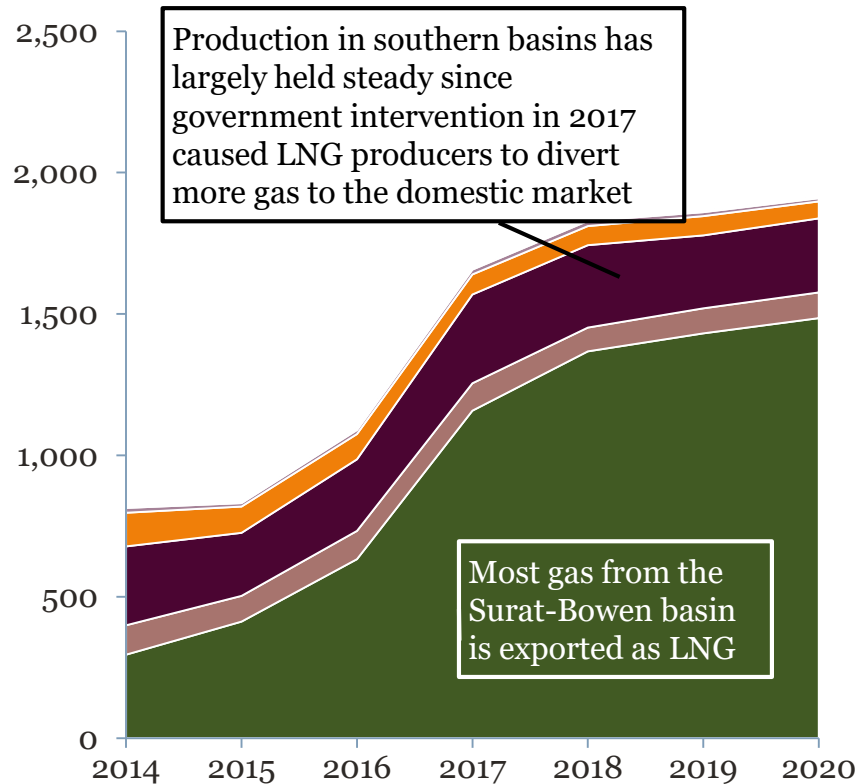
Source: Core Energy, Reserves and Resources and Cost Estimates (2020 GSOO) & Gas Production and Transmission Costs, Eastern and South Eastern Australia (Feb 2015)

GAS PRODUCTION AND RESERVES OF EAST AUSTRALIAN BASINS

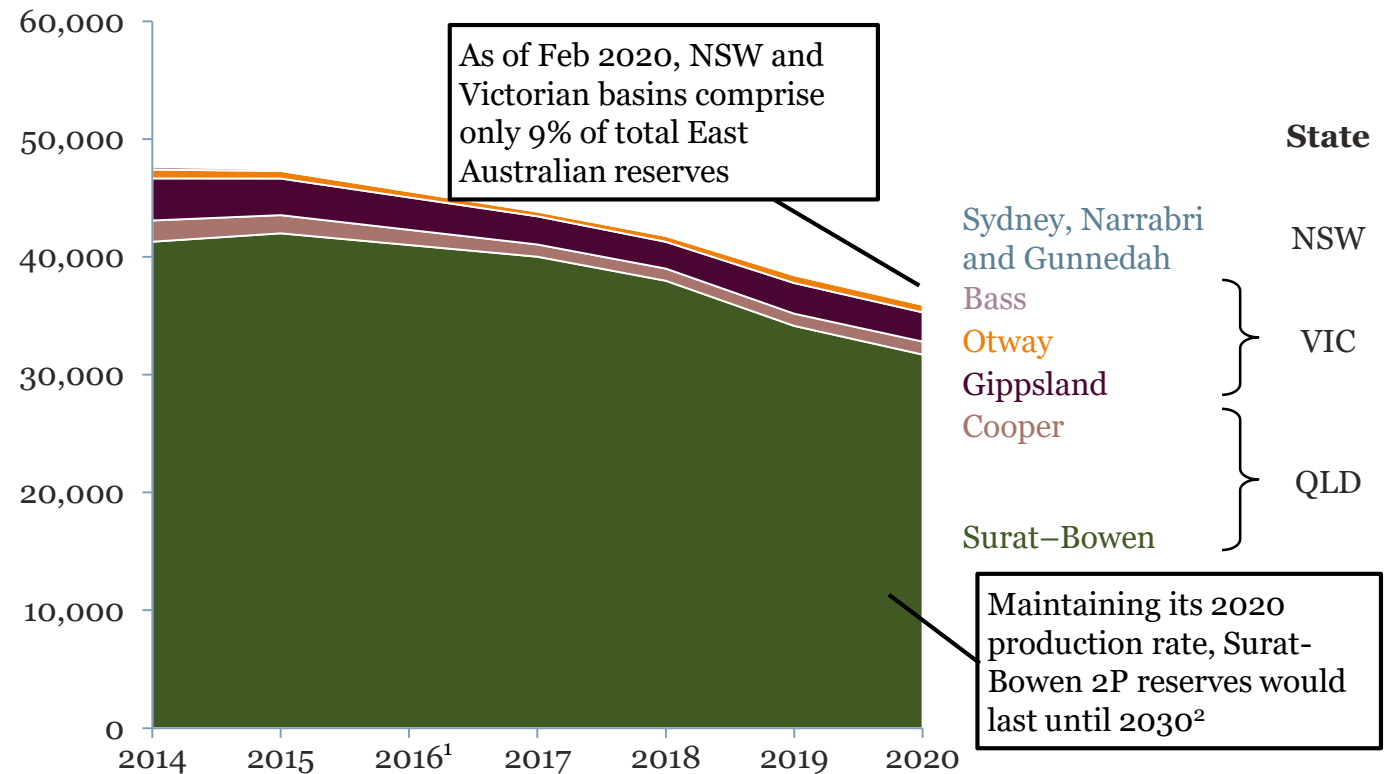
Since LNG production commenced, the vast majority of East Coast gas has been produced from the Surat-Bowen basin

Petajoules

ANNUAL GAS PRODUCTION BY BASIN



2P GAS RESERVES BY BASIN



¹ No data available for 2016 reserves so a simple average of 2017 and 2015 is used instead

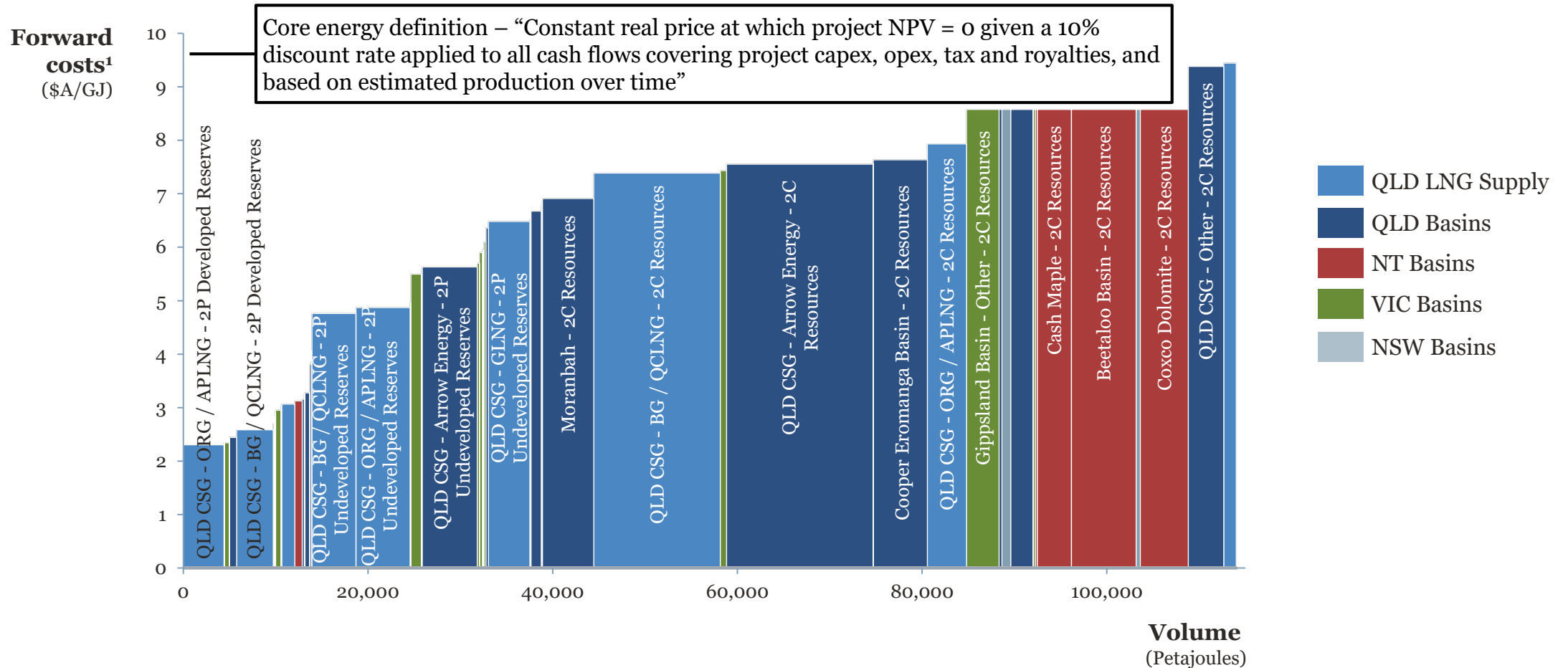
² Assuming that 50% of the 2P reserves ultimately prove commercially recoverable

Source: AER State of the Energy Market Reports (2014, 2015, 2017, 2018, 2020, plus 2019 data supplement)

EAST COAST GAS SUPPLY CURVE, DEC 2018

The producer economics have been sourced from Core Energy estimates – the most economical gas has been contracted to Queensland’s three LNG trains

2P (developed and undeveloped) and 2C reserve volumes and supply costs



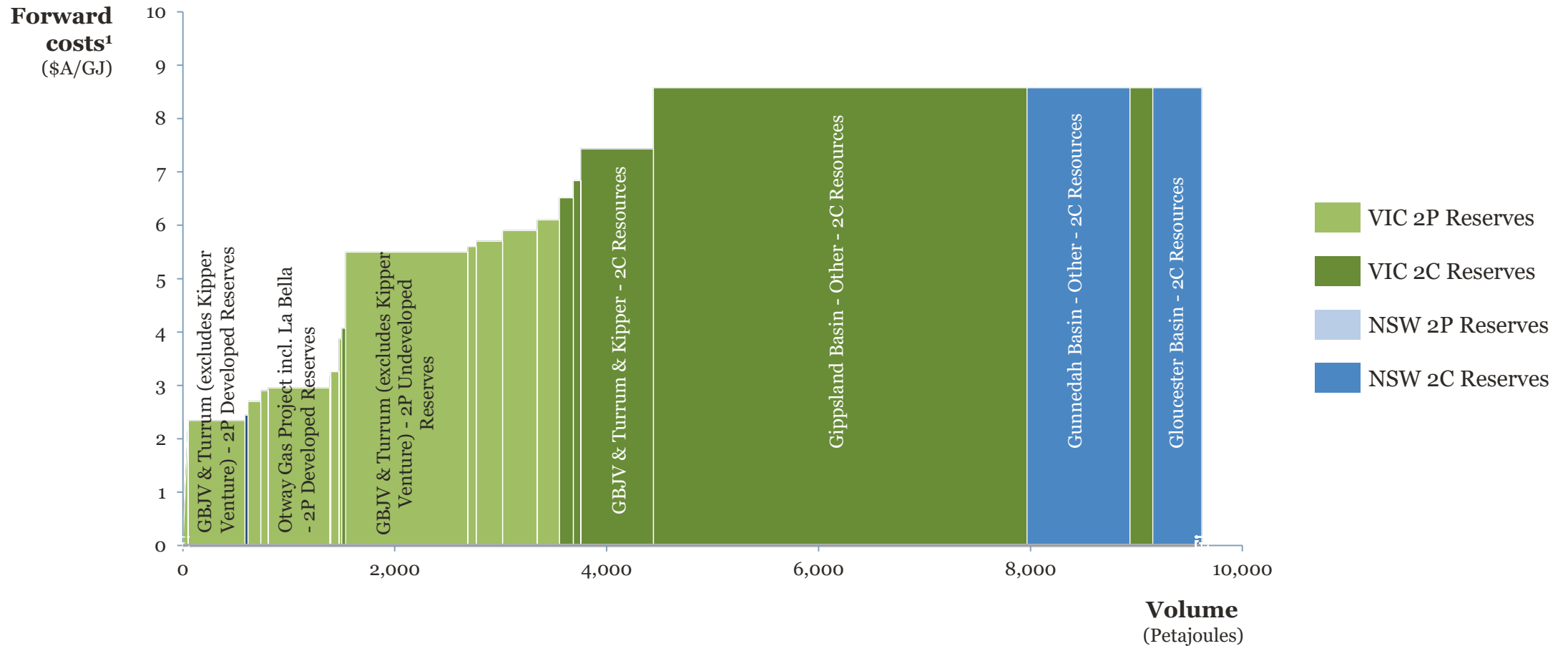
¹ Constant real breakeven price at which project NPV = 0 with a 10% discount rate applied to all future cash flows, including project capex, opex, tax and royalties

Source: Gas Reserves and Resources and Cost Estimates, Eastern Australia & NT (Core Energy, Nov 2019)

SOUTH-EAST COAST GAS SUPPLY CURVE, DEC 2018

The cost of gas production in Victoria and NSW rises quickly once Victoria's developed 2P reserves are extracted

2P (developed and undeveloped) and 2C reserve volumes and supply costs



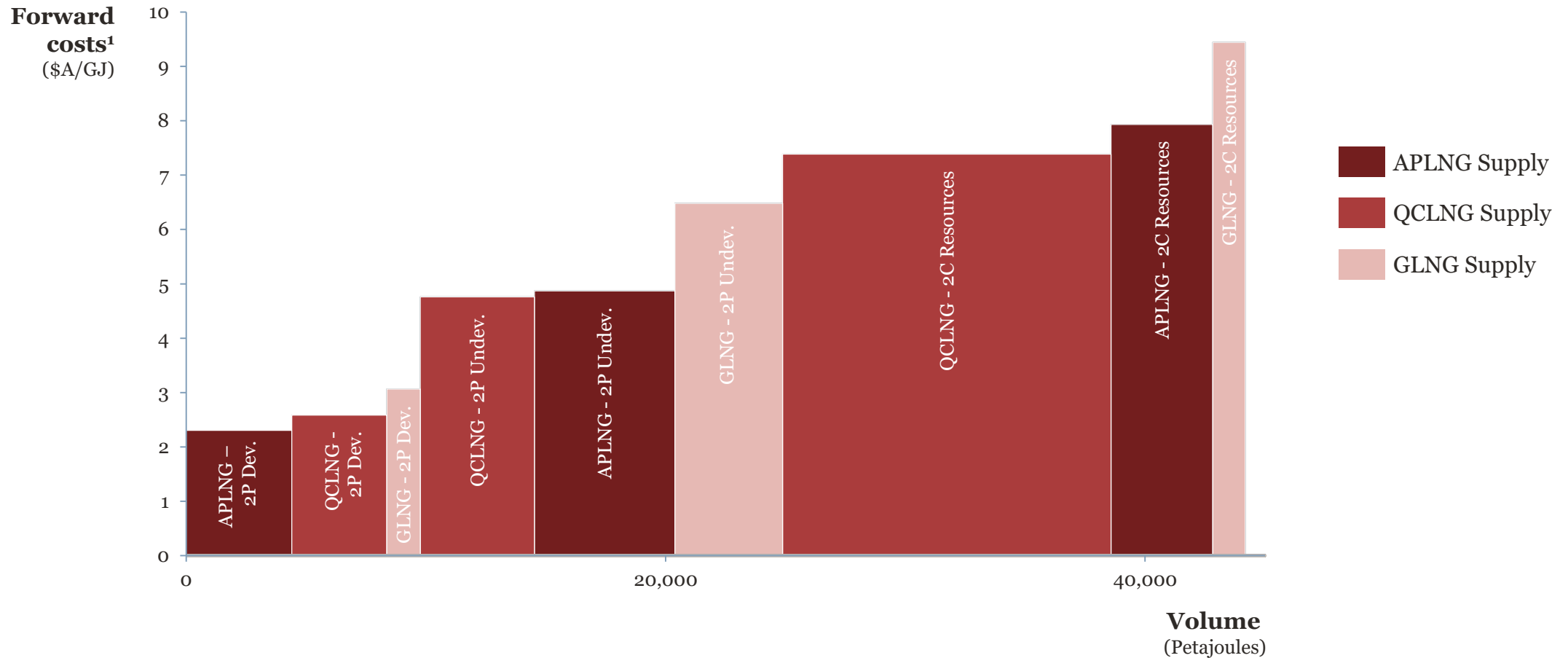
¹ Constant real breakeven price at which project NPV = 0 with a 10% discount rate applied to all future cash flows, including project capex, opex, tax and royalties

Source: Gas Reserves and Resources and Cost Estimates, Eastern Australia & NT (Core Energy, Nov 2019)

LNG TRAIN GAS SUPPLY CURVE, DEC 2018

LNG train operators are sitting on large volumes of gas with some of the East Coast's lowest gas production costs

2P (developed and undeveloped) and 2C reserve volumes and supply costs



¹ Constant real breakeven price at which project NPV = 0 with a 10% discount rate applied to all future cash flows, including project capex, opex, tax and royalties

Source: Gas Reserves and Resources and Cost Estimates, Eastern Australia & NT (Core Energy, Nov 2019)

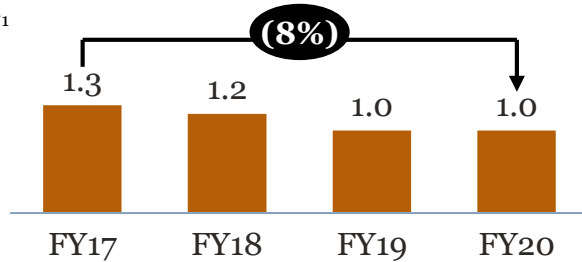
NATURAL GAS COST

However, Origin and Santos have both decreased well costs and either operating or production costs over the last several years

OPERATING COST

A\$ per GJ¹

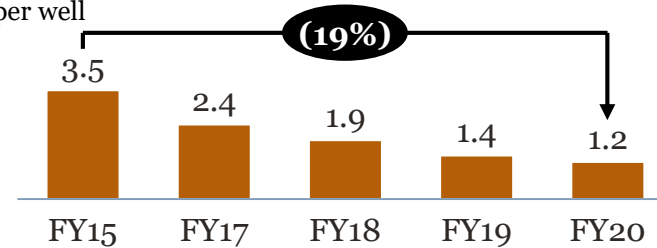
Origin



COST PER WELL²

A\$ million per well

Surat

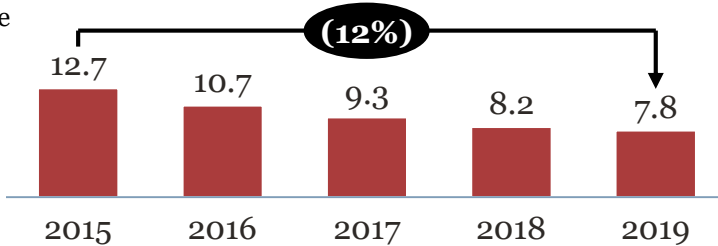


CAGR

PRODUCTION COST

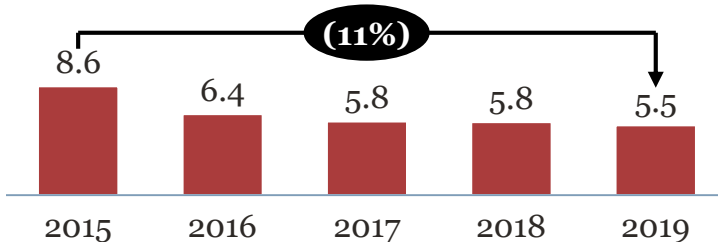
A\$ per boe

Cooper Basin



Santos

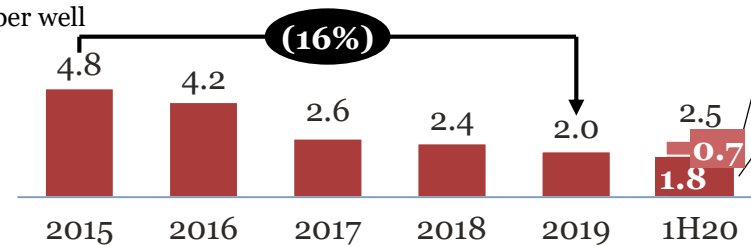
QLD & NSW



COST PER WELL³

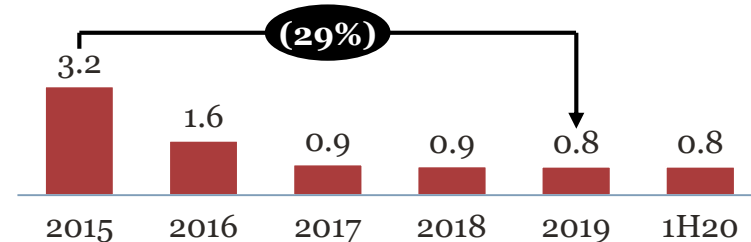
A\$ million per well

Cooper Basin



Horizontal wells
Vertical & deviated wells

Roma (QLD)



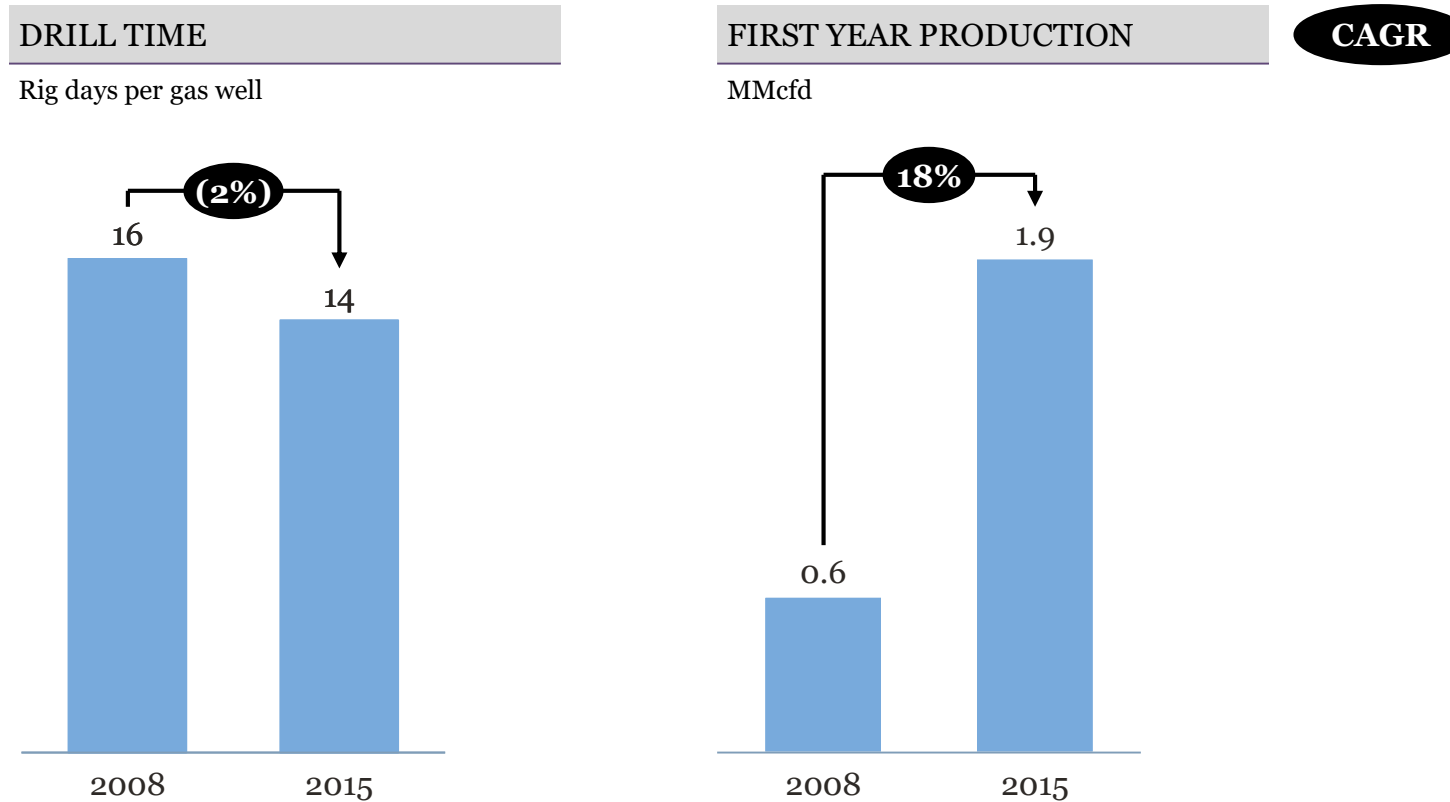
¹ Excludes pipeline and major turnaround maintenance costs

² Standard vertical unfracked well

³ Drill, complete, connect

DECREASING CSG COSTS OVER TIME – US SHALE EXPERIENCE

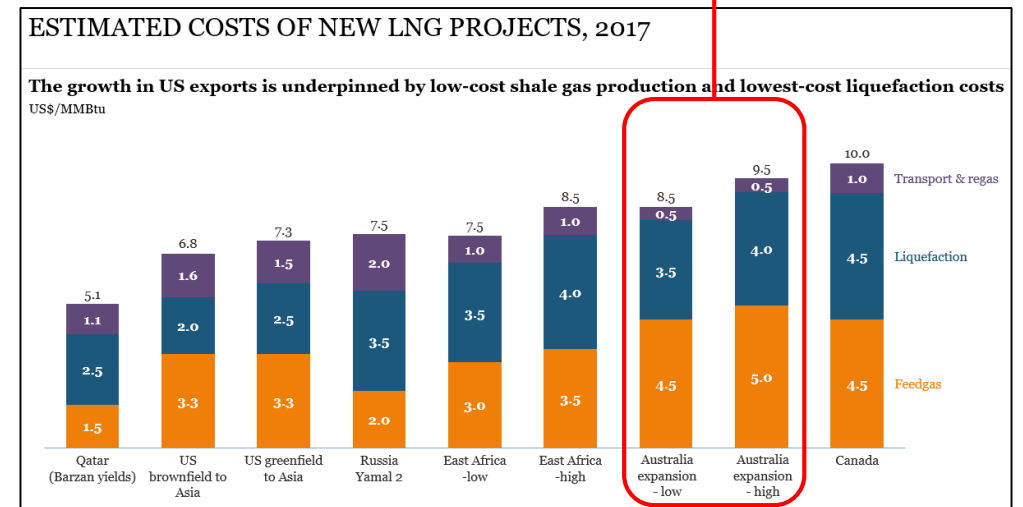
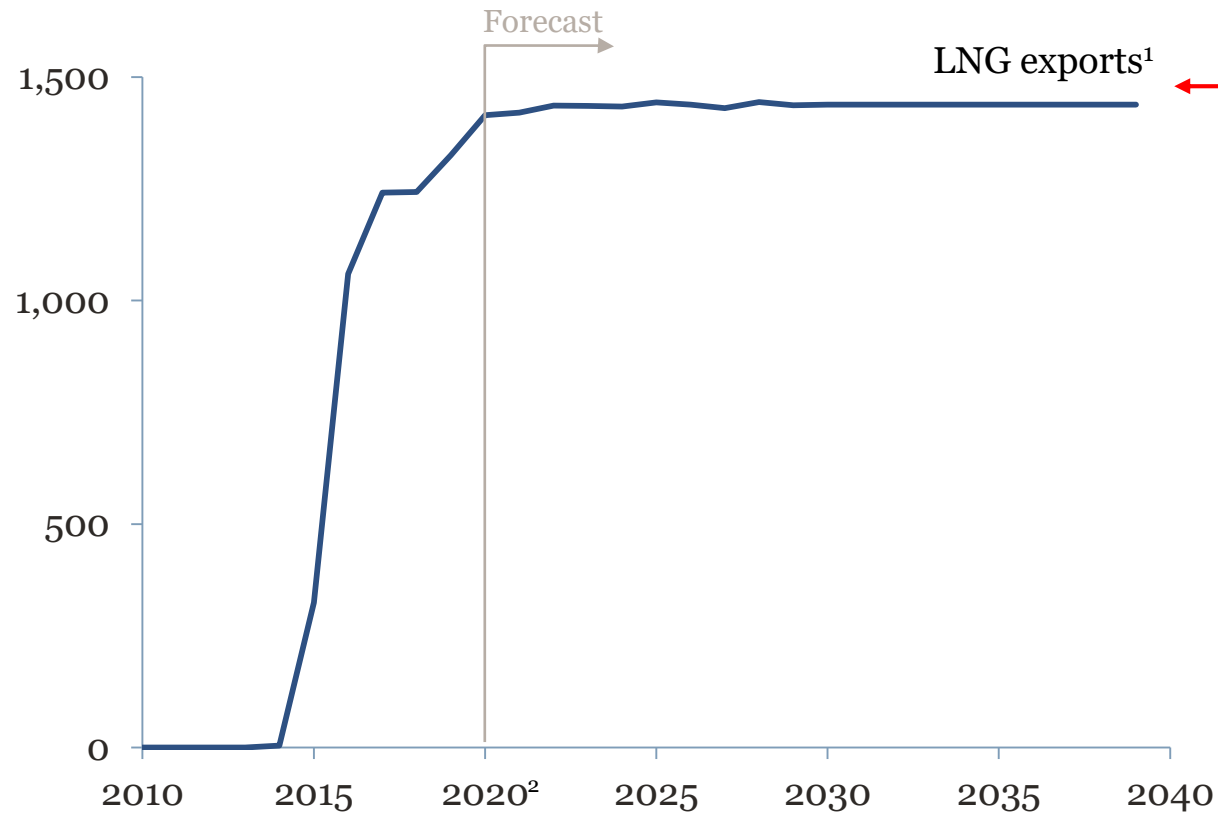
In 2016, Origin suggested increasing CSG experience, as for US shale producers, provides significant opportunity to decrease costs over time



EAST COAST LNG EXPORTS

The LNG export industry in Eastern Australia is not looking to expand capacity or volumes in the foreseeable future, as it is no longer globally competitive

Petajoules



¹ Based on the AEMO's central scenario, in which the pace of energy transition is determined by market forces under current Commonwealth and state government policies

² 2020 forecast does not account for COVID-19 demand shock

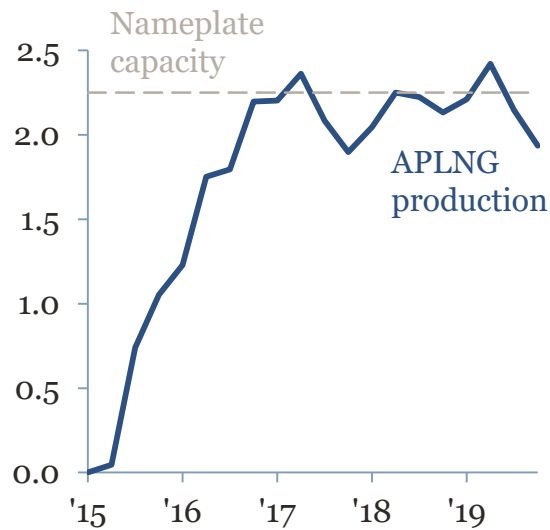
Source: 2020 Gas Statement of Opportunities

CURRENT CAPACITY UTILISATION OF LNG PRODUCERS

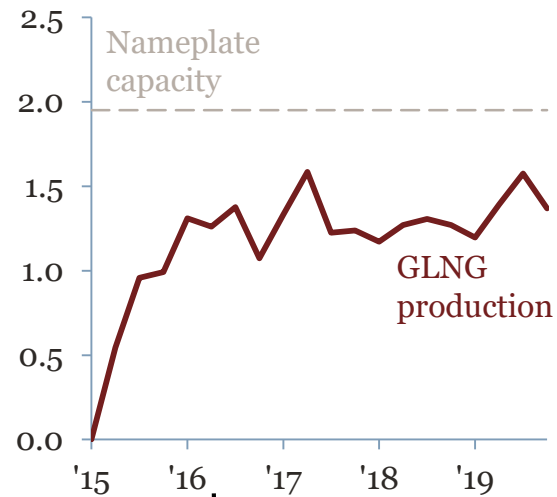
The LNG producers will continue to seek to acquire additional gas at prices up to short-run netback levels to drive capacity utilisation of their LNG facilities

Million tonnes

APLNG

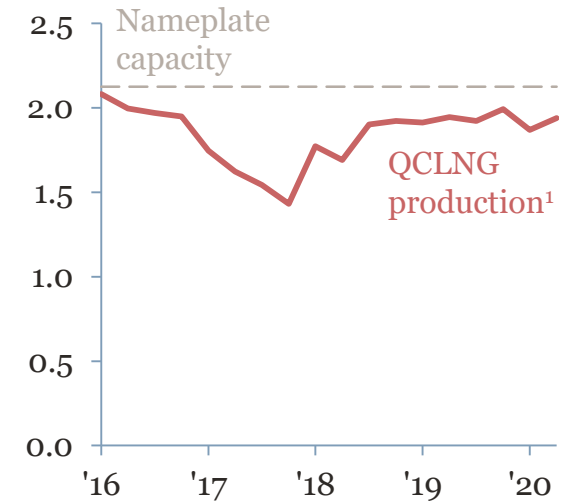


GLNG



Shortfall caused by difficulty sourcing economic gas supplies

QCLNG

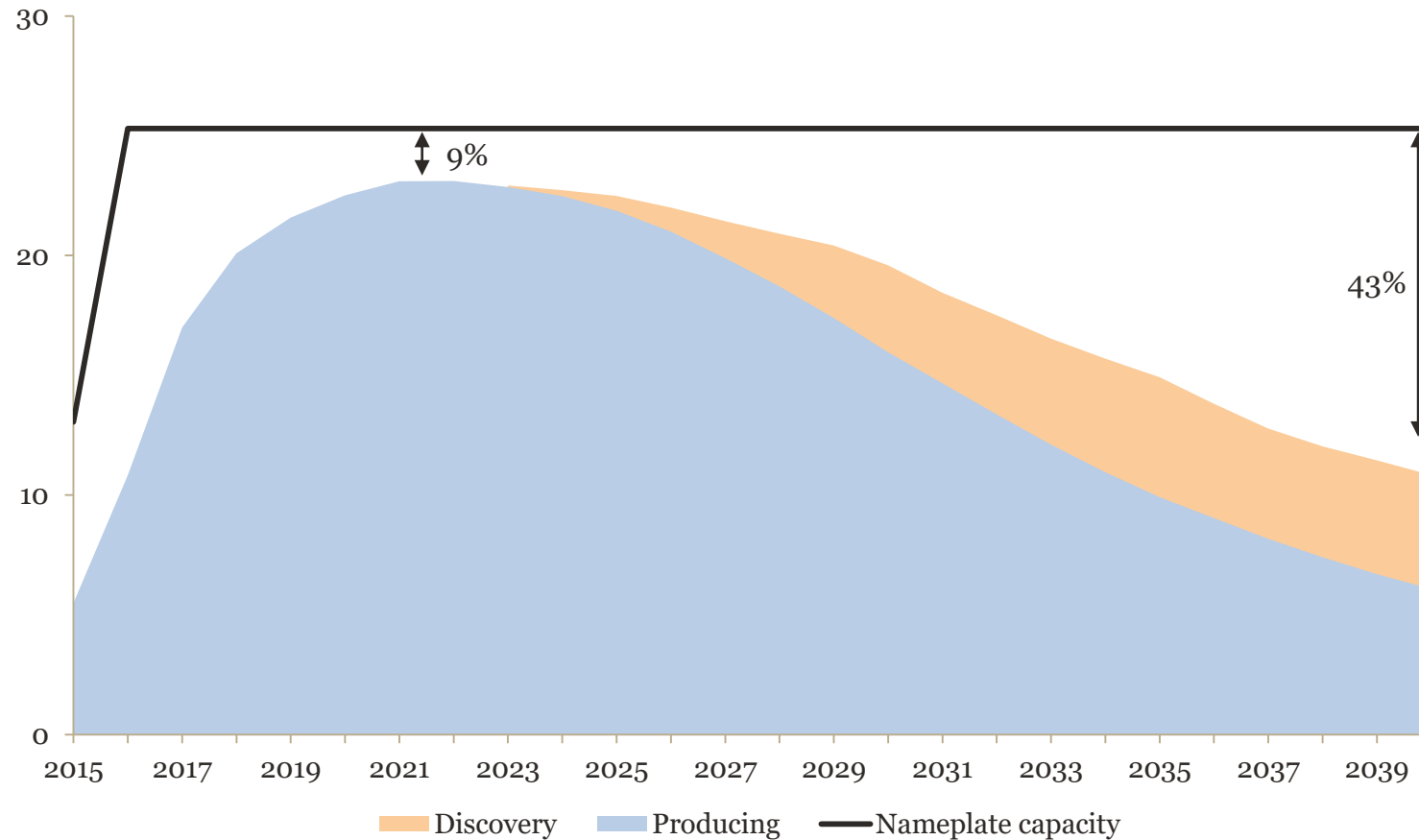


¹ Calculated from AEMO-reported incoming pipeline flows, using a conversion rate of 1PJ = 18,040 tonnes and assuming feed gas consumption at an industry average of 9%
Source: Origin Energy and Santos annual and quarterly reports; AEMO Quarterly Energy Dynamics Report, Q2 2020; News reports

EAST COAST LNG FACILITY CAPACITY VS PRODUCTION FORECAST

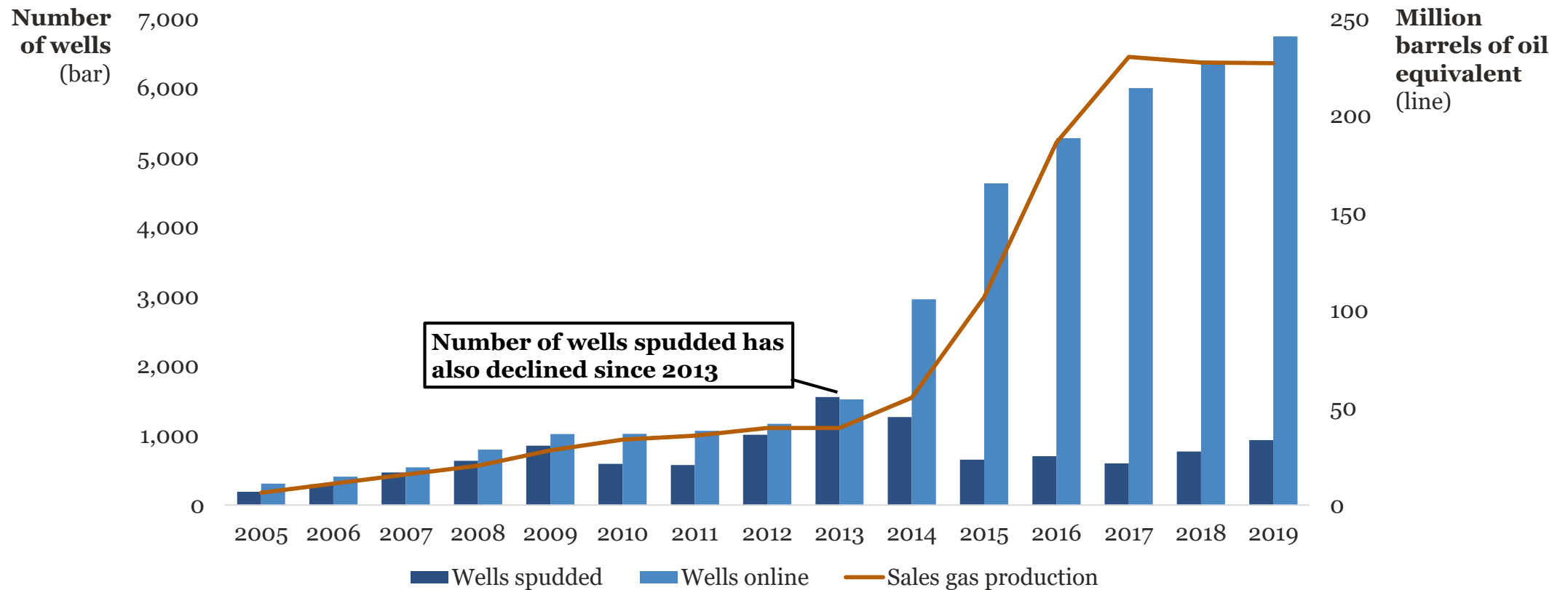
The expected decline in CSG production suggests the LNG projects facilities will continue seeking to purchase and/or develop new gas supply

Million tonnes per annum



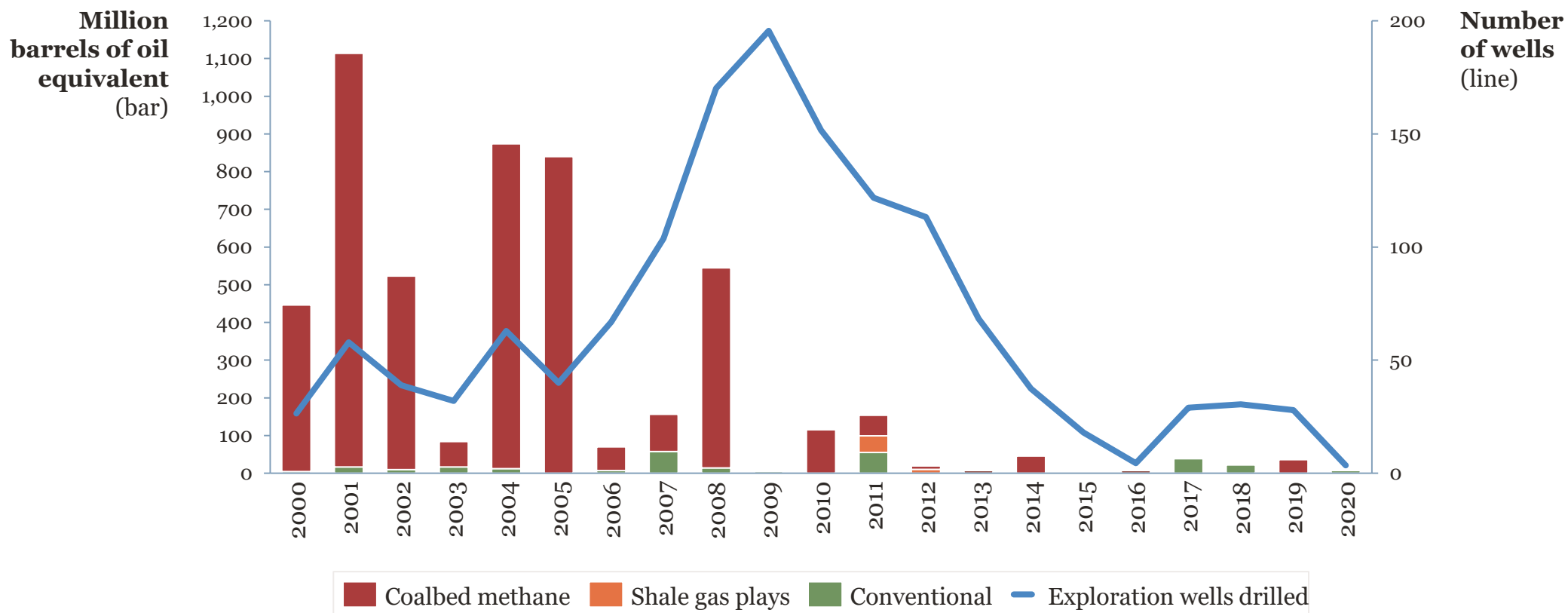
TOTAL CSG WELLS ONLINE VS TOTAL SALES GAS AND WELLS SPUDDED

Despite rising number of wells online, CSG production in QLD has declined since 2017, implying decreasing average well production



DISCOVERED RESOURCES IN QUEENSLAND BY UNCONVENTIONAL DETAIL VS TOTAL EXPLORATION WELLS DRILLED

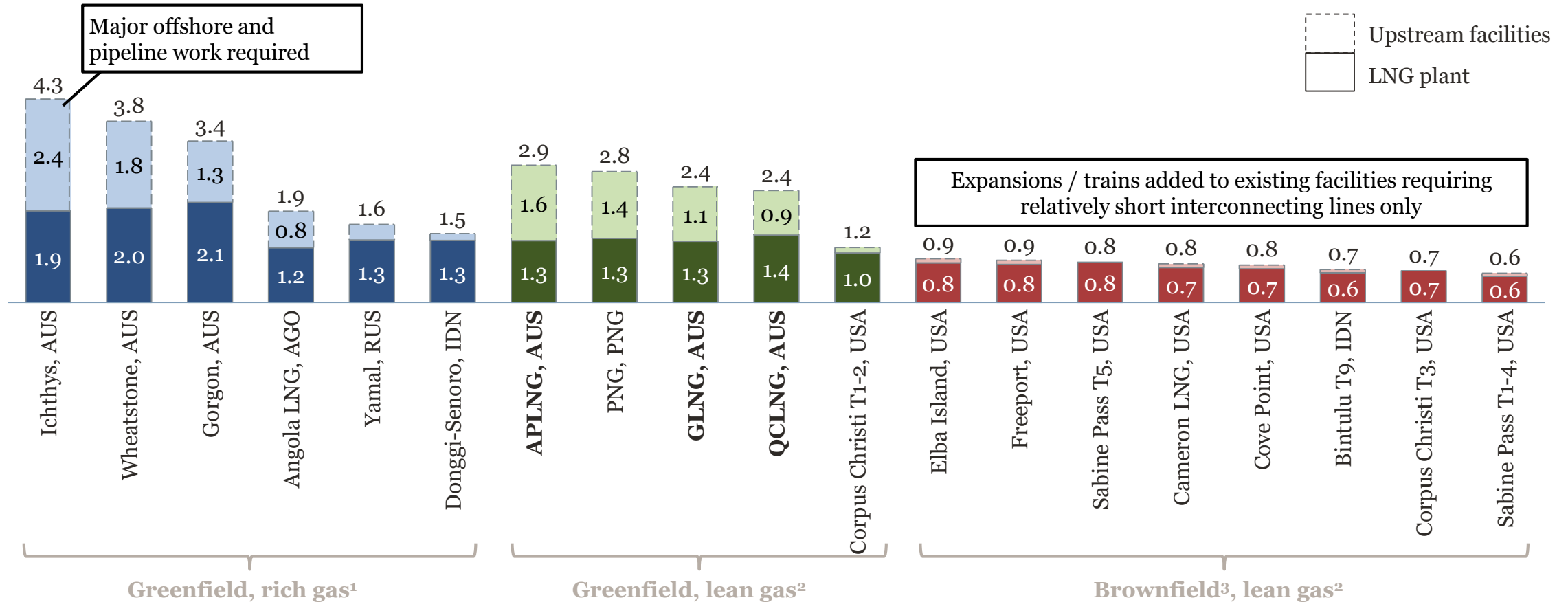
Exploration wells drilled in QLD peaked in 2009 with relatively limited activity and resources discovered in recent years



CAPITAL COST COMPARISONS BETWEEN GLOBAL LNG PROJECTS

Australia's existing LNG projects incurred significantly higher capital costs compared to other global plants

US\$ '000/tpa



¹ Rich gas = feed gas containing LPG and condensate typically associated gas from oil production or a gas condensate field, typically with increased complexity and cost compared to lean gas

² Lean gas = feed gas with a very low LPG and condensate content, essentially methane and ethane; typically a pipeline-quality gas

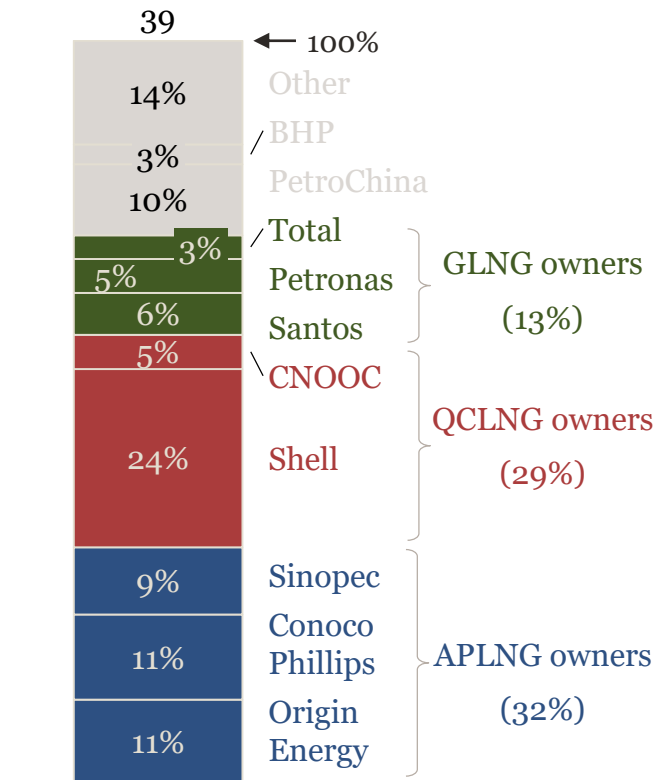
³ Brownfield expansions usually cost about 60-70% of equivalent greenfield projects as adding new trains to existing plant enables the project to take advantage of already developed infrastructure, leading to cost savings from reduced site preparation, use of existing storage tanks, the existence of established jetty and berthing facilities and sharing existing utilities

CONCENTRATION OF SUPPLIER MARKET POWER

Concentration of gas supply among producers allows them to have a stronger influence on market prices

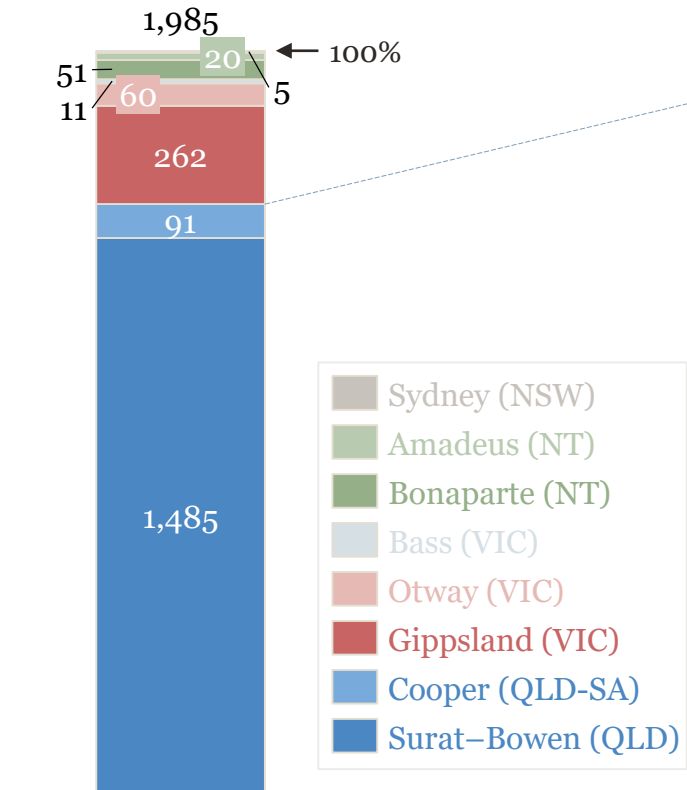
2P RESERVE IN EASTERN AUSTRALIA BY OWNERSHIP, 2019

'000 Petajoules



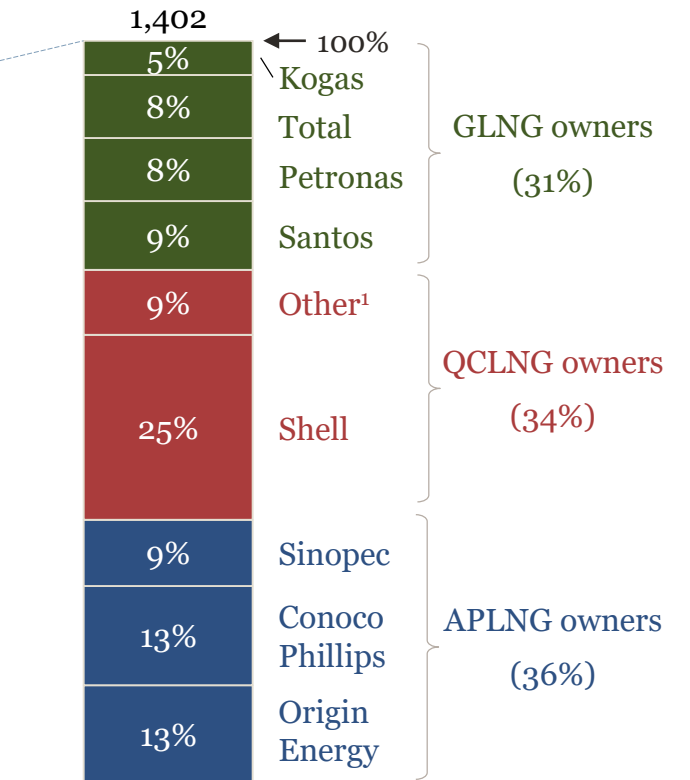
GAS PRODUCTION IN EASTERN AUSTRALIA BY BASIN, 2019

Petajoules



QLD LNG GAS PRODUCTION CAPACITY BY OWNERSHIP, 2019

Petajoules

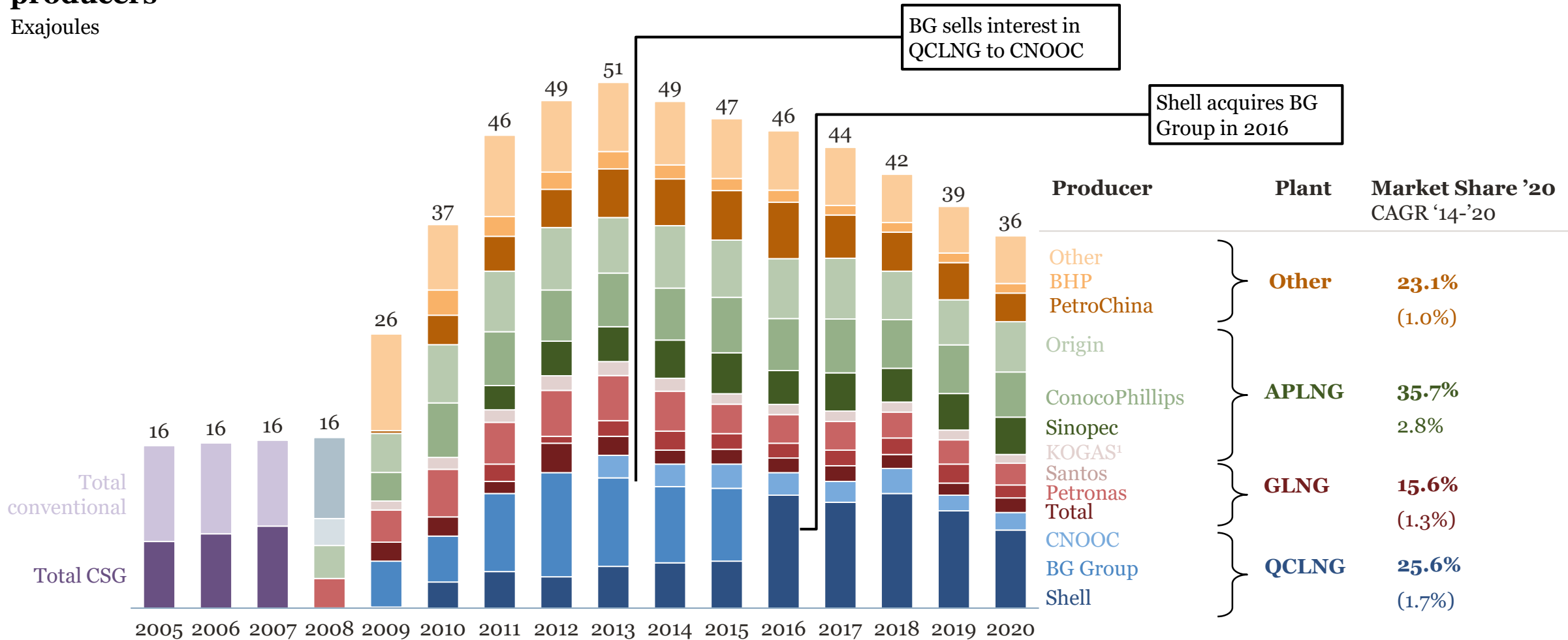


¹ Includes Tokyo Gas and CNOOC

2P GAS RESERVES, EASTERN AUSTRALIA, 2009-2020

Gas reserves in Eastern Australia are heavily weighted and highly concentrated in the hands of the LNG producers

Exajoules



¹ KOGAS calculated as 15% of GLNG total

Source: State of the Energy Market 2020; State of the Energy Market 2008; Getting gas right, Grattan Institute report, June 2013

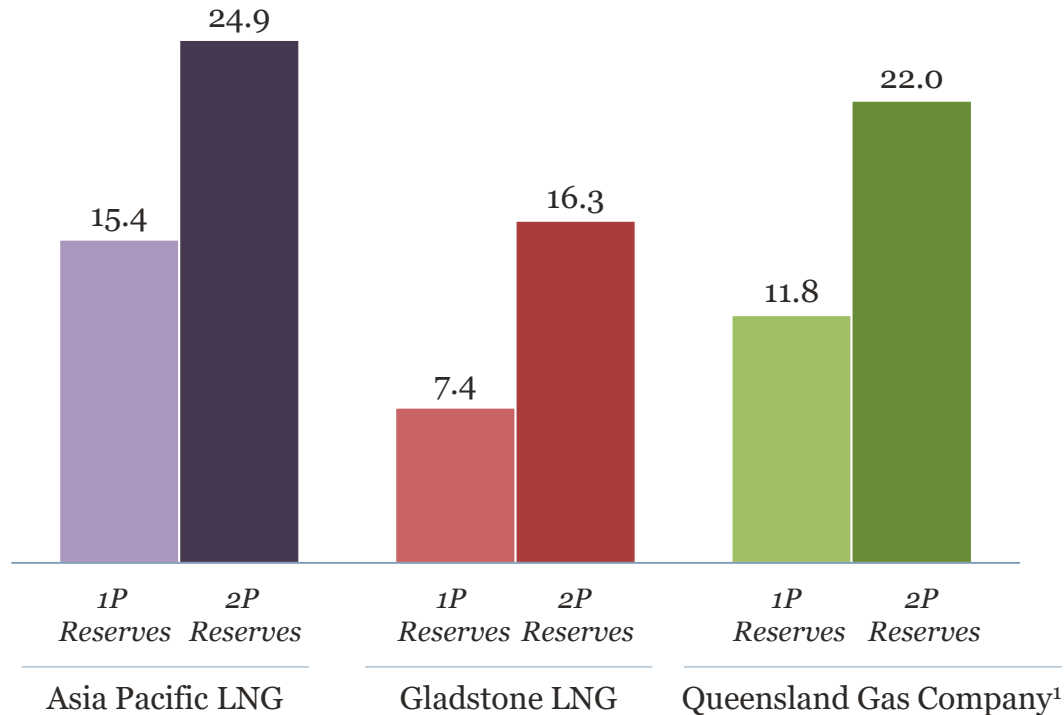
LNG TRAIN RESERVE POSITIONS

Gladstone LNG will need to increase their proven gas reserves to continue producing for the next 5-10 years, even at their recent low production volumes

Years, estimated life of current 1P and 2P reserves

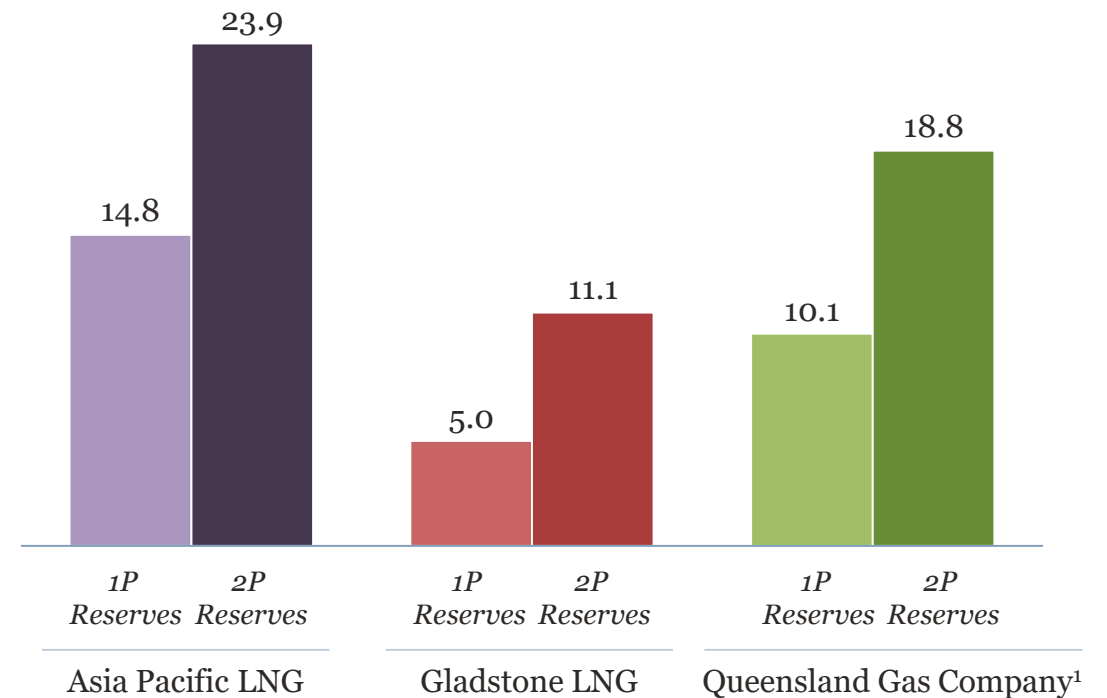
Producing at 3-year average volumes

8.6mtpa for APLNG, 5.3mtpa for GLNG, 7.3mtpa for QGC



Producing at nameplate capacity

9.0mtpa for APLNG, 7.8mtpa for GLNG, 8.5mtpa for QGC



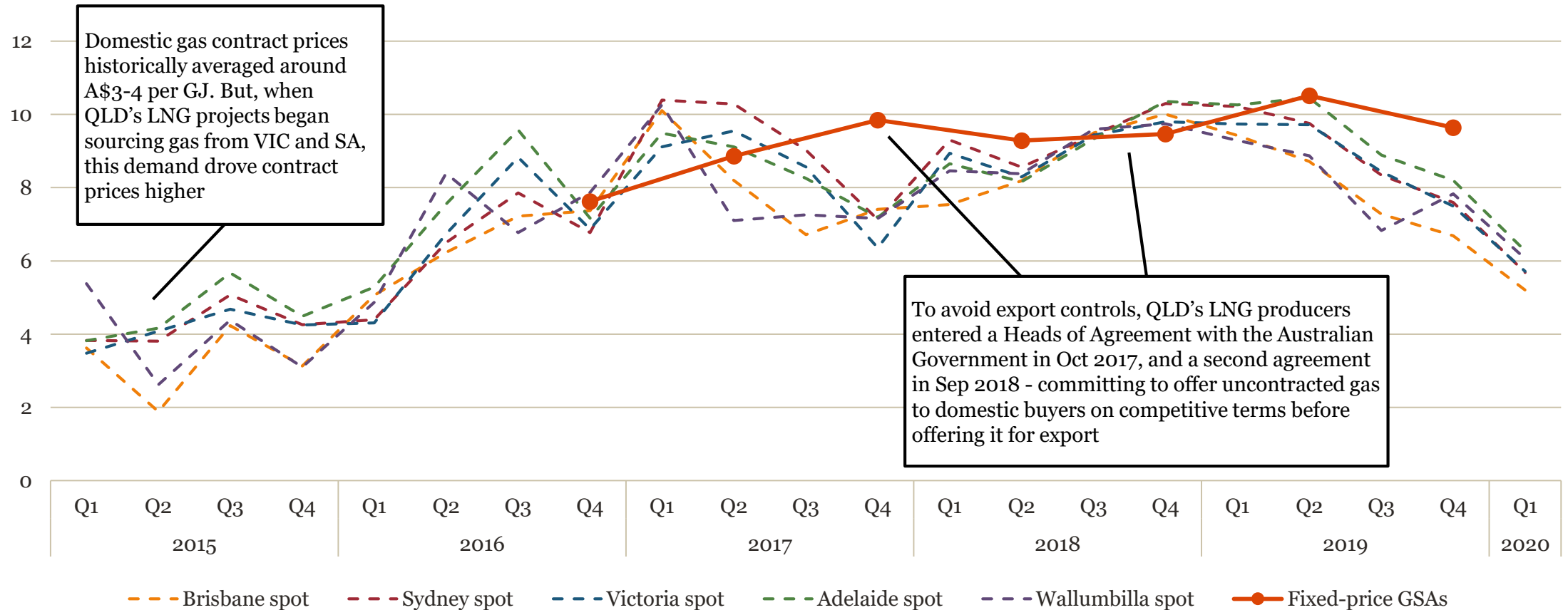
¹ Deriving reserve volumes from the 2020 SEM report and assuming industry average ratio of 1P to 2P reserves (0.54:1)

Source: Origin Energy and Santos annual and quarterly reports; State of the Energy Market 2020

EASTERN AUSTRALIA GAS PRICES – SPOT MARKET VS GAS SUPPLY AGREEMENTS¹

Eastern Australia gas prices have risen sharply from 2015-2017 since QLD’s LNG projects commenced, driven by increased demand to supply LNG exports

A\$/GJ



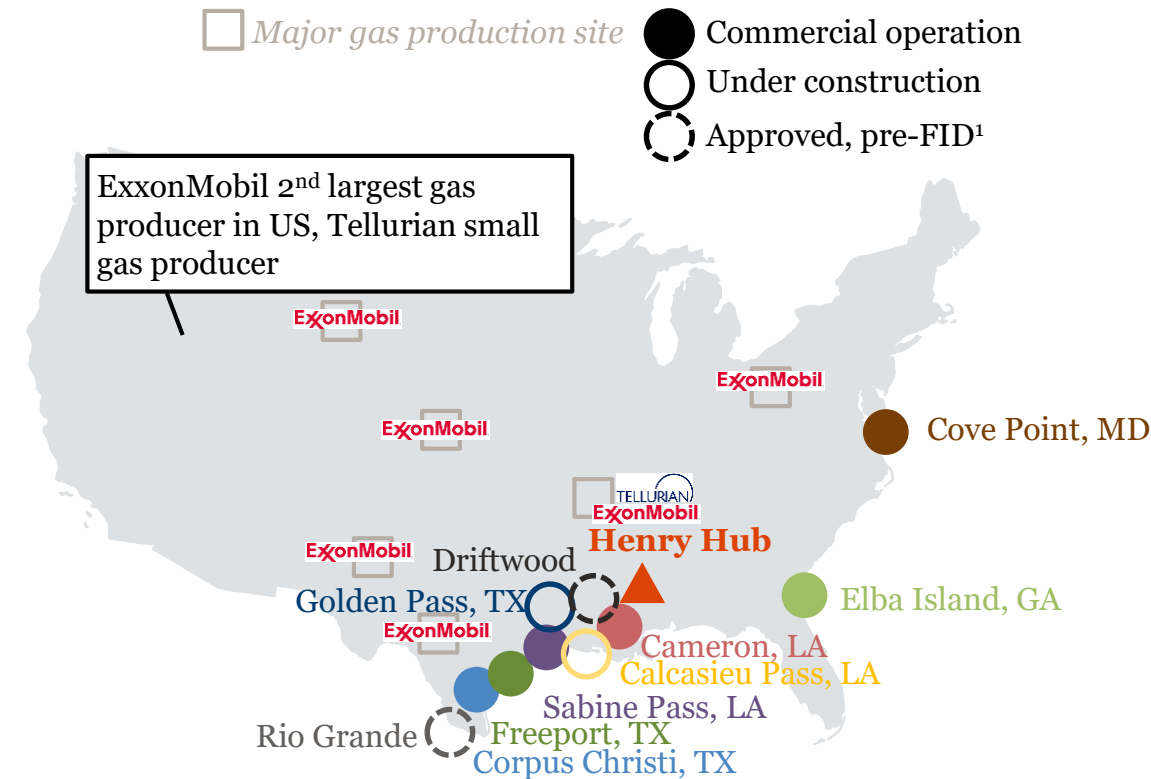
¹ ACCC’s methodology - Quantity-weighted average wholesale gas commodity prices under fixed price GSAs entered into by producers and retailers with commercial and industrial users - executed at arm’s length, have an annual contracted quantity of at least 0.5 PJ, a term of at least 12 months, and have fixed prices (GSAs with pricing mechanisms linked to international LNG or oil prices are excluded)

Source: State of the Energy Market 2020, AER; Gas Inquiry 2017–2025 Interim Report (Jul 2020), ACCC

US LNG EXPORT TERMINALS AND PLAYERS

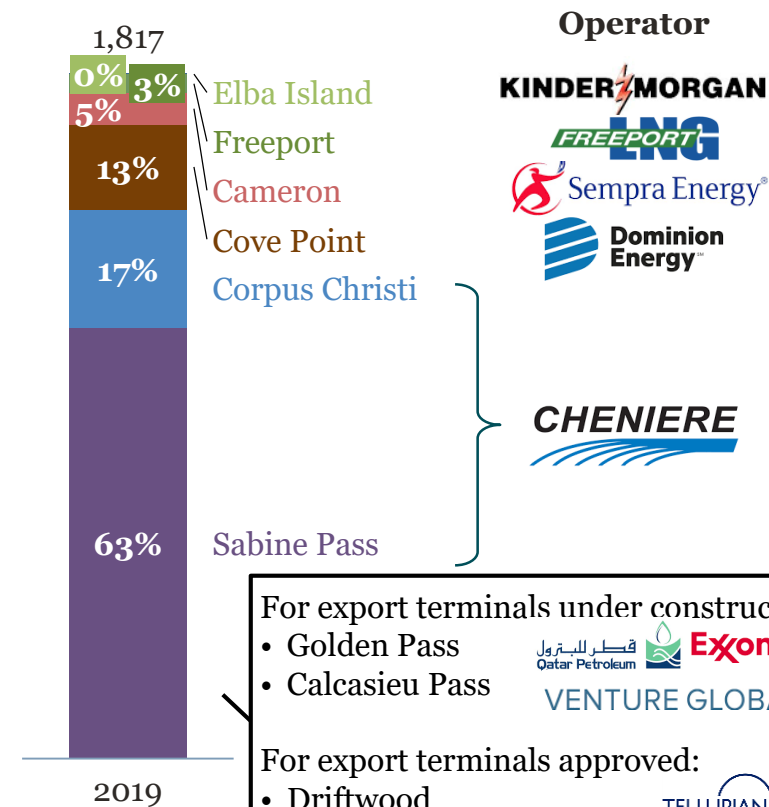
Currently there are five main LNG export companies in the US, with several new players entering the market

LNG EXPORT TERMINALS



VOLUME DELIVERED TO EXPORT TERMINAL

Proportion, billion cubic feet of domestically produced natural gas



For export terminals under construction:

- Golden Pass (Operator: Qatar Petroleum, ExxonMobil)
- Calcasieu Pass (Operator: VENTURE GLOBAL LNG)

For export terminals approved:

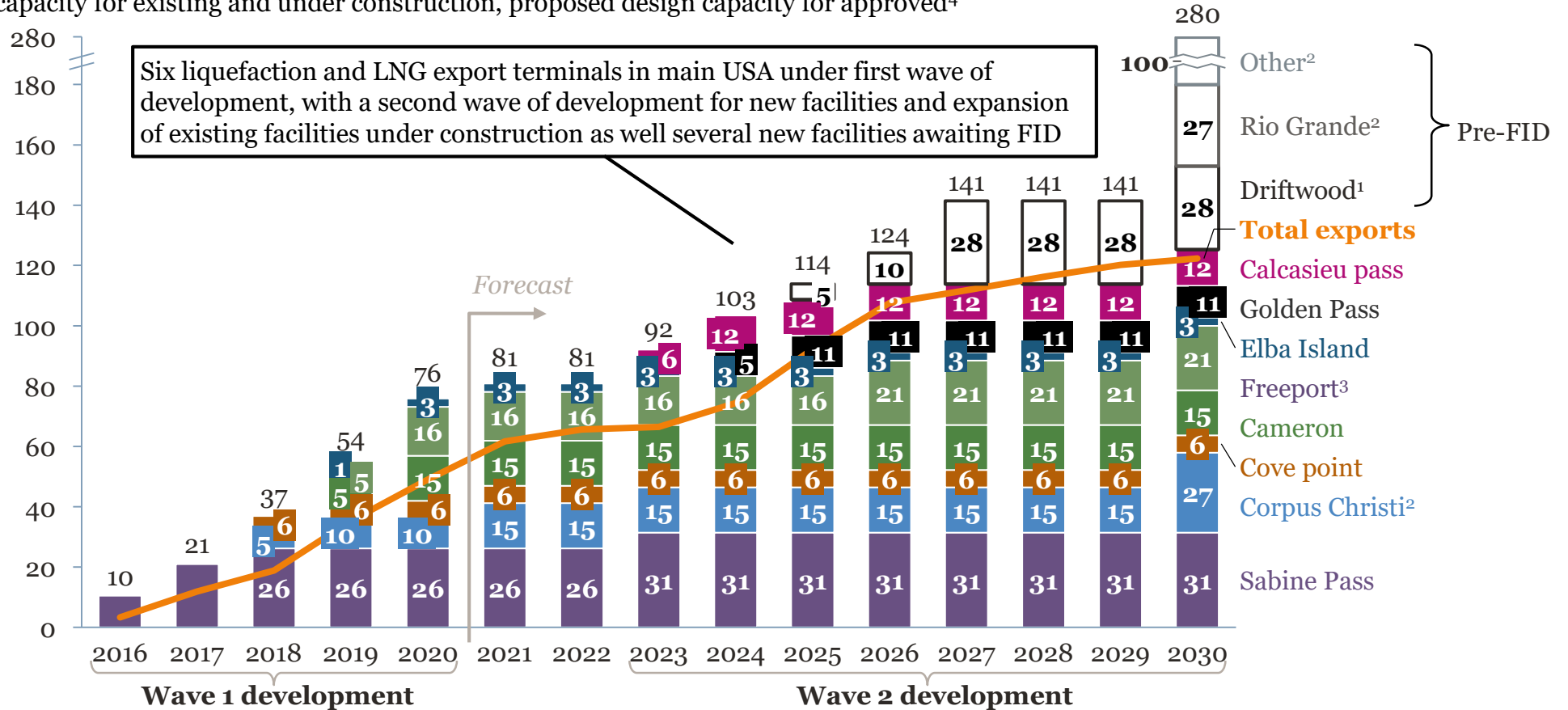
- Driftwood (Operator: TELLURIAN)
- Rio Grande (Operator: NEXTDECADE)

¹ Not showing all approved liquefaction facilities pre-FID

US LNG EXPORT CAPACITY

US LNG export capacity is predicted to increase under a second wave of development although timing may be slowed by COVID related FID delays

Mtpa, peak nameplate capacity for existing and under construction, proposed design capacity for approved⁴

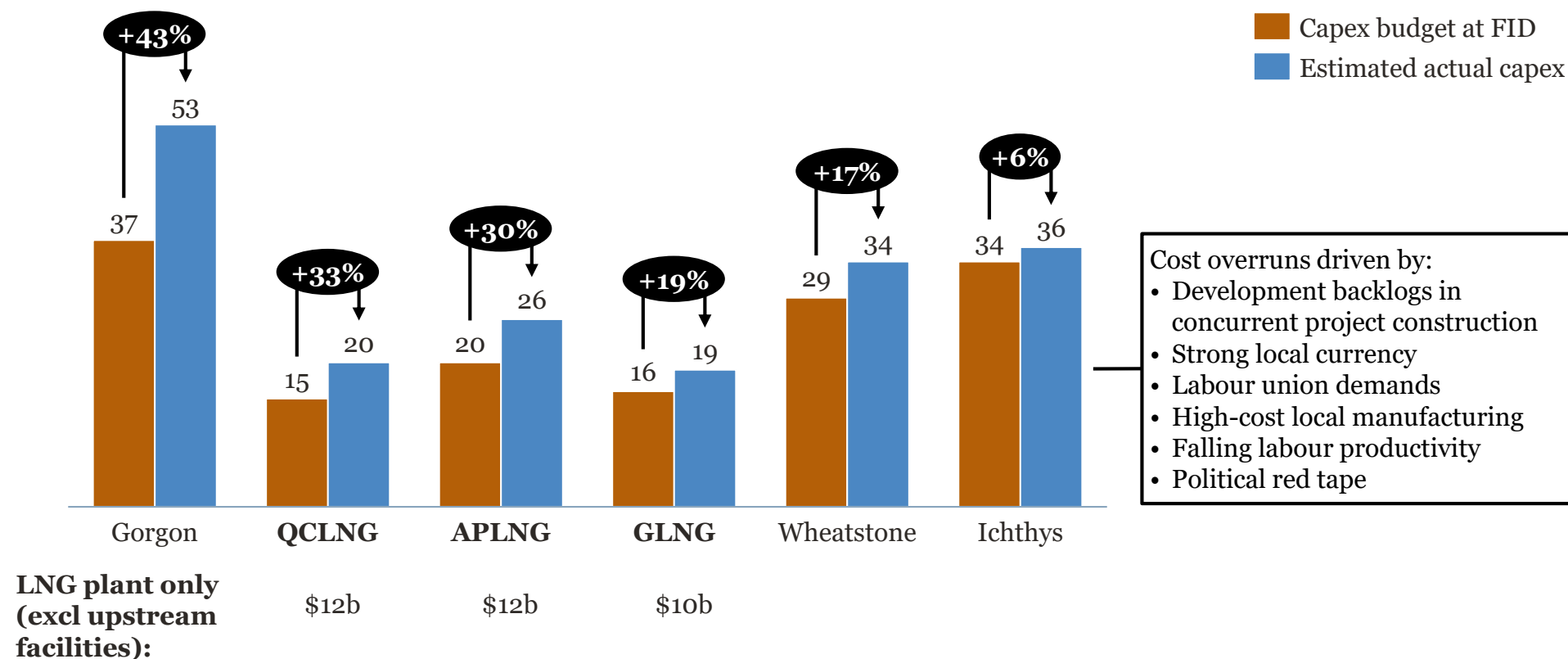


1 Assumes conservative in service date stated by Tellurian post-COVID with start in 2025 and fully operational by 2027
 2 Assumes all other pre-FID projects (including Rio Grande, Corpus Christi Liquefaction Stage III) conservative in service by 2030
 3 Assumes Freeport LNG Train 4 in service 2026 (latest date of operation in new application filed post COVID to FERC)
 4 Assumes conversion factor of 1 billion cubic feet NG to million tonnes of LNG of 0.021

AUSTRALIAN LNG PROJECTS' ACTUAL VS BUDGETED CAPEX (INCLUDING UPSTREAM FACILITIES)

In addition, Australia's LNG projects are on average ~25% over-budget due to local high cost environment pressures

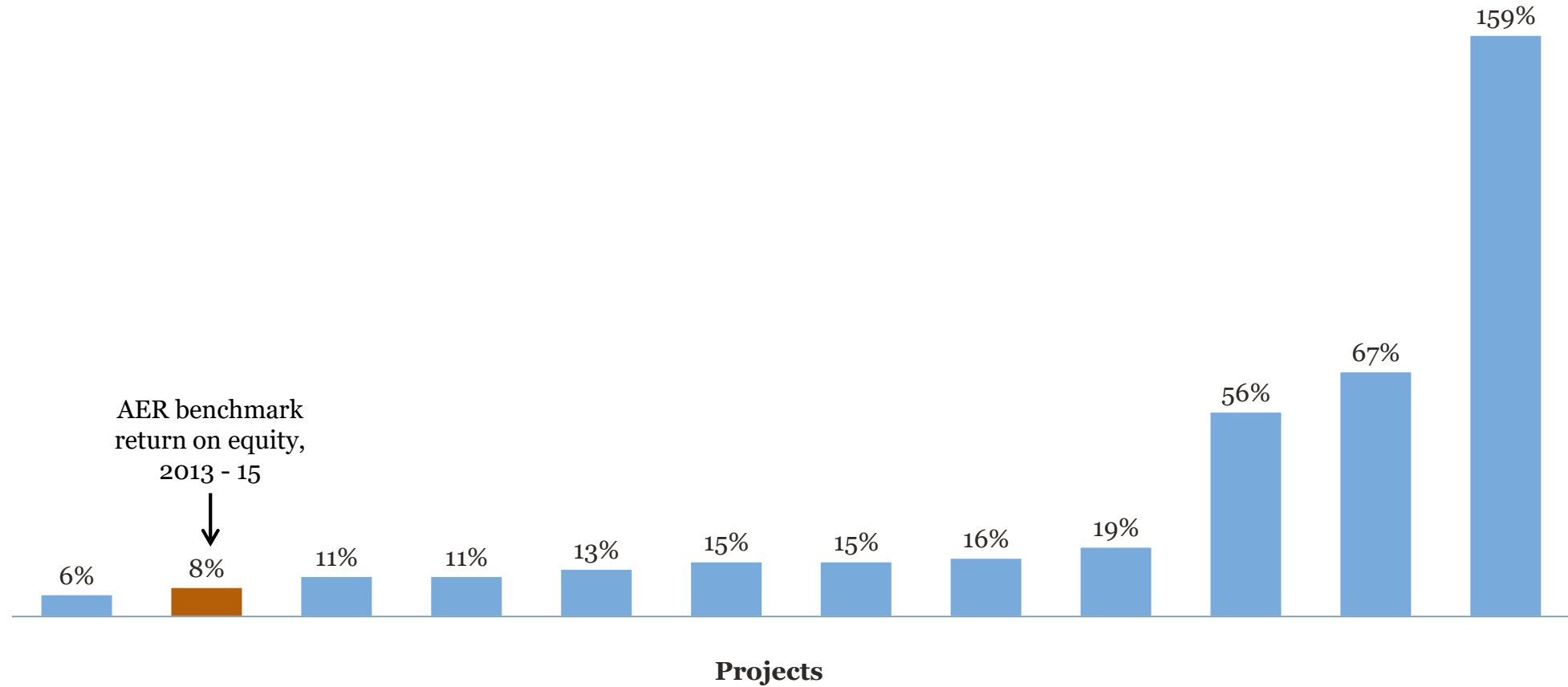
US\$ billion



EXPECTED ROE FOR INCREMENTAL PROJECTS, 2015

Pipeline operators earn high return on incremental investment, consistent with monopoly pricing

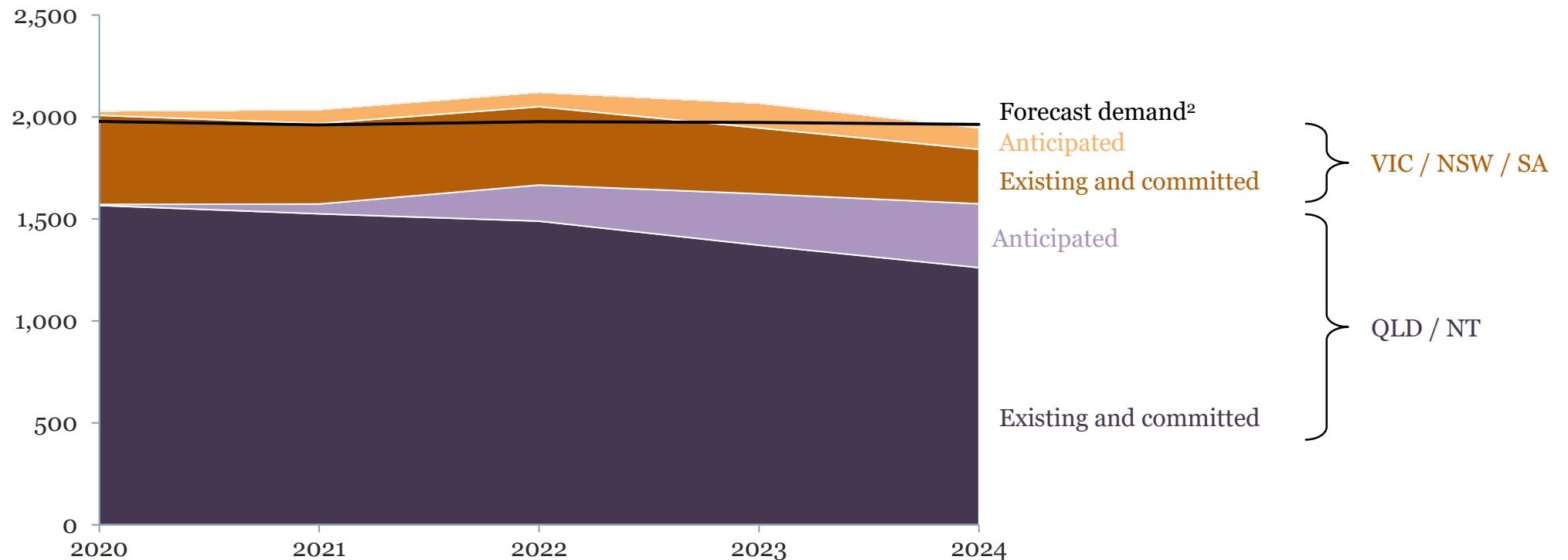
Percentage



EAST COAST PRODUCTION FORECASTS BY NORTHERN AND SOUTHERN STATES¹

Gas from northern states is forecast to supply the majority of East Coast demand into the future, with an increasing proportion contributed by anticipated projects

Petajoules



¹ As provided to the GSOO by gas producers

² Based on the GSOO's "Central" scenario, which falls between the "Slow Change" and "Step Change" scenarios

Source: AEMO GSOO 2020