CORE ENERGY & RESOURCES

Delivered Wholesale Gas Price Outlook 2019-2040

Residential & Commercial and Gas Generation Segments

Eastern Australia, Western Australia and Northern Territory

January 2019

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General Definitions

Acronyms

AEMO	Australian Energy Market Operator
AUD	Australian dollars
bbl	Barrel
CBJV	Cooper Basin Joint Venture
CCGT	Combined Cycle Gas Turbine
CORE	Core Energy & Resources Pty Limited
CPI	Consumer Price Index
CSG	Coal Seam Gas
EGP	Eastern Gas Pipeline
GBJV	Gippsland Basin Joint Venture
GJ	Gigajoule
GPG	Gas Powered Generation
I	Industrial
LMP	Longford Melbourne Pipeline
LNG	Liquefied Natural Gas
MAP	Moomba Adelaide Pipeline
MDQ	Maximum Daily Quantity
MSP	Moomba Sydney Pipeline
NEM	National Electricity Market
NGFR	National Gas Forecasting Report
NSW	New South Wales
NVI	NSW Victoria Interconnect
OCGT	Open Cycle Gas Turbine
QGP	Queensland Gas Pipeline
R&C	Residential and Commercial
RBP	Roma Brisbane Pipeline
SEA Gas	South East Australian Gas Pipeline
SWP	South West Pipeline
SWQP	South West Queensland Pipeline
TGP	Tasmania Gas Pipeline
TIPS	Torrens Island Power Station
USD	US dollars

Report Convention

Author	This Report has been prepared by Core Energy & Resources Pty Limited, referred to as 'CORE'.
Year References	All references to years that appear in the report are to calendar years.
$ value references	All references to $ are to Australian dollars unless otherwise stated, and values are expressed in real January 2018 terms.
Delivery points	Delivered prices are at exit flange/metering point of a transmission pipeline system

Frequently Used Terms

Delivered Price	The price of gas at the delivery point on a transmission pipeline to a generator or gas distribution offtake point. Note that all prices are quoted in real January 2018 terms.
Gas Powered Generation (GPG)	A gas market demand segment that comprises gas-fired power stations. Gas is delivered via transmission pipeline before being combusted to drive a gas turbine to generate electricity.
ICE Brent	An oil price marker widely used, intenationally, to establish the exchange value of oil-linked commodities.
Linepack	The pressurised volume of gas stored in the pipeline system. Essential to enable gas transportation through the pipeline network throughout each day and required as a buffer for within-day supply/demand balancing.
Residential & Commercial	A gas market demand segment that comprises households and businesses with connections to a gas distribution network.

1. Introduction

1.1. Scope of Report

The Australian Energy Market Operator ("AEMO") has engaged Core Energy & Resources ("**CORE**") to provide annual projections of wholesale delivered gas prices for the calendar year period from 2019 to 2040 as an input into AEMO's various 2019 forecasts, including the 2019 Gas Statement of Opportunities ("GSOO"). The delivered prices include:

- delivered wholesale gas price for residential and commercial ("**R&C**") demand nodes (entry gate to distribution network), and
- delivered wholesale gas price for gas powered generators ("**GPG**") in the eastern Australian National Electricity Market ("NEM"); South West Interconnected System ("SWIS") in Western Australia ("WA") and the Darwin Katherine Interconnected System ("DKIS") in the Northern Territory ("NT").

1.2. Report Structure

This report includes four main elements:

Executive Summary

The executive summary provides a concise overview of the assessment and methodology undertaken by CORE and highlights CORE's conclusion regarding:

- GPG delivered wholesale gas price by major system generator;
- Retail delivered wholesale price delivered to by major city demand nodes for sale to R&C consumers.

Methodology

This section outlines the methodology CORE has adopted to arrive at estimates of projected prices.

Risks and Uncertainties

This section summarises the key risks and uncertainties relating to the price estimates presented.

Delivered Price Projections

This section summarises projected price analysis and results.

2. Executive Summary

2.1. Introduction

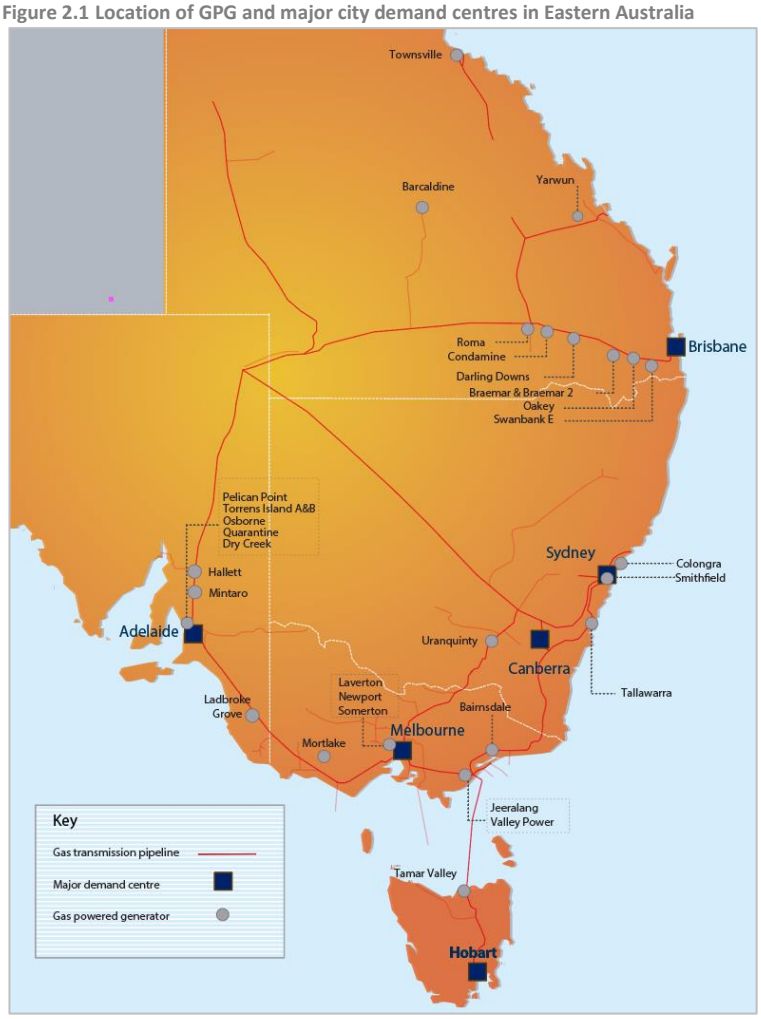
CORE has been engaged by AEMO to provide an independent estimate of future delivered wholesale gas prices, between 2019 and 2040, within three regional gas markets – Eastern Australia, Western Australia and Northern Territory, for two gas consumer segments:

- Residential and Commercial consumers ("R & C") who access gas via gas distribution networks (major city demand hubs included in figures 2.1 to 2.3).
- Gas Powered Generators ("GPG") with who receive gas via a transmission pipeline system (major GPG demand hubs included in figures 2.1 to 2.3).

For the avoidance of doubt, delivered wholesale price estimates referred to throughout this report exclude any costs associated with distribution services, retail cost and margin and any market or ancillary charges.

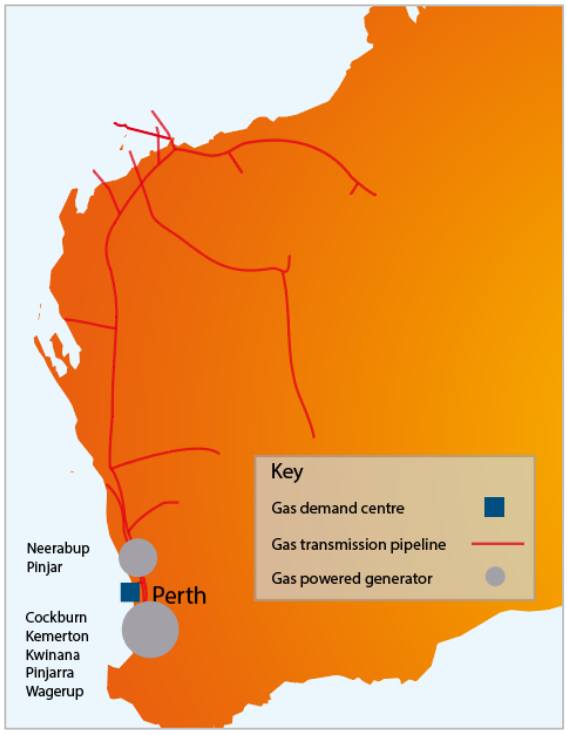
Figures 2.1 to 2.3 present an illustration of Australia's three regional gas systems, highlighting the location of the relevant GPG and major demand centres, for which delivered wholesale prices have been estimated by CORE. Note Sydney and Canberra prices have been combined for the purposes of this report

Figure 2.1 Location of GPG and major city demand centres in Eastern Australia



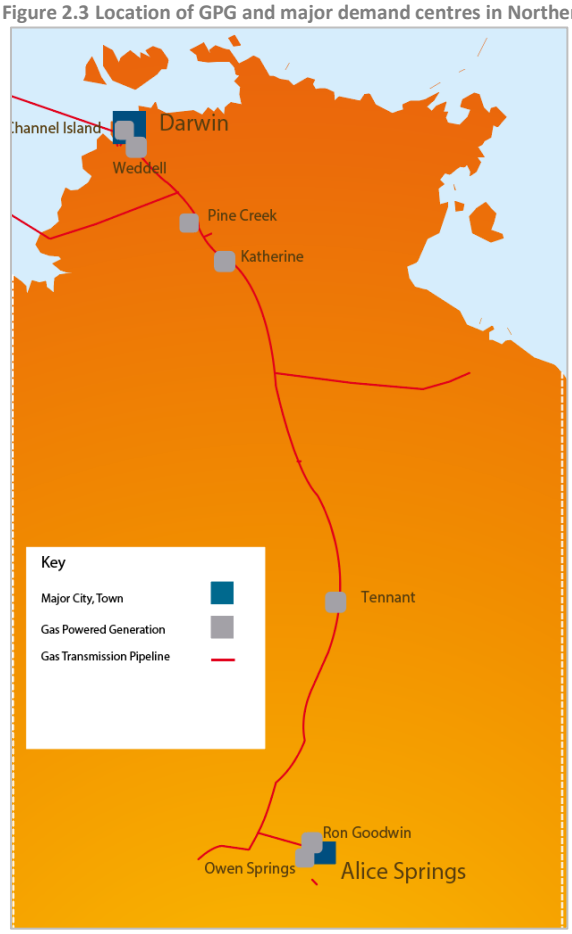
Source: Core Energy & Resources

Figure 2.2 Location of GPG and R&C Demand Nodes in Western Australia



Source: Core Energy & Resources Note[1]

Figure 2.3 Location of GPG and major demand centres in Northern Territory



Source: Core Energy & Resources

[1] Kalgoorlie is also a significant load on the SWIS and under "normal" non-peak operation, these Kalgoorlie non-mining loads are supplied by these generators.

2.2. Methodology

CORE has adopted a bottom-up approach to derive an estimate of delivered wholesale prices for the 2019-2040 period. Three major inputs have been separately estimated, and subsequently aggregated, to derive delivered wholesale price estimates. Each element has relied upon public data, including:

Wholesale contract price - the price of gas metered at the inlet to the gas transmission line, based on the estimated weighted average gas portfolio price for a specific gas buyer (retailer or generation facility owner).

Transmission cost - the relevant transmission pipeline tariff incurred when gas is transported from the upstream supply point to the metered delivery point relating to each GPG plant or distribution network delivery point (for R & C consumers), in accordance with an estimated gas transmission system tariff.

Peak supply cost - the cost of peak supply service to meet the variation between annual average demand and peak seasonal demand, which does not form part of the wholesale contract cost/price, or base transmission service but incurred as an additional cost – for example the use of the Iona and Mondarra underground gas storage services in Eastern and Western Australia respectively or the use of transmission system linepack.

CORE has applied its methodology based on three scenarios defined by AEMO, which present three alternative pathways to the development of the energy system and the future energy consumption needs of consumers. This includes a reference or 'Neutral' scenario which is CORE's best estimate of a most likely single point outcome on an annual basis; a Fast Change scenario and a Slow change scenario.

These scenarios take into consideration, among other influences, the following oil price and exchange rate scenarios:

Figure 2.4 Future Oil Price Scenarios (USD/Bbl)

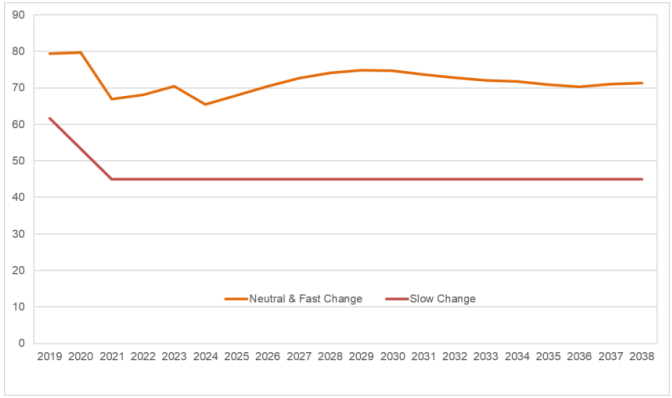
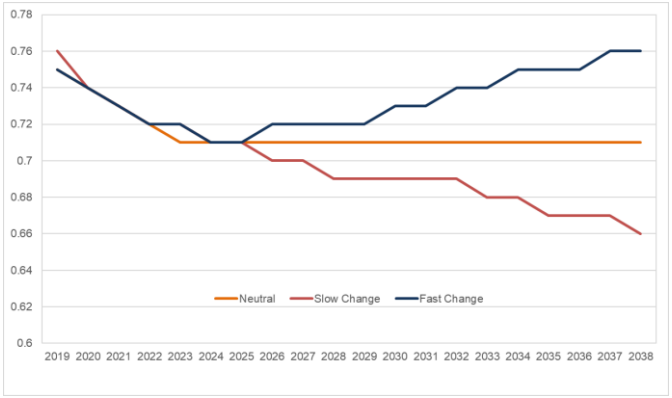


Figure 2.5 Future Exchange Rate Scenarios (USD:AUD)



Source: Provided by AEMO

2.3. Key Risk and Uncertainties

As is the case with any projection of future outcomes, there are a range of risks and uncertainties, both to the downside and upside, which relate to future price projections referenced throughout this report. CORE considers that the scenarios assessed provide a reasonable guide to the full range of potential wholesale delivered prices, however a range of factors, including the following, could give rise to a material variance outside this range:

- Government intervention
- Movement in supply/demand balance
- Changes in the concentration of market power/competition on buy and/or sell sides
- Changes in the pricing formula for LNG or any other gas related market which has commercial linkage with domestic markets

2.4. GPG Delivered Wholesale Price Projections 2019 – 2040

CORE's estimates of future prices take into consideration certain differences in market forces between Eastern Australia, Western Australia and Northern Territory:

- Eastern Australia is expected to have the closest link to LNG netback prices due to a relatively tight supply/demand balance and competition for supply between domestic and LNG markets. This is reflected by an estimated change in contract price formula whereby the domestic price has a relationship to an LNG/oil reference price such as Brent.
- Western Australia price inflation is expected to be lower than the east due to the influence of LNG project supply which must be reserved for domestic purposes.
- Northern Territory prices are expected to remain relatively flat in real terms as prices are assumed to be fixed under a long-term contract with the NT government, which is assumed to be passed on to generators and retailers at cost. Prices are assumed to inflate materially upon maturity of this contract due to competition with oil-price linked eastern Australia source gas, given the two regions have become connected via the Northern Gas Pipeline from December 2018.

2.4.1. Eastern Australia

Figures 2.6 to 2.10 present CORE's estimate of wholesale delivered gas prices for each generator, by region/State/Territory, under the Neutral scenario. All prices are presented in real January 2018, Australian Dollar (AUD) terms.

In broad terms prices are expected to trend upward by almost AUD3/GJ between 2018 and 2032, driven primarily by a closer link with LNG netback prices – moving from 7-8% of AUD Brent plus transmission and storage cost, toward 10+% of AUD Brent plus transmission and storage cost.

Variations between generators within States and across States is attributable to variations in the estimated weighted average portfolio prices of generator owners, including the price and term to maturity of existing contracts and assumed new contract prices beyond this term.

Figure 2.6 Victoria | AUD/GJ real 1.2018

Note: New CCGT, Jeeralang B&A share same price line, as do Valley Power, Somerton, Newport, Laverton and Bairnsdale

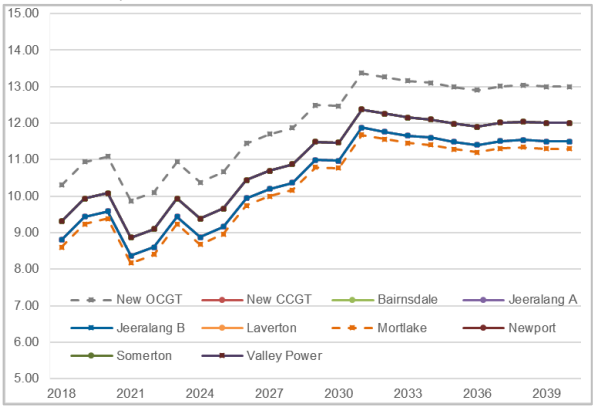


Figure 2.7 New South Wales | AUD/GJ real 1.2018

Note: Tallawarra and New CCG share same price line, as do Smithfield and Colongra.

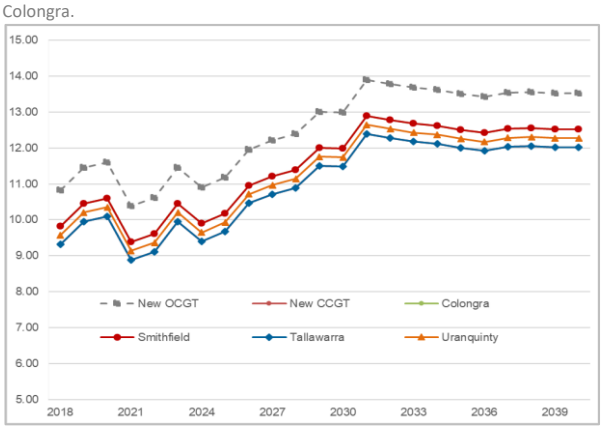


Figure 2.8 Queensland | AUD/GJ real 1.2018

Note: Barcaldine and Braemar 1&2; Condamine, Oakey, Roma and Swanbank E; and New CCGTand Darling Downs share same respective price paths.

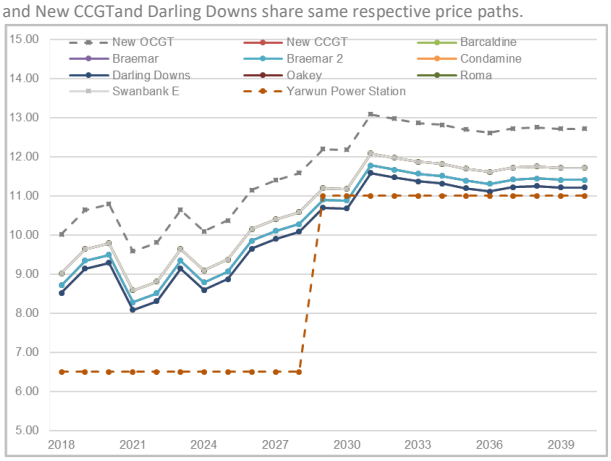


Figure 2.9 South Australia | AUD/GJ real 1.2018

Note: TIPS A&B, NewCCGT, Dry Creek, Hallet, Ladbroke Grove and Mintaro share same price line.

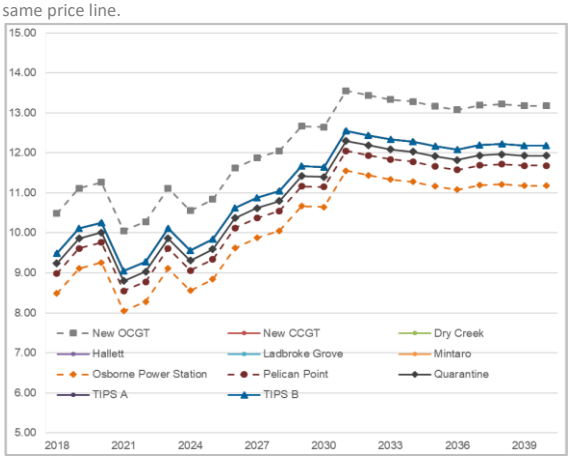
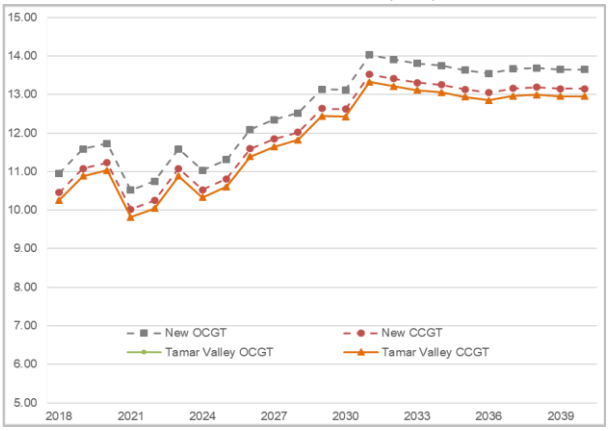


Figure 2.10 Tasmania | AUD/GJ real 1.2018

Note: Tamar OCGT is estimated to follow the same price path as Tamar CCGT



Source: Core Energy & Resources.

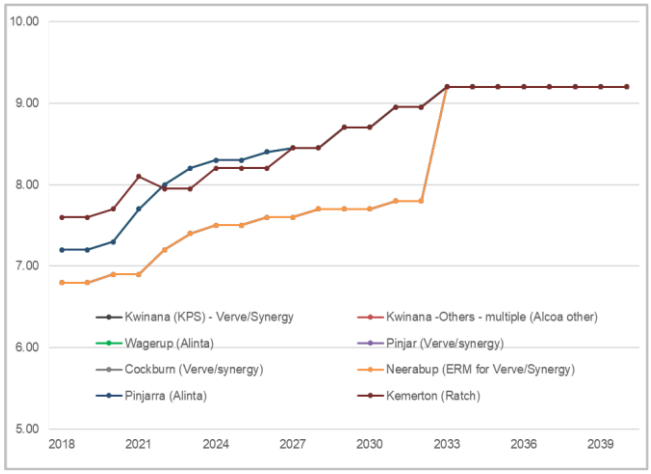
2.4.2. Western Australia

In broad terms, wholesale delivered prices to generators in Western Australia are expected to trend upward by almost AUD2/GJ between 2021 and 2033, due to a strengthening link with LNG netback prices, offset by the changing domestic gas supply/demand balance over time, including LNG project gas which is reserved for domestic markets under State Agreements.

Variations between generators is attributable to variations in the estimated weighted average portfolio prices of generator owners, including the price and term to maturity of existing contracts and assumed new contract prices. For example, the increase in the estimated price of Synergy GPG prices is based upon an estimated change in price from an existing Gorgon contract to an assumed future LNG netback price.

Figure 2.11 WA GPG Gas Price | Neutral Scenario | AUD/GJ real 1.2018

Note: Pinjar,Kwinana (all), Cockburn and Neerabup; and Wagerup and Pinjarra follow same respective price paths.



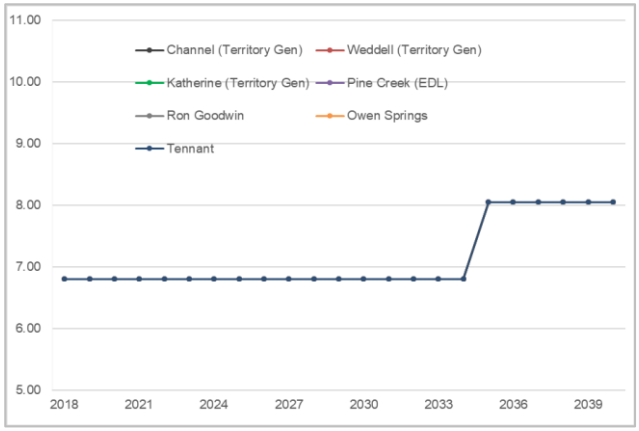
Source: Core Energy & Resources.

2.4.3. Northern Territory

In broad terms wholesale delivered prices to generators are expected to remain flat until the maturity of the existing Black-tip supply contract. New contract prices in 2034 are expected to increase toward AUD8/GJ, influenced in part by projected eastern Australian prices, given regional interconnection from 2019.

Figure 2.12 NT GPG Gas Price | Neutral Scenario | AUD/GJ real 1.2018

Note: All prices are estimated to follow the same price path



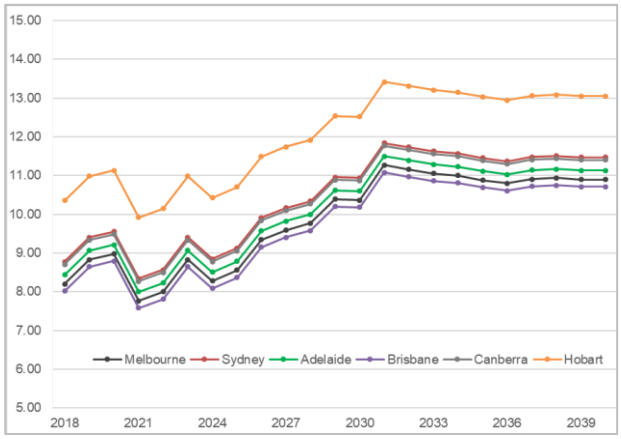
Source: Core Energy & Resources.

2.5. R&C Delivered Wholesale Price Projections

Figure 2.13 to 2.15 present CORE's estimate of the movement in wholesale delivered prices to major retail R&C demand nodes (at distribution network inlet point) under the Neutral Scenario for Eastern Australia (refer to Section 5 for CORE's estimates for each of the three scenarios for Eastern Australia) and all scenarios for Western Australia and Northern Territory.

2.5.1. Eastern Australia

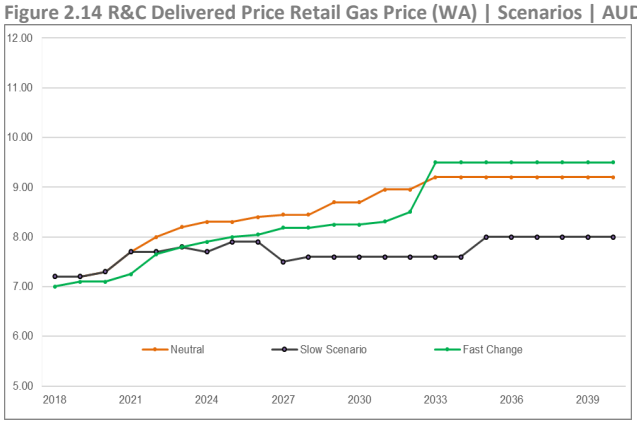
Figure 2.13 R&C Delivered Price Retail Gas Price (EA) | Neutral Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources

2.5.2. Western Australia

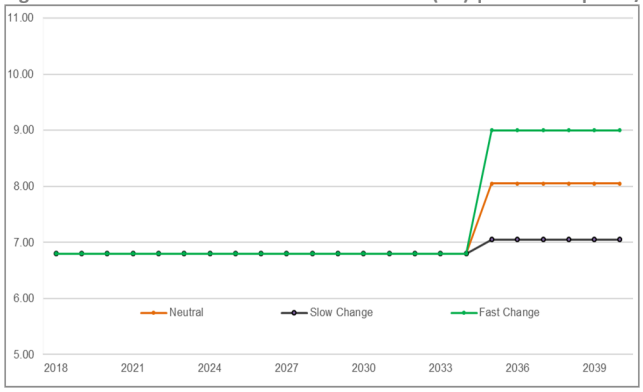
Figure 2.14 R&C Delivered Price Retail Gas Price (WA) | Scenarios | AUD/GJ real 1.2018



Source: Core Energy & Resources

2.5.3. Northern Territory

Figure 2.15 R&C Delivered Price Retail Gas Price (NT) | Scenarios | AUD/GJ real 1.2018

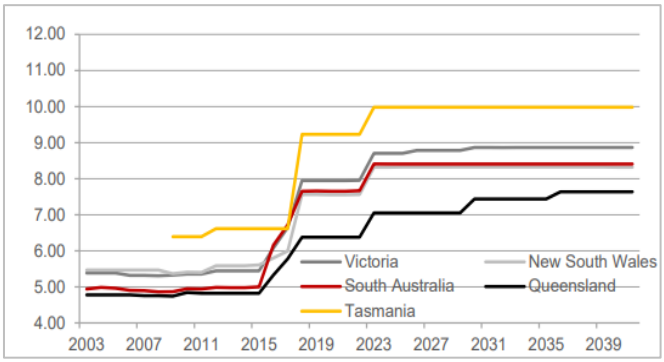


Source: Core Energy & Resources

2.6. Comparison Against Prior Assessment

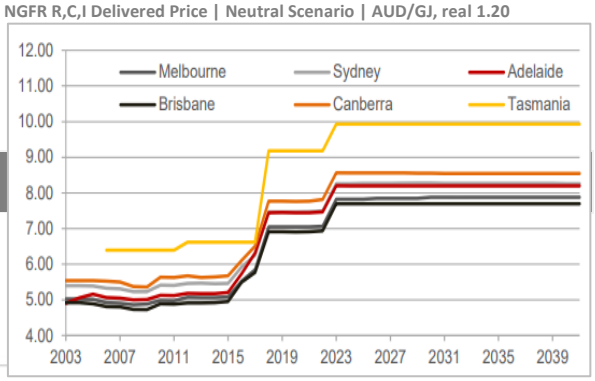
Figures 2.16 summarises a prior assessment by CORE of projected prices for AEMO's 2016 National Gas Forecasting Report (NGFR). This was completed for Eastern Australia only.

Figure 2.16 NGFR GPG Delivered Price | Neutral Scenario | AUD/GJ, real 1.2016



Source: Core Energy & Resources

NGFR R,C,I Delivered Price | Neutral Scenario | AUD/GJ, real 1.20



The prior analysis was based on the following major considerations.

	Slow Change		
CE derived gas production cost	AUD6.50/GJ		
AEMO oil price & exchange rate assumptions	Oil Price: USD30/bbl FOREX: 0.65	Oil Price: USD60/bbl FOREX: 0.75	Oil Price: USD90/bbl FOREX: 0.95
Gas prices (Gippsland) based on above LNG linkage	Fixed: AUD2.00/GJ Floating: AUD1.80/GJ Total: AUD3.80/GJ	Fixed: AUD2.00/GJ Floating: AUD3.35/GJ Total: AUD5.35/GJ	Fixed: AUD2.00/GJ Floating: AUD4.55/GJ Total: AUD6.55/GJ
Higher of Cost and LNG legacy Price	**AUD6.50/GJ**	**AUD7.00/GJ**	**8.50/GJ**

CORE's latest analysis, based upon new oil and gas price assumptions and scenarios provided by AEMO, assumes that demand and supply forces in eastern Australia will result in higher wholesale prices, without government intervention. CORE intelligence, which is supported by analysis disclosed by the ACCC, indicates that industrial prices have moved in the range of 0.10 to 0.115 or 10% to 11.5% of ICE Brent equivalent, plus transport cost. Therefore, an AUD oil price of $100/bbl would translate to a wholesale price ex Wallumbilla of approximately $10 to $11.50 per GJ.

As there have been few large retail or GPG contracts announced in the last 12 months, there is a high level of uncertainty as to what final prices will be negotiated as legacy contract mature in the 2020 to 2022 timeframe, with parties including Origin, AGL and Energy Australia. Given that these parties account for the majority of direct sale contracts in eastern Australia (>75%), the outcome of such negotiations will be influential in determining wholesale prices over the mid-term. CORE estimates that prices

will be linked to oil prices with 'slopes' or % of oil-based reference prices in the range of 8% at the low end of the range to 11% at the high end of the range.

This is a stronger linkage to netback prices than what was previously considered in the 2016 NGFR, given stronger recent evidence of these slopes penetrating domestic contract negotiations. Although higher slopes are possible, CORE considers that the ability of R & C customers to invest in long-term contracts at these high prices may reduce, and therefore the forecasts presented here are considered reasonable to minimise the potential for price-induced demand destruction and maintain reasonable energy consumption growth in the Fast Change scenario.

3. Methodology

The following is a summary of the methodology adopted by CORE to develop scenario-based projections of delivered wholesale gas prices for the GPG and R&C consumer segments.

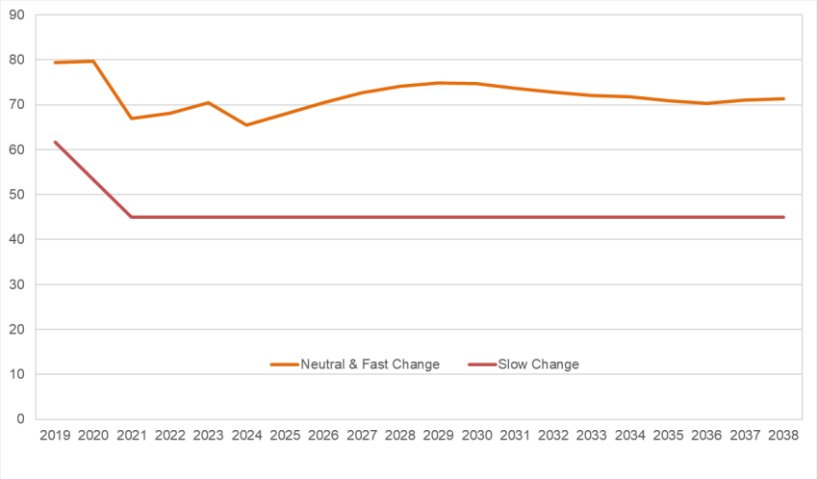
3.1. Scenarios

CORE has derived estimates of delivered wholesale gas prices (delivered to generator inlet or inlet of distribution network) under three scenarios, consistent with a scenario framework developed by AEMO.

- Neutral Scenario: CORE's best estimate of delivered wholesale gas prices under a range of mid-point projections of economic growth and domestic and international drivers that lead to a central, or neutral estimate of energy consumption. For the LNG sector, Australia's existing LNG assets continue to be at production levels sufficient to maintain investment in Queensland CSG fields.
- Fast Change scenario: CORE's best estimate of wholesale delivered gas prices in a scenario that has faster drivers for energy system change. Under this scenario, economic growth is higher than the Neutral Scenario, particularly from Australia's services sector, with higher population growth increasing demand for services reliant on energy than projected under the Neutral scenario. For the LNG sector stronger international demand is offset through stronger international supply, as well as some potential for increased utilisation of Australian LNG assets. This higher energy consumption leads to a faster relative need for development of energy systems in both gas and electricity, relative to the Neutral scenario.
  The influence of gas prices on consumption is such that this scenario relies on the continued relative affordability of natural gas as an input to industrial processes, particularly for energy intensive businesses to maintain international competitiveness. As such, the future prices in this scenario does not necessarily provide an upper estimate of future wholesale gas prices, but CORE's best estimate of the price level that would support growth in gas consumption.
- Slow Change – CORE's best estimate of delivered wholesale gas prices in a scenario that has slower drivers for energy system change. Under this scenario economic growth is weak, reducing business investment and increasing the potential for closures of some industrial facilities. For the LNG sector lower international consumption leads to a weaker environment for CSG investment, and utilisation of existing facilities may reduce as a result. This lower energy consumption leads to a slower need for development of energy systems in both gas and electricity, relative to the Neutral scenario.

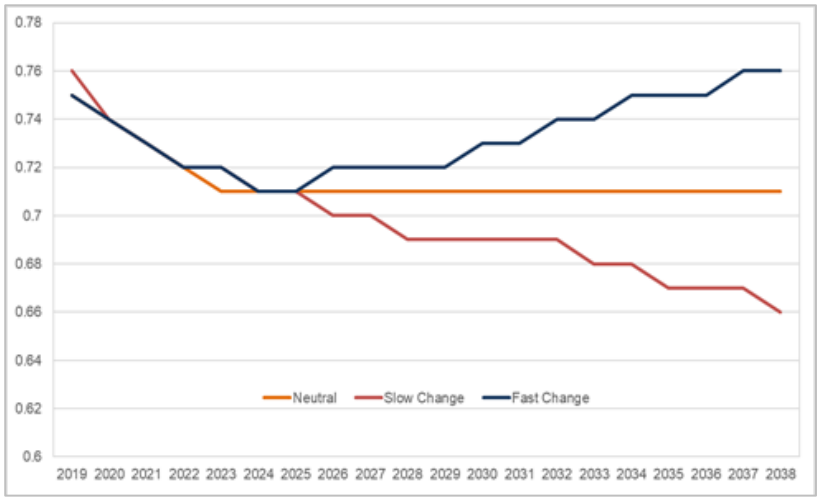
Unless otherwise stated, scenario-based prices assume the following average annual oil prices and AUD:USD exchange rates.

Figure 3.1 Brent Oil Price (USD per bbl)



Source: AEMO

Figure 3.2 Exchange Rate (AUD:USD)



Source: AEMO

3.2. Market Structure

CORE's projections have been developed following consideration of certain material differences between the market dynamics of western, eastern and northern markets are summarised below.

Eastern Australia: CORE assumes that the demand/supply balance in eastern Australia, as it relates to the domestic market, will remain tight throughout the projection period. Given linkages between export and domestic market supply, it is further assumed that future prices under new contracts will move closer to, but fall short of, LNG netback parity, where netback is defined as the price of LNG netted back to the Wallumbilla hub, which includes the Gladstone f.o.b. LNG price less costs associated with transport, marine facilities and LNG processing.

Western Australia: CORE assumes that WA will move from a situation where supply is long during the period to 2021 to one where it is generally in balance due to the combined influences of reserved gas supply from LNG projects and dedicated domestic supply projects including the new Waitsia development and demand which is expected to remain relatively flat. Accordingly, prices in WA are assumed to track below LNG net back prices as compared to eastern Australia.

Northern Territory: The majority of gas supply in Northern Territory is sourced under a long-term contract with Power and Water Corporation. Therefore CORE assumes that NT prices will remain flat until that contract matures. Future prices are assumed to be influenced by prices in eastern Australia, less the cost of transport, given interconnection between NT and the east from December 2018, via the Northern Gas Pipeline.

3.3. Delivered Wholesale Price Elements

In determining the wholesale gas prices, three elements have been considered, and these elements have been aggregated under each scenario to arrive at a future range of feasible delivered wholesale price outcomes:

Wholesale contract price - the price of gas metered at the inlet to the gas transmission line, based on the estimated weighted average gas portfolio price for a specific gas buyer (retailer or generation facility owner).

Transmission cost - the relevant transmission pipeline tariff incurred when gas is transported from the upstream supply point to the metered delivery point relating to each GPG plant or distribution network delivery point (for R & C consumers), in accordance with an estimated gas transmission system tariff.

Peak supply cost - the cost of peak supply service to meet the variation between annual average demand and peak seasonal demand, which does not form part of the wholesale contract cost/price, or base transmission service but incurred as an additional cost – for example the use of the Iona and Mondarra underground gas storage services in Eastern and Western Australia respectively or the use of transmission system linepack.

It should be noted that this price represents the estimated weighted portfolio cost of gas to the buyer (retailer or GPG owner) over time (existing contracts and assumed future contract prices) and not the marginal cost or opportunity cost, which may also influence future market behaviour. The prices therefore also do not reflect the potential volatility that may exist in short term gas markets.

Prices are expressed in January 2018 real terms unless stated otherwise.

The following sections provide more detail on CORE's approach to estimating each price/cost component.

3.3.1. Wholesale Contract Price

Internally, CORE maintains a database which incorporates a best estimate of existing contracts and key features of each contract. The database includes estimated prices, and these prices have been relied upon to develop estimates of projected wholesale gas price for the estimated duration of each contract. Further, CORE maintains an assessment of future prices for those years which extend beyond the estimated term of an existing contract and these prices have been relied upon to develop price estimates to 2040. CORE has also considered the extent of any shorter-term market price influence – i.e. trades via short-term markets, swaps, or other short-term exchange mechanism. The extent of this influence is assumed to be up to 20% in WA[2], less than 5% in Eastern Australia, and no impact in Northern Territory.

More specifically CORE's approach has involved the following steps:

1. Estimate a portfolio-wide weighted average price of wholesale gas for the major retailers and generators in each jurisdiction (e.g. Gentailers AGL, Origin Energy and EnergyAustralia in eastern Australia, gas retailers Alinta and Kleenheat in Western Australia and Territory Generation for GPG in Northern Territory);
2. Estimate the market share of each retailer for each region to derive an estimate of the weighted average wholesale price for that region;
3. For those existing contracts which are assessed to be linked to oil price, derive a future price estimate by applying the oil and exchange rate assumptions provided by AEMO, as outlined above;
4. For new future contracts, CORE has assumed that prices will be linked to future LNG netback prices, with that relationship varying between region and scenario.

[2] AEMO guidance based on internal market research

3.3.2. Transmission Tariff

CORE has utilised the Gas Infrastructure module of its Energyview system to develop estimates of future transmission tariffs.

CORE's approach involves:

1. An assumption under all scenarios is that transmission cost will remain relatively flat in real terms due to regulatory, supply and demand side competition influences and that Buyers portfolio tariffs are in line with public 'headline' tariffs. CORE notes that larger buyers will negotiate discounts to such prices in practice but the extent of discount by pipeline is not available in the public domain. Such discounts can be material, based on CORE's experience.
2. For R&C demand centres the transmission cost has been derived on a weighted average basis by estimating the relative utilisation of pipelines connecting with each State/Territory R&C and generator demand node. For example, gas is delivered to South Australia via both the South East Australian ("**SEA**") Gas Pipeline and Moomba Adelaide Pipeline ("**MAP**"), therefore transmission costs in South Australia are weighted based on the estimated relative pipeline flows.
3. The transmission cost for power stations is based on the main pipeline link. For example, Bairnsdale, Jeeralang A and B and Valley Power stations are situated on the Longford Melbourne Pipeline ("**LMP**"), and the associated transmission cost is assumed to be the LMP transmission tariff.

3.4. Peak Supply Tariff

CORE's approach to estimating peak supply costs is as follows:

1. Determine the R&C and GPG peak requirements in each State/Territory.
2. Determine the weighted average cost of utilisation of peak supply sources in each State/Territory.
3. Determine the weighted average cost of peak supply in each State/Territory for each R&C and GPG demand node. Note: For States and Territories with material swing in seasonal demand, a peak supply charge/tariff has been included for supply outside of contracted maximum daily quantity ("**MDQ**"). CORE assumes that any variability in daily demand is met by contracted MDQ in Queensland, Tasmania and Northern Territory. Therefore, peak supply costs are assumed to be negligible for R&C and GPG in those regions.

4. Key Risk and Uncertainties

The following table provides a summary of the key risks and uncertainties related to the future delivered wholesale gas prices.

Table 4.1 Key Uncertainties

Factor	Influence
Wholesale Price	
AUD Oil Price Linkage	▪ Movement in oil price and exchange rate could materially impact future gas prices through contract pricing mechanisms linked to AUD oil prices
Policy	▪ Changes in government policy which materially impact gas demand, supply or cost
Production Cost	▪ Future cost of gas extraction, including uncertainty associated with reservoir/well performance ▪ Scope for technology advancement
Availability of Supply Source	▪ Timing, location and scale of any future exploration success
LNG import terminal	▪ Timing, scale and contracting of gas supply from a future import terminal and impact of the cost of such supply in setting a new marginal price benchmark
Transmission Cost	
Pipeline capacity utilisation	▪ Movement in capacity contracting could result in movement in tariffs
Regulation	▪ Any change in regulation which impacts tariffs
Peak Supply Cost	
Movement in peak and intermediate gas supply/demand balance	▪ Movement in demand side forces such as reduction in peak GPG due to battery storage or reduction in winter gas heating due to expansion of R-C air-conditioning use in winter heating season
Cost of New Entrant Capacity	▪ Cost of any new greenfield underground storage service ▪ Cost of any new LNG spiking facility ▪ Availability and cost of any augmentation of linepack or other pipeline storage service

Based on the risks and uncertainties listed above, CORE considers it feasible that there will be a future price path that is materially above that presented under the Neutral and Fast Change scenarios for eastern Australia. CORE has undertaken quantitative analysis of a range of scenarios to define an upper price boundary. This analysis indicates that prices from 2022 onward could increase by 10-25% above the price presented in the eastern Australia Fast Change scenario due to tightening supply/demand balance. Under these circumstances CORE considers it possible that the pricing formula for oil-linked contracts could increase toward 11% of ICE Brent or another price marker. Under a high oil price scenario of $100 to $125 per barrel, this could equate to approximately $11-14 per GJ.

5. Delivered Price Projections

5.1. Introduction

Historical and projected delivered wholesale gas price paths for defined generators and major gas networks is provided in the following paragraphs.

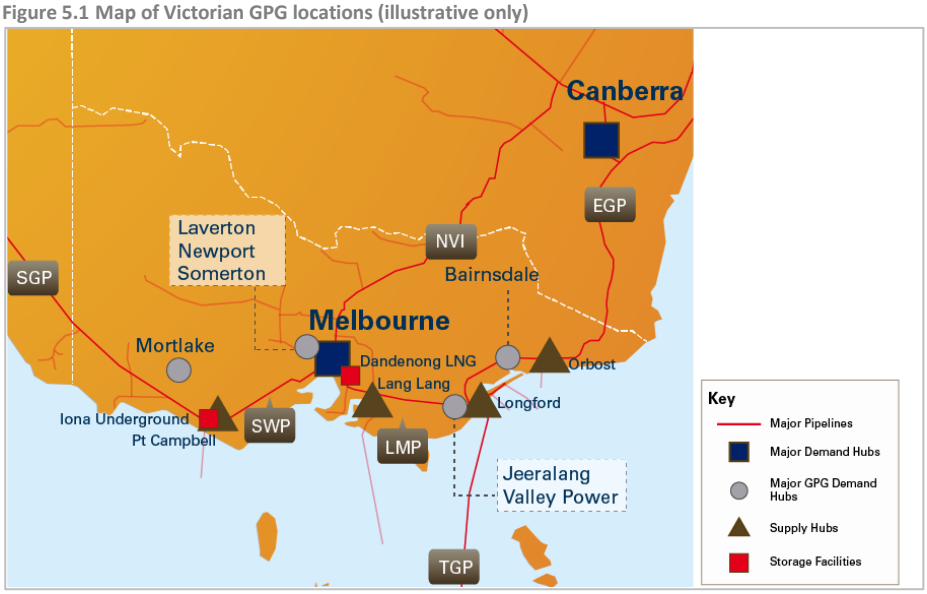
5.2. GPG Delivered Wholesale Price Projections

5.2.1. Eastern Australia

5.2.1.1 Victoria

The location of Victorian gas-powered generators is presented in Figure 5.1

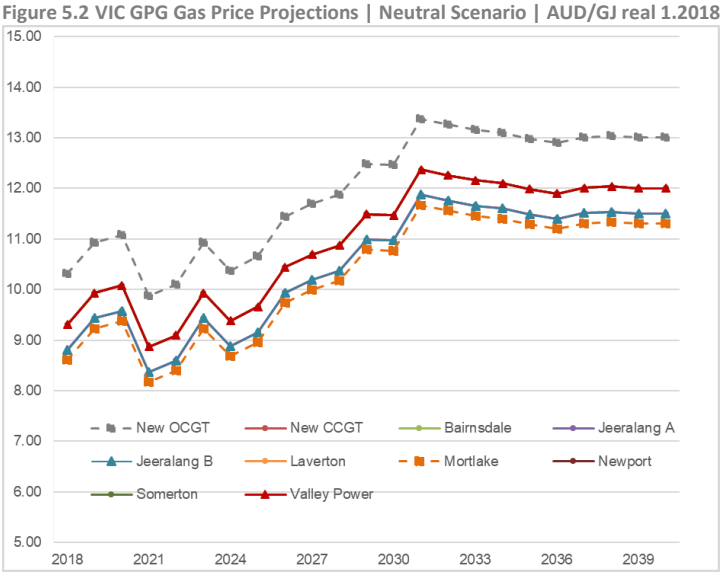
Figure 5.1 Map of Victorian GPG locations (illustrative only)



Source: Core Energy & Resources

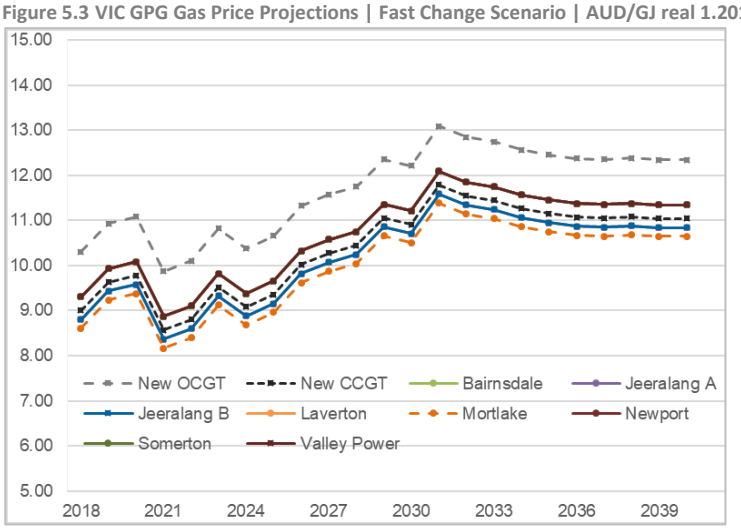
Figures 5.2 to 5.4 present a summary of CORE's projection of delivered VIC GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.2 VIC GPG Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018



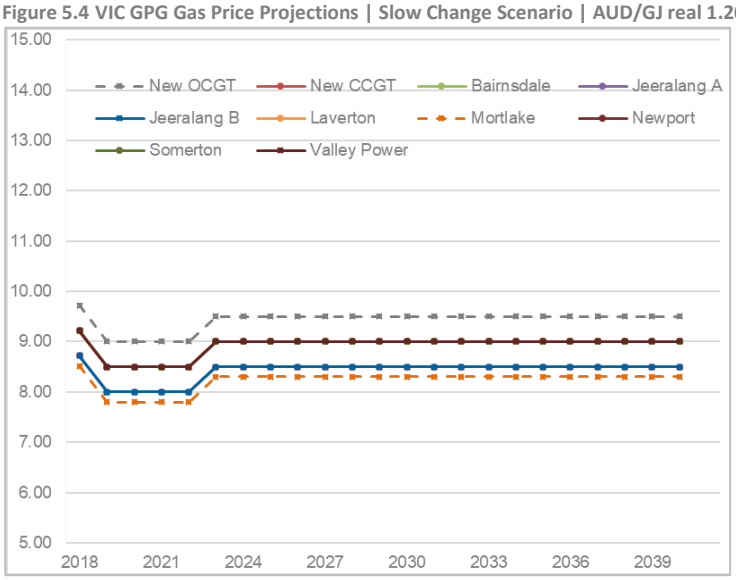
Source: Core Energy & Resources. Note: New CCGT, Jeeralang B&A; and Valley Power, Somerton, Newport, Laverton and Bairnsdale share same respective price paths

Figure 5.3 VIC GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Jeeralang B&A; and Valley Power, Somerton, Newport, Laverton and Bairnsdale share same respective price paths

Figure 5.4 VIC GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018

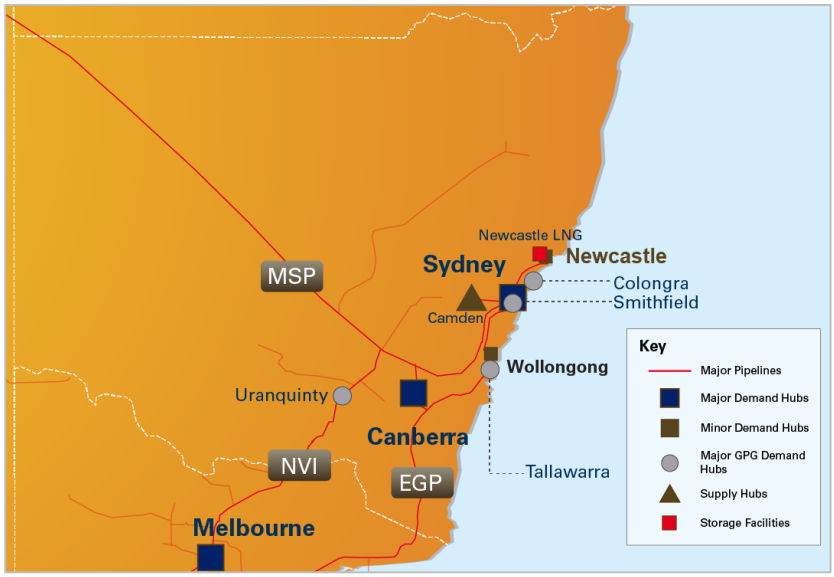


Source: Core Energy & Resources. Note: New CCGT, Jeeralang B&A; and Valley Power, Somerton, Newport, Laverton and Bairnsdale share same respective price paths

5.2.1.2 New South Wales

Figure 5.5 presents the location of gas-powered generators in New South Wales

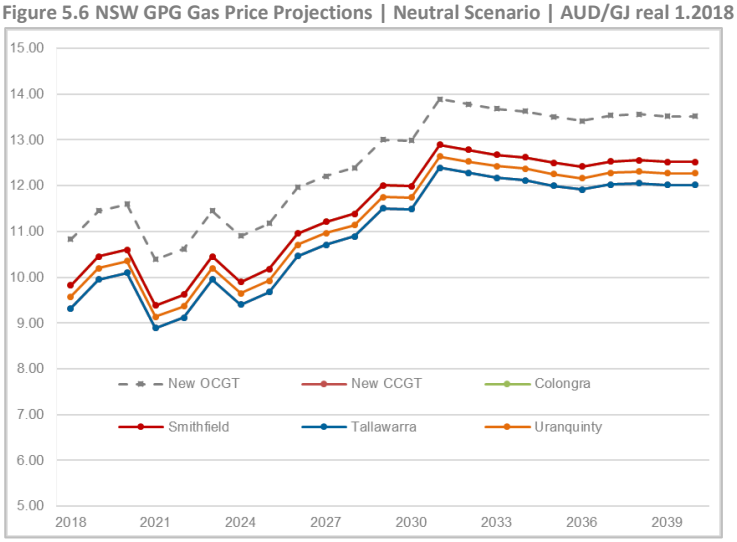
Figure 5.5 Map of New South Wales GPG locations (illustrative only)



Source: Core Energy & Resources

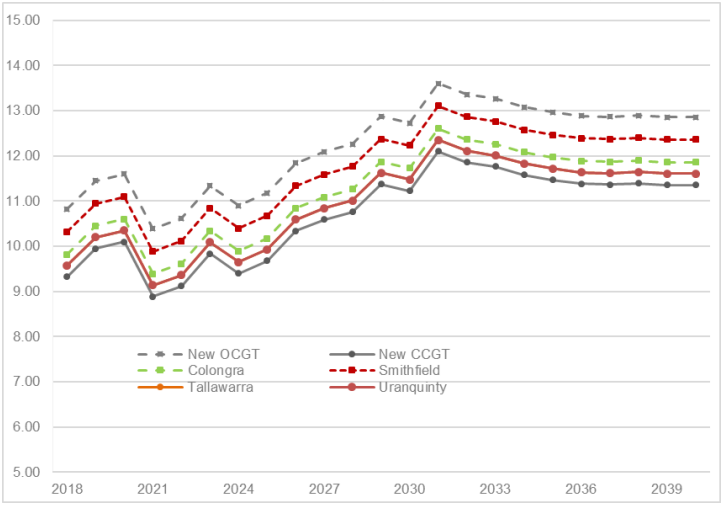
Figures 5.6 to 5.8 present a summary of CORE's projection of NSW delivered GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.6 NSW GPG Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018



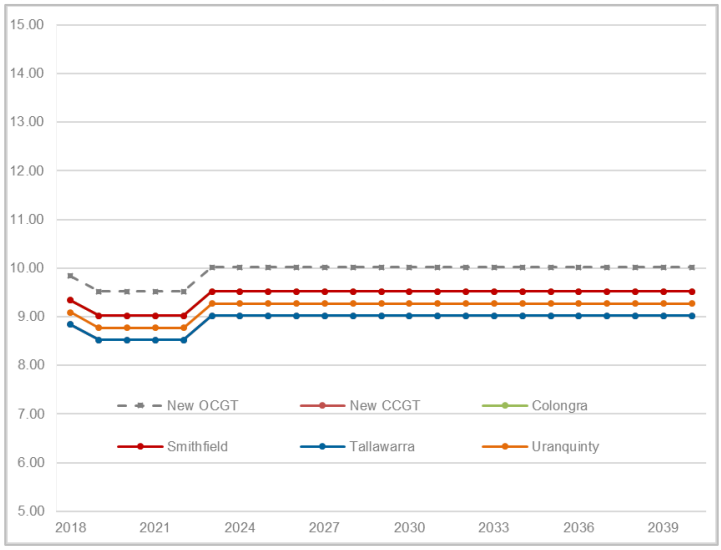
Source: Core Energy & Resources. Note: Tallawarra and New CCGT; and Smithfield and Colongra share same respective price paths.

Figure 5.7 NSW GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Tallawarra and Uranquinty share same price path

Figure 5.8 NSW GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Tallawarra and New CCGT; and Smithfield and Colongra share same respective price paths

5.2.1.3 South Australia

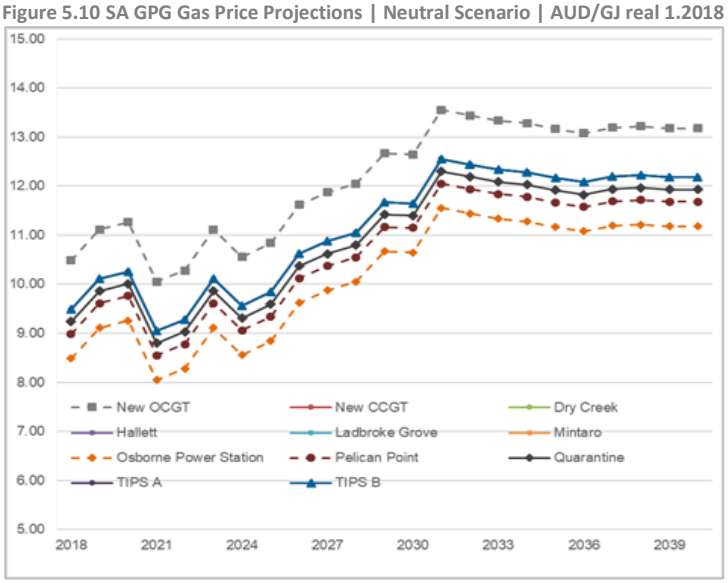
Figure 5.9 presents a summary of the location of gas-powered generators in South Australia

Figure 5.9 Map of South Australian GPG locations (illustrative only)

Source: Core Energy & Resources

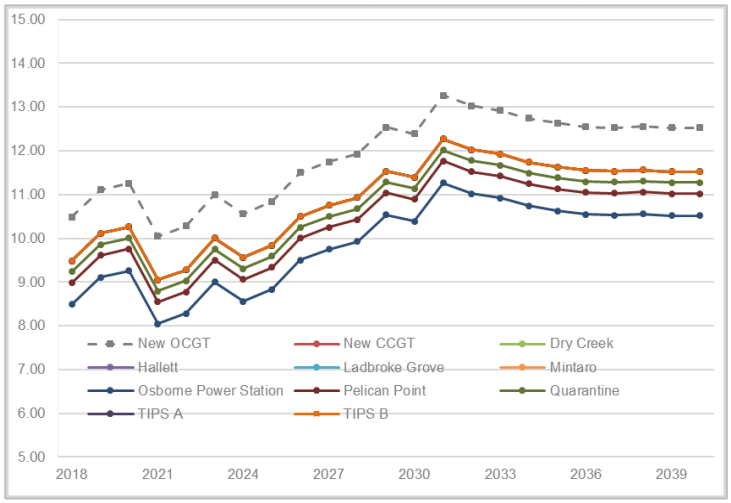
Figures 5.10 to 5.12 present a summary of CORE's projection of delivered SA GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.10 SA GPG Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018



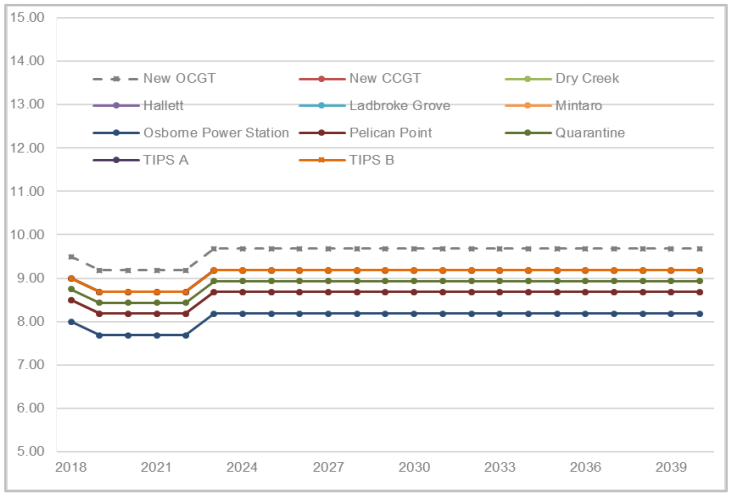
Source: Core Energy & Resources. Note: TIPS A&B, NewCCGT, Dry Creek, Hallet, Ladbroke Grove and Mintaro share same price path.

Figure 5.11 SA GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: TIPS A&B, NewCCGT, Dry Creek, Hallet, Ladbroke Grove and Mintaro share same price path

Figure 5.12 SA GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018

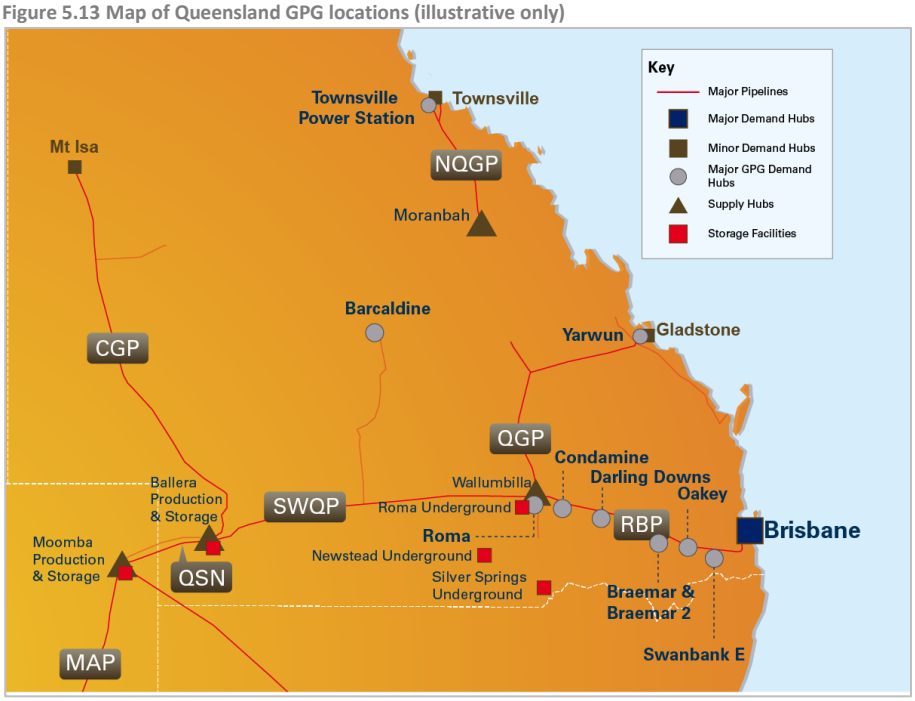


Source: Core Energy & Resources. Note: TIPS A&B, NewCCGT, Dry Creek, Hallet, Ladbroke Grove and Mintaro share same price path

5.2.1.4 Queensland

Figure 5.13 presents the location of gas-powered generators in Queensland.

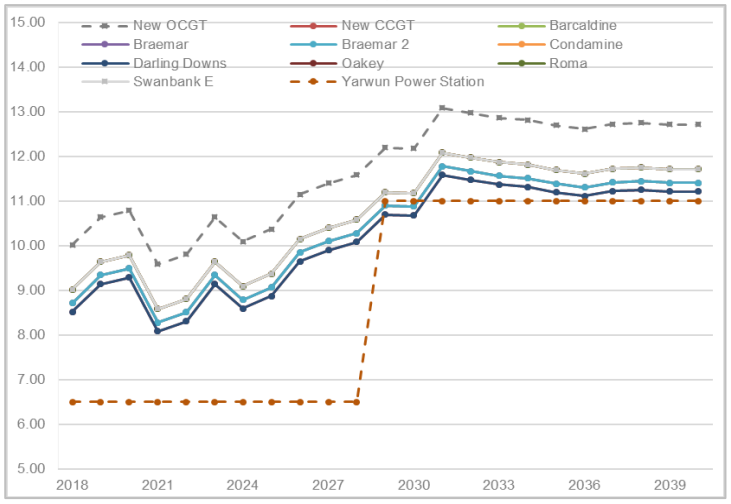
Figure 5.13 Map of Queensland GPG locations (illustrative only)



Source: Core Energy & Resources

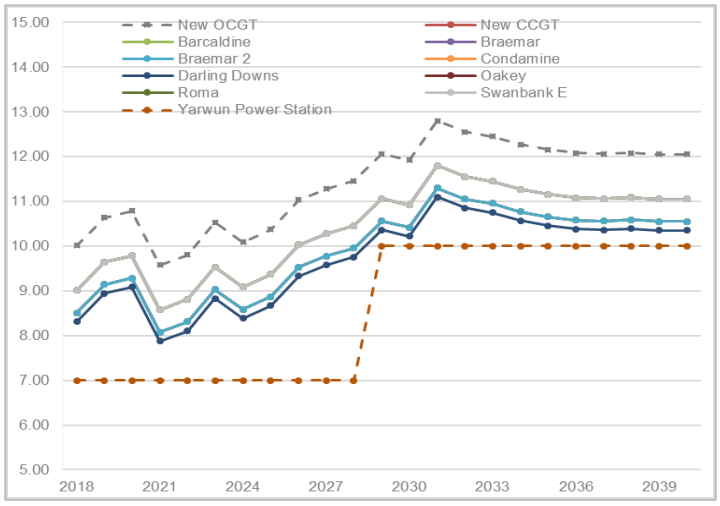
Figures 5.14 to 5.16 present a summary of CORE's projection of delivered QLD GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.14 QLD GPG Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018



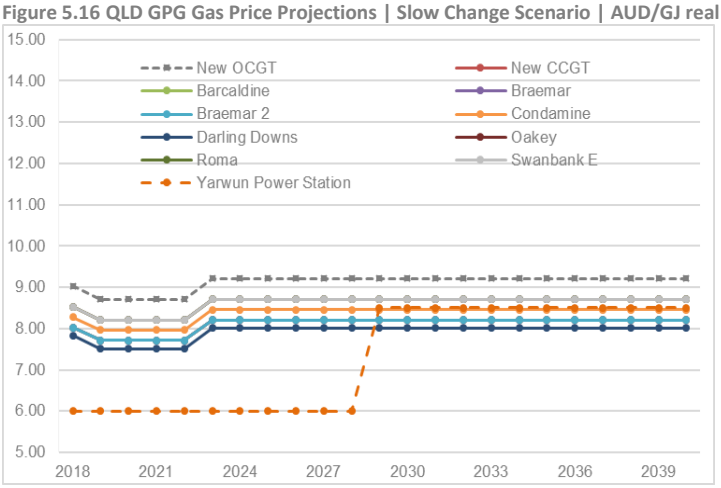
Source: Core Energy & Resources. Note: Barcaldine and Braemar 1&2; Condamine, Oakey, Roma and Swanbank E; and New CCGTand Darling Downs share same respective price paths.

Figure 5.15 QLD GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: New CCGT, Barcaldine and Braemar 1&2; and Condamine, Oakey, Roma and Swanbank E share same respective price paths

Figure 5.16 QLD GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018

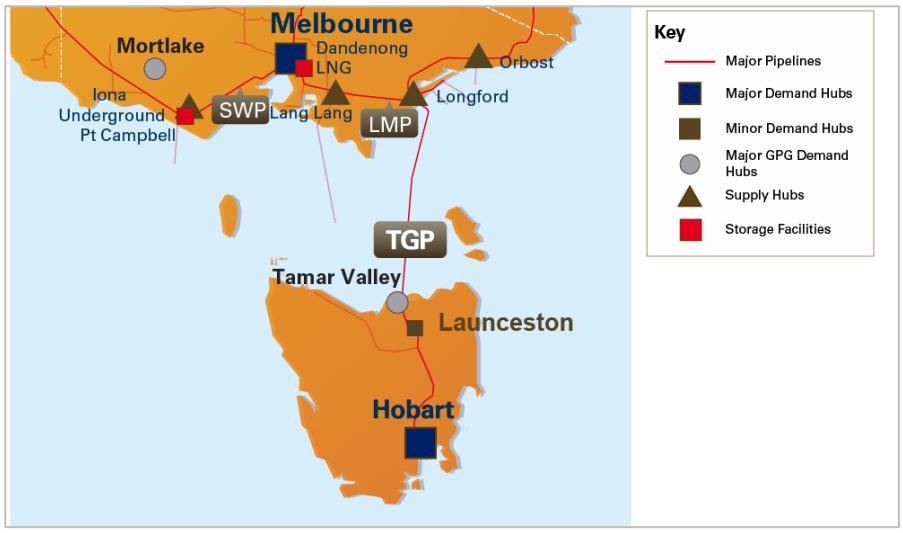


Source: Core Energy & Resources. Note: Barcaldine, New CCGTand Braemar 1&2; and Oakey, Roma and Swanbank E share same respective price paths

5.2.1.5 Tasmania

The following figure presents the location of gas-powered generators in Tasmania.

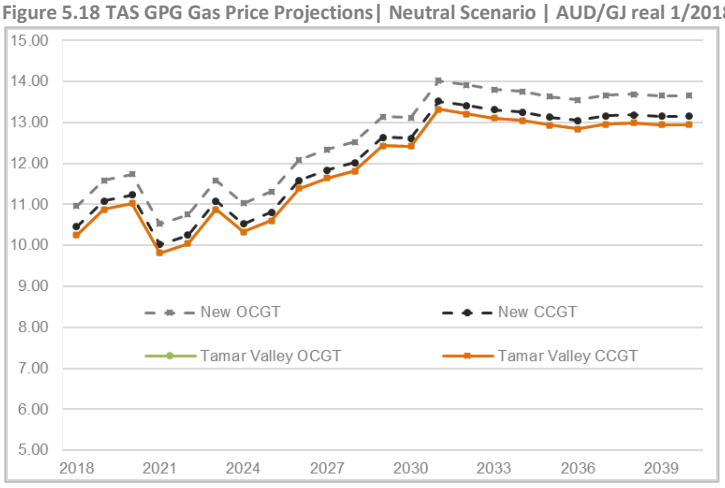
Figure 5.17 Map of Tasmania GPG locations (illustrative only)



Source: Core Energy & Resources.

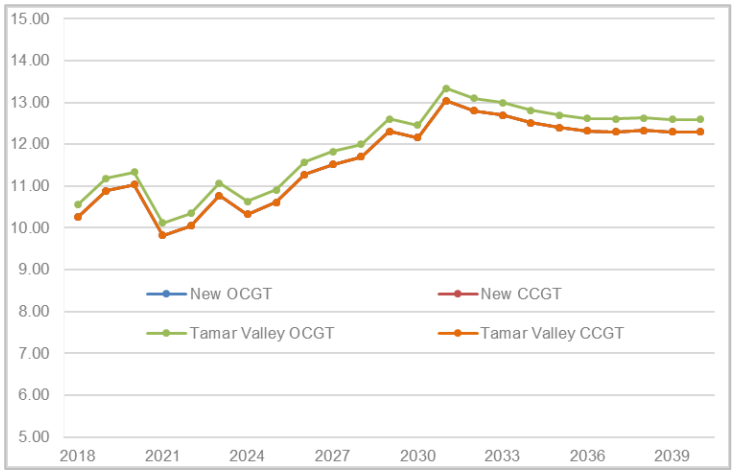
Figures 5.18 to 5.20 present a summary of CORE's projection of delivered TAS GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.18 TAS GPG Gas Price Projections| Neutral Scenario | AUD/GJ real 1/2018



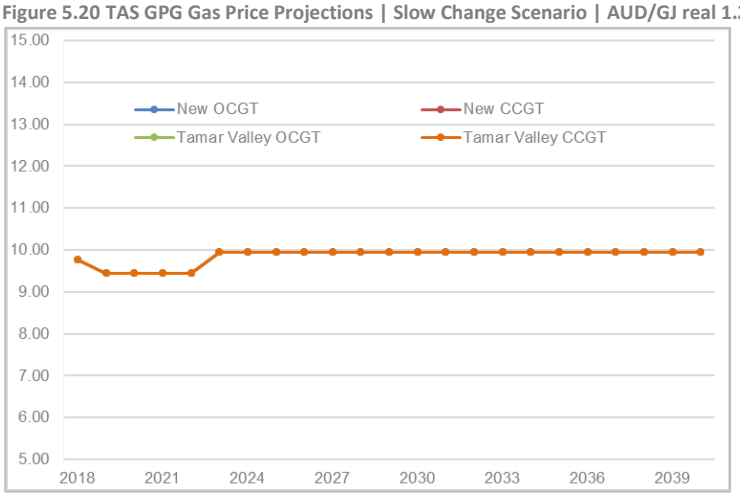
Source: Core Energy & Resources. Note: Tamar OCGT is estimated to follow the same price path as Tamar CCGT

Figure 5.19 TAS GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: The OCGT generators and the CCGT generators are estimatd to follow the same respective price paths.

Figure 5.20 TAS GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018

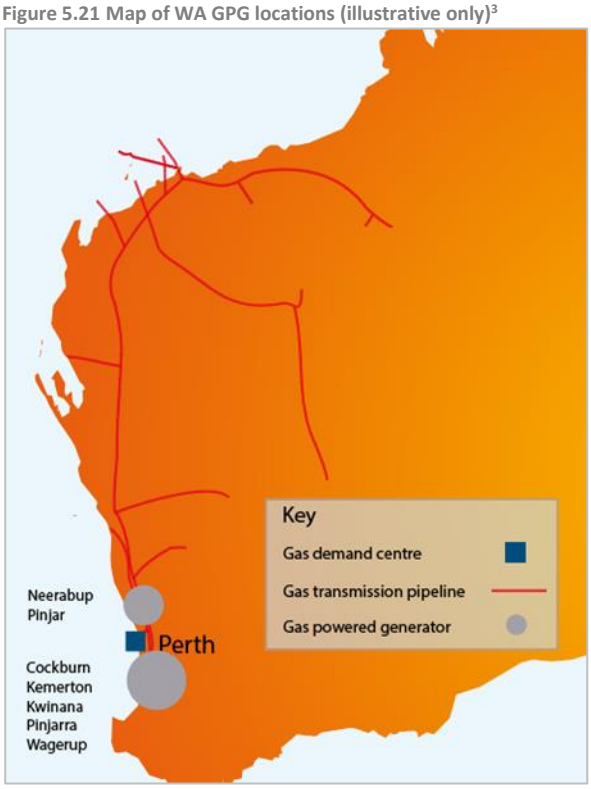


Source: Core Energy & Resources. Note: all generators are estimated to follow the same price path

5.2.2. Western Australia

The location of Western Australia's gas-powered generators is presented in the map in Figure 5.21

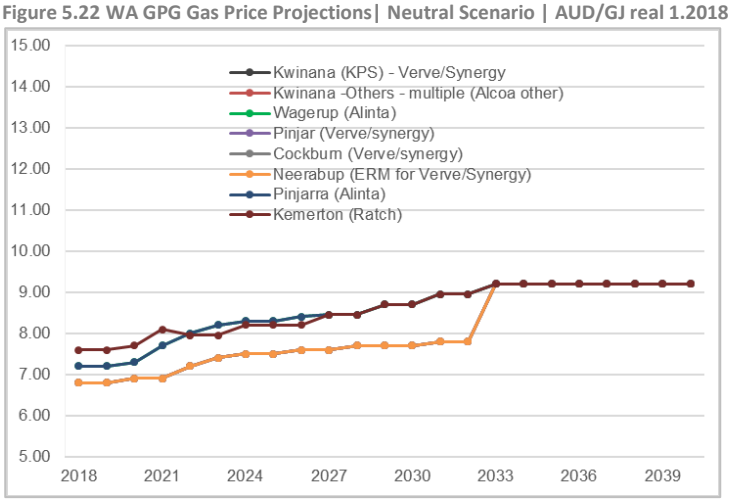
Figure 5.21 Map of WA GPG locations (illustrative only)[3]



Source: Core Energy & Resources.

Figures 5.22 to 5.24 present a summary of CORE's projection of delivered WA GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

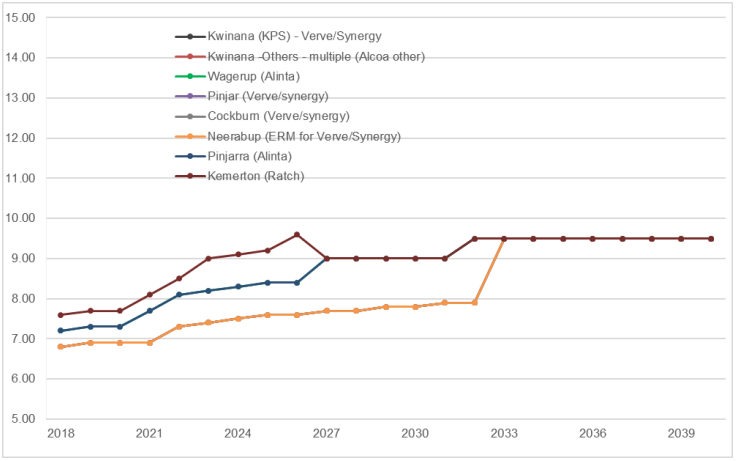
Figure 5.22 WA GPG Gas Price Projections| Neutral Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Pinjar,Kwinana (all), Cockburn and Neerabup; and Wagerup and Pinjarra follow same respective price paths

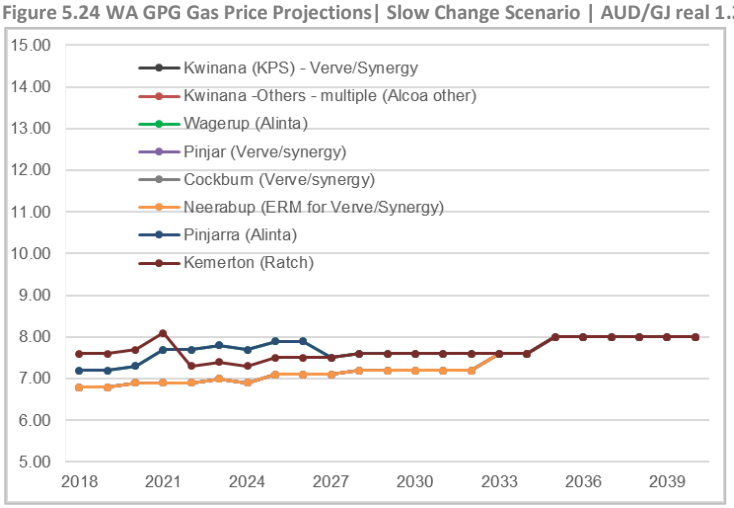
[3] Kalgoorlie is also a significant load on the SWIS and under "normal" non-peak operation, these Kalgoorlie non-mining loads are supplied by these generators.

Figure 5.23 WA GPG Gas Price Projections| Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Pinjar,Kwinana (all), Cockburn and Neerabup; and Wagerup and Pinjarra follow same respective price paths

Figure 5.24 WA GPG Gas Price Projections| Slow Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources. Note: Pinjar,Kwinana (all), Cockburn and Neerabup; and Wagerup and Pinjarra follow same respective price paths

5.2.3. Northern Territory

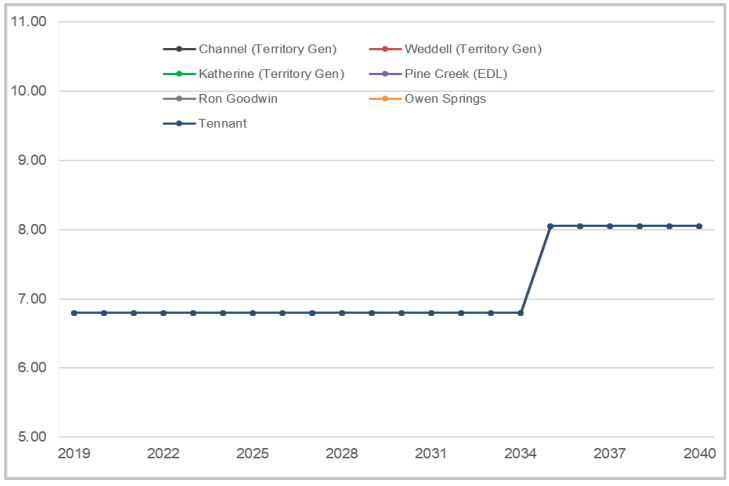
The location of Northern Territory's GPG's is presented in the map in Figure 5.25

Figure 5.25 Map of WA GPG locations (illustrative only)

Source: Core Energy & Resources

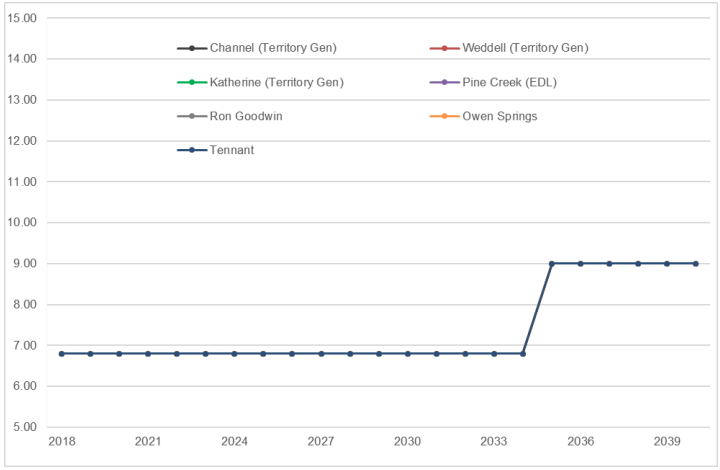
Figures 5.26 to 5.28 present a summary of CORE's projection of delivered NT GPG wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Figure 5.26 NT GPG Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018



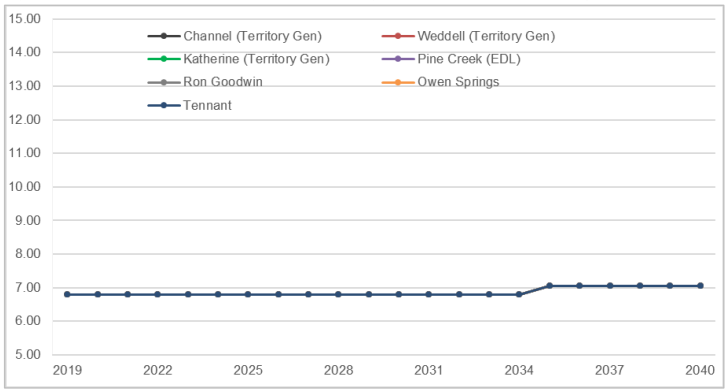
Source: Core Energy & Resources.

Figure 5.27 NT GPG Gas Price Projections | Fast Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources

Figure 5.28 NT GPG Gas Price Projections | Slow Change Scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources.

5.3. Residential and Commercial Delivered Wholesale Price

Figures 5.29 to 5.33 present a summary of CORE's projection of delivered wholesale prices between 2019 and 2040 under Neutral, Fast Change and Slow Change scenarios.

Eastern Australia

Figure 5.29 Retail Gas Price Projections | Neutral Scenario | AUD/GJ real 1.2018

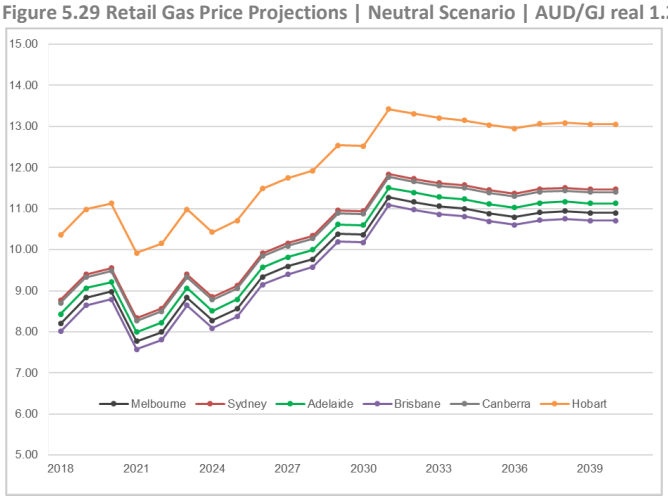


Figure 5.30 Retail Gas Price Projections | Fast Change scenario | AUD/GJ real 1.2018

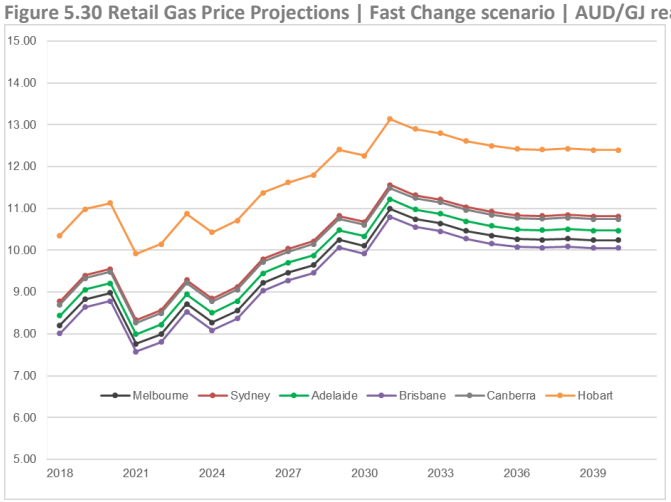
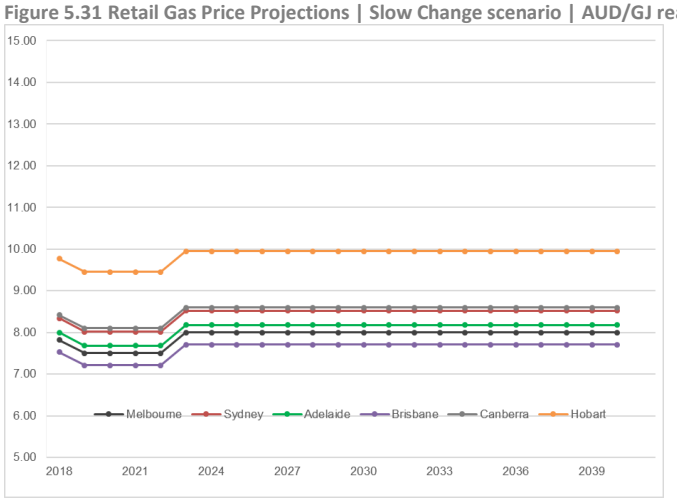


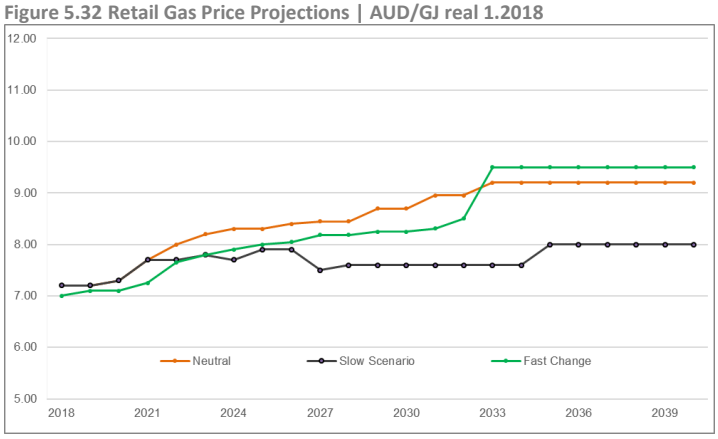
Figure 5.31 Retail Gas Price Projections | Slow Change scenario | AUD/GJ real 1.2018



Source: Core Energy & Resources.

Western Australia

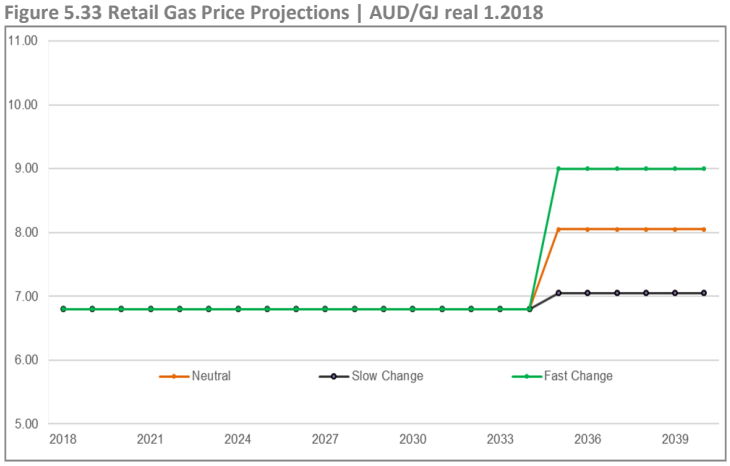
Figure 5.32 Retail Gas Price Projections | AUD/GJ real 1.2018



Source: Core Energy & Resources

Northern Territory

Figure 5.33 Retail Gas Price Projections | AUD/GJ real 1.2018



Source: Core Energy & Resources

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