KPMG

Economic contribution of the gas industry

Final report

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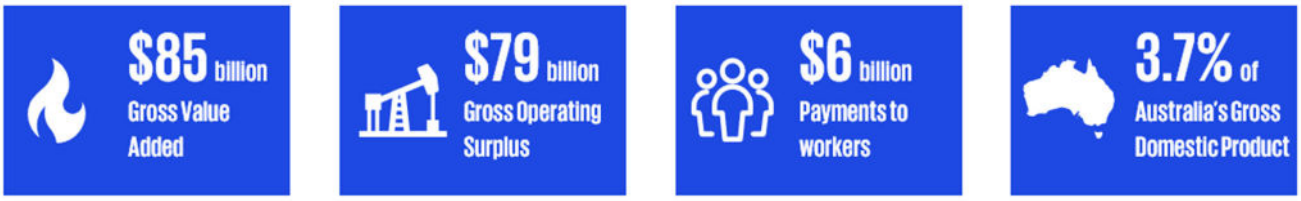
Executive summary

KPMG was engaged by Australian Energy Producers to develop a robust and evidence-based analysis of the contribution of the gas industry to the Australian economy. There are two parts to the analysis: the first focuses on the current state of the gas industry and is designed to provide estimates of the industry's direct and indirect contribution to the Australian economy; and the second focuses on the future state of the gas industry. Domestic gas supply projections taken from the federal government's Future Gas Strategy (FGS) are used to estimate what will happen to the gas industry's Gross Value Added (GVA) over the next decade. The gas supply and demand projections in the FGS are used to estimate potential gas shortfalls over the next decade.

Economic contribution of the gas industry

Direct economic contribution

The gas industry encompasses businesses along the entire hydrocarbon value chain, including in exploration, development and construction, extraction and processing, distribution, storage, wholesaling and retailing. The gas industry is a large part of the Australian economy. In 2021-22 the following points indicated the size of the industry:



Official data for 2022-23 indicates that GVA grew to over $100 billion.[1] In 2021-22, when comprehensive industry data is available, the gas industry:

- Produced 6,362 petajoules of gas in 2022 calendar year making it the seventh-largest gas producer globally;[2]
- Purchased $33 billion worth of goods and services from other Australian businesses;
- Sold $39 billion worth of gas products and services to other Australian businesses;
- Sold $7 billion worth of gas products and services to Australian households;
- Sold $86 billion worth of gas products to overseas customers, predominantly LNG to Japan, South Korea, China, and Taiwan;
- Employed over 30,000 Full-time Equivalent (FTE) workers in 2021-22, with Greater Perth leading the way with over 8,000 FTE workers followed by Greater Melbourne with over 4,000 FTE workers; and
- Productivity of the gas industry is high by comparison with Australian industry overall. The average FTE gas worker produces $2.8 million of GVA and $3.9 million of output. This is 16 and 11 times the Australian average respectively.

In 2023-24 the gas industry is estimated to have paid over $17 billion in taxes and royalty charges.

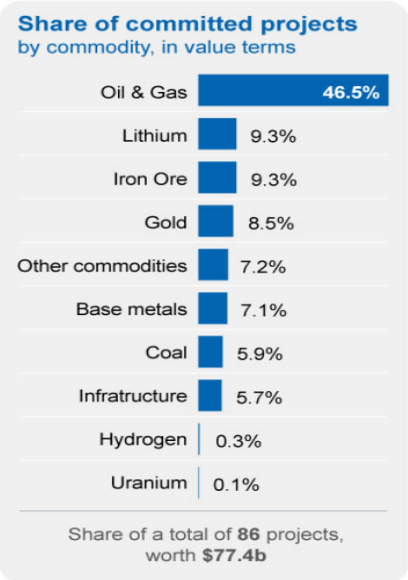
Natural gas currently meets 26% of Australia's energy needs.[3] Natural gas is currently the largest source of energy for Australian industry.[4] This includes gas consumed by the manufacturing sector, which is reported to source 37% of its final energy use from gas, nationally.[5] Power generation is also a major consumer in most states, particularly in Western Australia and Queensland. Mining also plays a significant part in gas consumption highlighting the gas-

[1] The 2022-23 data published by the ABS in relation to the gas industry is incomplete. However, the data published applies to the segments of the industry that account for about 95% of its GVA.
[2] Gas, Australia's Energy Commodity Resources 2024, Geoscience Australia, https://www.ga.gov.au/aecr2024/gas.
[3] Australian Energy Update 2024, Department of Climate Change, Energy, the Environment and Water, https://www.energy.gov.au/sites/default/files/2024-08/australian_energy_update_2024.pdf
[4] Ibid.
[5] Ibid.

intensive nature of Australia's mining operations. Reflective of this demand, oil and gas projects dominate the committed projects in 2023, accounting for 46.5% of the total value.

Figure E1: Share of committed projects, 2023

Indirect economic contribution



SOURCE: Department of Industry, Science and Resources (2023)

In addition to its direct contribution to the economy, the gas industry also contributes indirectly to the Australian economy. The gas industry's indirect contribution encompasses the flow-on effects generated through its supply chain interactions, including the demand it creates for goods and services from other industries, as well as the subsequent economic activity stimulated by the spending of the incomes that the industry pays to its workers and investors. Economy-wide modelling is used to estimate the indirect contribution of the industry to the Australian economy. Indirect economic impacts must be estimated with the aid of a model, hence there is a higher degree of uncertainty around such estimates compared with estimates of direct impacts, which are based on published data. To estimate the overall direct and indirect contribution of the gas industry a hypothetical shut-down scenario has been modelled in a Computable General Equilibrium model where:

- Australia stops producing gas; and
- All Australian gas users meet their requirements by using imported gas.

This hypothetical scenario provides an estimate of the total contribution of the gas industry to the economy in 2021-22. The industry's indirect economic contribution is deduced by subtracting the industry's direct contribution from its total contribution. The shut-down scenario modelled means that the extraction component of the industry does not generate any value added, does not employ any workers and does not purchase any goods and services from other Australian businesses. The indirect impacts of this shut-down scenario emanate from two key channels:

- **Supply chain impacts** – the industry no longer purchases goods and services from other Australian businesses; and;
- **Income impacts** – the industry no longer makes payments to workers or to Australian investors.

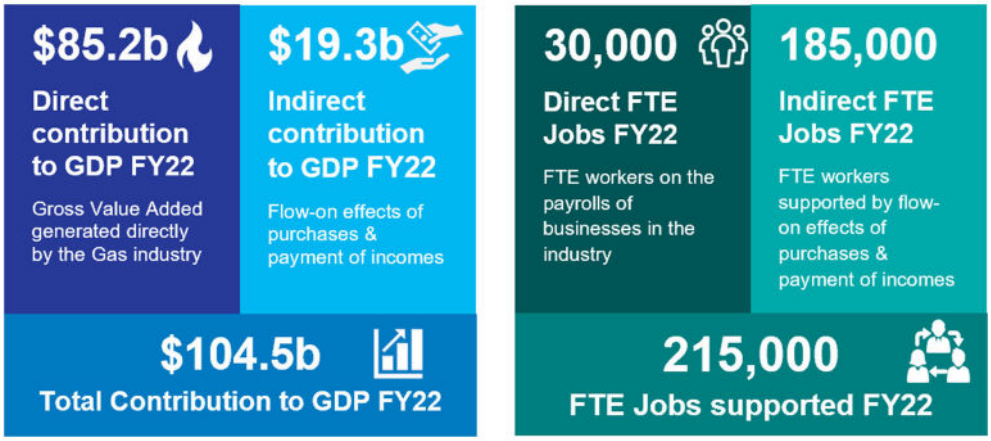
In 2021-22 the gas industry's total contribution to the economy is estimated to have been:

- Generation of $105 billion in GDP; and
- Support for 215,000 FTE jobs.

The indirect contribution of the industry 2021-22 was deduced to be:

- Generation of $19 billion in GDP; and
- Support for 185,000 FTE jobs.

Figure E2: Summary of direct and indirect contribution of the gas industry



Additional scenarios to illustrate indirect impacts

The gas industry's indirect economic contribution is further analysed by simulating three additional scenarios that focus on particular elements of the gas industry's indirect economic contribution. The first of these scenarios explores how increases in costs that flow through to higher gas prices impacts customers and the economy as a whole. The second, considers the economic contribution of construction activity related to the development of gas projects. The third scenario estimates the impact on the economy of additional productive capacity in the gas industry.

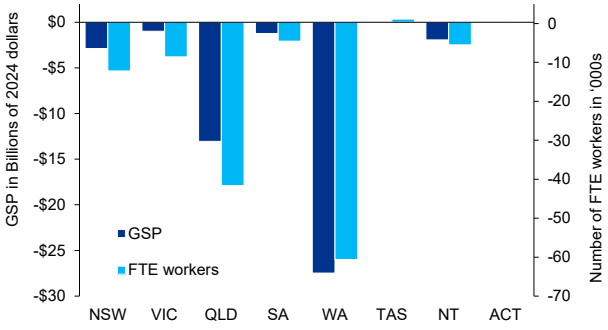
Gas industry cost-shock scenario

A hypothetical 10% increase in the costs of the extraction segment of the industry is estimated to:

- Reduce GDP by $48 billion per annum
- Result in the loss of 133,000 FTE jobs.

A shock of this type discourages investment, which may impact future supply.

Figure E3: Impact of gas industry cost-shock scenario

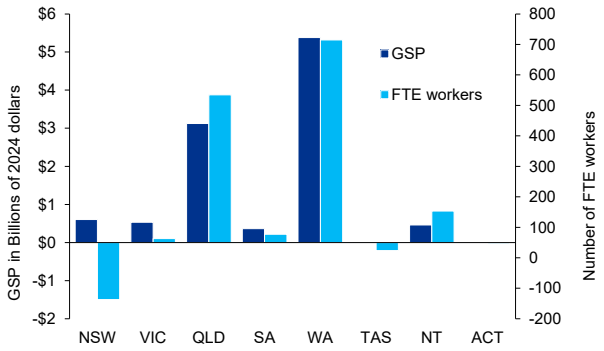


Gas industry capacity scenario

To understand how the gas industry's productive capacity impacts the economy a hypothetical scenario where the capacity of the industry is expanded by 5% has been simulated. The expansion in capacity is proportionally distributed around the country. The impact of this shock is estimated to:

- Increase GDP by $10.5 billion per annum
- Support an additional 1,150 ongoing FTE jobs.

Figure E5: Impact of gas industry capacity scenario



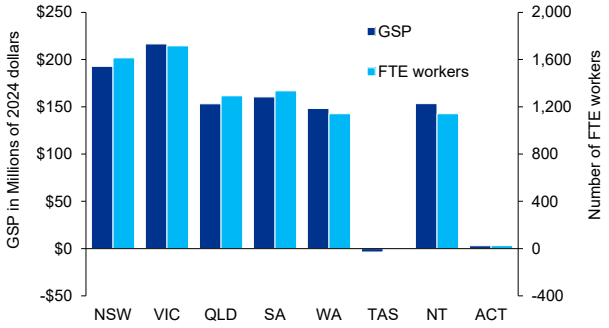
Gas industry project capex scenario

The gas industry contributes to the economy through its development and construction activities. This scenario simulates the impact of $3 billion in capital expenditure spread evenly across five hypothetical projects across the country. The impacts of this hypothetical construction activity are estimated to:

- Increase GDP by $1 billion
- Support an additional 8,350 FTE jobs.

The scenario is designed to be illustrative and does not reflect any assessment of the need for new projects in any particular location. Projects developed by the gas industry are typically large and take multiple years to complete. To understand the impacts of such projects on the regional economies in which they are located more detailed modelling is required to take account of the specific nature of the project and the local economy.

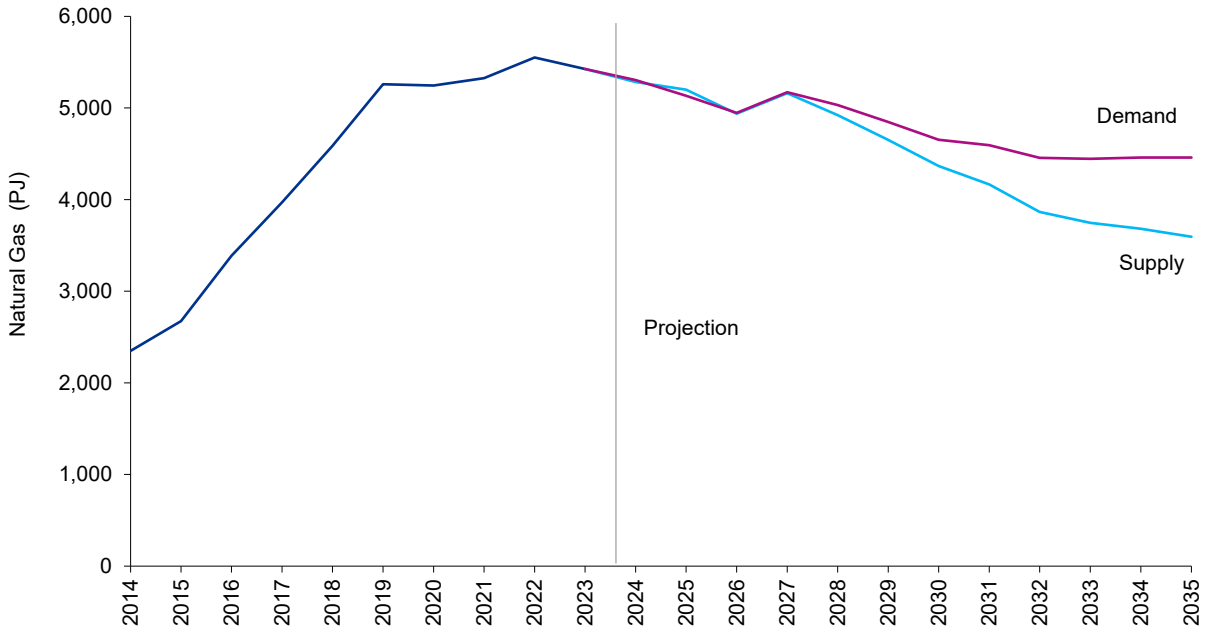
Figure E4: Impact of gas industry project capex scenario



Forward-looking scenario for the gas industry

Natural gas is projected to play an important role as a transitional energy source as the domestic and global economy decarbonises[6]. Gas will remain a key component of the global energy mix because it is relatively abundant, has a lower carbon footprint compared to conventional energy options such as coal, and provides flexibility for power generation. However, the Australian gas supply outlook from the Future Gas Strategy (FGS) report has natural gas production declining over the next decade unless new investments are made in exploration and developments. The projected levels of supply will be insufficient to meet even the most conservative gas demand scenario according to the FGS.[7]

Figure E6: Australian natural gas supply and demand based on projections in the Future Gas Strategy



The GVA projections for 2024 and beyond reflect two key drivers. The first driver is the projected supply of gas, deduced from the FGS report. The second driver is gas prices, which are assumed to revert back to trend from high levels in 2022.[8] The GVA projections are based on assumptions about gas supply that are expected to result in gas shortfalls. That is, AEMO's projections for gas demand under the three scenarios that it reports are greater than the supply assumptions underpinning the GVA estimates.[9] The gas industry's GVA is projected to fall by about 36% by 2035, equivalent to around 1.4% of Australia's GDP in 2023, if there is no additional investment in exploration and development to boost production. GVA will be higher than we are projecting if the industry does make investments to boost gas supply to match the demand projections set out in the FGS.

In the absence of these investments to augment gas supply our estimates show that over the decade spanning 2024-25 to 2034-35 the gas industry is expected to generate just over $800 billion in Gross Value Added.

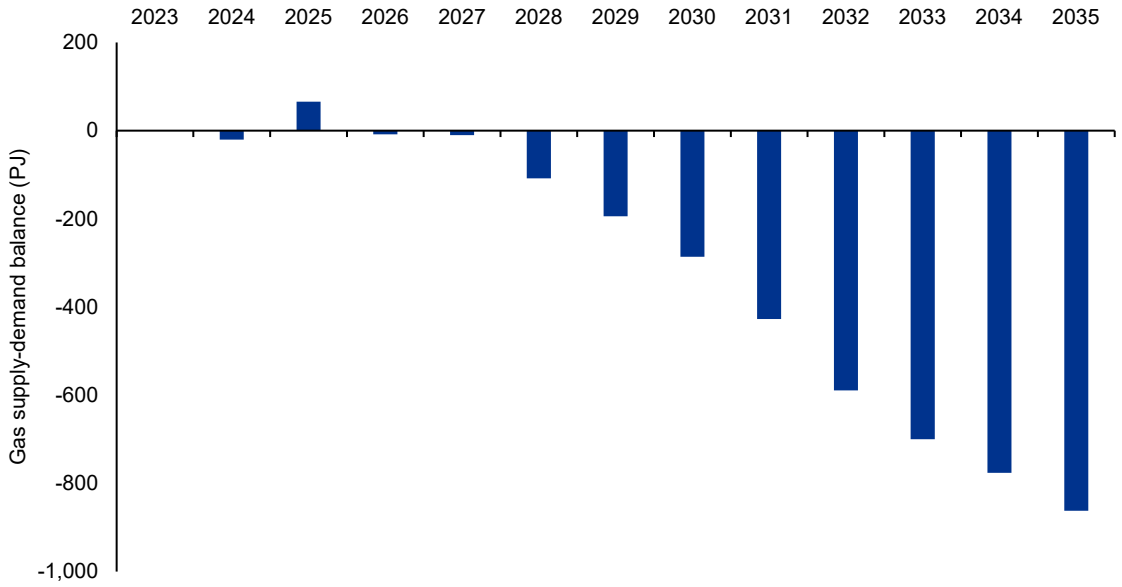
[6] IEA - The Oil and Gas Industry in Net Zero Transitions Report (2023)
[7] Future Gas Strategy, Analytical Report, May 2024.
[8] Gas production in 2012-13 was around 2140 PJ and GVA for the extraction segment of the industry was around $29 billion. By 2022-23 production was more than 2.5 times greater than in 2012-13 while GVA was 3.4 times greater. The differential largely reflects the impact of higher gas prices.
[9] AEMO has developed the Green Energy Exports, Step Change and Progressive Change demand scenarios for the East-Coast market and the Low, Base/Expected and High demand scenarios for the West-Coast market. The relationship between the AEMO scenarios and the IEA scenarios is set out in the FGS (Table A.1). In summary:

- IEA's NZE (Net Zero Emissions by 2050) scenario corresponds to AEMO's Green Energy Exports and the High demand scenarios;
- IEA's APS (Announced Pledges) scenario corresponds to AEMO's Step Change and Base/Expected demand scenarios; and
- IEA's STEPS (Stated Policies) scenario corresponds to AEMO's Progressive Change and Low demand scenarios.

Figure E7: Projected Gross Value Added by the Gas Industry

The latest AEMO Gas Statements of Opportunity (GSOO) for the East Coast and West Coast gas markets identify potential gas supply shortfalls in Australia as early as 2028. Estimates of Australia's gas shortfalls can be deduced from the ACCC and AEMO projections reported in the FGS, which are based on existing, committed, and anticipated developments. These projected shortfalls would amount to around 19% of the total demand for gas by 2035. AEMO notes that a combination of solutions is likely to be required to address the risk of annual, seasonal and peak day shortfall risks, potentially including upgrades and expansions of existing pipelines, development of uncertain (2C) southern supply and renewable gas projects, LNG import terminals, increased storage, and demand response mechanisms.[10] In addition, AEMO notes that it is critical that committed and anticipated supply and infrastructure projects are progressed on schedule to minimise the risks of supply constraints that could impact market reliability and domestic gas prices, especially during peak demand periods[11].

Figure E8: Forecasted gas supply shortfalls



[10] AEMO 2024 Gas Statement of Opportunity (March 2024)
[11] AEMO 2024 Gas Statement of Opportunity (March 2024) – Section 4: Gas Supply Adequacy (pg. 60)

Contents

Glossary

Terms	Abbreviation	Definition
Australian Bureau of Statistics	ABS	Australia's national statistical agency provides trusted official statistics on a wide range of economic, social, population and environmental matters.
Australian Competition and Consumer Commission	ACCC	The ACCC is an independent Commonwealth statutory authority established in 1995. Its role is to administer and enforce the Competition and Consumer Act 2010 and other legislation, promoting competition, fair trading and regulating national infrastructure for the benefit of all Australians.
Australian Energy Market Operator	AEMO	AEMO is a government-owned organisation responsible for operating Australia's electricity and gas markets, ensuring their reliability, efficiency, and security. AEMO manages the National Electricity Market (NEM), the Wholesale Electricity Market (WEM) in Western Australia, and various natural gas markets and systems. It also plays a key role in energy forecasting and planning, as well as integrating renewable energy sources.
Australian Energy Producers	AEP	Australian Energy Producers is the peak Australian industry association representing companies that explore and produce oil and gas in Australia.
Australian Taxation Office	ATO	The ATO is the Government's principal revenue collection agency.
Computable General Equilibrium modelling	CGE	A CGE model is an economic analysis tool with an economy-wide focus that estimates changes in key economic indicators at the national level, for individual industries and often regions or small areas, as a result of external changes or policy changes (Australian Transport Assessment and Planning Guidelines, 2020).
Coal Seam Gas	CSG	CSG, also known as coalbed methane, is a form of natural gas extracted from coal seams. It is used similarly to conventional natural gas for power generation and as an industrial feedstock
Contingent resources		As defined in the ACCC report[12], contingent resources are estimated to be potentially recoverable from known accumulations but are not currently considered to be commercially recoverable due to one or more contingencies.
Exajoule	EJ	A quantity of energy equal to 10^18 joules.
Full-time equivalent	FTE	The number of hours considered to be employed full-time.
Greater Capital City Statistical Area	GCCSA	GCCSAs are geographic areas built from SA4s. GCCSA boundaries represent labour markets and the functional area of Australian capital cities respectively. There are 16 GCCSAs covering the whole of Australia without gaps or overlaps (ABS, 2021).
GSOO	Gas Statement of Opportunities	Australian Energy Market Operator's Gas Statement of Opportunities.
Gross Operating Surplus	GOS	GOS represents the gross income businesses generate from their operations, excluding the cost of intermediate goods and services, payments to workers and payments of net indirect taxes.
Gross Value Added	GVA	GVA reflects an industry's direct contribution to Australia's economy, capturing the value it adds through its operations. It is calculated by taking the total output of the industry (including the value of all gas extracted, processed, and sold) and subtracting the costs of the industry.
Gross Domestic Product	GDP	GDP total production of goods and services in the economy, which measures the size of an economy (RBA).

[12] Framework for the consistent reporting of natural gas reserves and resources, 2019, see Reporting Framework.

Terms	Abbreviation	Definition
Gross Regional Product	GRP	GRP total production of goods and services in a local economy, the region's equivalent of the GDP.
Gross State Product	GSP	GSP total production of goods and services in a state or territory economy, the state equivalent of the GDP.
Input-Output Industry Group	IOIG	IOIG is the industry classification used in the Australian National Account Input-Output Table based on the ABS Australian and New Zealand Standard Industrial Classification (ANZSIC).
Input-Output Product Classification	IOPC	IOPC is the product classification used in the Australian National Account Input-Output Table based on the ABS ANZSIC.
International Energy Agency	IEA	The International Energy Agency is a Paris-based autonomous intergovernmental organisation, established in 1974, that provides policy recommendations, analysis and data on the global energy sector.
Local Government Area	LGA	Local Government Areas are an ABS Mesh Block approximation of gazetted local government boundaries as defined by each state and territory. There are 566 Local Government Areas covering the whole of Australia, including unincorporated areas, without gaps or overlaps.
Liquefied Natural Gas	LNG	LNG is natural gas that has been cooled down to liquid form for ease and safety of non-pressurised storage or transport.
Natural Gas Liquids	NGLs	NGLs are hydrocarbons that are in the same category of molecules as natural gas and crude oil, composed exclusively of carbon and hydrogen. NGLs are components of natural gas that are separated from the gas state in the form of liquids.
Statistical Area Level 2	SA2	Statistical Areas Level 2 (SA2s) are medium-sized general purpose areas built up from whole Statistical Areas Level 1 (SA1s). Their purpose is to represent a community that interacts together socially and economically. There are 2,473 SA2s covering the whole of Australia without gaps or overlaps (ABS, 2021).
Statistical Area Level 4	SA4	SA4s are the largest sub-state regions in the Main Structure of the ASGS and are designed for the output of a variety of regional data. There are 108 SA4s covering the whole of Australia without gaps or overlaps (ABS, 2021).
World Energy Outlook	WEO	An annual report by the International Energy Agency (IEA) that provides projections and analysis of future energy demand, supply, and environmental impacts under various scenarios
2P reserves	2P	This means the best estimate of reserves. "Reserves represent that part of resources which are commercially recoverable and have been justified for development, while contingent and prospective resources are less certain because some significant commercial or technical hurdle must be overcome prior to there being confidence in the eventual production of the volumes." (SPE Petroleum Resources Management System, 2007).
2C resources	2C	This means the best estimate of contingent resources. "Contingent resources are less certain than reserves. These are resources that are potentially recoverable but not yet considered mature enough for commercial development due to technological or business hurdles." (SPE Petroleum Resources Management System, 2007).

1 Introduction

KPMG was engaged by Australian Energy Producers to develop a robust and evidence-based analysis of the contribution of the gas industry to the Australian economy. There are two parts to the analysis: the first focuses on the current state of the gas industry and is designed to provide estimates of the industry's direct and indirect contribution to the Australian economy; and the second focuses on the future state of the gas industry and is designed to provide estimates of the potential Gross Value Added (GVA) that the industry could contribute to the economy based on domestic energy outlook scenarios, Future Gas Strategy (FGS) published by the Department of Industry, Science and Resources.

1.1 Scope of this study

The scope of this study includes three main components:

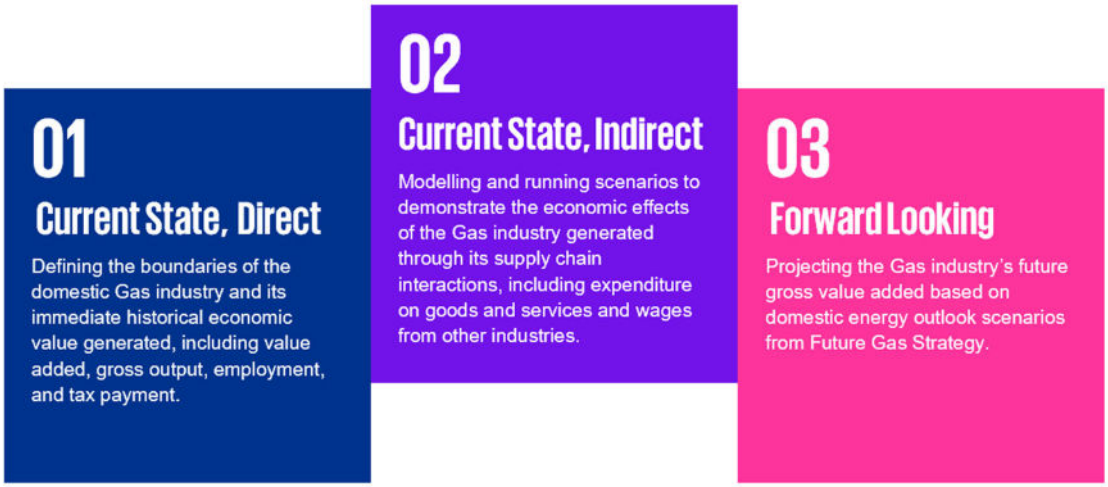
1. Analysis of the direct contribution of the gas industry to the Australian economy based on historical data.
2. Analysis of the indirect contribution of the gas industry to the Australian economy.
3. Analysis of the gas industry's potential GVA contributions in the future based on mainstream global and domestic energy and gas scenarios.

To provide context this study touches on elements of government policy related to the gas industry and on the potential role of gas in the global and domestic energy transition. However, it is beyond the scope of this study to analyse in any detail government policy or the energy transition. Similarly, it is beyond the scope of this report to analyse climate change and/or environmental impacts, including policy related to these issues. Finally, the study does not provide any assessment of specific gas projects (existing or prospective).

1.2 High level methodology

Figure 1 provides an overview of this study's methodology and details are discussed below.

Figure 1: Methodology overview



1.2.1 Current state – Direct contribution

This study provides an estimate of the direct contribution of the gas industry to the Australian economy in its current state using the latest available historical data. The direct contribution of the gas industry to the Australian economy refers to the immediate economic value generated by the gas industry's operations, including its gross output, GVA, employment, and tax payments, without considering the flow-on effects on other sectors or induced economic activity. This study utilises public data to estimate the current direct contribution of the gas industry to the Australian economy including the following measures and information:

- Gross value added generated by the gas industry, using analysis of ABS Australian National Accounts finding the relevant activities of the gas industry.
- Fixed capital stock, reserves and ongoing investment within the industry.
- Output value of gas commodities and related services using the ABS classifications.
- Cost and sales structures of the industry including payments to providers of inputs used by the industry, along with sales to customers which includes final users of gas, and also intermediate users (such as manufacturing) who utilise gas in the production of other goods and services.
- Employment factors of the industry including the number of workers employed, the levels of compensation, and the diversity in roles and gender balance.
- Contribution of the gas industry made in tax and royalty payments.

These combined elements give a broad picture of the contribution of the current gas industry to the Australian economy.

1.2.2 Current state - Indirect contribution and impacts

The gas industry's indirect contribution encompasses flow-on effects generated through its supply chain interactions, including the demand it creates for goods and services from other industries, as well as the subsequent economic activity stimulated by the spending of incomes that the industry pays to its worker and investors. Economy-wide modelling is used to estimate the indirect contribution of the industry to the Australian economy. Four scenarios are modelled to analyse the industry's indirect impacts from different perspectives. The scenarios include:

1 Shut-down scenario where Australia is assumed to stop producing gas and all gas requirements by Australian households and businesses are met by imported gas. This scenario is designed to highlight the indirect contribution the industry makes through its domestic supply chain (i.e., purchases from other Australian businesses) and through its payment of incomes to Australian residents (i.e., workers and investors).

2 Cost-shock scenario where the costs of producing gas are assumed to increase by 10% and flow through to higher gas prices, impacting customers and the economy as a whole.

3 The economic contribution of construction activity associated with the development and construction of hypothetical gas projects assumed to be distributed across the country.

4 Additional productive capacity of the industry – this is a secondary scenario that builds on the item above. This scenario illustrates an increase in productive capacity of the industry as a result of the investments undertaken in scenario 3.

These four scenarios provide a basis for estimating the indirect contribution of the industry to the economy and to analyse this contribution from different perspectives.

1.2.3 Forward looking – Gas industry value add in the future

The final section of this report provides projections of the gas industry's GVA over time based on supply projections set out in the Future Gas Strategy report published by the Department of Industry, Science and Resources.

The future of the Australian gas industry is discussed in the context of the future of gas globally. Forward-looking global scenarios published by energy industry leaders, including the International Energy Agency, the Intergovernmental Panel on Climate Change (IPCC), BP, and ExxonMobil are used to provide global context for the projections and scenarios published by AEMO and reported in the FGS.

The forward-looking analysis uses the demand and supply projections reported in the FGS to estimate potential gas shortfalls.

2 The Australian gas industry

This chapter will set out the definition of the gas industry to be used in this study. This chapter also provides an overview of gas resources and consumption in Australia, the end-to-end hydrocarbon value chain, and discusses the role that gas plays in Australia. The definition of the gas industry in this report encompasses the entire hydrocarbon value chain, including upstream, midstream, and downstream processes.

2.1 Definition of gas

In this study, "gas" refers to conventional and unconventional natural gas as defined by Geoscience Australia.[13]

Conventional gas refers to natural gas accumulations typically found in permeable sandstone or carbonate reservoirs. Conventional natural gas in eastern Australia is currently produced in several fields in the Gippsland, Otway, Cooper, Bass and Surat-Bowen basins.[14] Conventional natural gas is also produced from the Carnarvon and Perth basins in Western Australia and the Bonaparte basin in the Northern Territory. The gas is trapped in well-defined reservoirs by impermeable rock formations, allowing for relatively straightforward extraction methods.

Unconventional gas in Australia primarily encompasses coal seam gas (CSG), shale gas, tight gas, basin-centred gas and in-situ gasification products.[15] These resources are characterised by their occurrence in low-permeability rock formations or coal seams, where the gas is often adsorbed onto the rock surface or trapped in minute pores. Unconventional gas resources in Australia are predominantly found onshore, with significant CSG deposits found in Queensland and New South Wales, and emerging shale and tight gas prospects in various basins across the country.

Table 1 provides the definitions of various types of gas for the purpose of this study.

Table 1: Definitions of Gas

Type	Description
Natural Gas	Natural gas is primarily composed of methane, with small amounts of other hydrocarbons such as ethane, propane, and butane. It is found in underground reservoirs, often in association with oil deposits. Natural gas is colourless, odourless, and highly combustible, making it an efficient energy source. It is widely used for heating, cooking, and electricity generation, and as a feedstock for various industrial processes. Its relatively lower carbon emissions compared to coal and oil have made it an increasingly important fuel in the transition to cleaner energy sources.
Liquefied Natural Gas (LNG)	LNG is natural gas that has been cooled to approximately -162°C (-260°F), at which point it becomes a clear, colourless, non-toxic liquid. This process, known as liquefaction, reduces the volume of the gas by about 600 times, making it much more efficient to transport over long distances where pipelines are not economical or feasible. LNG is stored in specially designed cryogenic tanks and transported in purpose-built LNG carriers. Upon reaching its destination, LNG is regasified and distributed through local pipeline networks. The LNG trade has revolutionised the global gas market, allowing countries without pipeline connections to import natural gas and enabling gas-rich countries to reach distant markets.
Liquefied Petroleum Gas (LPG)	LPG, also known as propane or butane, is a mixture of hydrocarbon gases. It is typically derived as a by-product of natural gas processing and crude oil refining. At normal temperatures and pressures, LPG is gaseous, however, it can be liquefied under moderate pressure or cooling, making it easy to store and transport. LPG is widely used as a fuel for heating, cooking, and vehicles, particularly in areas not served by natural gas

[13] Gas, Australian Government, Geoscience Australia, 2024, https://www.ga.gov.au/aecr2024/gas
[14] Ibid.
[15] Conventional and unconventional gas, NSW EPA

Type	Description
	pipelines. It is also an important feedstock for the petrochemical industry. LPG is notable for its high energy content and clean-burning properties, making it a popular choice for both residential and industrial applications.
Compressed Natural Gas (CNG)	CNG is natural gas stored at high pressure, typically between 200-248 bar (2900-3600 psi). The gas is compressed to less than 1% of its volume at standard atmospheric pressure, making it much more compact for transportation and storage. CNG is primarily composed of methane, similar to conventional natural gas, but in a more energy-dense form due to compression. CNG is widely used as a transportation fuel, particularly for buses, trucks, and fleet vehicles.
Coal Seam Gas (CSG)	CSG, also known as coalbed methane, is a form of natural gas extracted from coal seams. It is used similarly to conventional natural gas for power generation and as an industrial feedstock.
Shale gas	Shale gas refers to natural gas trapped within shale formations, which are fine-grained sedimentary rocks. Unlike conventional gas reservoirs, shale gas has low permeability, meaning the gas does not flow easily. Extraction of shale gas typically requires horizontal drilling and hydraulic fracturing (fracking), where water, sand, and chemicals are injected at high pressure to create fissures in the rock, allowing the gas to flow more freely.
Tight gas	Tight gas refers to natural gas trapped in extremely low-permeability rock formations, typically sandstone or limestone, which require hydraulic stimulation for gas production.
Basin centred gas	Basin-centred gas occurs in abnormally pressured, gas-saturated, low-permeability stacked reservoirs within thick sedimentary successions. Extraction typically requires advanced drilling and stimulation techniques.
In-situ gasification products	In-situ coal gasification refers to gas being extracted from coal seams by in-situ heating to produce synthesis (syn) gas.

2.2 Definition of the gas industry

The definition of the gas industry in this report encompasses the entire hydrocarbon value chain, including the upstream, midstream, and downstream processes. Using ABS data, industries that produce gas commodities and services across the value chain are identified. This data forms the basis of the metrics estimated to show the size and characteristics of the gas industry.

Table 2 below is the list of key gas commodities and services by Input-Output Product Classification (IOPC) across the value chain and the commodity and industry classification by Input-Output Industry Group (IOIG) used by the ABS.

Table 2: Gas commodities and services in the gas value chain

ABS IOPC	List of key gas commodities/services	Production industry (ABS IOIG)
Upstream Process		
07000030	Natural gas - in the gaseous state (extraction)	Oil and gas extraction
07000050	Coal seam gas	Oil and gas extraction
07000020	Liquefied natural gas	Oil and gas extraction

ABS IOPC	List of key gas commodities/services	Production industry (ABS IOIG)
Upstream Process		
18110040	Liquefied natural gas - other than from the wellhead	Basic chemical manufacturing
7000070	Liquefied petroleum gas from the wellhead	Oil and gas extraction
7000010	Crude oil (including condensate)	Oil and gas extraction
10110010	Petroleum exploration	Exploration and mining support services
Midstream Process		
07000030	Natural gas - in the gaseous state (transportation)	Oil and gas extraction
Downstream Process		
07000030	Natural gas - in the gaseous state (distribution)	Oil and gas extraction
27000010	Gas service income nec	Gas supply
27001500	Margin - gas distribution and on selling	Gas supply

Source: KPMG analysis of ABS Australian National Accounts, Input-Output data, 2021-2022

In this study, the gas industry is defined to include the below ABS IOIG industries:

- Oil and gas extraction.
- Gas supply.
- Basic chemical manufacturing (Partial).
- Exploration and mining support services (Partial).

Appendix A details the methods for estimating the specific proportions of basic chemical manufacturing, and exploration and mining support services. Note, other ABS IOIG industries, such as professional, scientific and technical services, are involved in the gas industry through services including engineering and financial consultancy, however, these are captured by indirect activities.

2.3 Gas consumption in Australia

According to the Future Gas Strategy (2024)[16], between 2011 and 2021, Australian residential gas consumption averaged approximately 200 petajoules (PJ) annually. Natural gas is utilised by approximately five million households across Australia, predominantly used for cooking, water heating, and space heating and cooling.

Natural gas is currently the largest source of energy for Australian industry.[17] The industrial sector, particularly manufacturing, is a significant consumer of natural gas in Australia. In 2020-21, the manufacturing sector alone consumed 380 PJ of gas, accounting for approximately 26% of the domestic gas supply. Heating constitutes about 74% of industrial gas consumption.[18] Industrial heat is integral to numerous processes that underpin the modern economy and is crucial to many aspects of daily life. Industrial heat can be classified into low, medium, and high heat applications:[19]

- Low-heat range temperatures (below 150 Celsius) are used for:
  - Manufacturing food and beverages.
  - Chemical and paper production.
  - Drying.

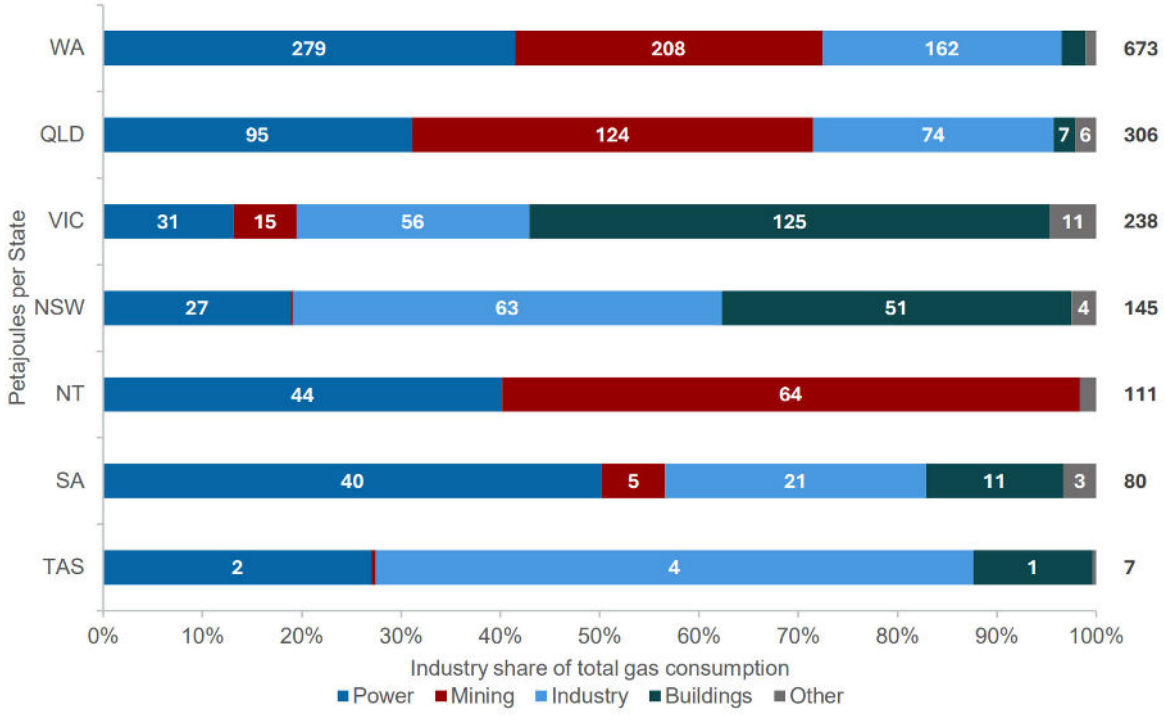
[16] Future Gas Strategy, Australian Government, Department of Industry, Science and Resources, 2024
[17] Conventional and unconventional gas, NSW EPA
[18] Ibid.
[19] Ibid.

  - Baking.
  - Evaporation.
  - Pasteurisation.
- Medium heat range temperature (from 150 Celsius to 500 Celsius) are used for:
  - More advanced chemical production processes.
  - Refining biofuel.
  - Dying and drying materials in the textiles industry.
- High-heat range temperatures (over 500 Celsius) are used for:
  - Producing plastics.
  - Smelting metals.
  - Critical and other minerals.
  - Transforming limestone into clinker for cement.
  - Heating kilns that fire bricks and ceramics.

LNG facilities are also substantial gas consumers, utilising it primarily for powering compressors and on-site electricity generation.

Natural gas currently meets 26% of Australia's energy needs.[20] Figure 2 illustrates the distribution of gas consumption across different states and territories in Australia, broken down by sector. Western Australia is the largest consumer of gas with 673 PJ, followed by Queensland with 306 PJ. Power generation is a major consumer in most states, particularly in Western Australia and Queensland. Gas remains the largest source for energy for the manufacturing sector, accounting for 37% of manufacturing final energy use in 2022-23. Mining also plays a significant part in gas consumption, especially in Western Australia, Queensland, and the Northern Territory, highlighting the gas-intensive nature of Australia's mining operations. Industrial use of gas is substantial across all states, with New South Wales and Victoria showing particularly high proportions.

Figure 2: Gas consumption by state/territory and sector, 2021-2022



Source: Future Gas Strategy, Department of Industry, Science and Resources, May 2024 (ACT is included in NSW. On-site electricity generation is included in the power sector. Buildings includes commercial and residential building gas use.)

[20] Australian Energy Update 2024, Department of Climate Change, Energy, the Environment and Water, https://www.energy.gov.au/sites/default/files/2024-08/australian_energy_update_2024.pdf

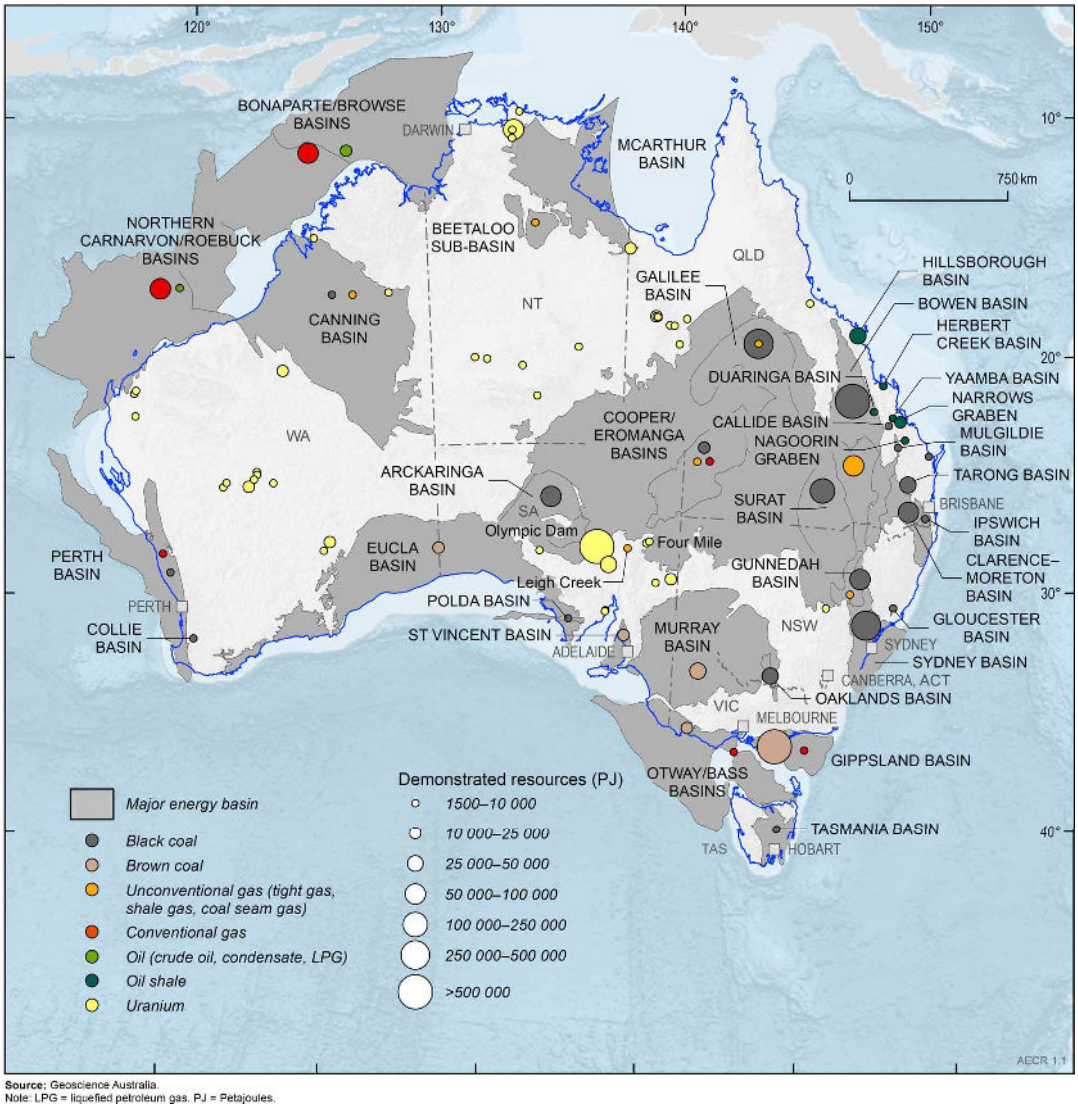
2.4 Gas resources in Australia

Australia was the seventh largest global natural gas producer with 6,362 PJ of production in calendar year 2022.[21]

Australia possesses substantial gas resources with the majority of its conventional resources located offshore and unconventional gas deposits onshore.[22] CSG make up three-quarters of identified unconventional gas resources.[23] Conventional gas and CSG remain Australia's most important gas resources for production and trade.[24] In 2022, approximately 70% of Australia's natural gas production was exported and Australia was the world's second largest LNG exporter with 81.4 million tonnes (4,427 PJ) of gas exported.[25]

Figure 3 provides the distribution of Australia's major non-renewable energy sources. Approximately 93% of conventional gas resources are located on the North West Shelf where gas is produced from the Northern Carnarvon, Browse and Bonaparte Basins providing feedstock to seven LNG projects (Gorgon, Wheatstone, North West Shelf, Pluto, Prelude, Ichthys and Darwin).[26] CSG reserves and resources are located in Bowen-Surat Basin, Galilee Basin, Gunnedah Basin, and Sydney Basin while other unconventional gas resources are located in Beetaloo Sub-basin, Cooper Basin, Canning Basin, Bowen-Surat Basin, and Telford Basin.[27]

Figure 3: Distribution of Australia's major non-renewable energy resources in 2022 (by basin or deposit), that contain total demonstrated resources greater than 1,500 petajoules[28]



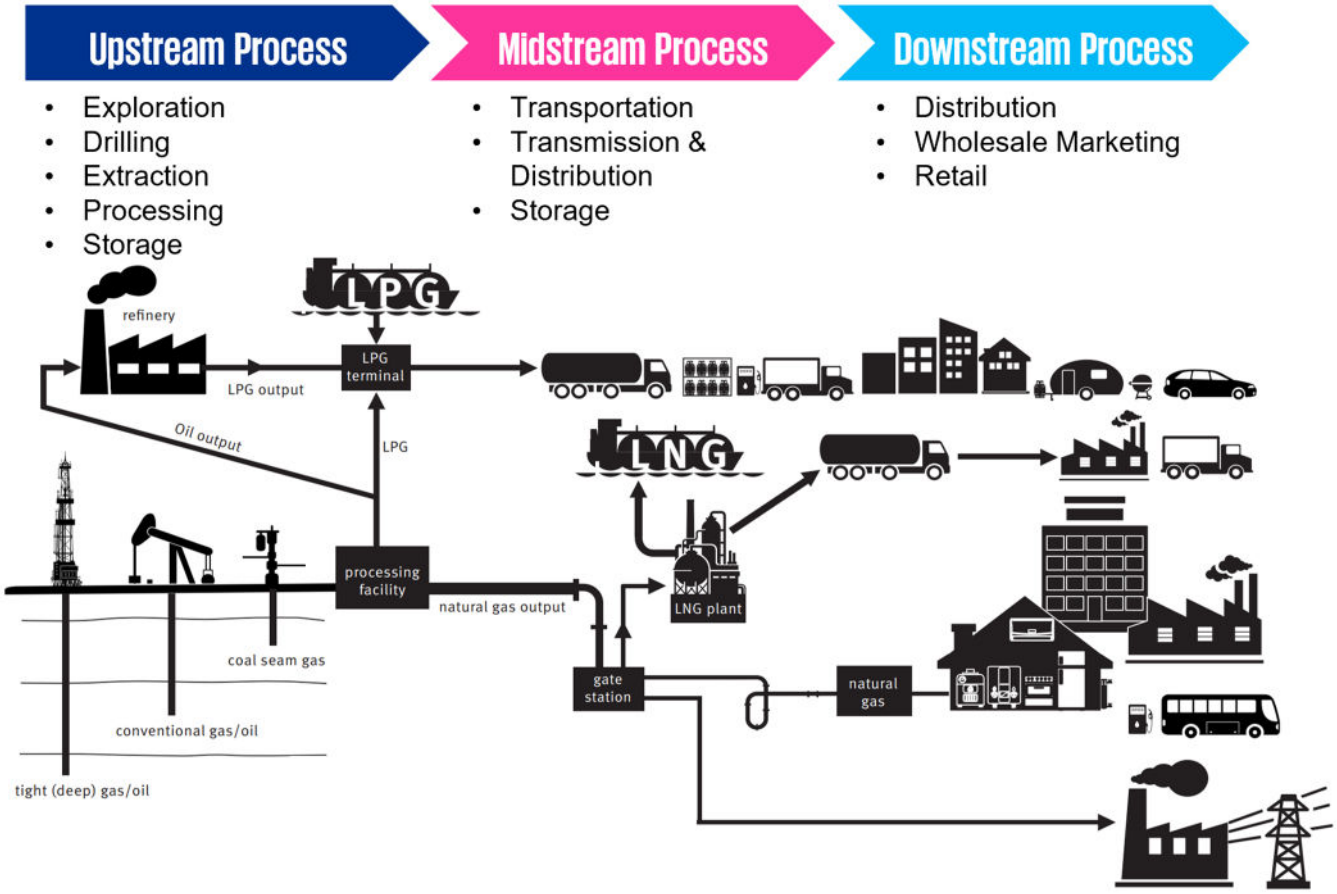
Source: Geoscience Australia.
Note: LPG = liquefied petroleum gas. PJ = Petajoules.

[21] Gas, Australia's Energy Commodity Resources 2024, Geoscience Australia, https://www.ga.gov.au/aecr2024/gas.
[22] Ibid.
[23] Ibid.
[24] Ibid.
[25] Ibid.
[26] Ibid.
[27] Ibid.
[28] Gas, Australia's Energy Commodity Resources 2024, Geoscience Australia, https://www.ga.gov.au/aecr2024/gas.

2.5 The gas value chain

This study is based on an analysis of the entire gas value chain, including the upstream, midstream, and downstream processes. Figure 4 provides the summary of gas activities in each of the processes. Details of the activities are explained in Table 3.

Figure 4: The gas value chain



Source: Petroleum and gas supply chain, Queensland Government, Gas Industry Overview, July 2024

Table 3: Definition of processes in the gas value chain

Gas Value Chain	Process	Description
Upstream Process	Exploration	Involves identifying areas with potential natural gas reserves. Geologists use various techniques, such as seismic surveys, to locate these underground reserves. Exploration is the first step in the natural gas value chain and is crucial for finding viable gas deposits.
	Drilling	Once a potential gas field is identified, drilling is carried out to reach the gas reserves. This process involves using advanced drilling rigs to penetrate the Earth's surface and extract gas from underground formations. Depending on the location and geology, drilling can be onshore or offshore.
	Extraction	After drilling, natural gas is extracted from the underground reservoirs. This process involves bringing the gas to the surface through the well and separating it from other substances like water and oil. Extraction is a continuous process that can last for years or even decades, depending on the field's size and productivity.

Gas Value Chain	Process	Description
	Processing	The extracted gas often contains impurities, including water vapour, carbon dioxide, hydrogen sulphide, and other hydrocarbons. Processing involves removing these impurities to produce pipeline-quality natural gas, which is primarily methane. Processing also allows for the separation of natural gas liquids (NGLs), which can be valuable by-products.
	Storage	Before it is transported or used, processed natural gas is often stored to balance supply and demand. Storage facilities, such as underground reservoirs, ensure that there is a steady supply of available natural gas, especially during periods of high demand.
Midstream Process	Transportation	Involves moving natural gas from production sites to processing plants and storage facilities. Transportation is typically done through an extensive network of pipelines, which can span hundreds or even thousands of kilometres. This step is critical for connecting gas-rich regions to markets where the gas is needed. This can also involve the shipping and trading of LNG. LNG is loaded onto specially designed cryogenic tankers to facilitate marine transportation along trade routes.
	Transmission & distribution	High-pressure transmission pipelines transport natural gas from production facilities to distribution network entry points (known as city gates) or directly to large industrial consumers. These pipelines utilise very high pressure, compressor stations, and various storage facilities to efficiently move gas across long distances. The current gas transmission system incorporates several storage capabilities: • Line pack[29] within the pipelines themselves • Two LNG storage tanks on the east coast (Newcastle and Dandenong) • Six underground storage facilities in depleted gas fields. These storage facilities, typically owned by energy retailers, can rapidly inject gas into the transmission system to manage peak demand or emergencies.[30]
	Storage	Storage in the midstream phase aims to ensure natural gas is available to meet fluctuations in demand. Gas is injected into storage facilities during periods of low demand and withdrawn during periods of high demand. Storage can occur in underground formations, such as depleted oil and gas fields, aquifers, or salt caverns.

[29] Line pack is the volume of gas contained within a pipeline network at any given time. It acts as a short-term storage mechanism within the pipeline system.
[30] The Australian Energy Market Commission, Gas Supply Chain, https://www.aemc.gov.au/energy-system/gas/gas-supply-chain

Gas Value Chain	Process	Description
Downstream Process	Distribution	Distribution pipelines form the final link in delivering natural gas from transmission pipelines to end users. This network consists of: • A backbone of high and medium-pressure pipelines connecting city gates to major demand centres • Low-pressure pipelines branching off to supply businesses and homes. The extensive distribution network in Australia: • Serves approximately five million households[31] • Serves 130,000 commercial and industrial customers • Spans over 88,000 km of low-pressure pipelines. Energy retailers are the primary customers of distribution pipeline operators. They purchase gas in bulk and resell it to individual consumers and businesses[30].
	Wholesale marketing	Wholesale marketing refers to the buying and selling of large quantities of natural gas, typically between producers, large consumers, and marketers. These transactions often occur on commodity exchanges or through direct contracts, and they are crucial for ensuring that gas is available where and when it is needed.
	Retail	Retailing involves selling natural gas directly to consumers, such as households, businesses, and industries. Retailers manage the customer relationship, billing, and service provision, ensuring that end-users have access to natural gas for heating, cooking, and industrial processes.

2.6 Investment pipeline

The gas industry has contributed to the economic and technological development, employment generation, and infrastructural expansion, particularly in regional areas across Australia. AEMO has identified a predicted gas supply shortage along the East Coast of Australia by 2028, which is expected to expand over time[32]. Compounding this issue is a separate forecast from AEMO that anticipates a substantial increase in the Western Australian supply gap around 2030, driven by heightened gas-powered generation (GPG) demand following the retirement of coal-fired power stations[33].

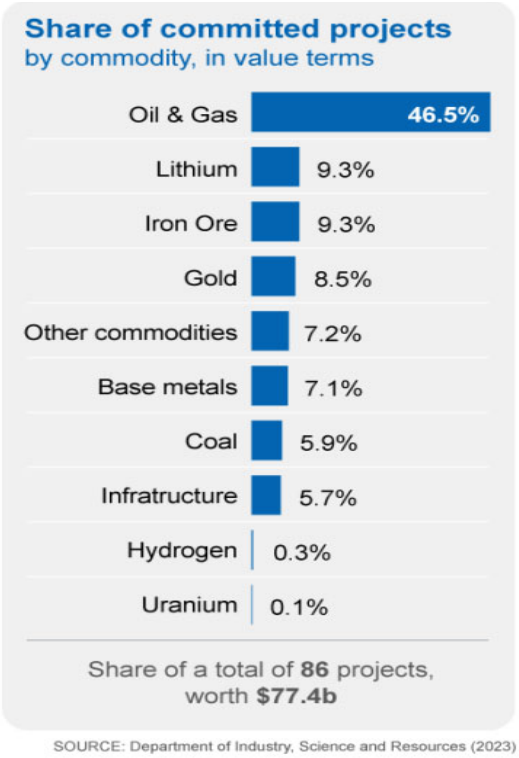
Timely development of a portfolio of gas projects is crucial to mitigate the risk of potential shortages in the domestic gas market. For Australia to observe an increase in gas supply in the domestic market, a significant increase in investment towards exploration and development is required[34]. Securing new sources of gas supply will support the transition of the economy as it decarbonises.

As of October 31, 2023, Australia had 421 major resource and energy projects under development, an increase from 393 projects the previous year according to the Australian Government Department of Industry, Science and Resources. This total includes 86 committed projects valued at $77.4 billion,[35] where final investment decisions have been made, and 46 projects at the advanced feasibility stage worth $29.5 billion.

Oil and gas projects dominate the committed projects as presented in Figure 5:, accounting for 46.5% of the total value. In 2023, 27 new oil and gas projects were publicly announced in Australia, as presented in Appendix B. Additionally, 12 oil and gas projects are committed, with an approximate value of $36 billion, as provided in Appendix B. Five oil and gas projects, worth $6.4 billion, have been completed.

[31] Future Gas Strategy, Australian Government, Department of Industry, Science and Resources, 2024
[32] AEMO 2024 East Coast GSOO Report
[33] AEMO 2023 Western Australian GSOO Report
[34] DISR Future Gas Strategy Analytical Report
[35] All dollar figures in this report are in Australian dollars (AUD).

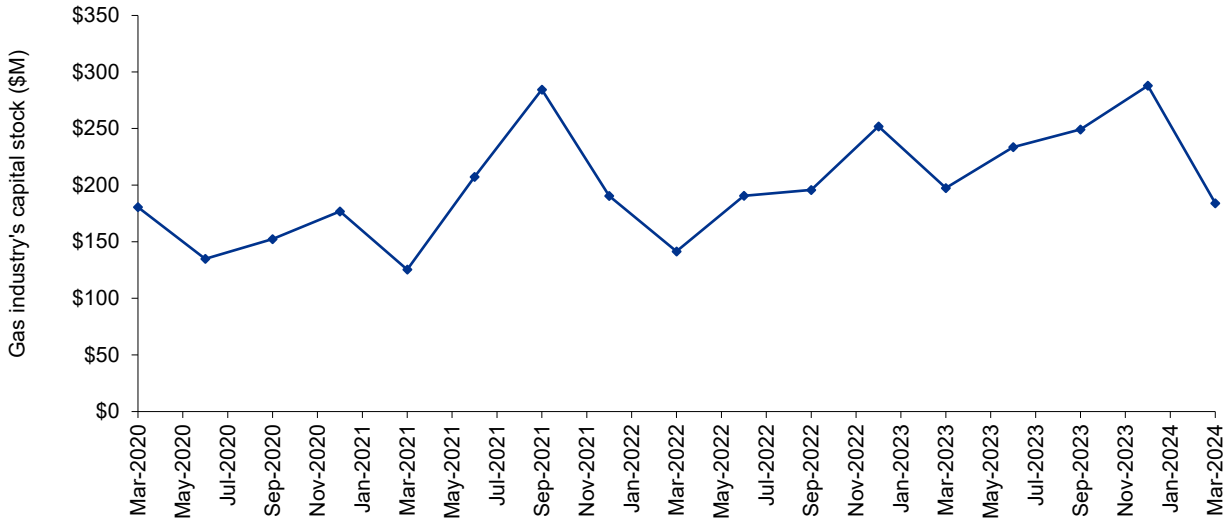
Figure 5: Share of committed projects, 2023



The expenditure of the gas industry on equipment, plant, and machinery is illustrated in Figure 6:, which displays the quarterly spending trend since 2020. The most recent data, from March 2024, shows that the gas industry invested $184 million in these assets.[36]

Timely development of supply fields across various basins is expected to be needed to meet demand and avoid market disruptions. [37] However, there are many considerations and approvals required before projects can commence. Producers experience delays in developing new sources of supply due to regulatory, infrastructure, and commercial barriers.[38] Gas producers are required to obtain approvals from both the state and federal government for all stages of the project's life cycle. This is necessary to ensure environmental, cultural and community considerations are managed appropriately. ACCC reports a common experience across the industry where these approvals are taking longer to be processed. Similarly, regulatory approvals and minimal coordination in developing and accessing gas infrastructures, such as pipeline projects and gas storage facilities, are also reported to cause delays. Commercial barriers are seen in highly concentrated markets, such as the upstream east coast market. This market has many possible sources of new gas supply, however, they are held by new market participants, explorers, and small producers that face the challenges of consolidating their market positions against the three LNG producers and their associates that dominate the market.[39] This is noted by ACCC as a barrier to entry and competition.

Figure 6: Gas industry's actual expenditure on equipment, plant and machinery ($M), 2024



Source: ABS Private New Capital Expenditure and Expected Expenditure, Australia, Table 19. Mining and Manufacturing subdivisions by Type of Asset - Current Prices $m, 2024

[36] ABS Private New Capital Expenditure and Expected Expenditure, Australia, Table 19. Mining and Manufacturing subdivisions by Type of Asset - Current Prices $m, 2024
[37] AEMO 2024 Gas Statement of Opportunity (March 2024)
[38] Gas Inquiry 2017-2030: Interim update on east coast gas market, ACCC, Jun 2024
[39] Ibid.

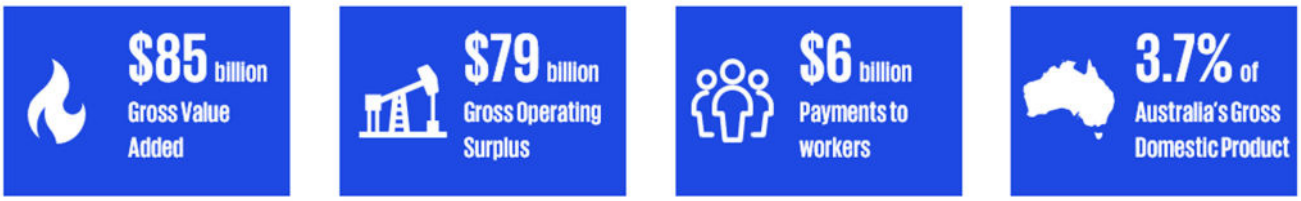
3 Direct contribution of gas, current state

This section is focused on the gas industry's direct economic contribution to Australia. It examines several key metrics to provide a picture of the industry's current state and impact. These metrics include:

- Gross value added generated by the gas industry.
- Fixed capital stock, reserves and ongoing investment within the industry.
- Output of gas commodities and related services.
- Cost and sales structures.
- Employment and compensation.
- Tax and royalty contributions.

By assessing these factors, this report aims to provide a thorough picture of the gas industry's role in the Australian economy and its operational dynamics.

3.1 Gross Value Added



The gas industry directly contributed $85 billion to Australia's gross domestic product (GDP) in 2021-22, including $79 billion of gross operating surplus generated by businesses operating in the industry,[40] and $6 billion of payment to workers employed by the industry.

All business activities in the oil and gas extraction and gas supply industries are naturally part of the industry. In addition, KPMG has assessed that partial components of the exploration and mining support services industry, and the basic chemical manufacturing industry are attributable to the gas industry. Based on KPMG's assessment, 11% of exploration and mining support services are directly related to the gas industry; and 22% of basic chemical manufacturing involves entities that are producing gas commodities. In summary, the gas industry's value-added consists of the GVA from:

- 100% of oil and gas extraction.
- 100% of gas supply.
- 11% of exploration and mining support services.
- 22% of basic chemical manufacturing.

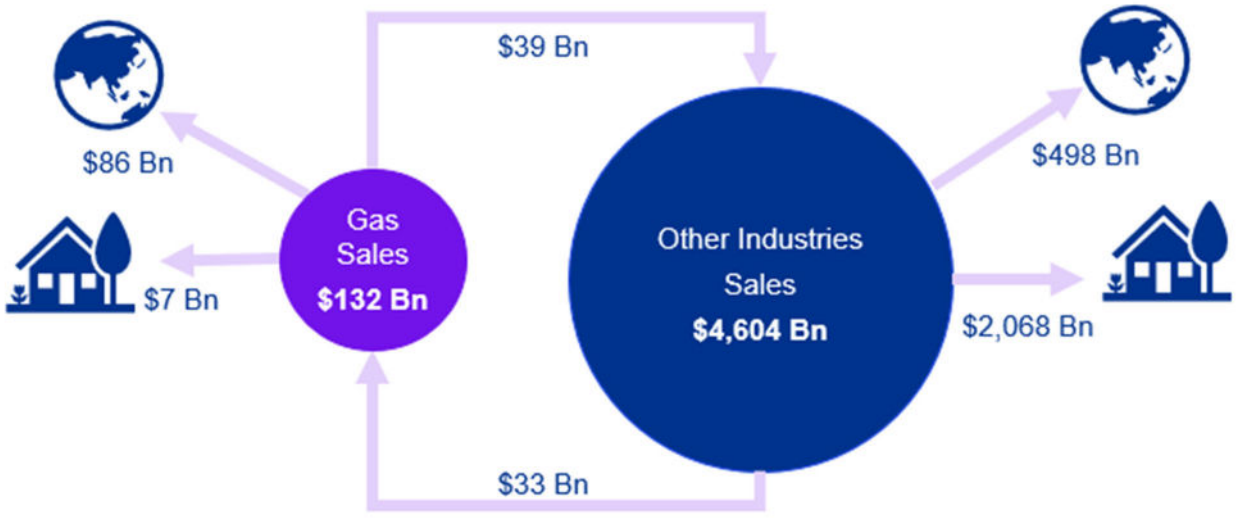
Figure 7 provides an overview of the gas industry's sales structure in the context of the overall economy. Total gas sales amount to $132 billion, including $86 billion in exports, $7 billion sold to households, and $39 billion sold to other industries within Australia. To make these sales, the gas industry purchases $33 billion in inputs from other industries. It can be deduced from Figure 7 that the gas industry accounts for:

- 2.9% of all sales in the Australian economy.

[40] Gross Operating Surplus for businesses operating in the gas industry is the total profit these companies generate from their core operations before accounting for taxes, interest payments, and depreciation. It is calculated by subtracting the costs of goods sold and employee compensation from the total revenue.

- 0.3% of purchases by Australian households.
- 17.3% of all exports.

Figure 7: Overview of the gas industry and the other industries



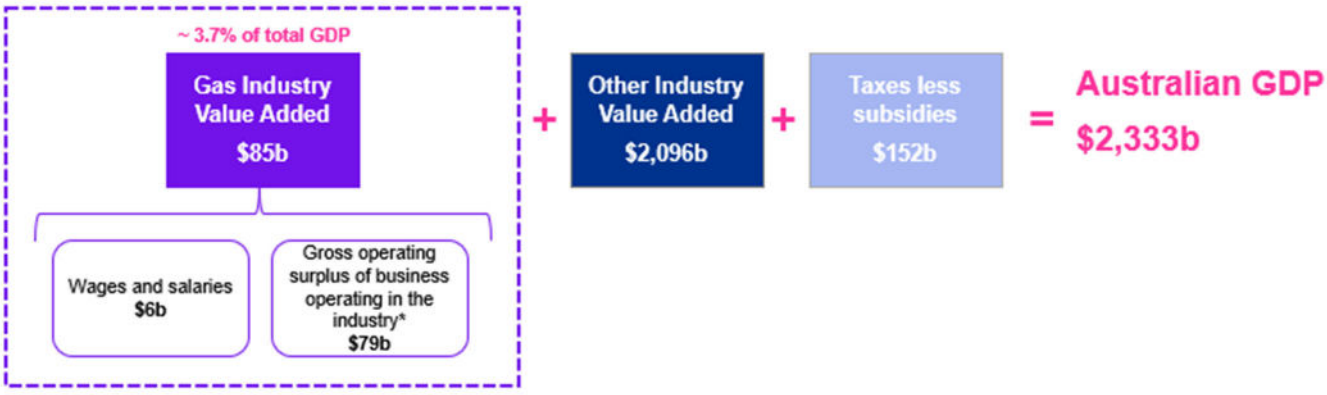
Source: KPMG analysis of ABS Australian National Accounts: Input-Output Tables 2021-2022

Figure 8 summarises the GVA generated by the gas industry in the context of the GVA generated by the economy as a whole. The gas industry generates $85 billion of GVA, comprising $6 billion in payment to workers employed by the industry and $79 billion in gross operating surplus (GOS) generated by businesses operating in the industry.

The gas industry's contribution to Australia's GDP can be inferred by combining the industry's GVA and payments of net indirect taxes. As can be deduced from Figure 8, the gas industry directly accounted for 3.7% of Australia's GDP in 2021-22.

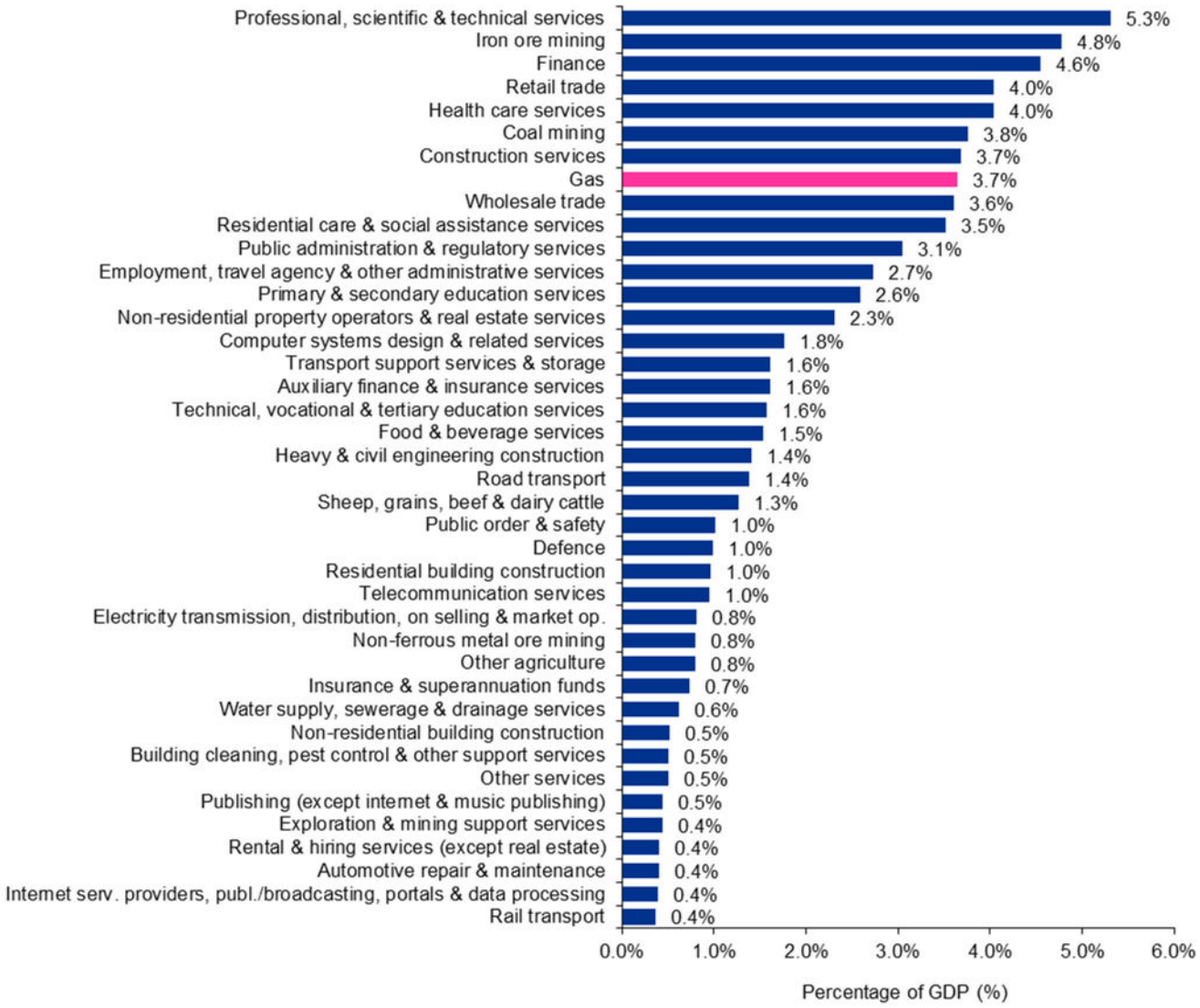
The gas industry's economic significance is comparable to other major industries. For instance, in 2021-22, coal mining contributed 3.8% to Australia's GDP, while construction services accounted for 3.7%. This is either just above or at the same level as the gas industry. Figure 9: presents the position of the gas industry among different industries by GVA. While this is not an exhaustive list of industries, it demonstrates where the gas industry stands as a contributor to Australia's GDP.

Figure 8: Direct value added to the gas industry



Source: KPMG analysis of ABS Australian National Accounts: Input-Output Tables 2021-2022

Figure 9: Gross value added share of Australian GDP for gas industry and other industries, 2021-22

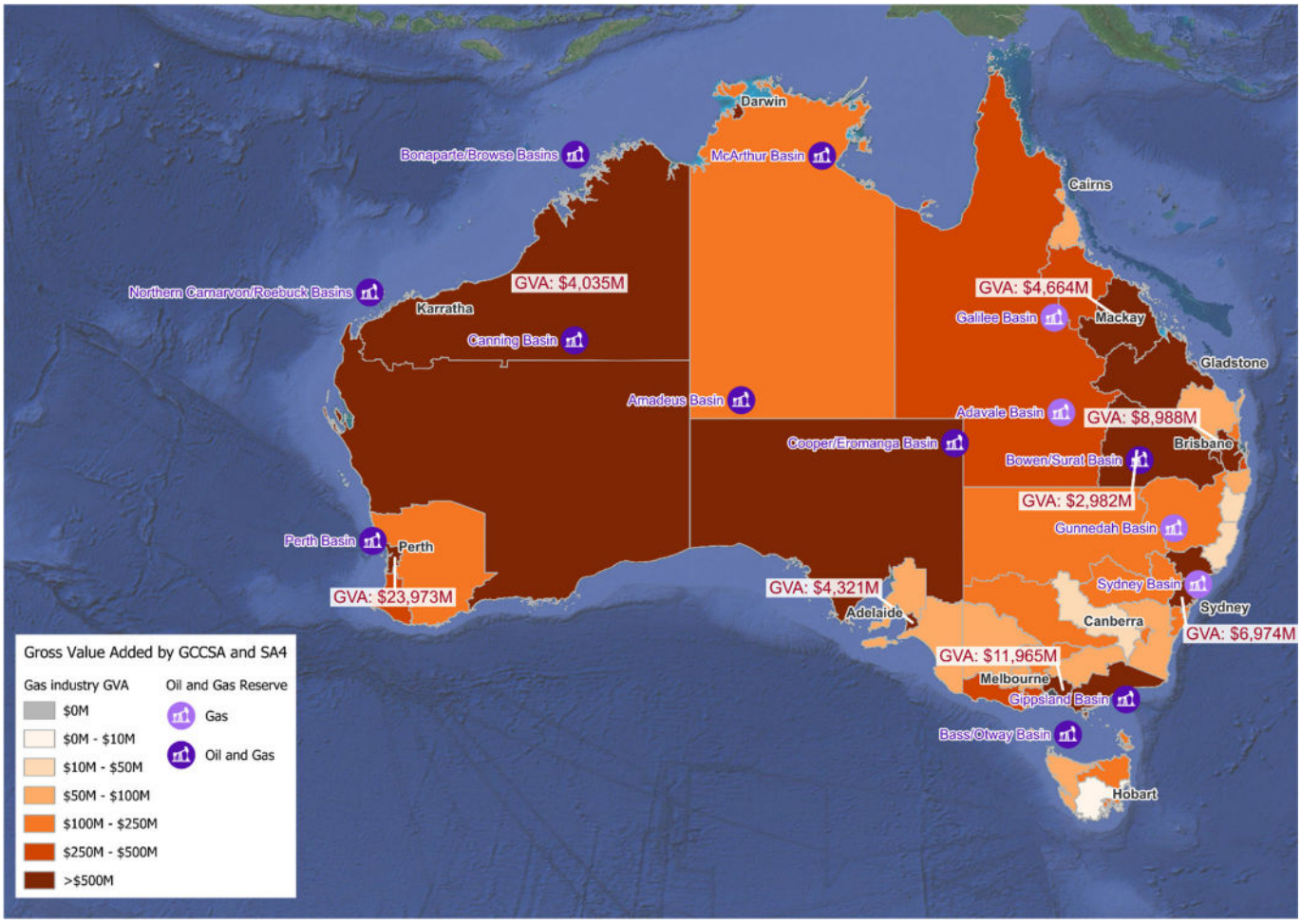


Note: This figure presents the gas industry's position among the top 40 ABS IOIG industries with the highest GVA out of 113. The imputed rent for owner-occupiers and actual rent for housing industries were excluded from the comparison. These industry groupings are detailed to provide a granular point of comparison.

Source: KPMG analysis of ABS Australian National Accounts: Input-Output Tables 2021-2022

Figure 10: presents how the gas industry's GVA is distributed across GCCSAs and SA4 regions. Greater Perth leads with $24 billion, accounting for 28% of the national total. Greater Melbourne follows with $12 billion, or 14% of the total. Each region's GVA is estimated by applying its share of gas industry employment to the national GVA. This method was adopted because no official GVA data is available at the subnational level. The employment data is discussed in Section 3.5.

Figure 10: Gas industry gross value added in Australia ($million), 2021-22



Note: Spatial distribution of GVA is estimated using each GCCSA and SA4 share of the total gas industry employment. The above map shows labels for the GCCSA and SA4s that have GVA greater than $2 billion.

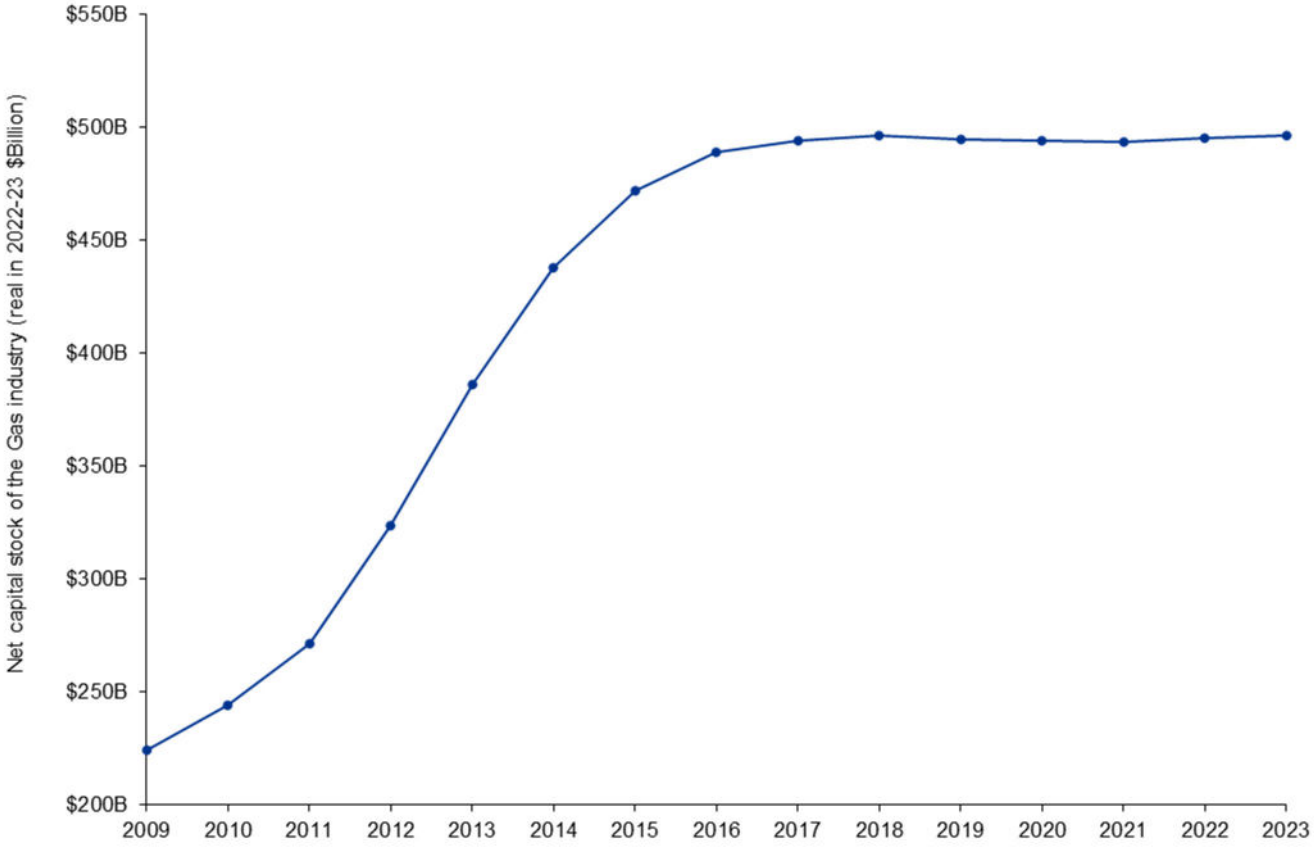
Source: KPMG analysis of ABS Australian National Accounts: Input-Output Tables 2021-2022

3.2 Stock of fixed capital and reserves

The estimated net capital stock of the Australian gas industry is around $497 billion as of 2022-23, based on available data from the ABS on the net capital stock and private new capital expenditure across different industries in Australia.

Since the ABS data on net capital stock does not provide a breakdown specific to the gas industry, the estimate is derived by using the proportion of private new capital expenditure on the gas industry from March 2009 to March 2023. The analysis indicates that approximately 50% of the mining industry's actual expenditure is contributed by the gas industry. Therefore, the gas industry's net capital stock is estimated to be 50% of the mining industry's net capital stock. Figure 11: illustrates the trend of the gas industry's net capital stock from 2008-09 to 2022-23.

Figure 11: Estimated net capital stock of the gas industry



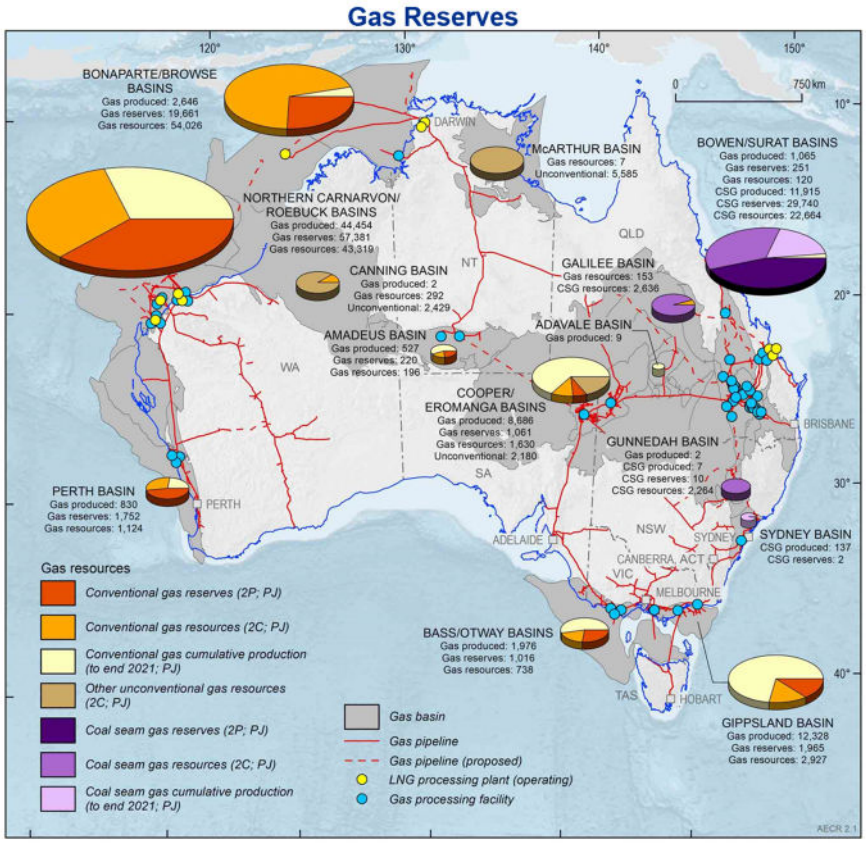
Source: KPMG analysis using ABS data 5204. Table 63 and ABS 5625. Values are in real terms.

Gas resources are reported as best estimate of the Total Proven and Probable reserves (2P) and best estimate of Contingent reserves (2C) using the SPE-Petroleum Resources Management System. Reserves are commercially recoverable amounts of petroleum that remain in known accumulations, of which 2P reserves are the best estimate. 2C reserves are defined as the best estimate of contingent resources. Total demonstrated resources are estimated as 2P reserves plus 2C contingent resources.

Figure 12 provides the distribution of Australia's remaining oil and gas reserves. Australia's Proven and Probable (2P) reserves for conventional gas in 2022 are estimated as 78,061 PJ, a decline of 5,246 PJ (6.3%) from 2021, while for coal seam gas, proven and probable reserves are estimated as 30,859 PJ in 2022, an increase of 1,107 PJ (3.7%) from 2021.

In 2022, Australia's identified Contingent (2C) conventional gas resources are estimated as 98,649 PJ, a decrease of 5,883 PJ (5.6%) from 2021; while coal seam gas Contingent resources are estimated as 25,489 PJ, a decrease of 2,075 PJ (7.5%) from 2021.

Figure 12: Australia's remaining gas reserves



Note: MMbbl is million barrels.

Source: Geoscience Australia, Gas 2024

3.3 Output by product and/or service

Production is defined as the value of goods and services produced in Australia, which is different from GVA which represents the additional value created in the production process. The gas industry produces 31 different commodities and services according to the ABS classifications, contributing $118 billion in 2021-22. Of these 31 commodities and services, nine are supplied in full by the gas industry. The remaining 22 commodities and services are supplied by other industries (e.g., construction, mining, and electricity, water and waste services) as well as the gas industry. In 2021-22, the industry contributed 12% of the total Australian production of these 31 commodities and services.

Table 4 provides the list of 31 commodities and services produced by the gas industry along with their corresponding output values, compared to the total Australian output for each commodity and service.

Table 4: Gas industry output by products and services

ABS IOPC	ABS IOPC Description	Gas industry output ($M)	Australian output ($M)	% of gas industry output
7000010	Crude oil (including condensate)	14,075	14,075	100.00%
7000020	Liquefied natural gas	68,493	68,493	100.00%
7000030	Natural gas - in the gaseous state	10,924	10,924	100.00%
7000050	Coal seam gas	3,323	3,323	100.00%
7000070	Liquefied petroleum gas from the wellhead	3,529	3,529	100.00%
10110010	Petroleum exploration	2,393	2,393	100.00%

ABS IOPC	ABS IOPC Description	Gas industry output ($M)	Australian output ($M)	% of gas industry output
10900010	Mining support services nec[41]	1,200	19,686	6.10%
18110040	Liquefied natural gas - other than from the wellhead	3,804	3,804	100.00%
18110090	Industrial gases (excl liquefied natural gas)	893	896	99.67%
26110012	Electricity generated from natural gas	843	6,332	13.31%
26110013	Electricity generated from other fossil fuels	13	898	1.45%
26190010	Electricity generation nec	4	2,155	0.19%
27000010	Gas service income nec	2,190	2,190	100.00%
27001500	Margin - gas distribution and on selling	3,284	3,284	100.00%
30200010	Non-residential building construction	1,082	70,087	1.54%
31090010	Non-building construction nec	504	81,997	0.61%
32000010	Trade services repair and maintenance	200	63,172	0.32%
32000020	Other construction trade services	487	163,279	0.30%
37001500	Margin - wholesaling services	181	153,749	0.12%
46101600	Margin - road freight transport services	13	42,904	0.03%
50211600	Margin - pipeline transport services	5	2,310	0.22%
52920010	Freight forwarding agency services	5	24,083	0.02%
66310010	Heavy machinery and scaffolding (excl erection) rental or hire (excl financial leases)	521	17,319	3.01%
67120010	Non-residential property operator services (incl non-residential property body corporate or strata corporation services)	9	93,182	0.01%
69000030	Surveying and mapping services	18	3,417	0.53%
69000080	Scientific testing and analysis services	27	6,363	0.42%
69000140	Corporate head office management	29	13,977	0.21%
69000220	Own account research and development	216	22,761	0.95%
70000010	Computer systems, hardware and software design and development services	1	59,002	0.00%
72120010	Labour supply services	7	36,206	0.02%
72910020	Office administration services nec (incl clerical, billing, record-keeping and payroll services)	4	16,494	0.02%
Total		118,277	1,012,284	11.68%

Note: The gas industry production ($118 billion) plus imports and intermediate sales equals to gas sales as seen in Figure 7.

Source: KPMG analysis of ABS Australian National Accounts: Input-Output Tables 2021-2022

[41] Nec means not elsewhere classified

3.4 Cost and sales structure of the gas industry

Figure 13 provides a detailed representation of the gas industry's sales and cost structures from 2021-22 Australian National Accounts Input-Output Table published by ABS.42 The cost structure captures the direct contribution of the gas industry to the economy through its payments to providers of inputs that the industry needs to produce the gas products and services that it sells. This includes primary inputs labour and capital supplied to the industry by workers and investors as well as intermediate inputs (i.e., goods and services produced by other industries in the economy). The sales structure captures the direct contribution of the gas industry to the economy through its sales to customers. This includes final users of gas products and services such as Australian households and overseas customers as well as other Australian businesses that use gas products and services as intermediate inputs in their production processes.

Figure 13 shows that:

- Approximately 72% of the industry's costs are accounted for by payments to capital providers ($78.8 billion) and workers[43] ($6.0 billion). Labour and capital are primary factors that provide non-produced services that are used as inputs by the industry. Labour services are provided by the workforce employed directly by entities in the gas industry. Capital services are provided by assets employed by the industry, including fixed assets such as natural resources, built structures, plant, machinery and equipment. The services provided by these assets are essential to the operation of the industry and the cost of developing and maintaining these assets must be financed by investors with the appropriate tolerance for risk.
- The remaining 28% of the gas industry's costs are associated with purchases of intermediate inputs, which are goods and services produced by other industries that are used in the gas industry's production process. This includes operating costs for gas projects as well. Finance and professional services, construction, basic chemicals, petroleum and specialised equipment manufacturing, electricity and transport are key inputs purchased by the gas industry from other industries in the economy.
- On the sales side, Australian households account for about 6% ($7.5 billion) and overseas customers account for about 65% ($86.2 billion) of the gas industry's revenue. Gas products and services are an essential intermediate input for a range of industries in Australia. The gas industry sells about $39 billion of its output to other industries. Key industry customers include the basic chemical and petroleum manufacturing industry, mining, electricity utilities and construction industries.

The gas industry's cost and sales structures provide the foundations for understanding its indirect contribution to the economy. This includes the flow-on effects from:

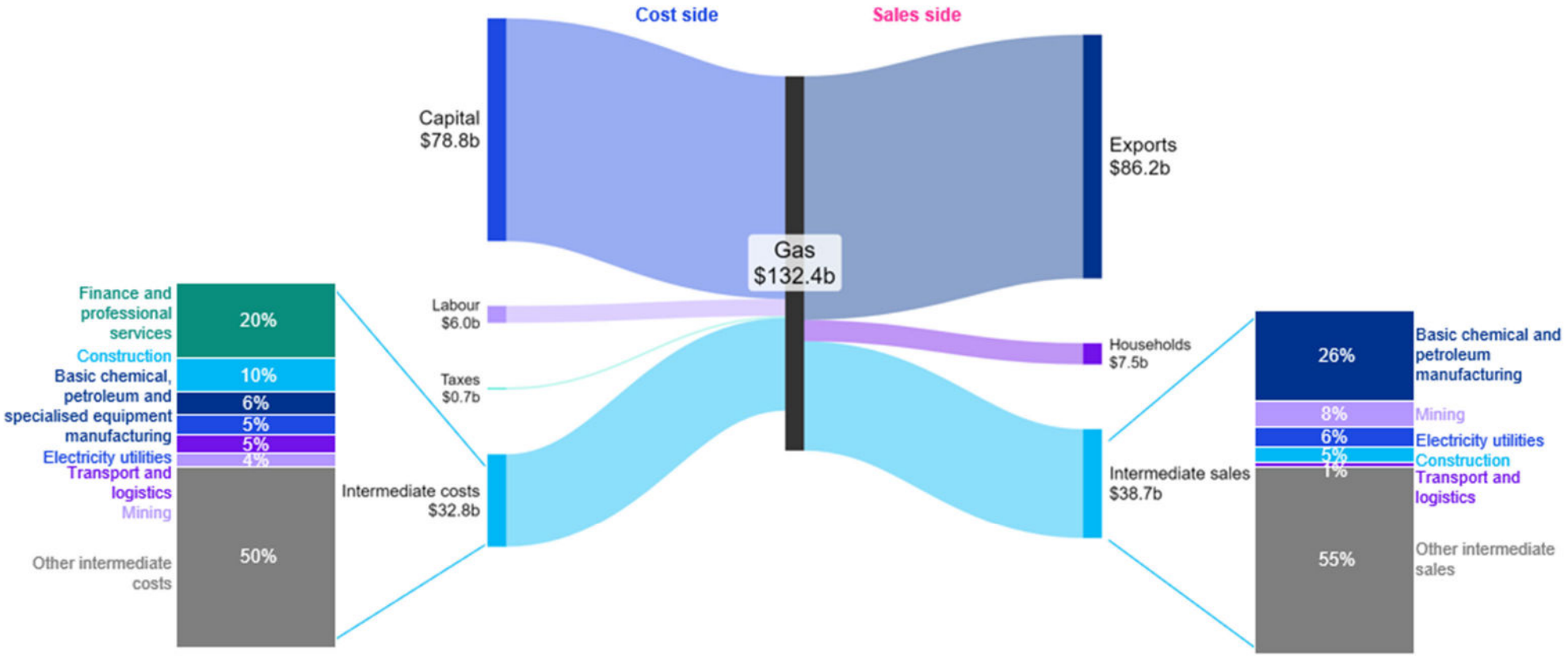
- The income directly generated by the industry.
- The industry's supply chain linkages.
- The provision of an essential input to other businesses in the economy.

These indirect contributions are discussed in more detail in Section 5.

[42] Australian National Accounts: Input-Output Tables – Table 2. Input by Industry and Final Use Category and Australian Production and Imports by Product Group - 2021-22

[43] Compensation of employees comprises wages and salaries (in cash and in kind) and employers' social contributions. It does not include any unpaid work undertaken voluntarily or any taxes payable by the employer on the wage and salary bill such as payroll tax, according to ABS 2020-21.

Figure 13: Sales and cost structure of the gas industry 2021-22



Note: The gap between cost and sales captures the cost of imports and a component of intermediate sales.

Source: KPMG analysis of ABS Australian National Accounts: Table 2 Input by Industry and Final Use Category and Australian Production and Imports by Product Group 2021-2022

3.5 Employment

The 2021-22 Australian National Accounts Input-Output Table published by ABS[44] recorded 30,114 full-time equivalent (FTE) employees working in the Australian gas industry. Using the 2021 Census record, this number was apportioned across Australia.[45] More than a third of this industry's workforce is in Western Australia (36.8%), followed by Queensland (24.8%). This is consistent with the locations of the major gas resources in Australia, as discussed in Section 3.4. Identifying where the gas industry workforce are located provides insight into the industry's impact across Australia. Table 5 presents the number of gas industry employees, and the share of the Australian gas industry workers by state and territory.

Table 5: State and territory gas industry FTE employees, 2021

State/Territory	Gas industry employees (FTE)	Share of gas industry workforce (%)
Western Australia	11,091	36.8%
Queensland	7,481	24.8%
Victoria	5,355	17.8%
New South Wales	3,315	11.0%
South Australia	2,017	6.7%
Northern Territory	649	2.2%
Tasmania	147	0.5%
Australian Capital Territory	59	0.2%
National	**30,114**	**100%**

Note: Gas industry FTE number of employees were calculated by aggregating full time and part time workers (one part-time worker is equivalent to half a full-time worker) across oil and gas extraction, gas supply, exploration and other mining support services, and basic chemical and chemical product manufacturing ANZSIC industry classes while applying the proportions discussed in Appendix A to the latter two.

Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year.

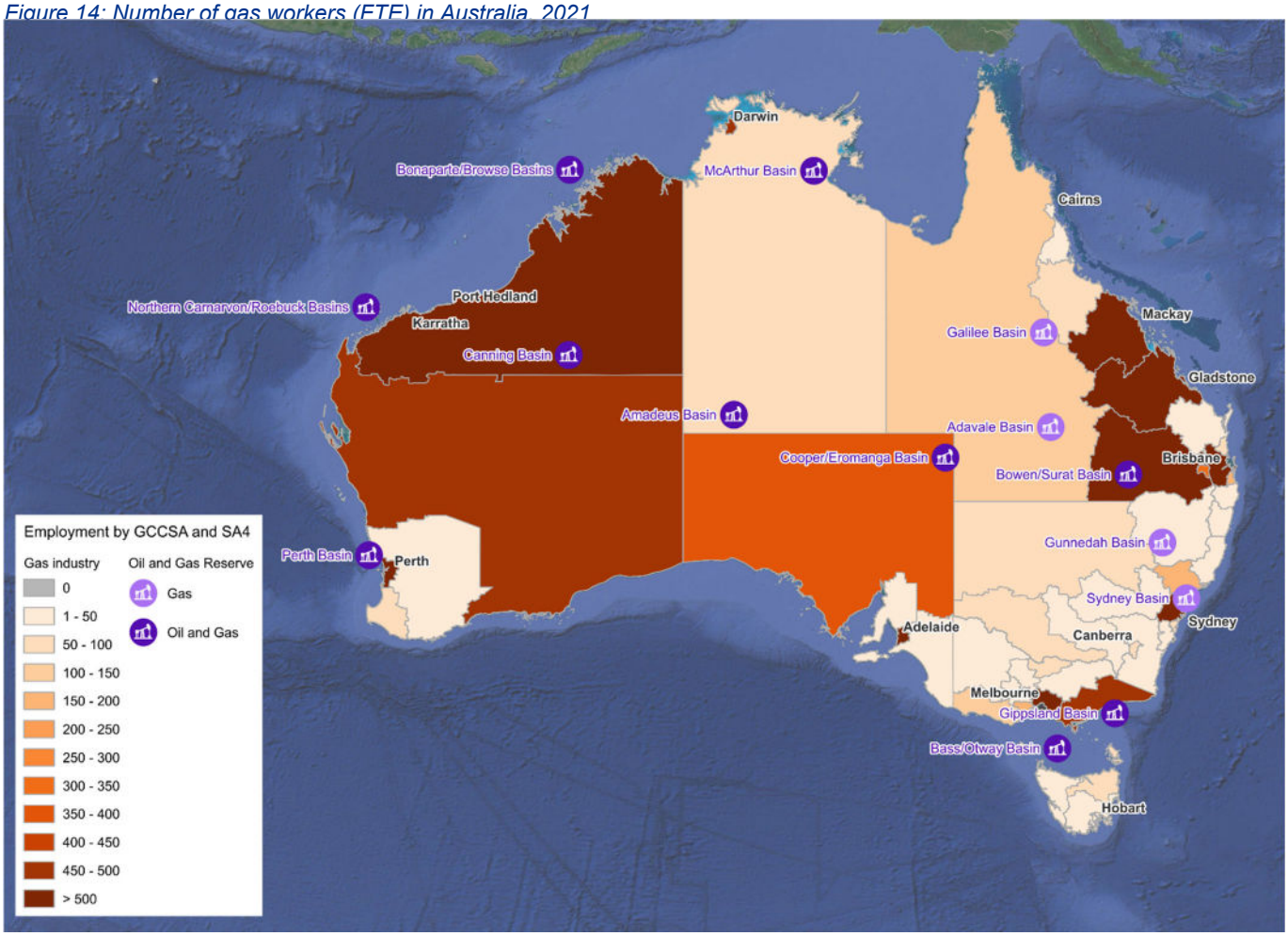
Figure 14 and Figure 15 show the geographic distribution of the 30,114 FTE gas industry workers at the more granular GCCSA and SA4 levels. Greater Perth has the largest number of gas industry employees with 8,470 FTE workers followed by Greater Melbourne with 4,228 FTE workers.

In considering the impact of an industry's employment footprint on a region, it is important to consider the proportion of workers in that industry relative to the total number of employees working in that region. Small and remote regions may have highly concentrated industry structures built around a natural resource base. Such regions may be susceptible to shocks that impact the dominant industry.

The gas industry accounted for 0.3% of Australia's total FTE employment in 2021-22 Australian National Accounts. The highest share of gas industry employees in the GCCSA and SA4 regions was recorded by the Western Australia – Outback (North) SA4 where 1.9% of the employed workers had jobs in the gas Industry. This was closely followed by the Darling Downs – Maranoa SA4 where the gas industry accounted for about 1.8% of employment in the region. For these two regions, the share of employment accounted for by the gas industry was over seven times greater than the share at the national level.

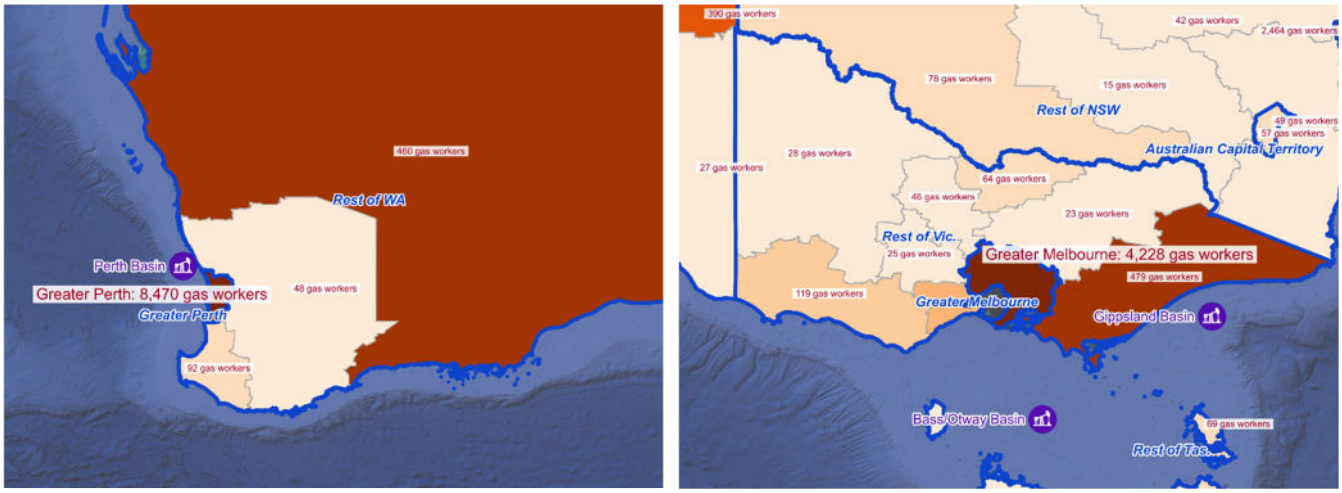
[44] Australian National Accounts: Input-Output Tables – Table 20. Employment by industry - 2021-22.
[45] The FTE gas industry workers estimated using the 2021 Census data is lower than the value estimated using the Australian National Accounts 2021-22 due to differences in data collection time periods. As a result, the spatial distribution of the Census data was used to apportion the Input-Output Table number to maintain consistency in data sources.

Figure 14: Number of gas workers (FTE) in Australia, 2021



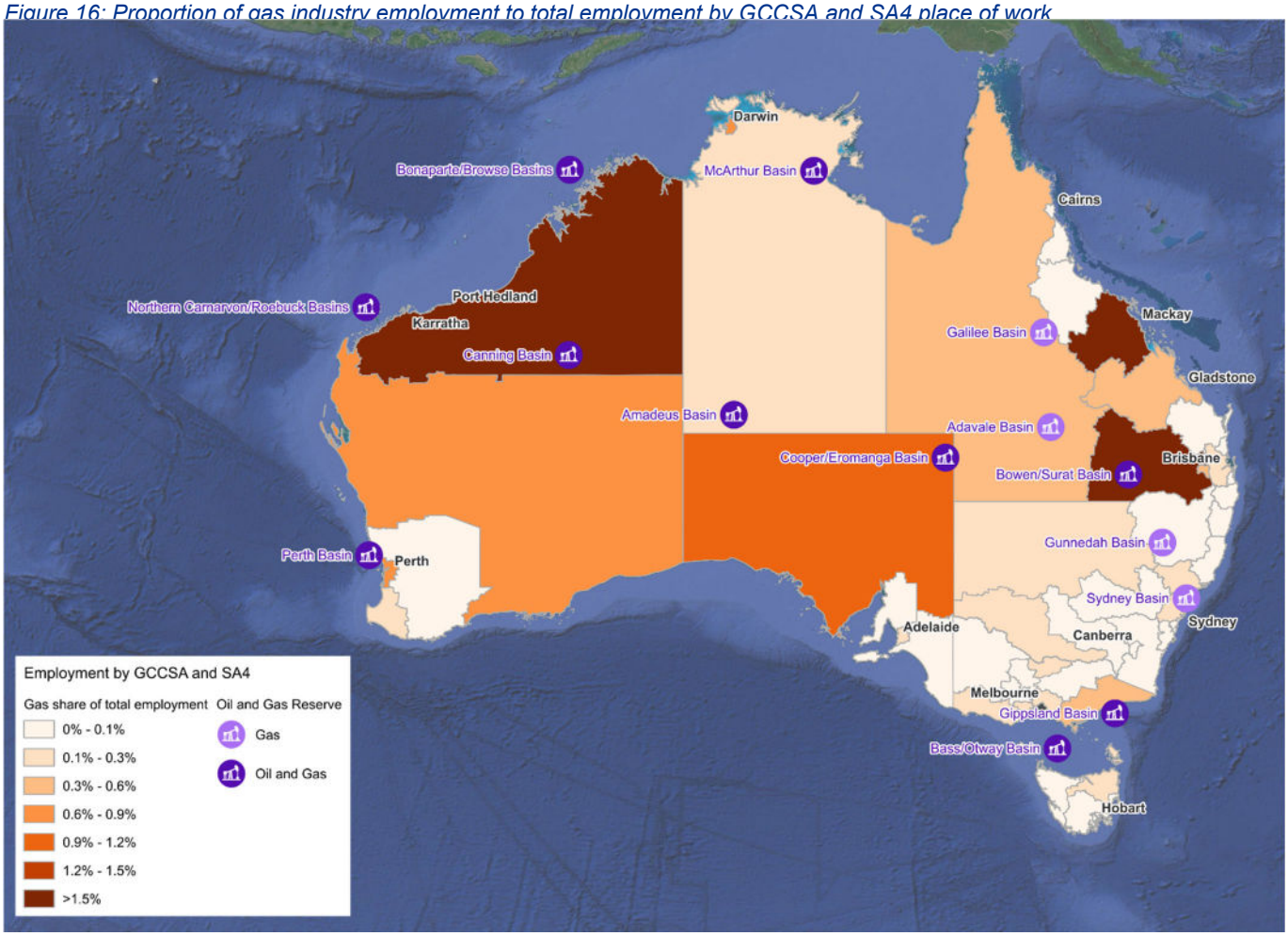
Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year

Figure 15: Number of workers (FTE) in Greater Perth and Greater Melbourne



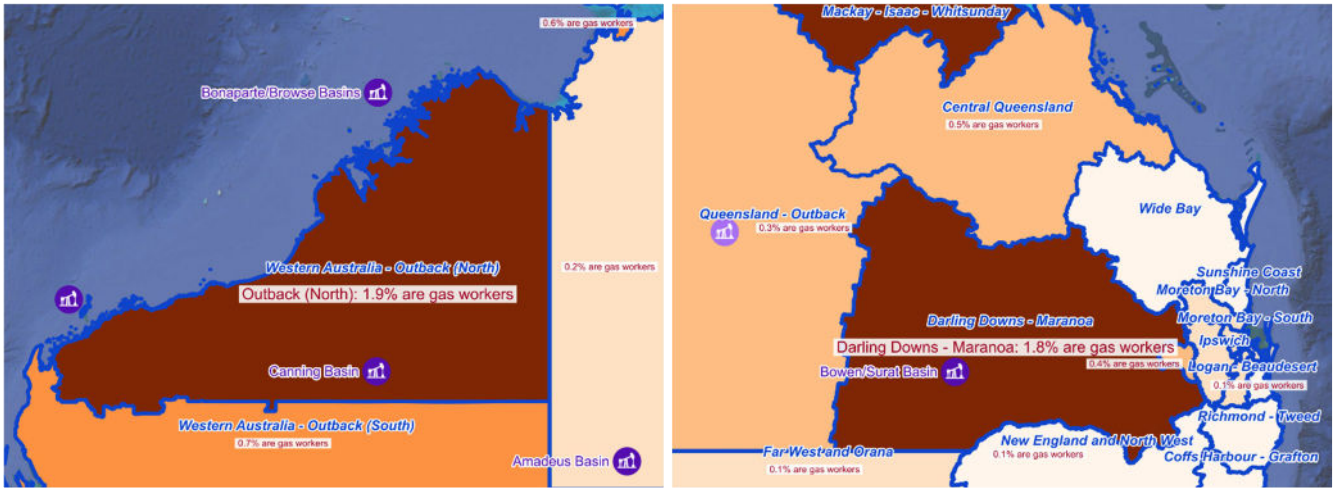
Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year

Figure 16: Proportion of gas industry employment to total employment by GCCSA and SA4 place of work



Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year

Figure 17: The proportion of gas workers in Outback (North), Western Australia and Maranoa SA4, Darling Downs, relative to total workers

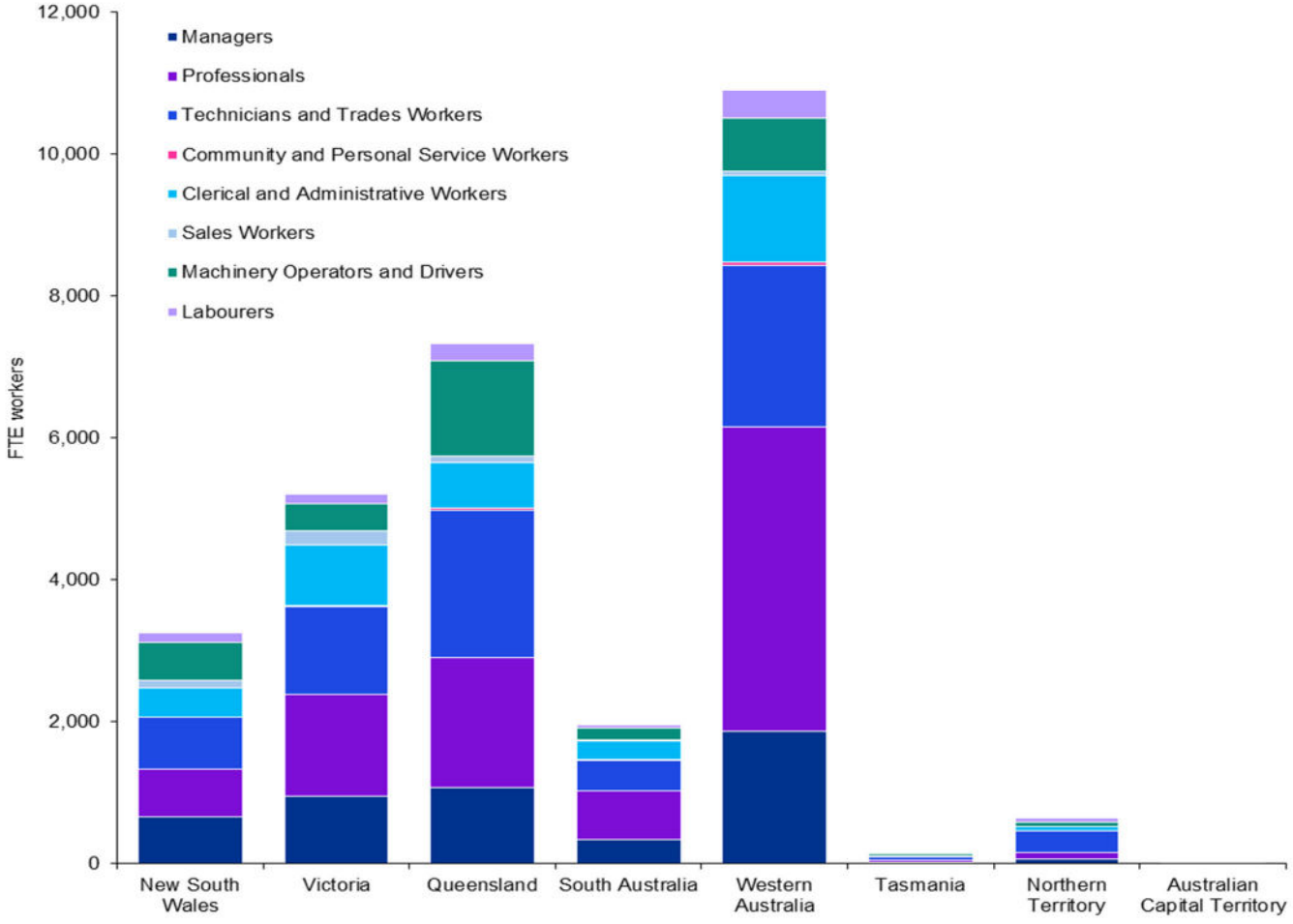


Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year

Employees in the gas industry work across a broad spectrum of occupations. Some of these occupations are concentrated in regions where extraction activities take place while others are concentrated in urban centres where retail and distribution, head office and some processing activities are concentrated.

Figure 18 illustrates the distribution of gas industry employees based on the nature of their work. This report follows the definitions of occupation classes from the ABS Census (2021). While there are no specific class for extraction workers, some workers from the technicians and trades workers, machinery operators and drivers, labourers, and managers are likely to be involved in the process. They make up 54% of the FTE-employed people in the Australian gas industry.[46] The remaining occupation classes, which includes professionals, community and personal service workers, clerical and administrative workers, and sales workers, may be involved in activities in the urban centres.

Figure 18: Gas industry FTE workers by occupation class by state and territory



Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and ABS Census 2021 calendar year

[46] This figure was estimated by apportioning the FTE Gas workers from the Australian National Accounts 2021-22 data using the 2021 Census proportion of each occupation class workers in the gas industry by state and territory.

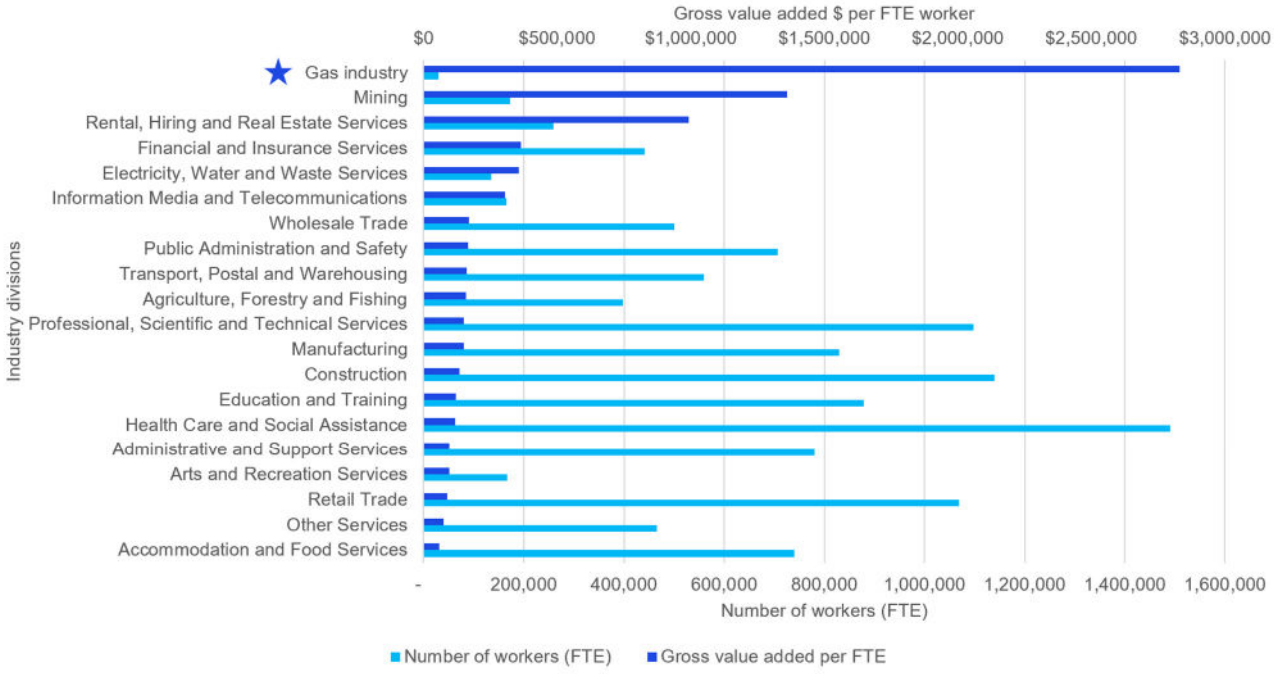
3.5.1 Employee productivity levels

In 2021-22, the Australian gas industry reported high productivity through high levels of GVA and output per FTE worker. This can be attributed to the highly capital intensive and skilled labour force involved in the industry.

Figure 19 compares the GVA per FTE worker across various industries, with a focus on the gas industry. The figures are derived from ABS data for 2021-22, calculated by dividing GVA by the number of FTE workers for each industry. The gas industry records the highest GVA per FTE worker at approximately $2.8 million, followed by the mining industry at around $1.4 million. This is 16 times more than the Australian average of $181,286 per FTE worker. The gas industry's high figure reflects the capital intensity of its production process. Appendix C provides the values of each data point.

Figure 20 compares the production per FTE worker across various industries. The figures are derived from ABS data for 2021-22, calculated by dividing each industry's production value by its number of FTE workers. The gas industry records the highest production per FTE worker at approximately $3.9 million. This high figure reflects that the output per worker in the gas industry is relatively higher than in other industries. This is 11 times more than the Australian average of $355,885 per FTE worker. Appendix C provides the values of each data point.

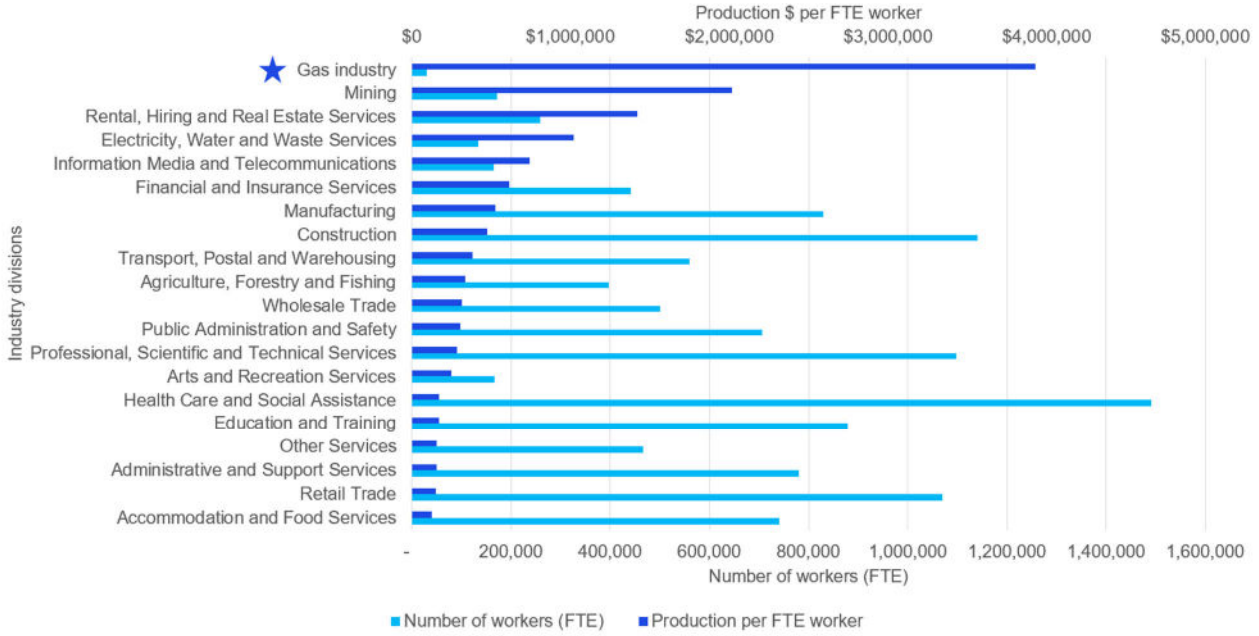
Figure 19: Australian employment numbers and GVA comparison by industry



Note: The data for the Mining, Electricity, Water and Waste Services and Manufacturing industry divisions has been adjusted to exclude those parts that are apportioned to the gas industry (defined in Appendix A). This ensures there is no double counting of employment.

Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-22 and Table 2 2021-22

Figure 20: Australian employment numbers and production comparison by industry



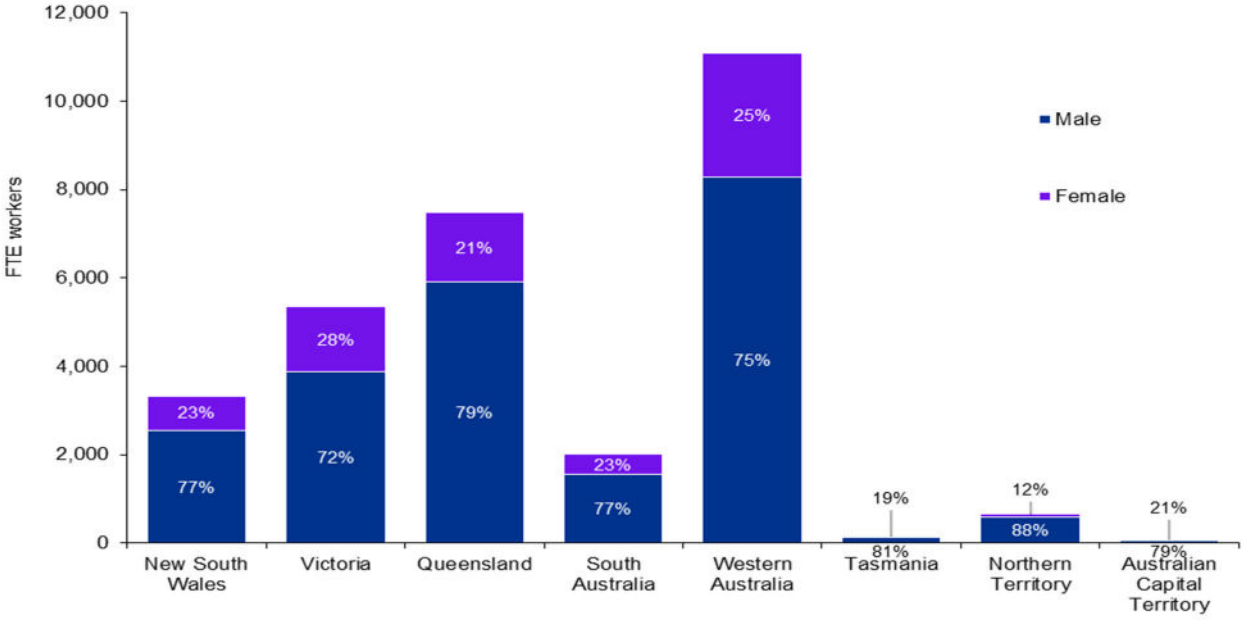
Note The data for the Mining, Electricity, Water and Waste Services and Manufacturing industry divisions has been adjusted to exclude those parts that are apportioned to the gas industry (defined in Appendix A). This ensures there is no double counting of GVA.

Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-22 and Table 2 2021-22

3.5.2 Workforce diversity

Twenty-four per cent (24%) of gas industry employees are reported as female workers based on the ABS Census (2021). This equates to 7,203 FTE workers and almost half are employed in Western Australia.[47] This proportion is just below that of the manufacturing industry and above the mining industry, which reported 26% and 17% respectively. Figure 21 provides the gender breakdown by state and territory.

Figure 21: Gas industry FTE employees by gender by state and territories



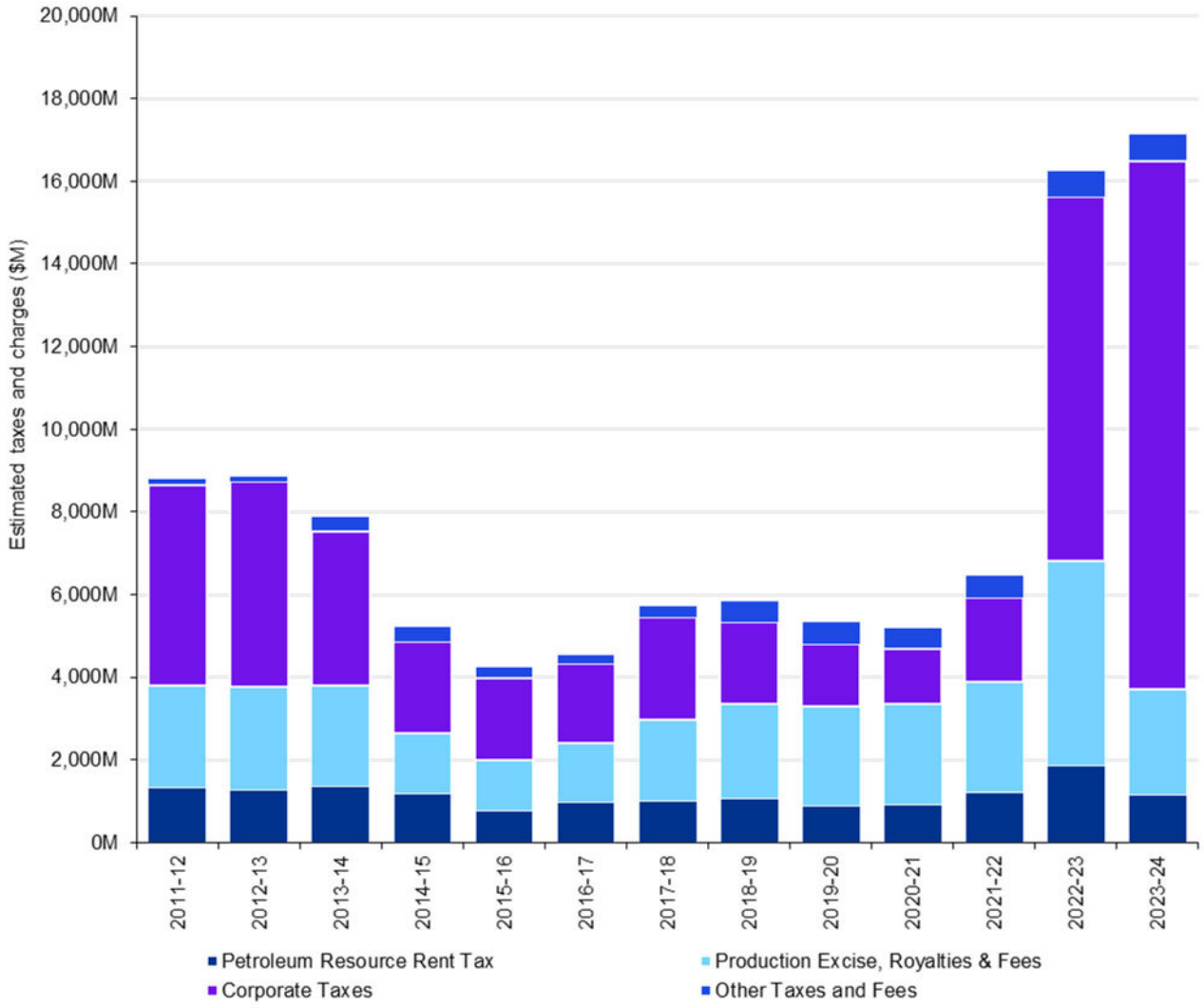
Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-22 and ABS Census 2021 calendar year

[47] This figure was estimated by apportioning the FTE Gas workers from the Australian National Accounts 2021-22 data using the 2021 Census ratio of female workers in the gas industry by state and territory.

3.6 Tax and royalties

The gas industry paid over an estimated $17 billion in taxes and royalty charges in 2023-24. Recent years, particularly from 2022-23 onwards, witnessed a substantial rise in tax and royalty payments by the gas industry as shown in Figure 22. This trend is corroborated by annual financial survey results provided by Australian Energy Producers, natural resource royalty expenditure data from the ABS and taxation data from the ATO. Australian Energy Producers conducts an annual survey of its members to establish the contribution of the industry to the revenues of state, territory, and commonwealth governments through the payment of taxes and royalties. This includes company income tax, Petroleum Resource Rent Tax (PRRT), state royalties and excise.

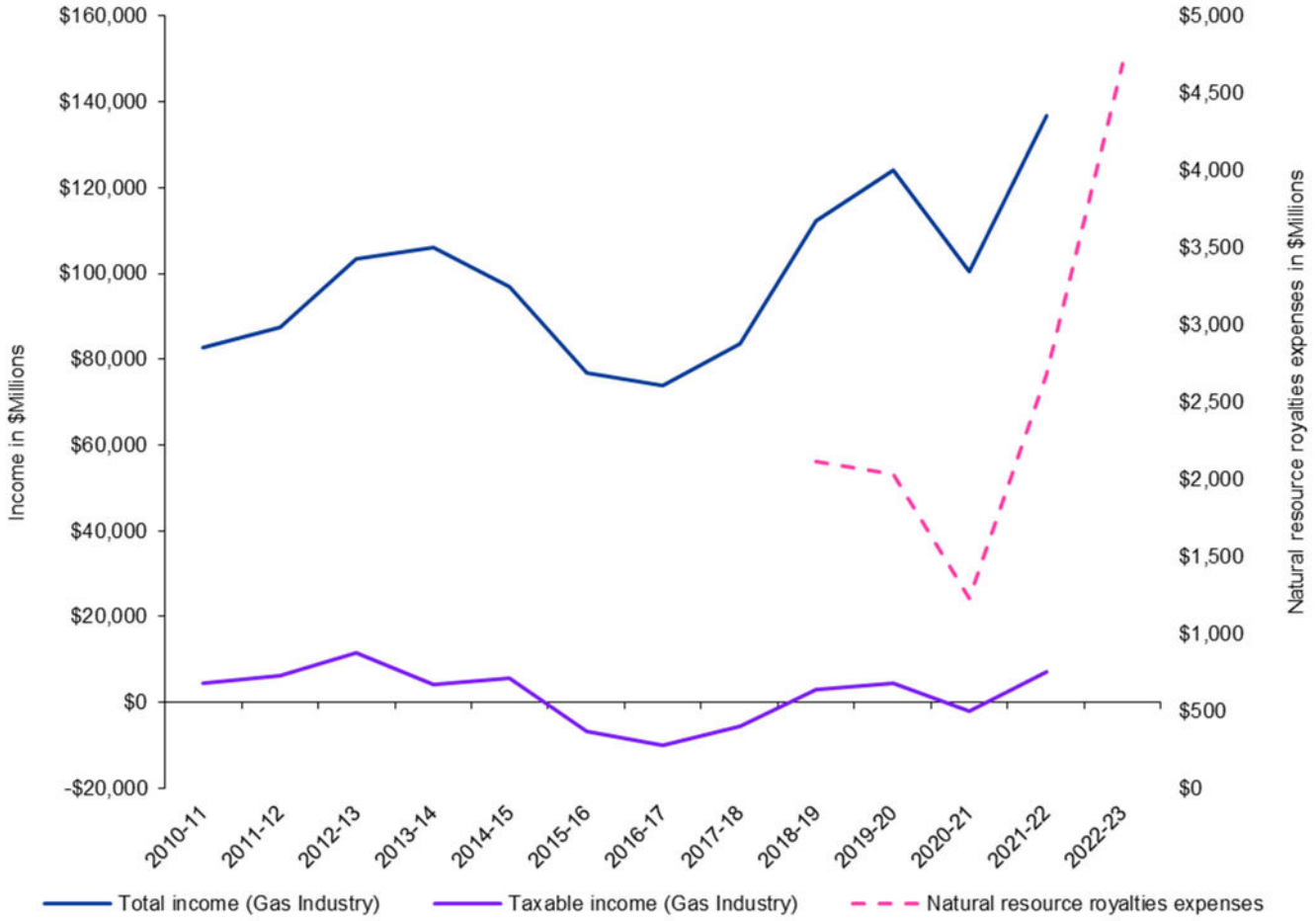
Figure 22: Estimated taxes and royalty charges contributed by the gas industry



Source: Australian Energy Producers annual financial survey, 2023-2024. The data is based on the responses that the survey received, which cover a limited number of gas producers

Figure 23 shows that the gas industry has experienced an overall upward trend in both total income and taxable income, with an acceleration in growth during 2020-21. This trend is mirrored in the industry's royalty expenses, which have seen a substantial increase from approximately $1 billion in 2020-21 to over $4.5 billion in 2022-23.

Figure 23: Income and taxable income of the gas industry



Note: The natural resource royalties expenses data is not available for the period before 2018-19.

Source: KPMG analysis of ATO taxation statistics and ABS natural resource royalties expenses data.

4 Indirect contribution of gas to the economy – current state

The previous section focused on the direct contribution of the gas industry to the economy, which was relatively easy to measure objectively using official data. In summary, the direct economic contribution of the gas industry can be transparently related to its cash flows. The gas industry generates revenues from sales of gas products and services. To generate this revenue the industry utilises a range of inputs, including:

- Tangible and intangible assets (e.g., gas reserves, buildings, machinery, plant and equipment, intellectual property etc)
- Labour resources
- Goods and services produced by other businesses (e.g., construction services, professional and scientific services, financial services, electricity, steel products, plastic products, chemicals etc).

The revenue generated by the gas industry reflects the market value of its output. This revenue is used to pay:

- Wages, salaries and supplements to workers directly employed by the businesses in the industry
- For inputs of goods and services purchased from other businesses
- Royalties, taxes and other government charges.

The remainder of the gas industry's revenue is Gross Operating Surplus, which constitutes a gross return to the owners of the tangible and intangible assets used by the business.

This section considers how the economic contribution of the gas industry extends beyond it's direct contribution, which was analysed in the previous section. The direct impacts of the gas industry summarised above will have flow-on impacts on the rest of the economy. For example, expenditure by the industry on goods and services stimulates the output and employment levels of Australian businesses that supply these inputs. In turn, this instigates further rounds of stimulus further along the supply chain.

In the remainder of this section we present results from a range of simulations that are designed to demonstrate the indirect economic contribution of the gas industry from different perspectives. We start with a simulation designed to highlight the indirect contribution the industry makes through its domestic supply chain (i.e., purchases from other Australian businesses) and through its payment of incomes to Australian residents (i.e., workers and investors). This scenario is special case of the industry shut-down scenario and provides a conservative estimate of the overall direct and indirect economic contribution of the gas industry.

Three additional scenarios are simulated to focus on particular elements of the gas industry's indirect economic contribution. The first of these scenarios explores how increases in costs that flow through to higher gas prices impacts customers and the economy as a whole. The second, considers the economic contribution of construction activity related to the development of major projects. The third scenario estimates the impact on the economy of additional productive capacity in the gas industry.

4.1 Domestic gas replaced with imported gas

To derive an indicative estimate of the overall direct and indirect contribution of the gas industry we have modelled a hypothetical shut-down scenario where:

- Australia stops producing gas; and
- all Australian gas users meet their requirements by using gas imported at approximately the same price as domestic gas.

This hypothetical scenario is designed to highlight the industry's direct and indirect economic impacts. The shut-down scenario means that the extraction component of the industry does not generate any value added, does not employ

any workers and does not purchase any goods and services from other Australian businesses.[48] The indirect impacts of this shut-down scenario emanate from two channels:

- **Supply chain impacts** – the industry no longer purchases goods and services from other Australian businesses; and
- **Income impacts** – the industry no longer makes payments to workers or to Australian investors.

Headline simulation results for Gross Regional Product (GRP) and FTE jobs are presented in Figure 24: and Figure 25:. We have used 2021-22 as the reference year and the results show what would have happened in that year if the shut-down scenario has played out. The simulation results show that the Australian economy would have been about $105 billion smaller in 2021-22 and that there would have been over 215,000 fewer jobs. As the results indicate, the biggest impacts are felt in the regions where the gas industry is concentrated. In the simulation we have assumed that real wages are sticky downwards and have not allowed real wages to fall to absorb the shock to the labour market. If such a shock did materialise, there would be downward pressure on real wages over time as the economy adjusted to re-absorb these workers.

In summary, the gas industry's total contribution to the economy in 2021-22 is estimated to have been:

- $105 billion to GDP; and
- 215,000 FTE jobs.

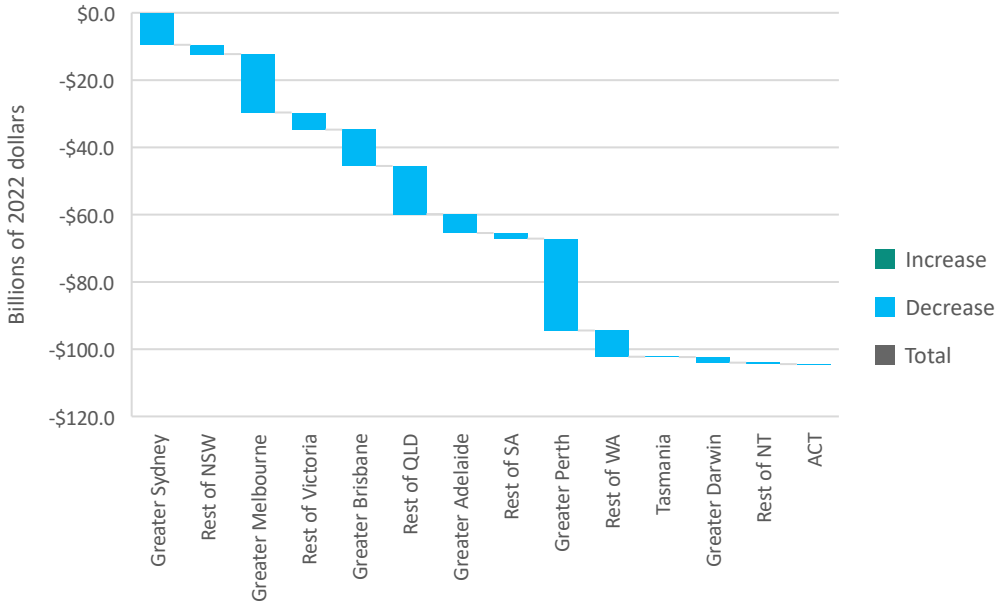
In section 3 the direct contribution of the gas industry was estimated to be:

- $85.2 billion to GDP; and
- 30,000 FTE jobs.

Subtracting the direct contribution from the total contribution provides the following estimate of the gas industry's indirect contribution to the economy in 2021-22:

- $19 billion to GDP; and
- 185,000 FTE jobs.

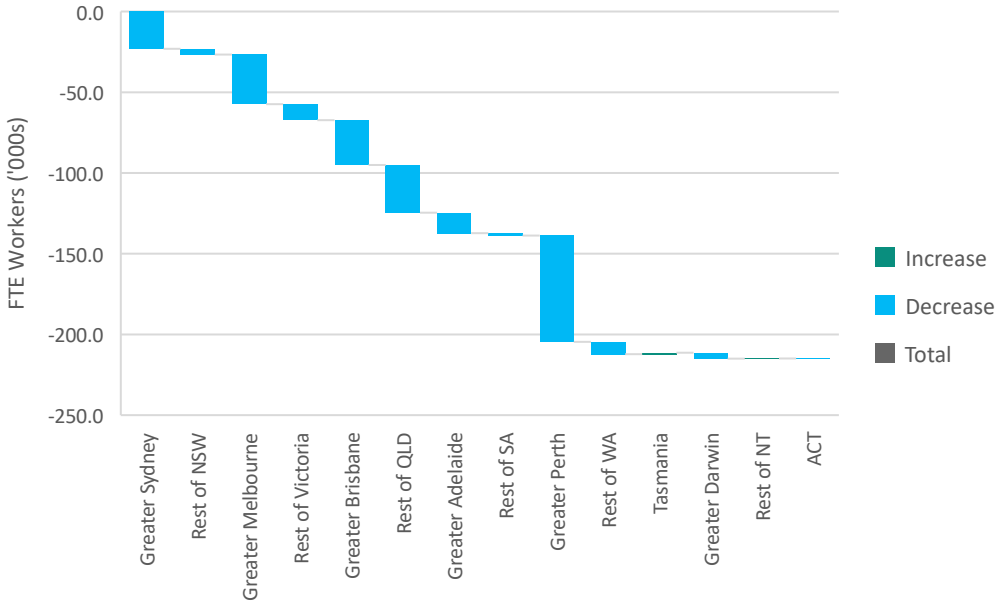
Figure 24: The impact on GRP of replacing domestic gas with imported gas



Source: KPMG analysis.

[48] Additional technical details relevant to this scenario are presented in Appendix D.

Figure 25: The impact on FTE jobs of replacing domestic gas with imported gas



Source: KPMG analysis.

Over time the impact of the gas industry shut-down on the economy would diminish as resources were re-absorbed in other businesses. The dynamics of such a re-adjustment are complex but likely to involve lower real wages and incomes. To minimise the negative impact on the economy, high value adding economic activities will need to emerge to absorb the resources directly and indirectly freed up by the gas industry, which supports high wages and value. Finally, we note that the shut-down scenario we have modelled under-estimates the potential negative impacts on the Australian economy because we have assumed that Australian gas users can seamlessly access imported gas for approximately the same price.

4.2 Increase in the cost of gas extraction

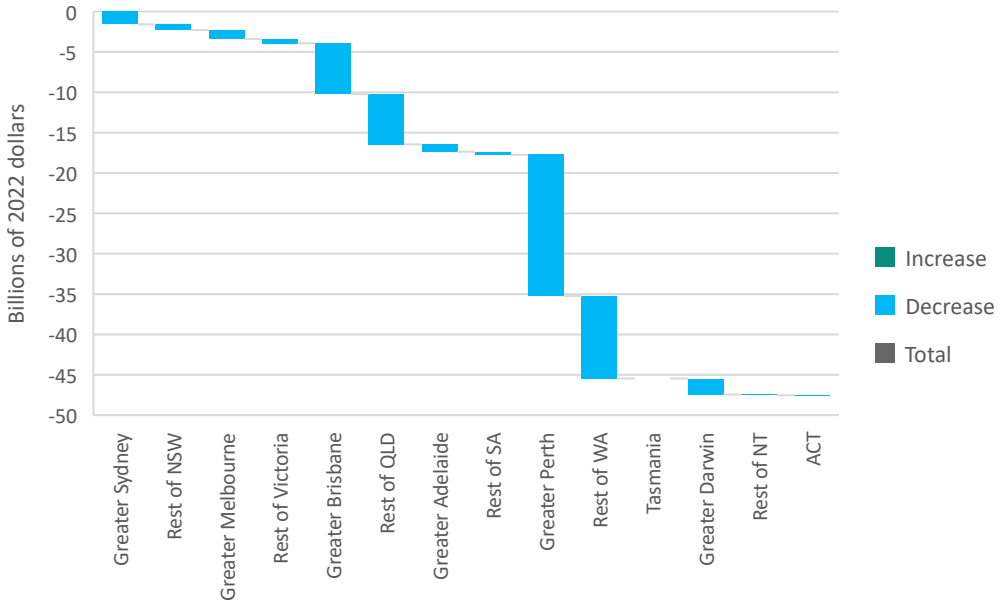
The indirect contribution of the gas industry to the economy can be considered in the context of its customers and how they would be impacted by a shock to industry costs that results in higher gas prices. The indirect impacts of this cost shock reflect the fact that gas is an essential input that cannot be easily replaced.

The hypothetical scenario considered in this section involves a 10% shock to costs in the gas extraction segment of the industry, which is passed on the customers in the form of higher wholesale gas prices. In this scenario the price of gas to customers goes up by less than 10% because we have assumed that the cost increases apply just to the extraction activities of the industry (i.e., does not apply to the transportation, storage, processing, wholesale and retail activities).[49]

Figure 26: and Figure 27: presents the headline simulation results for the cost-shock scenario. We have used 2021-22 as the reference year and the results show what would have happened in that year if the costs of gas extraction had been 10% higher. Higher gas prices reduce the purchasing power of household budgets. Since households cannot easily switch to an alternative fuel, especially in the shorter term, higher gas prices lead to lower real household income and lower real household consumption. Similarly, cost increases will reduce the competitiveness of businesses that use gas as a fuel or feedstock, particularly for businesses that compete on global markets. Again, this loss of competitiveness will be greatest in the short term where alternative fuels or technology are not readily available. The simulation results show that reducing the purchasing power of households and the competitiveness of businesses would have resulted in the Australian economy being almost $48 billion smaller in 2021-22 and supporting about 133,000 fewer jobs. While the negative impacts of the cost increase on GRP and employment are largest in the regions that have the biggest direct exposure to the gas industry, there are negative impacts on other regions due to indirect effects.

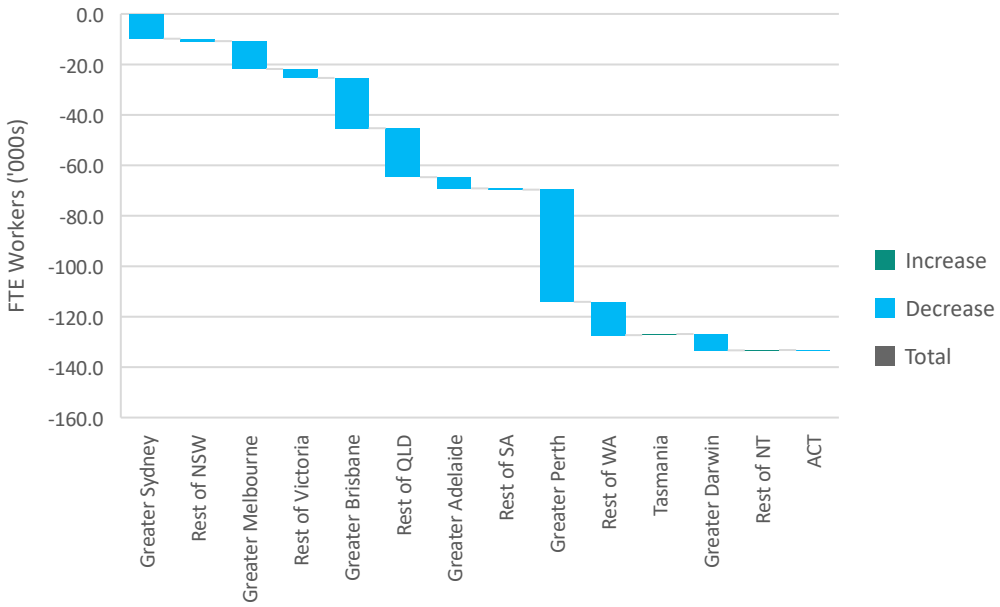
[49] The cost shock we have considered in this simulation is "pure" in the sense that there is no offsetting benefit in another part of the economy. For example, a cost shock emanating from higher wages or from a tax has potential offsetting impacts because it involves cash flows.

Figure 26: The impact on GRP of increasing the cost of gas extraction by 10%



Source: KPMG analysis.

Figure 27: The impact on FTE jobs of increasing the cost of gas extraction by 10%



Source: KPMG analysis.

In summary, the hypothetical 10% increase in the costs of the extraction segment of the industry is estimated to:

- reduce GDP by $48 billion per annum; and
- result in the loss of 133,000 FTE jobs.

A shock of this type discourages investment, which may impact future supply.

4.3 Construction phase impacts of gas projects

Investment activity by the gas industry has two primary purposes: firstly, to sustain its productive capacity; and secondly to increase its productive capacity. The value of this investment activity is reported in Appendix B. Investments by the gas industry to expand its productive capacity are typically large, lumpy projects that are located in regional areas and that take several years to develop and commission. Projects of this type impact the local, regional and national economies. These impacts differ greatly between Projects' development/construction phases and their operational phases.

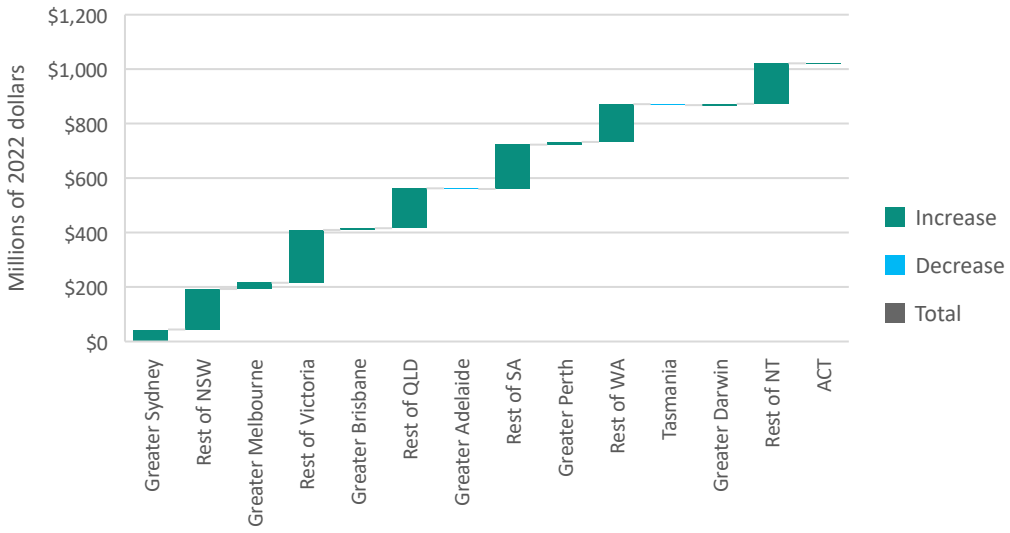
The 2023 Resources and Energy Major Projects report lists 39 gas projects that are at the "committed" or "publicly announced" stages and for which a cost estimate is provided. The average cost of these projects is estimated to be $2.4 billion. Ten of these projects are estimated to cost $3.5 billion or more with the largest estimated to cost over $20 billion. Projects of this scale take multiple years to develop and construct.

To illustrate the potential economic impacts of developing and constructing gas projects we have simulated the economic impacts of generic gas projects across the country in a typical year of their construction phase. The projects are assumed to be located outside of the Greater Capital City for each state and territory other than the ACT and Tasmania. The capex for the typical year of construction is assumed to be $0.5 billion for each project, amounting to total capex of $3 billion for Australia. The construction phase of a gas project can be conceptualised as a temporary shock to the economy involving a one-off boost to investment expenditure. The economic impacts of a project during its construction phase are directly related to the stimulus that this boost to investment expenditure provides to the economy. Among other things this will depend on the:

- Quantum and dispersion of the capital expenditure across jurisdictions (e.g., local, regional, state and offshore);
- Size, composition and source of workforce; and
- Degree of spare capacity in the labour market and in the business sector more generally.

The headline results for this simulation are reported in Figure 28 and Figure 29. We have used 2021-22 as the reference year and the results show what would have happened in that year if the hypothetical projects had spent $500 million each on development/construction activities. The simulation results show that the Australian economy would have been about $1 billion larger in 2021-22 and supported an additional 8,353 jobs.[50] It is important to recognise that this simulation is designed to show the economic impacts of construction activity by the gas industry. The scenario does not reflect any assessment of the need for new projects in any particular location.[51]

Figure 28: The impact on GRP of constructing $3 billion worth gas projects across Australia

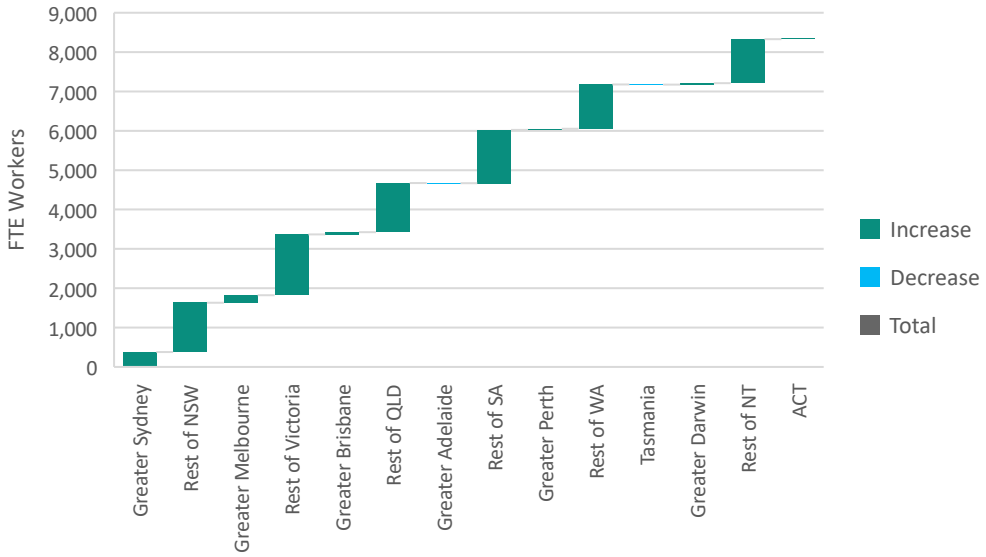


Source: KPMG analysis.

[50] This increases in GDP/GRP is less than the capex reflecting the fact that the former measures value added while the latter measures spending. Some of the project expenditures are on imported goods and services (e.g., specialised plant & equipment, financial services etc), which does not stimulate domestic activity. In addition, only some of the spending on domestic goods and services flows through to value added, which is comprised of compensation to labour and gross operating surplus.

[51] To emphasise the hypothetical nature of this scenario we note that the 10th biggest gas project on the 2023 Resources and Energy Major Projects lists is projected to cost $3.5 billion, or seven times the amount we have assumed for each region. A reasonable assumption is that projects would not be developed simultaneously across all regions and that a project of this size constructed in a particular region would take multiple years to complete. As a rough approximation, for a $3.5 billion project completed over seven years in a particular region, the impacts reported in Figure 28 and Figure 29 for that region would persist for seven years.

Figure 29: The impact on FTE jobs of constructing $3 billion worth gas projects across Australia



Source: KPMG analysis.

In summary, construction activity associated with capital expenditure of $3 billion, spread evenly across five hypothetical gas projects across the country, is estimated to:

- increase GDP by $1 billion; and
- support an additional 8,350 FTE jobs.

These estimates are designed to be indicative as they are based on a hypothetical scenario that does not consider project-specific characteristics. Projects developed by the gas industry are typically large and take multiple years to complete. To understand the impacts of such projects on the regional economies in which they are located more detailed modelling is required to take account of the specific nature of the project and the local economy.

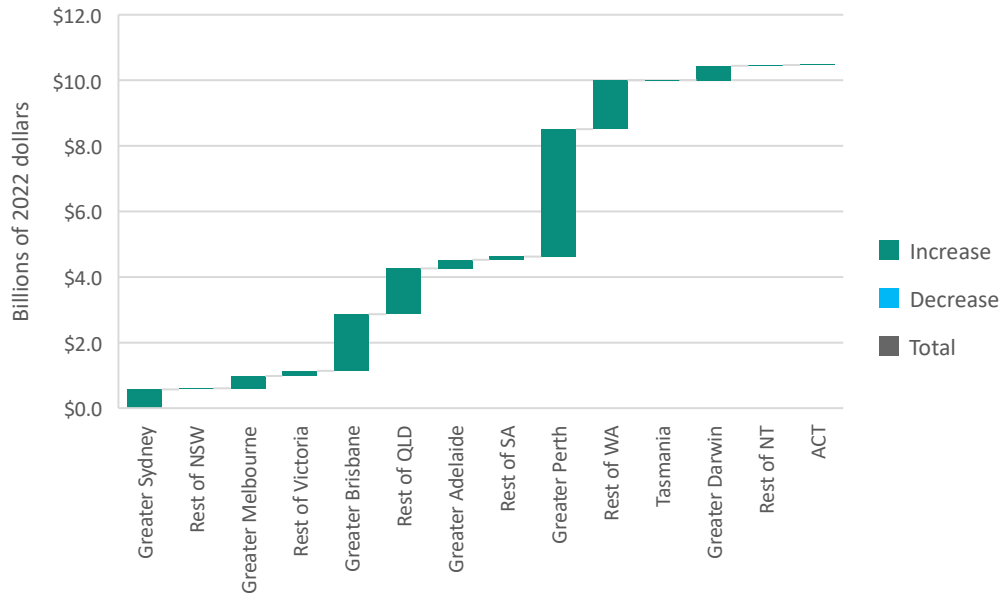
4.4 Expanded productive capacity of the gas industry

Projects developed and constructed by the gas industry are designed to increase the productive capacity of the industry. That is, once new projects are commissioned and become operational they add to the output produced by the industry. To show the potential impact of additional productive capacity in the gas industry we have simulated a scenario where the capacity of the industry is expanded by 5% (e.g., as a result of previous investments). We have assumed that capacity is scaled up uniformly around the country (as opposed to a specific region).

The headline results for this simulation are reported in Figure 30: and Figure 31:. The results show that GRP increases in all regions, with the largest increases centred on regions with the greatest exposure to gas activities. The increase in the supply of gas puts downward pressure on gas prices (relative to the base case), which benefits gas users across the country.

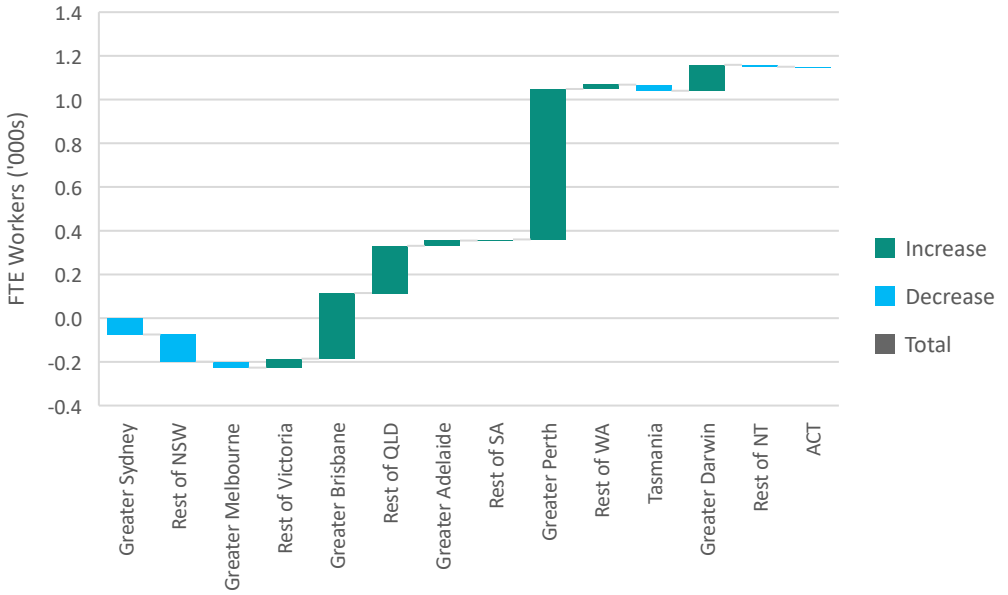
The simulation results show that the Australian economy would have been almost $10.5 billion larger in 2021-22 and supported an additional 1,150 jobs, consistent with this scenario the impacts are spread across regions, however Queensland and Western Australia experience the largest increases. As explained in Appendix D we have assumed for this scenario that the increase in productive capacity is in the context of the long run where the labour market is in equilibrium. This means that there is limited scope for aggregate employment to increase and the benefits to the labour market accrue in the form of higher real wages. Under these assumptions some regions release labour which is absorbed in other regions at higher real wages.

Figure 30: The impact on GRP of expanding the productive capacity of the gas industry by 5%



Source: KPMG analysis.

Figure 31: The impact on FTE jobs of expanding the productive capacity of the gas industry by 5%



Source: KPMG analysis.

In summary, a hypothetical 5% expansion in the gas industry's productive capacity that is proportionally distributed around the country is estimated to:

- increase GDP by $10.5 billion per annum; and
- support an additional 1,150 ongoing FTE jobs.

5 Forward Looking

In this section we consider forward-looking scenarios for the Australian gas industry that are conditioned on global energy market scenarios. Forward-looking scenarios are inherently uncertain, particularly for industries directly impacted by the domestic and global energy transition. Natural gas is projected to play an important role as a transitional energy source as the domestic and global economy decarbonises[52]. Gas will remain a key component of the global energy mix because it is relatively abundant, has a lower carbon footprint compared to conventional energy options such as coal, and provides flexibility for power generation. Mainstream global energy outlook scenarios have natural gas complementing the expansion of renewable energy sources over the longer term and assisting to bridge the gap between fuels during the energy transition.[53]

5.1 The future role of the Australian gas industry

Australia's natural gas industry plays a dual role as a key supplier for domestic energy needs and a major contributor to exports through LNG. As Australia strives for reduced carbon emissions, natural gas is considered an important transition fuel, supporting the increased role of renewable energy sources due to its lower carbon footprint compared to coal, as well as its reliability and flexibility.

On the international stage, Australia is a major LNG exporter to key trading partners across the Asia-Pacific region including Japan, South Korea, China, and Taiwan. Other developing and emerging countries in the Asia-Pacific region are projected to increase their demand for energy as their populations and economies expand. Gas could help developing countries meet their increased energy needs, particularly by providing coal-to-gas switching opportunities[54]. Australia's abundant reserves and advantageous geographical location means it can play a role in helping counties in the region meet their future energy needs during the energy transition.

The following two sections provide an overview of widely accepted global and domestic future energy scenarios, and the role projected for gas. The role projected for gas in the global and domestic scenarios presented is consistent with that envisaged in the Australian government's Future Gas Strategy, which sets out the principles to be used to guide policymaking about gas to support the transition to net zero.

5.1.1 Global future energy scenarios

Global energy outlook scenarios published by reputable organisations show that natural gas is expected to remain an important energy resource that is necessary to satisfy global energy demands out to 2050 as well as to provide ongoing support as a transitional fuel during the global energy transition. The IEA World Energy Outlook (WEO) scenarios provide global context for the energy outlook scenarios developed by AEMO for Australia. Appendix E provides additional information for each IEA WEO scenario. Global energy scenarios are published by a range of other organisations, with each of these relying on a range of different forecasts and assumptions.[55,56] Figure 32 presents a range of global natural gas supply projections.

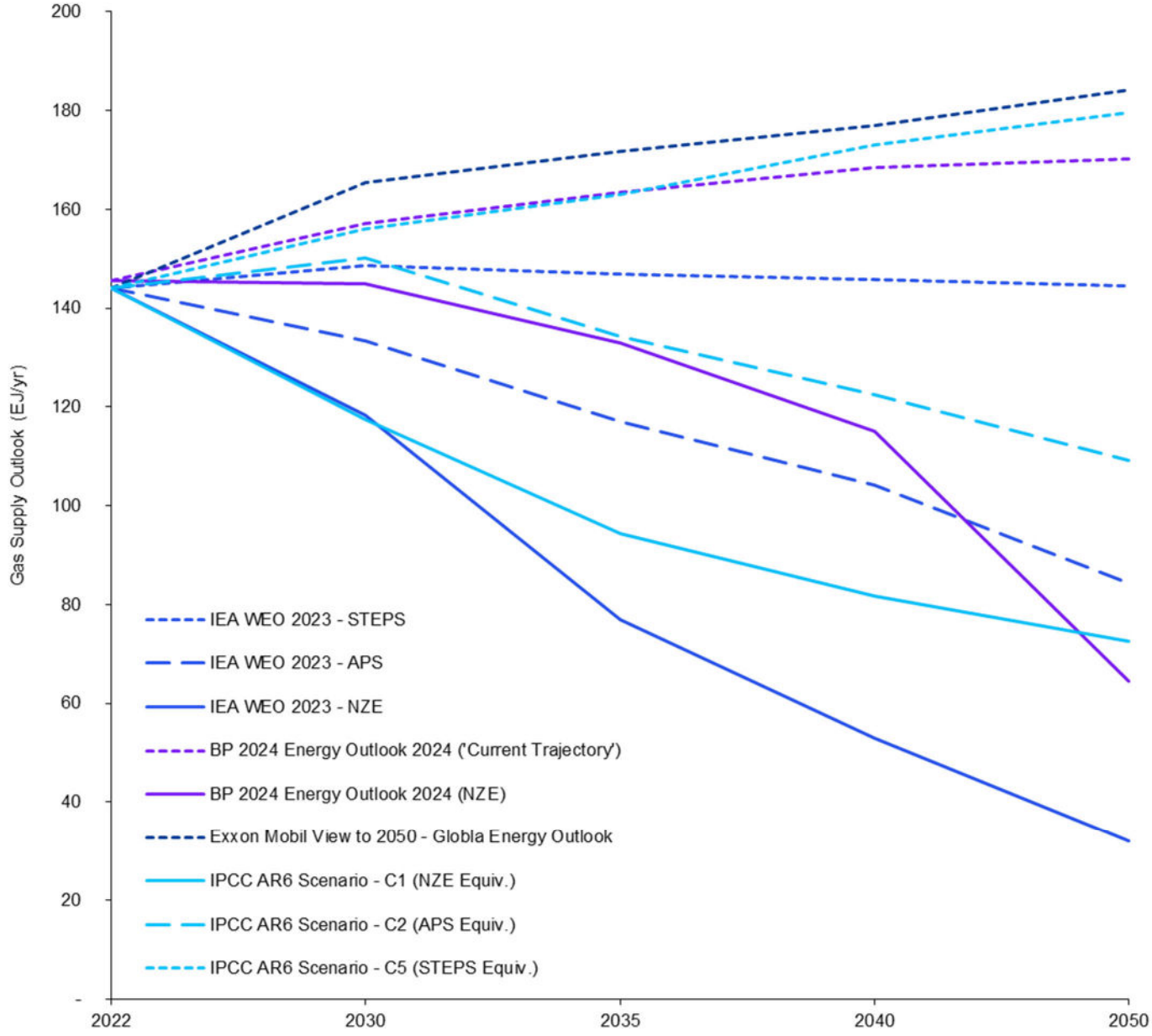
The projections for natural gas supply contained within the global energy scenarios indicate that even in the most stringent emissions reduction scenarios natural gas continues to play an important role. For example, in the IEA's Net Zero Emissions (NZE) Scenario gas supply is projected to fall to 77 EJ in 2035, which is more than half the volume supplied in 2022, and then to 32 EJ in 2050. The BP "net zero" and IPCC (AR6 - C1) net zero emissions scenarios have higher projections for gas supply in 2035 and 2050.[57] For example, the IPCC scenario projects gas supply of 72.5 EJ in 2050, which is 2.3 times the volume projected in the IEA NZE scenario. Gas supply in the IEA and IPCC announced pledges (IEA APS and IPCC AR6 – C2) and stated policies scenarios (IEA STEPS and IPCC

[52] IEA - The Oil and Gas Industry in Net Zero Transitions Report (2023)
[53] IEA WEO Scenarios (2023)
[54] DISR Future Gas Strategy Analytical Report
[55] This includes scenarios developed by non-industry organisations such as the Intergovernmental Panel on Climate Change (IPCC) and the International Energy Agency (IEA) as well as scenarios developed by businesses within the industry such as BP and ExxonMobil.
[56] The differences in these scenarios, which can limit their comparability, reflect the uncertainty of forward-looking forecasts and the different assumptions upon which they are built. These differences include differing forecasts of energy demand drivers, including economic growth and population growth, and differing assumptions regarding the level of decarbonisation ambition, behavioural and technological change, and expected climate outcomes.

[57] These differences in the global NZE energy outlook scenarios reflect the fact that all forward looking scenarios are built around uncertain forecasts of energy demand drivers, including population growth, economic growth, technological advancements, energy intensity and the impact of evolving consumer preferences.

AR6 – C5) is projected to be significantly higher than in the NZE scenarios. The IEA STEPS scenario has gas supply above or around 2022 levels out to 2050. Gas supply in the IPCC stated policies scenario is higher still, with the projections for 2035 and 2050 volumes around 13% and 25% higher than 2022 volumes. The IEA and IPCC announced pledges scenarios have projections for gas supply that lie between the projections in their respective NZE and stated policies scenarios.

Figure 32: Global energy supply outlooks for natural gas (primary energy resource)



Source: KPMG analysis of data from IEA WEO 2023, BP 2024 Energy Outlook 2024, Exxon Mobil View to 2050, and IPCC AR6

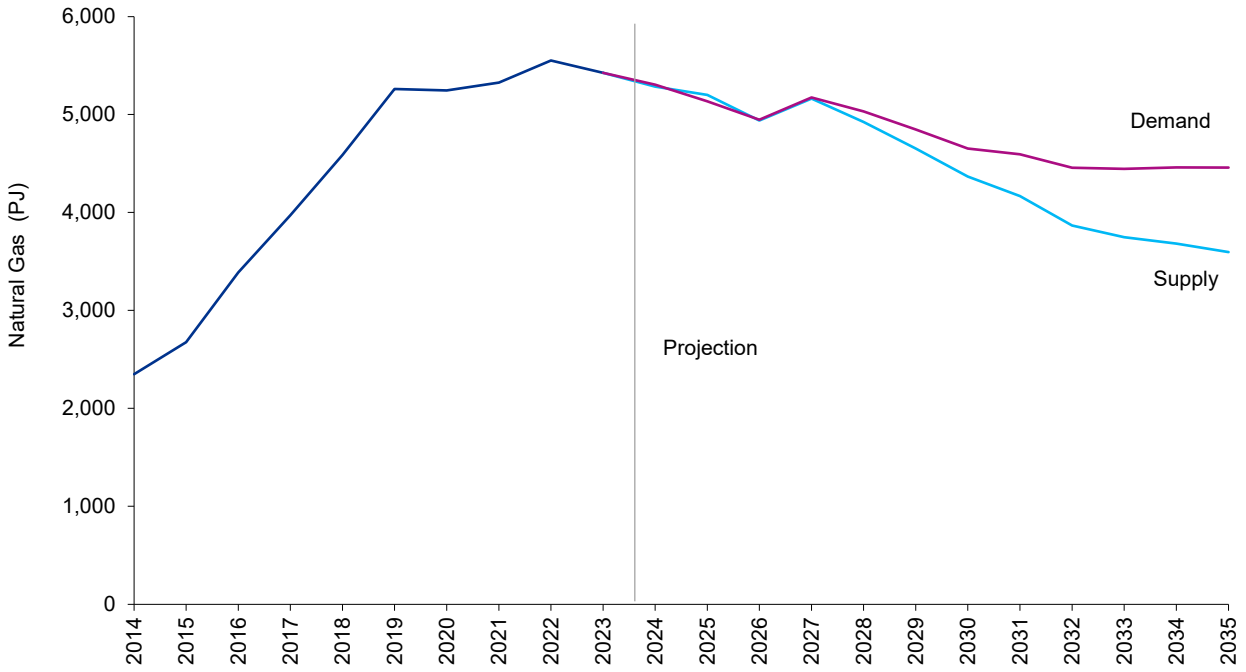
The IEA has assessed that in the Southeast Asian region natural gas production falls short of demand in the near term with LNG expected to fill the gap.[58] This results in the southeast Asian region, which has historically been an exporter of gas, becoming a net importer of gas by 2025. The Institute of Energy Economics, Japan (IEEJ) has forecast that Asia's LNG consumption will more than double from 2021 to 2050, from 273 million tonnes to 551 million tonnes. This growth will be driven by demand from China, India and ASEAN economies with continued demand in Japan and Korea.[59] The IEEJ notes that as growing users of gas China, India and ASEAN will need to secure stable supplies of LNG.

[58] International Energy Agency, Southeast Asia Energy Outlook 2022
https://iea.blob.core.windows.net/assets/e5d9b7ff-559b-4dc3-8faa-42381f80ce2e/SoutheastAsiaEnergyOutlook2022.pdf
[59] Energy Economics, Japan, Outlook 2023, p.35 https://eneken.ieej.or.jp/data/10974.pdf

5.1.2 Australian gas supply and demand outlook

The outlook for natural gas supply and demand presented in the Future Gas Strategy (FGS) report is summarised in Figure 33:. According to these projections gas supply will decline gradually over the next decade. The demand projections are based on AEMO's Step Change scenario for the East Coast market and the "Base/Expected scenario" for the West Coast (see section 5.3 for more details). The projected supply of gas is insufficient to meet gas demand under all scenarios projected in the FGS.[60] In addition, the FGS Report notes that "*Australia will need to see much higher levels of investment in exploration and development before production levels can increase*".[61] This will be discussed further in Section 5.3 but before doing so we consider the implications of the supply projections for the gas industry's Gross Value Added.

Figure 33: Australian natural gas supply and demand based on projections in the Future Gas Strategy



Source: Data to 2023 taken from the 2024 Energy Institute Statistical Review of World Energy. Projections taken from the FGS (Tables 5.1 and 5.2) with two additional assumptions. First, West Coast gas supply for LNG is assumed to be equal to demand, which is taken from the 2023 WA GSOO (Figure 14, Base / Expected scenario). Second, for 2034 and 2035, which are beyond the projection period of the WA GSOO, we have assumed that West Coast gas supply is equal to the level reached in 2033.

5.2 Projection of gross value added for the gas industry

Based on the supply profile assumed in the FGS we have estimated the implications for the Australian gas industry's Gross Value Added. Figure 34: shows the projected profile of the gas industry's GVA corresponding to the FGS supply profile. For context, the historical profile of gas industry GVA is also shown in the same figure.

Historical GVA data for the gas industry as a whole is available to 2021-22. However, GVA data for the extraction segment of the industry, which accounted for almost 95% of the gas industry, is available to 2022-23. Between 2021-22 and 2022-23, GVA for the extraction segment of the gas industry grew by just over 21%. We have assumed that GVA in the rest of the gas industry grew by 2.5% over this same period. Using this assumption, we estimate that GVA for the gas industry as a whole was around $102 billion in 2022-23. The GVA projections for 2024 and beyond

[60] The demand and supply scenarios set out in the FGS are consistent with the demand and supply scenarios reported in the AEMO Gas Statement of Opportunities (GSOO) for the East Coast market and the West Coast market.
[61] Future Gas Strategy, Analytical Report, May 2024, p76.

reflect two key drivers. The first driver is the projected supply of gas, deduced from the FGS report. The second driver is gas prices, which are assumed to revert back to trend from high levels in 2022.[62]

It is important to note that the GVA projection is based on assumptions that are expected to result in gas shortfalls. That is, AEMO's projections for gas demand under the three scenarios that it reports are greater than the supply assumptions underpinning the GVA estimates.[63] As shown in Figure 34:, if there is no additional investment in exploration and development to boost production, GVA is projected to fall by about 36% ($37 billion) by 2035, equivalent to around 1.4% of Australia's GDP in 2023 ($2,567 billion). GVA will be higher than we are projecting if the industry does make investments to boost gas supply to match the demand projections set out in the FGS.

In the absence of additional investments to augment gas supply our estimates show that over the decade spanning 2024-25 to 2034-35 the gas industry is expected to generate just over $800 billion in GVA.

Figure 34: Implications of supply projection for gas industry Gross Value Added

Source: KPMG Analysis

5.3 Potential supply shortfalls

The latest AEMO GSOO for the East Coast and West Coast gas markets identifies potential gas supply shortfalls in Australia as early as 2028.[64] Figure 35 presents estimates of Australia's gas shortfalls deduced from the AEMO projections reported in the FGS, which are based on existing, committed, and anticipated developments. To match the projected supply profile presented in the previous section, the shortfall estimates are based on AEMO's Step Change scenario for the East Coast market and their corresponding scenario, labelled "Base/Expected scenario", for the West Coast market. We note that the demand and supply profiles for the West Coast market reported in the FGS excluded LNG. In estimating the shortfalls for the West Coast market we have assumed that demand and supply of gas related to LNG are balanced. This means that our estimates for the West Coast market account only for supply

[62] Gas production in 2012-13 was around 2140 PJ and GVA for the extraction segment of the industry was around $29billion. By 2022-23 production was more than 2.5 times greater than in 2012-13 while GVA was 3.4 times greater. The differential largely reflects the impact of higher gas prices.

[63] AEMO has developed the Green Energy Exports, Step Change and Progressive Change demand scenarios for the East-Coast market and the Low, Base/Expected and High demand scenarios for the West-Coast market. The relationship between the AEMO scenarios and the IEA scenarios is set out in the FGS (Table A.1). In summary:

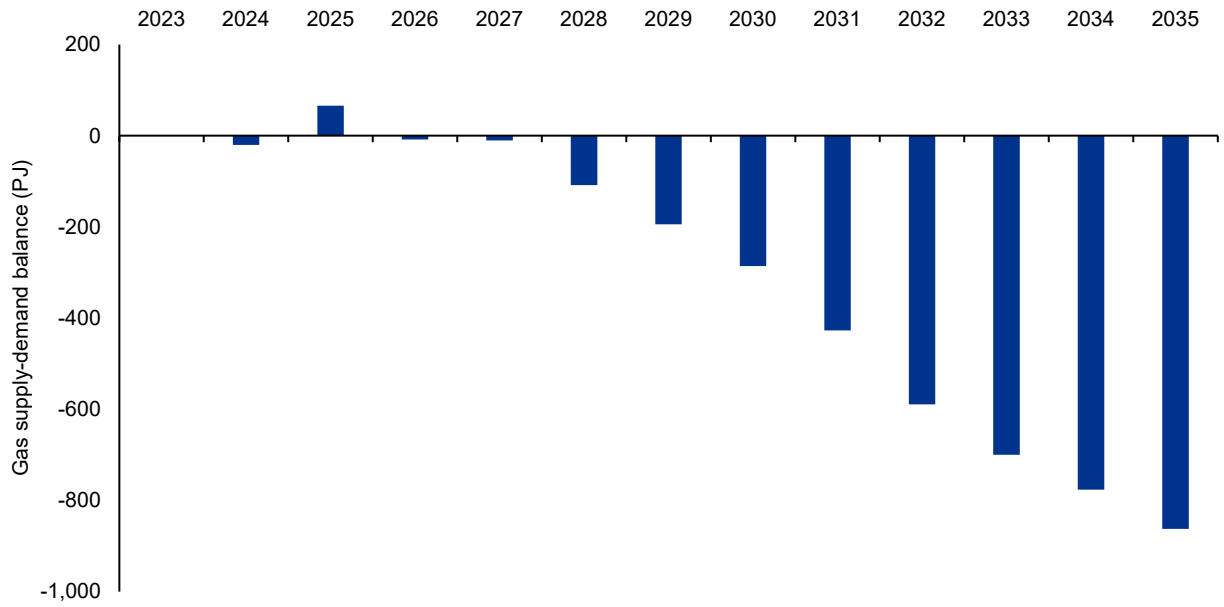
- IEA's NZE (Net Zero Emissions by 2050) scenario corresponds to AEMO's Green Energy Exports and the High demand scenarios;
- IEA's APS (Announced Pledges) scenario corresponds to AEMO's Step Change and Base/Expected demand scenarios; and
- IEA's STEPS (Stated Policies) scenario corresponds to AEMO's Progressive Change and Low demand scenarios.

[64] AEMO 2024 Gas Statement of Opportunity (March 2024) and AEMO 2023 WA Gas Statement of Opportunity (December 2023)

gaps in the domestic gas market. The projected gas shortfalls would amount to around 19% of the total national demand for gas by 2035.

AEMO notes that a combination of solutions is likely to be required to address the risk of annual, seasonal and peak day shortfall risks, potentially including upgrades and expansions of existing pipelines, development of uncertain (2C) southern supply and renewable gas projects, LNG import terminals, increased storage, and demand response mechanisms.[65] In addition, AEMO notes that it is critical that committed and anticipated supply and infrastructure projects are progressed on schedule to minimise the risks of supply constraints that could impact market reliability and domestic gas prices, especially during peak demand periods.

Figure 35: AEMO supply gap projections based on existing, committed, and anticipated developments



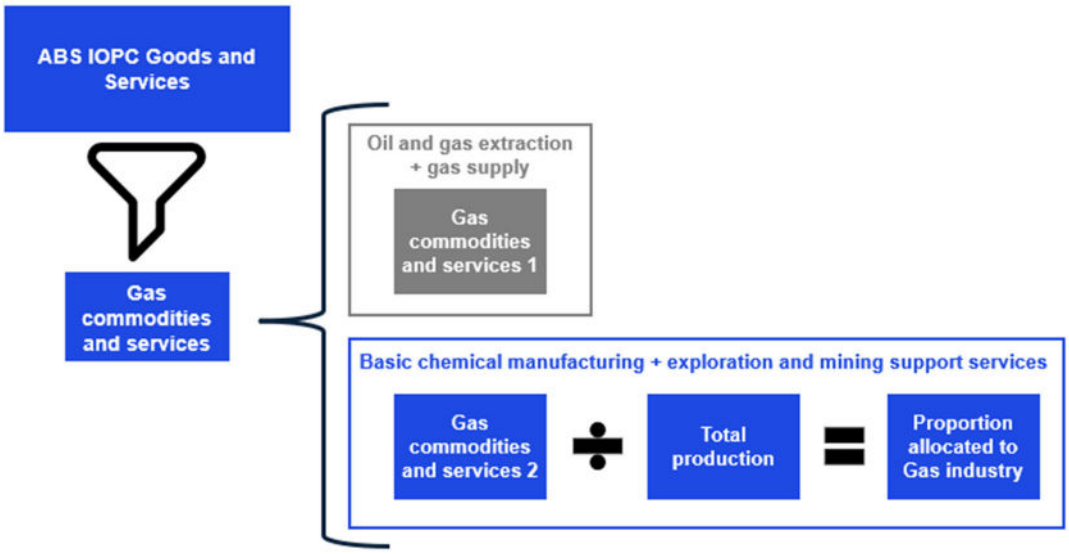
Source: Projections deduced from the FGS demand and supply profiles (Tables 5.1 and 5.2). Note that for the West Coast market the shortfall relates just to the difference between domestic market demand and supply. This reflects the fact that the FGS provides supply projections for the domestic market only (i.e., excludes LNG). Supply and demand projections for the West Coast market extend to 2033 only. We have assumed that the shortfall in 2034 and 2035 for the domestic West Coast market is equal to the shortfall estimated for 2033.

[65] AEMO 2024 Gas Statement of Opportunity (March 2024)

Appendix A: Method for estimating the specific proportions of basic chemical manufacturing, and exploration and mining support services

In this report, the gas industry is defined based on the information provided in the Australian National Accounts Input-Output Table published by ABS. As discussed in Section 2.2, the ABS IOIG classifications included are oil and gas extraction, gas supply, basic chemical manufacturing, and exploration and mining support services. The entirety of the former two classes is included in the definition, while only a proportion of the latter two are considered as part of the gas industry. The methodology applied to estimate the proportions of basic chemical manufacturing, and exploration and mining support services is summarised in Figure A- 1: Method for estimating the proportions of the gas industry.

Figure A- 1: Method for estimating the proportions of the gas industry



The following steps were undertaken to estimate the proportions.

Step 1: Identify the gas commodities and services not yet captured by oil and gas extraction, and gas supply

Based on ABS IOIG classifications, the goods and services identified to be gas commodities and services but were yet to be captured by the oil and gas extraction, and gas supply ABS IOIG industries were found. These goods and services are listed in Table A- 1: Gas commodities and services not captured by oil and gas extraction and gas supply.

Table A- 1: Gas commodities and services not captured by oil and gas extraction and gas supply

ABS IOPC	ABS IOPC Description
10110010	Petroleum exploration
18110040	Liquefied natural gas - other than from the wellhead
18110090	Industrial gases (excl liquefied natural gas)

Source: KPMG analysis of ABS Australian National Accounts, Input-Output data, 2021-2022

Step 2: Identify the ABS IOIG industries that produce the majority of the Australian supply

Following the latest (2021-2022) data reported in the *Australian National Accounts: Input-Output Tables (Product Details) Table 2. Supply (Basic Price)*, the ABS IOIG industries that produced the majority of the Australian supply of gas commodities and services from Step 1 were identified. Table A- 2: ABS IOIG industries producing the majority of the gas commodities and services supply provides the ABS IOIG industries and their corresponding production.

Table A- 2: ABS IOIG industries producing the majority of the gas commodities and services supply

ABS IOPC	ABS IOPC Description	ABS IOIG Industry	ABS IOIG Industry Production ($M)	Australian Production ($M)	Proportion of Australian Production (%)
10110010	Petroleum exploration	Exploration and mining support services	$2,393	$2,393	100%
18110040	Liquefied natural gas - other than from the well head	Basic chemical manufacturing	$3,804	$3,804	100%
18110090	Industrial gases (excl liquefied natural gas)	Basic chemical manufacturing	$893	$896	99.7%

Source: KPMG analysis of ABS Australian National Accounts, Input-Output data, 2021-2022

Basic chemical manufacturing, exploration, and mining support services produce the majority of the Australian supply of the remaining gas commodities and services.

Step 3: Calculate the total production of gas commodities and services by the ABS IOIG industry

The total production across the three identified gas commodities and services by ABS IOIG industry was calculated, refer to calculations in Table A- 3: The calculation to estimate the total production of gas commodities and services by the ABS IOIG industry.

Table A- 3: The calculation to estimate the total production of gas commodities and services by the ABS IOIG industry

ABS IOIG Industry	Calculation of total gas commodities and services production
Basic chemical manufacturing	$3,804 + $893 = $4,697
Exploration and mining support services	$2,393

Source: KPMG analysis of ABS Australian National Accounts, Input-Output data, 2021-2022

Step 4: Calculate the proportion of the gas commodities and services over total production

The total production of gas commodities and services was calculated in Step 3, and the total production across all goods and services under basic chemical manufacturing, and exploration and mining support services ABS IOIG industries was used to find the proportion of gas commodities and services. Table A- 4: Calculation to estimate the proportion of gas commodities and services by ABS IOIG industry provides the calculations.

Table A- 4: Calculation to estimate the proportion of gas commodities and services by ABS IOIG industry

ABS IOIG Industry	Calculation of gas commodities and services proportion
Basic chemical manufacturing	$4,697 ÷ $21,290 = 22.06%
Exploration and mining support services	$2,393 ÷ $22,026 = 10.86%

Source: KPMG analysis of ABS Australian National Accounts, Input-Output data, 2021-2022

The 22.06% for basic chemical manufacturing and the 10.86% for exploration and mining support services provide the proportion of these ABS IOIG industries allocated to the gas industry.

Appendix B: Oil and gas major projects in 2023

Table B- 1: Publicly announced oil and gas major projects, 2023

Project	Company	State	Type	Annual Estimated New Capacity	Capacity Unit	Resource	Construction Employment Estimate	Operating Employment Estimate	Cost Estimate A$m	Estimated Start Commercial Operation	Critical mineral
Atlas (Stage 3)	Senex Energy	QLD	Expansion	82	TJ/d	Gas	100		1000	2025	No
Bowen Gas Project	Arrow Energy	QLD	New project	n/a	TJ/d	Gas	2450	300	500	2025	No
Browse to North West Shelf	Woodside/ BP / PetroChina / Japan Australia LNG	WA	New project	1624.1	TJ/d	Gas	1800	720	21429	2026+	No
Clio-Acme	Chevron	WA	New project	717	TJ/d	Gas			6751	2027+	No
Dorado	Santos / Carnarvon Petroleum	WA	New project	88	kbd	Oil			2766	2028	No
Equus	Western Gas	WA	New project	455	TJ/d	Gas / condensate			2600	2027	No
Glenaras gas project	Galilee Energy	QLD	New project	94.5	TJ/d	Gas			1500	2025	No
Golden Beach Gas project	GB Energy	VIC	New project	250	TJ/d	Gas		5	500	2025	No
Greater Sunrise	Timor GAP / Woodside / Osaka Gas	NT	New project	n/a	TJ/d	Gas / condensate			n/a	2029+	No
Ichthys expansion (Train 3)	Ichthys LNG	NT	Expansion	n/a	TJ/d	LNG			n/a	2030	No
Judith Gas Field Project	Emperor Energy Ltd	VIC	New project	80	TJ/d	Gas			500	2027	No
Leigh Creek coal to gas - project stage 2	NeuRizer	SA	New project	n/a	TJ/d	Gas			2600	2026+	No

Project	Company	State	Type	Annual Estimated New Capacity	Capacity Unit	Resource	Construction Employment Estimate	Operating Employment Estimate	Cost Estimate A$m	Estimated Start Commercial Operation	Critical mineral
LNG import terminal - Geelong LNG Regasification Terminal	Viva Energy	VIC	New project	383.6	TJ/d	LNG	150	100	300	2024	No
LNG import terminal - Outer Harbor Project	Venice Energy	SA	New project	219.2	TJ/d	LNG	350	50	250	2026	No
LNG import terminal - Port Philip Bay	Vopak	VIC	New project	328.8	TJ/d	LNG			250	2026	No
Lockyer Gas Project	Mineral Resources	WA	New project	199.5	TJ/d	Gas			250	2028	No
Mahalo Gas project	Comet Ridge / Santos	QLD	New project	60	TJ/d	Gas			200	2025	No
Manta Gas Project	Cooper Energy	VIC	New project	49.3	TJ/d	Gas / condensate			416	2028	No
Narrabri coal seam gas project	Santos	NSW	New project	200	TJ/d	Gas	1300	200	3600	2025	No
Northern Territory LNG	Tamboran Resources	NT	New project	1002	TJ/d	LNG			n/a	2030	No
Otway (Phase 3) Development Project	Cooper Energy	VIC	Expansion	328.7671233	TJ/d	Gas			400	2024	No
South Erregulla	Strike Energy	WA	New project	80	TJ/d	Gas			90	2024	No
Surat Gas Project (Phases 2-5)	Arrow Energy	QLD	New project	400	TJ/d	Gas	600	200	8000	2026	No
Transborders Energy's	Transborders Energy	WA	Expansion	213.7	TJ/d	LNG	150	100	1600	2028+	No

Project	Company	State	Type	Annual Estimated New Capacity	Capacity Unit	Resource	Construction Employment Estimate	Operating Employment Estimate	Cost Estimate A$m	Estimated Start Commercial Operation	Critical mineral
Generic FLNG Solution											
Trefoil Project	Beach Energy	VIC	New project	n/a	TJ/d	Gas			459	2025	No
Tubridgi Phase 2	AGI Tubridgdi	WA	Expansion	n/a	TJ/d	Gas			53	2023	No
West Erregulla (Phase 1)	Strike Energy / Hancock Energy / Australian Gas Infrastructure Group	WA	New project	87	TJ/d	Gas	100		347	2024	No

Source: Department of Industry, Science and Resources, Australian Government, Office of the Chief Economist, 2023

Table B- 2: Committed oil and gas major projects, 2023

Project	Company	State	Type	Annual Estimated New Capacity	Capacity Unit	Resource	Construction Employment Estimate	Operating Employment Estimate	Cost Estimate A$m	Estimated Start Commercial Operation	Critical mineral
Barossa backfill to Darwin LNG	Santos / SK	NT	New project	n/a	TJ/d	Gas / condensate	600	350	4300	2025+	No
Crux LNG	Shell / SGH Energy / Osaka gas	WA	New project	657.3	TJ/d	Gas	141		3500	2027	No
Enterprise Project	Beach Energy	VIC	New project	n/a	TJ/d	Gas / condensate			51	2024	No
Goog-a-binge	Shell QGC	QLD	Expansion	84.9	TJ/d	Gas	350		500	2023	No
Jansz-Io Compression Project	Chevron / ExxonMobil / Shell / Osaka Gas /	WA	Expansion	n/a	TJ/d	Gas			6000	2026	No

Project	Company	State	Type	Annual Estimated New Capacity	Capacity Unit	Resource	Construction Employment Estimate	Operating Employment Estimate	Cost Estimate A$m	Estimated Start Commercial Operation	Critical mineral
	Tokyo Gas / JERA										
Julimar-Brunello Project (Phase 3)	Woodside / KUFPEC	WA	Expansion	n/a	TJ/d	Gas / condensate			500	2025+	No
Kipper	Esso / Woodside / Mitsui	VIC	Expansion	137.0	TJ/d	Gas			400	2023	No
LNG import terminal - Port Kembla Gas Terminal	Squadron Energy	NSW	New project	274.0	TJ/d	LNG	140	45	250	2023	No
Pluto expansion (Train 2)	Woodside / GIP	WA	Expansion	712.3	TJ/d	LNG			9267	2026	No
Scarborough	Woodside / LNG Japan	WA	New project	1139.7	TJ/d	Gas	3200	600	8385	2026	No
Surat Gas Project (Phase 1)	Arrow Energy	QLD	New project	300	TJ/d	Gas	800	200	2000	2023	No
Waitsia (Stage 2)	Beach Energy / Mitsui	WA	Expansion	250	TJ/d	Gas	200	25	850	2024	No

Source: Department of Industry, Science and Resources, Australian Government, Office of the Chief Economist, 2023

Appendix C: Comparison of Australian employment

Table C- 1: Comparison of Australian employment numbers with gross value added and production by industry

Industry	Number of workers (FTE)	Gross value added per FTE	Production per FTE worker
Gas industry	30,114	2,830,340	3,927,591
Mining	172,502	1,360,872	2,018,843
Information Media and Telecommunications	165,980	305,007	742,258
Public Administration and Safety	706,753	167,438	304,119
Electricity, Water and Waste Services	134,668	356,655	1,022,500
Financial and Insurance Services	441,757	364,533	616,013
Professional, Scientific and Technical Services	1,098,275	150,520	285,350
Education and Training	878,941	119,341	171,196
Wholesale Trade	500,022	168,393	318,204
Health Care and Social Assistance	1,491,075	118,410	172,115
Rental, Hiring and Real Estate Services	258,865	993,340	1,422,394
Manufacturing	830,187	149,876	526,821
Administrative and Support Services	780,627	96,966	154,503
Transport, Postal and Warehousing	559,340	161,553	380,658
Construction	1,139,572	134,880	475,520
Arts and Recreation Services	166,862	95,738	251,597
Other Services	465,824	73,277	155,677
Retail Trade	1,069,668	88,231	152,918
Accommodation and Food Services	740,685	58,670	128,050
Agriculture, Forestry and Fishing	397,179	157,173	334,620

Note: The gas industry components of the other industry divisions excludes the proportion defined as gas in Appendix A.

Source: KPMG analysis of ABS Australian National Accounts: Table 20 Employment by Industry 2021-2022 and Table 2 2021-2022

Appendix D: Modelling indirect economic impacts

In contrast to measuring an industry's direct economic impact, there is no unique method for quantifying an industry's indirect contribution. A unique and objective measure of an industry's direct contribution to the economy is Gross Value Added (GVA). Australia's GDP is the sum of the GVA generated by each industry in the economy plus taxes minus subsidies levied on products and services.[66] Any method for estimating the indirect economic contribution of an industry implicitly involves a change to the level or distribution of industry GVA relative to that measured and published by the ABS. Such estimates must be done with the aid of a model, which introduces a degree of arbitrariness to the estimate. Different models and different assumptions could yield different estimates.

At a minimum, the model used to estimate the indirect economic contribution of an industry must have a detailed specification of the gas industry's links to the rest of the economy through its cost and sales structures. As discussed in Section 4, the industry's direct impacts are captured by the industry's cash flows (expenses incurred and revenues earned). The industry's indirect impacts can be traced to the economic actions of the customers who purchase gas products and services and the workers, investors, businesses and government entities that receive payments from the industry.

D.1 Modelling approach

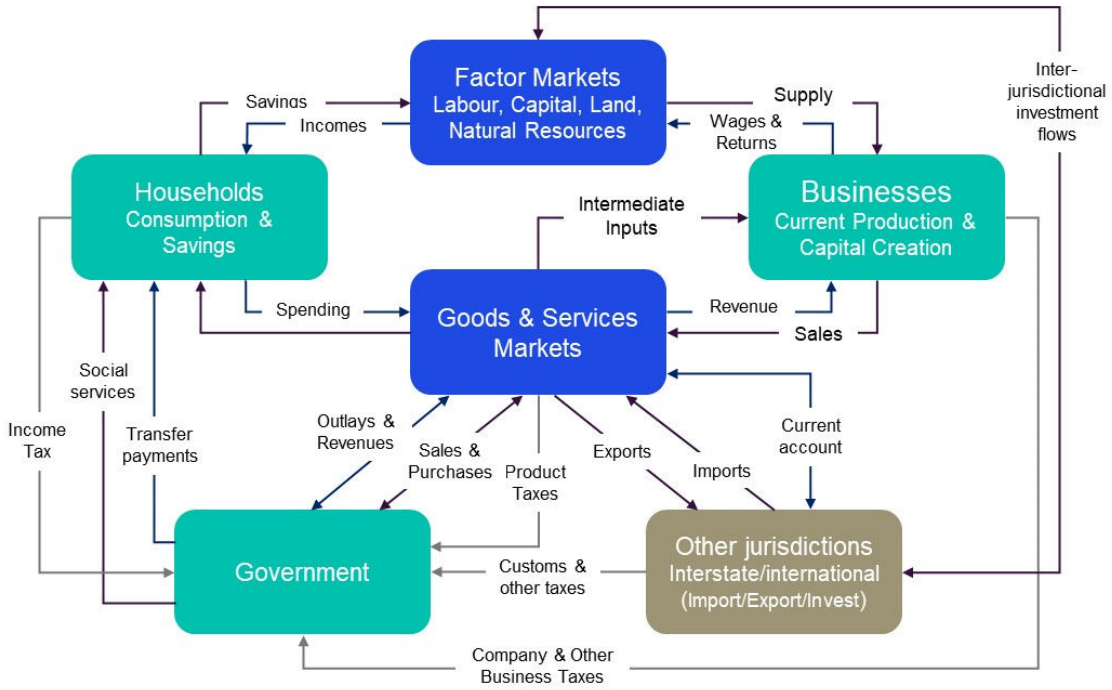
The scenarios presented in Section 4 have been simulated using KPMG-SD, a proprietary regional Computable General Equilibrium (CGE) model. KPMG-SD models the economy as a system of interrelated economic agents operating in competitive markets. For these simulations the Australian economy is represented by 14 integrated regional economies. Tasmania and the ACT are individually represented while each of the remaining states and territories are divided into two regions: the Greater Capital City of the state/territory and the Rest of the state/territory. The 14 regional economies are integrated through interregional flows of goods and services, factors of production and the explicit representation of population and labour supply.

Figure D- 1 is a schematic representation of the types of economic inter-relationships that are captured in KPMG-SD. Economic theory is used to specify the behaviour and market interactions of economic agents, including consumers, investors, producers and governments operating in markets for domestic and foreign goods and services and capital and labour. Defining features of the theoretical structure of KPMG-SD include:

- Optimising behaviour by households and businesses in the context of competitive markets with explicit resource constraints and budget constraints;
- The price mechanism operates to clear markets for goods and factors such as labour and capital (i.e. prices adjust so that supply equals demand); and
- At the margin, costs are equal to revenues in all economic activities.

[66] GVA accounts for about 93.5% of GDP with taxes less subsidies on goods and services accounting for the remaining 6.5%.

Figure D- 1: Economic inter-relationships in KPMG-SD



Source: KPMG-SD

D.2 Key assumptions and caveats

Four scenarios designed to highlight the indirect economic impacts of the gas industry have been simulated.

1 Shut-down scenario where the extractive segment of the domestic gas industry ceases operations and Australian gas users are able to replace domestic gas with imported gas at roughly the same cost.
2 Higher gas price scenario driven by a cost shock.
3 Construction phase of a gas project.
4 Expansion in the productive capacity of the gas industry.

Below we summarise key relevant assumptions made in the modelling for each of these scenarios.

Scenario 1: Shut-down of domestic extractive segment of gas industry

The key relevant assumptions made in this simulation are designed to mimic a short run environment where the economy's productive capacity cannot respond to the shock. In this environment:

- The shut-down is sudden and unexpected so that businesses cannot adjust their capacity and gas users have limited options for replacing gas with an alternative fuels;
- Businesses and households that use gas are able to replace domestic gas with imported gas at approximately the same cost; and
- Real wages are assumed to be sticky so do not adjust down to absorb the shock.

The negative impacts of a shut-down might be mitigated if it unfolded over long period of time allowing businesses and households time to gradually adjust. The assumptions in this scenario relating to the ability of the economy to adjust mean that the impacts estimated are less applicable to the longer term. Our modelling has also not contemplated any additional costs a shut-down, sudden or gradual, may impose on the economy. For example, the adjustment process might require additional investments by businesses and households so they can replace gas with alternative energy technologies. Similarly, it is unlikely that Australian businesses and households can replace domestic gas with imported gas at approximately the same cost, even over a longer term.

Scenario 2: Cost shock resulting in higher gas prices

Similar assumptions to those in scenario 1 the exception of the assumption relating to imported gas, which is not relevant to this scenario. The caveats described above in relation to the ability of the economy to adjust are relevant here as well.

The shock that we have imposed reduces the productivity of the industry's tangible and intangible assets. Unlike other possible cost shocks there are no compensating cash flows to other parts of the economy. For example, cost increases due to a production tax or wage increase generate revenue for the government and workers.

Scenario 3: Construction phase of a gas project

The assumptions in this simulation are designed to mimic a short run environment where the economy's productive capacity does not expand to accommodate the temporary shock. The labour market is assumed to be able to accommodate the direct and indirect demands for workers at the prevailing real wage. The latter assumption means that the benefits to the labour market are taken in the form of additional jobs as opposed to higher incomes. An alternative assumption would be to assume that labour markets had not spare capacity and any new project would have little impact on the net number of jobs and labour market benefits would be taken in the form of higher real wages.

In addition to the assumptions related to the economic environment, we have made assumptions specific to the project. The dispersion of capex (i.e., in the local economy, rest of Australia, rest of the world) and the source of the workforce (e.g., local, rest of Australia) are assumed to be typical for the industry in recent history, as captured by the model's historical database.

Scenario 4: Increase productive capacity in the extractive segment of the gas industry

In contrast to the previous three scenarios, the assumptions in this simulation are designed to mimic a long run environment. This environment is appropriate for considering the impact of an increase in the productive capacity of an industry. In such an environment the labour market is in, or close to equilibrium, so benefits to workers are largely in the form of higher real incomes.

Appendix E: International Energy Agency (IEA) World Energy Outlook (WEO) Scenarios

The IEA's World Energy Outlook (WEO) scenarios characterise plausible pathways for the global energy system based on assumptions about governmental policies, social developments, and technological progress. Table E-1 outlines the characteristics of these global scenarios that represent varying degrees of ambition in tackling energy challenges and climate change. These three scenarios provide a foundation for framing plausible global high, medium, and low global natural gas scenarios.

Table E-1: IEA WEO Scenarios

IEA World Energy Outlook Scenario	Targeted Degree of Global Warming	Scenario Description
Net Zero Emissions by 2050 (NZE)	Limited to 1.5 °C above pre-industrial levels in year 2100 (with at least a 50% probability) with limited overshoot.	The global energy sector is evolving to align with the Paris Agreement goals, emphasising the rapid deployment of renewables, enhanced energy efficiency, and the introduction of supportive technologies like energy storage, hydrogen production, and carbon capture. Policy-driven efforts are underway to phase out internal combustion engine vehicles by 2035, move towards a net-zero electricity sector by 2040, and reduce reliance on natural gas, treating it as a transitional energy source. Investments are being redirected toward infrastructure upgrades such as smart grids and electric vehicle charging stations to support these changes. This journey necessitates extensive international collaboration and strong governmental policy frameworks, aiming to transition from traditional fossil fuels to a sustainable energy mix dominated by renewables and advanced technologies.
Announced Pledges Scenario (APS)	Limited to 1.7 °C above preindustrial levels in year 2100 (with at least a 50% probability).	In the IEA's Announced Pledges scenario (APS) reflecting the 2023 commitments, a moderate modification of the energy sector is projected, with an increase in renewables and improved energy efficiency, while not fully moving away from fossil fuels. Energy-related CO2 emissions are foreseen to peak before 2030, but the Announced Pledges are insufficient to meet the ambitious 1.5°C global warming target. The IEA acknowledges the necessity for greater changes, both in policy and in consumer patterns, to avert worsening climate impacts. While natural gas plays a bridging role in the current energy landscape, anticipated advancements in renewables and energy storage solutions are projected to reduce its importance over time.
Stated Policies Scenario (STEPS)	Limited to 2.4 °C above preindustrial levels in year 2100 (with at least a 50% probability).	The Stated Policies Scenario (STEPS), constructed upon existing governmental policies and public intentions, projects the global energy sector's progress absent new climate commitments or policy alterations. This scenario projects an increased energy demand with a slow shift towards renewable energy, insufficient for achieving aggressive climate goals such as the sub-2°C global temperature target. Under STEPS, reliance on fossil fuels persists, and emissions are likely to rise or stabilise long-term based on current policies. While natural gas currently plays a vital transitional role due to its grid support and relatively lower emissions, its significance is expected to decline as renewable technologies advance, though it remains a key energy source.

Source: IEA WEO 2023