



Australian Government

Department of Industry, Science,  
Energy and Resources

# GLOBAL RESOURCES STRATEGY COMMODITY REPORT:

## *Liquefied Natural Gas*





## FOREWORD



*Australia has a well-deserved reputation as a reliable and responsible supplier of energy and resources.*

The Australian Government is committed to delivering the strongest and most business friendly investment environment for the Australian resources sector. We offer a strong, stable and transparent regulatory environment as well as research and development incentives to support innovation.

Our proximity to Asia and high quality resources have seen us become the supplier of choice in ever-expanding global supply chains. In the decades to come, we will seek to consolidate and strengthen this position.

This is especially true for liquefied natural gas (LNG). Australia is a global leader in the LNG trade, accounting for around one fifth of global LNG exports. We will build on our comparative advantages to grow our LNG exports for decades to come, fuelling the Australian economy by providing our trading partners with energy security.

Global changes in LNG demand will create many opportunities for Australia. A strong LNG demand outlook in our region will allow Australia to capitalise on the growth of global spot markets and meet unexpected demand.

The Australian Government will support the private sector to realise these opportunities. The Strategic Basin Plans are accelerating exploration and development across the Beetaloo, North Bowen and Galilee, and Cooper-Adavale Basins. Introductions, finance and a business friendly investment environment are some of the other ways we are helping businesses capitalise on the opportunities in the LNG market.

This LNG report is the first in a series of commodity reports highlighting trade and investment opportunities that create jobs and economic prosperity for Australians. The commodity reports are designed to build on the [Global Resources Statement](#) to make Australia the most globally attractive and competitive investment destination for resources projects.

A handwritten signature in black ink, appearing to read 'K. Pitt'.

**The Hon Keith Pitt MP**  
Minister for Resources and Water





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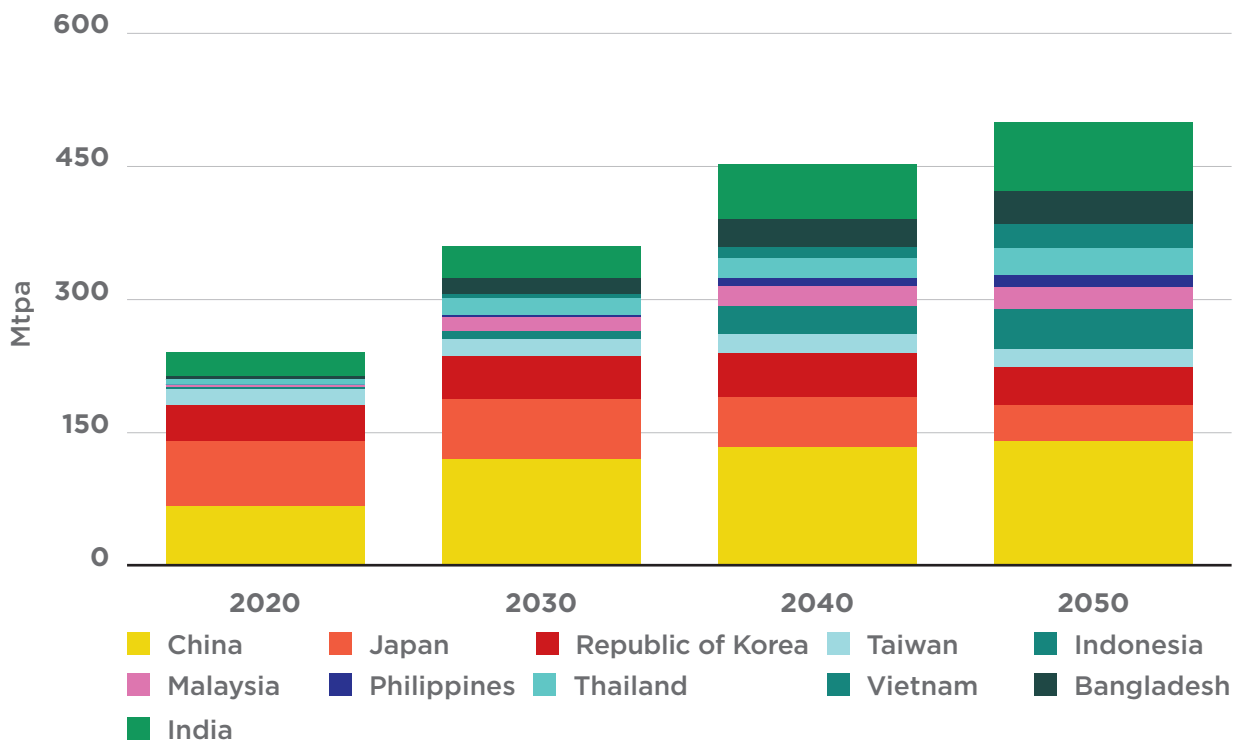
# LNG INDUSTRY OUTLOOK

## Gas demand to 2050

Most analysts forecast strong growth in Asian LNG demand over the coming decades. For example, Wood Mackenzie forecasts global liquefied natural gas (LNG) demand will more than double over the coming decades, to more than 800 million tonnes by 2050.

Asian markets will drive this increased demand, with the largest increases forecast in China, India, Indonesia and Bangladesh. Asian gas and LNG demand growth over the next few decades is generally robust across scenarios and modelling exercises.

**Figure 1:** LNG demand growth in Australia's high potential markets. Source: Wood Mackenzie (December 2021).



### IEA World Energy Outlook 2021

Each year the International Energy Agency (IEA) publishes a World Energy Outlook (WEO) analysing trends in energy supply and demand.

For the 2021 WEO, 4 scenarios were modelled: the Net Zero Emissions by 2050 Scenario (NZE), the Announced Pledges Scenario (APS), the Stated Policies Scenario (STEPS), and the Sustainable Development Scenario (SDS).

Under each of the WEO's scenarios, global net gas demand grows between 2020 and 2030. Demand growth will be strongest and most sustained in Asia, where gas will be used out to 2050.

The 2021 WEO scenarios do not envisage regional pipeline supply and domestic production in Asia being able to meet demand to 2050. By 2050, most natural gas trades will be in the form of LNG imports into Asia.

### Modelling undertaken for Australia's long-term emissions reduction plan

Modelling was undertaken in the development of Australia's Long-term Emissions Reduction Plan, which was published in October 2021. The modelling shows that under the Plan, the value of Australian gas production is expected to peak in the early 2040s at around a third higher than 2020 levels, before gradually declining to 2050. Even in 2050, Australian gas production value is modelled to be 13% higher than in 2020.

## LNG supply outlook

Continued LNG demand growth in Asia is expected to drive LNG trade growth over the decades to 2050.

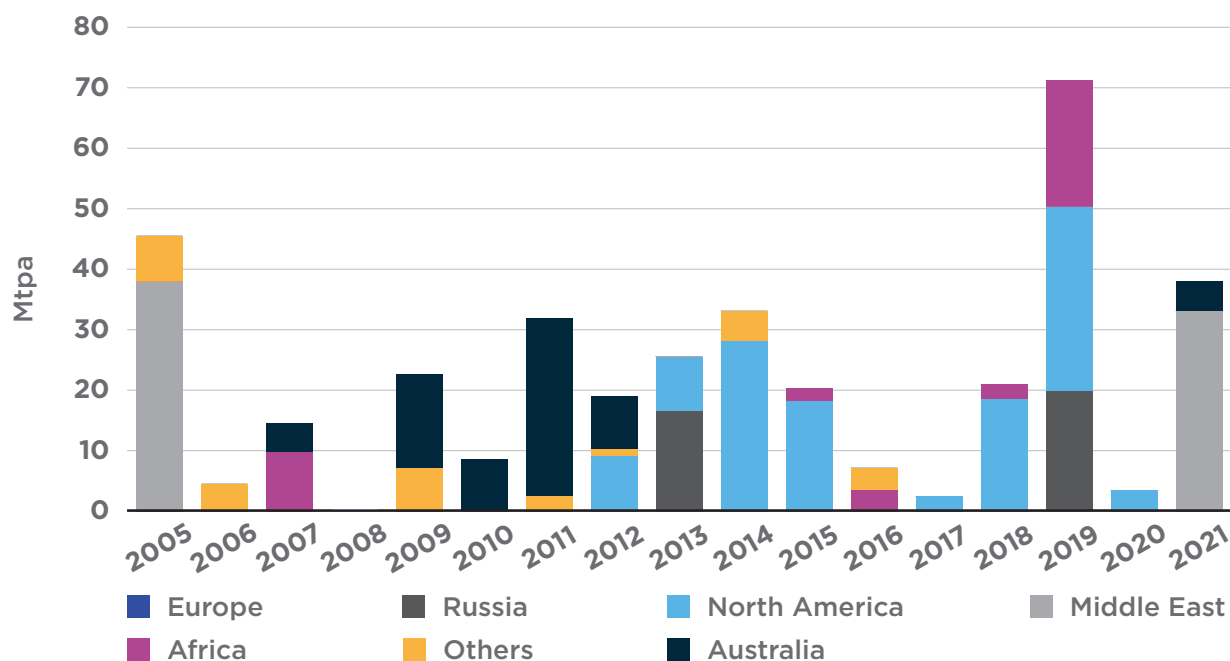
At the end of 2020, global LNG export capacity was around 450 Million tonnes per annum (Mtpa). Projects already approved and under construction will increase global capacity by 125 Mtpa by the mid-2030s.

In 2020, Australia and Qatar were the world's largest LNG exporters, each accounting for around 22% of global LNG exports (DISER 2021a). The United States is expected to show the strongest growth in LNG supply in the coming years, exporting more than 200 Mtpa by the early 2030s.

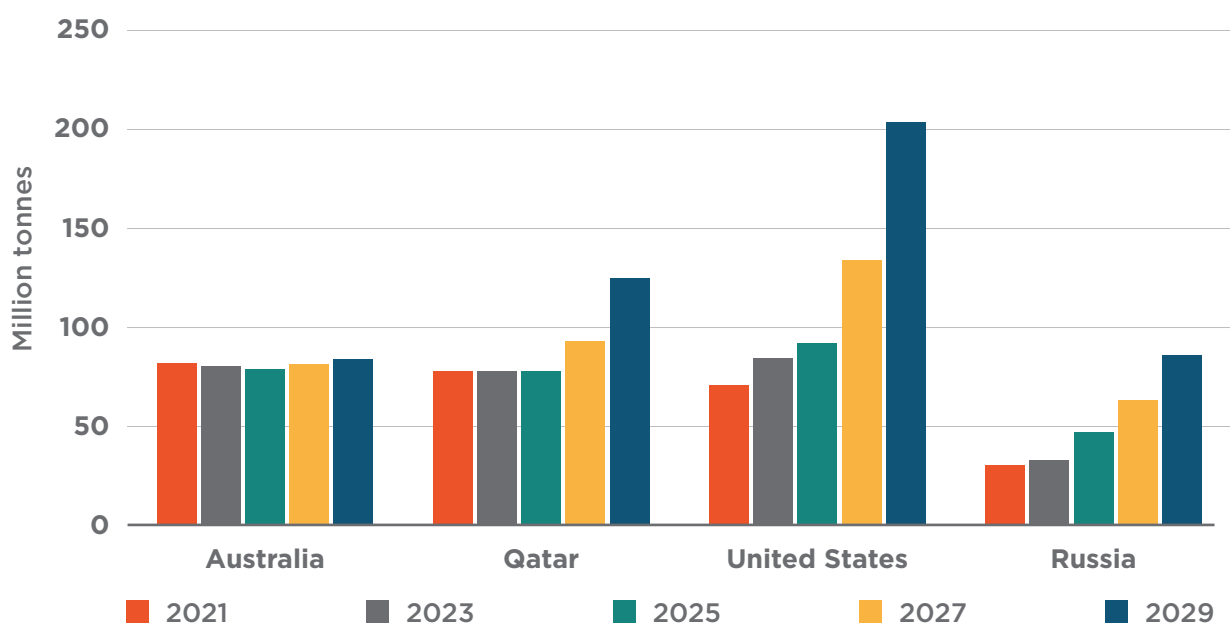
Qatar's LNG exports are also expected to grow as a result of the US\$29 billion North Field East project. This project has a nameplate capacity of 33 Mtpa, bringing Qatar's export capacity to 110 Mtpa by 2025.

Australia's competitors have announced regular large investment decisions over the past decade. Australia has not, but the time is ripe. More than \$200 billion of LNG projects were approved for final investment decisions (FIDs) in Australia before 2012. Since then, Woodside's Scarborough project is the only LNG capacity project to reach FID (in November 2021). Without further investment in new LNG trains and upstream infrastructure, Australia may lose its position as a major LNG exporter.

**Figure 2:** LNG capacity by year of Final Investment Decision. Sources: IEA, World Energy Investment 2020 (2020), DISER.



**Figure 3:** Forecasted LNG exports by country. Source: Wood Mackenzie December 2021.



# THE AUSTRALIAN LNG INDUSTRY

*The Australian LNG industry is a key part of the Australian economy.*

In 2020–21, LNG was Australia's third-largest commodity export by value. Australia exported 77.7 Mt of LNG in 2020–21 with a value of \$30.5 billion (DISER 2021a).

The oil and gas extraction industry also directly employed 22,900 Australians in November 2021 (ABS 2021).

Australia is committed to achieving net zero emissions by 2050 while continuing to serve our traditional export markets. The Australian Government's [Long-Term Emissions Reduction Plan](#) focuses on innovation, enterprise and technology to lower the costs of clean energy.

The Plan sees an enabling role for government to guide investments in new industries. At its core, it recognises that reducing the costs of low emissions technologies is key to unlocking widespread deployment, and that global technology trends will drive demand shifts at home and abroad.

Global changes in demand will create many new opportunities for Australia.

Under the [Technology Investment Roadmap](#), the government will invest at least \$21 billion in the next generation of low emissions technologies in the decade to 2030, driving over \$84 billion in total public and private investment. The Roadmap prioritises technologies based on their abatement potential, Australia's comparative advantage, potential economic benefit, and government ability to make a difference.

Clean hydrogen and carbon capture and storage (CCS), among others, are identified as priority technologies in the Roadmap. Development of Australia's clean hydrogen industry may create new opportunities for Australia's LNG industry when coupled with CCS.

For LNG and according to customer preferences, Australia's technology-led approach to emissions reductions could mean:

- decarbonising Australia's natural gas industry to produce lower emissions LNG in the near term
- pivoting Australia's LNG industry to clean hydrogen in the medium to long term, according to customer preferences
- working with international partners, both exporters and importers of LNG, to share information, advance low emissions innovations, and consider common accounting standards.

## Japan-Australia Partnership on Decarbonisation Through Technology

Japan and Australia consider a technology-led response as critical to reducing greenhouse gas emissions while also ensuring economic growth and job creation. We share an ambition to accelerate the development and commercialisation of low and zero emissions technologies as soon as possible, as achieving cost parity with high emitting alternatives is vital for decarbonisation efforts.

To this end, Japan and Australia committed in July 2021 to jointly support initiatives that will contribute to net zero emissions, including lower emissions LNG production, transport and use; clean fuel ammonia, clean hydrogen; and carbon capture utilisation and storage.

This partnership builds on Australia's strong trade relationship with Japan, and cooperation through initiatives and statements such as the Hydrogen Energy Supply Chain (HESC), the Japan-Australia Energy and Resources Dialogue (JAERD) and the Australia-Japan Joint Statement of Cooperation on Hydrogen and Fuel Cells.

## Quad working together on methane abatement in the natural-gas sector

On 24 September 2021, leaders of Quad countries (the United States, Australia, India and Japan) announced they would work together to reduce methane emissions from the natural gas sector.

## Carbon Capture and Storage (CCS)

Effective greenhouse gas emissions management will be key to a successful LNG sector in the future. CCS will play an important role in the LNG sector's emissions management through approaches like direct capture, sequestration at the source of production, separation of CO<sub>2</sub> and storage for transport.

Australia is blessed with a natural abundance of potential CO<sub>2</sub> storage sites and released a suite of greenhouse gas storage sites in 2021. Australia is currently developing a National CCUS Technology Emissions Abatement Strategy to improve policy frameworks and help coordinate the deployment of CCUS, including the importation of CO<sub>2</sub> to Australia.

## Chevron Australia's Gorgon Project

The Gorgon emissions reduction system is demonstrating the vital role of CCS technology in advancing Australia's pursuit of a lower carbon future. As of November 2021, the Gorgon CO<sub>2</sub> Injection Project had sequestered approximately 5.5 million tonnes of CO<sub>2</sub>. At full capacity the facility will sequester up to 4 million tonnes of CO<sub>2</sub> per year, which is equivalent to removing more than 1 million cars from the road each year.

## Australia's gas resources and LNG capacity

*According to Geoscience Australia's report, Australia's Energy Commodity Resources, Australia's total demonstrated resources for all conventional and unconventional gas in 2019 are estimated at 269,206 PJ.<sup>1</sup>*

Australia's gas reserves are located throughout the country. Offshore conventional reserves make up the majority of them, with the largest reserves in Western Australia and the Northern Territory.

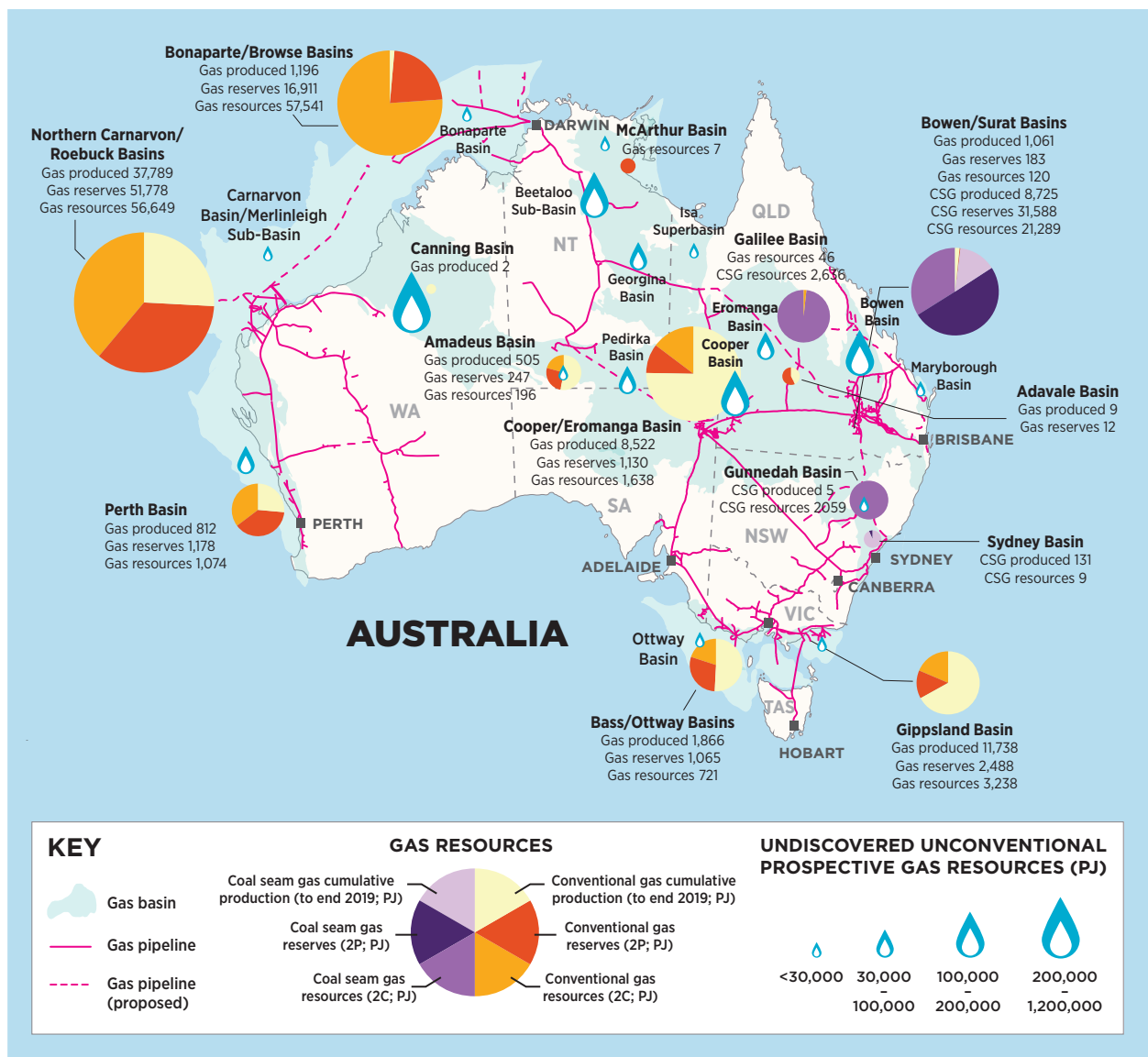
Onshore conventional reserves are mostly located in the Cooper Basin in South Australia. Queensland has large onshore unconventional gas reserves and is home to the world's only projects producing LNG from coal seam gas.

This distribution of reserves corresponds with the locations of Australia's LNG capacity. Western Australia's capacity is 49.9 Mtpa across its 5 LNG projects,<sup>2</sup> which represents 57% of Australia's total LNG capacity. Queensland has 25.3 Mtpa across 3 projects while the Northern Territory's 2 projects have a capacity of 12.6 Mtpa.

1 This text was updated on 2 March 2022 due to an error in the original publication. Total demonstrated resources of gas refers to the sum of 2P reserves and 2C contingent resources.

2 This text was updated on 29 April 2022 due to an error in the original publication.

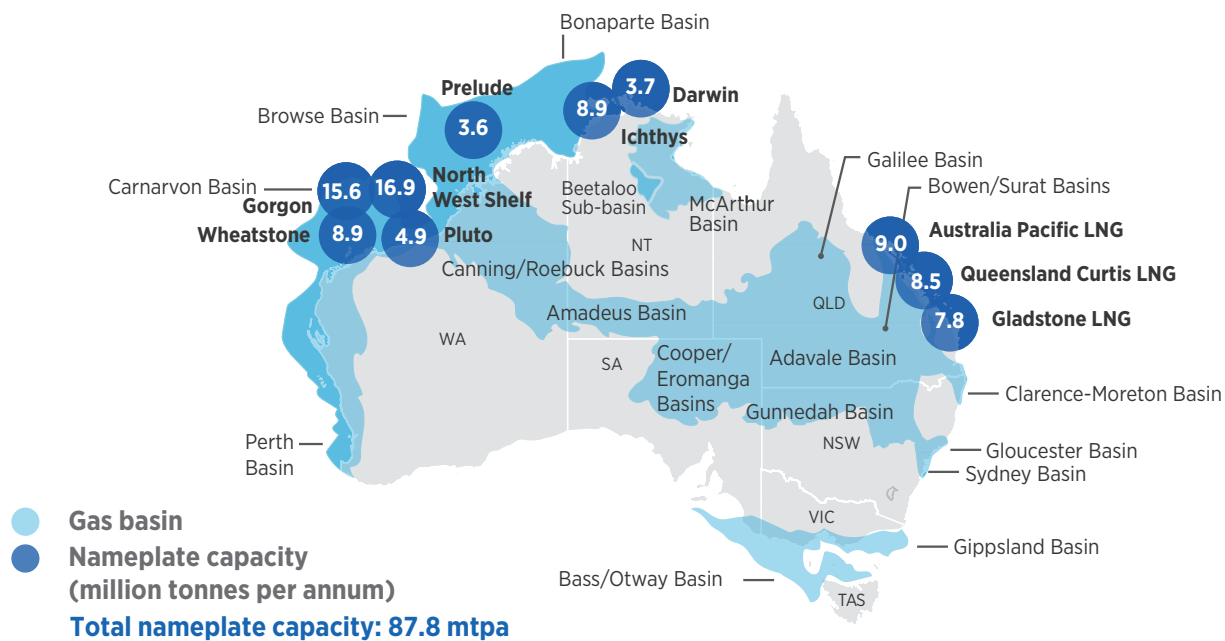
**Figure 4:** Australia's remaining gas reserves (2P), contingent resources (2C), cumulative production and undiscovered unconventional prospective gas resources, end 2019. Source: Geoscience Australia.



**Note:** Offshore data provided by NOPTA to year-end 2019. Onshore data are sourced from government statistics and company estimates reported at various dates between June 2019 and June 2020.



**Figure 5:** Australia's LNG projects and gas basins.<sup>3</sup> Source: DISER Resources and Energy Quarterly.



<sup>3</sup> This figure was updated on 29 April 2022 due to an error in the original publication.

### Australia's domestic gas consumption

In 2019–20, natural gas accounted for about a quarter (1,647 petajoules) of energy consumption in Australia (DISER 2021b).

Its main uses are:

- electricity generation (36%)
- mining (25%)
- manufacturing (23%)
- residential applications, like gas heating and cooking (11%).





## Australia's competitive advantages

Australia can improve its position as a major LNG exporter and investment destination by responding to global demand now.

Our competitive advantages are based around being reliable, responsible, and ready for the future.

### We are reliable

- Australia has a stable, low-risk investment environment and a business culture of delivering as agreed.
- Australia is a strong advocate for free trade in a rules-based international order.
- Australia has large gas reserves and demonstrated experience in large scale LNG production.
- Choosing Australian LNG guarantees energy security for our customers.
- Backing Australian projects means lower risk for our investors.

### We are responsible

- Australia's gas industry is renowned for its best-practice health and safety solutions that support productivity.
- Australia is a world leader in sustainable resource development. We have effective environmental regulations and industry-led voluntary codes of practice.
- Australia's emissions measurement and management approaches are world-leading.
- Our resources sector engages meaningfully with Traditional Owners and local communities to create jobs and share the industry's benefits.

### Australian coal seam gas (CSG) – a responsible choice

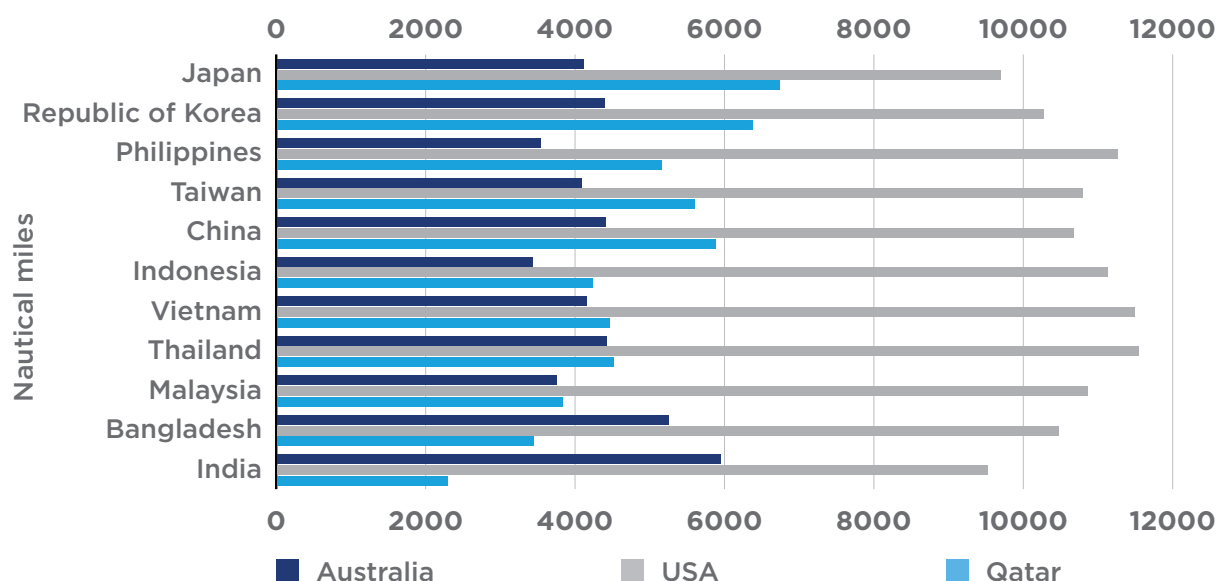
Hydraulic fracturing (fracking) is a widely used technique for extracting oil and gas resources including shale gas and CSG. Hydraulic fracturing has come under scrutiny for its potential adverse environmental impacts.

Australia's CSG extraction processes are world leading and an example of Australia's competitive advantages for LNG. Australia's national scientific organisation, CSIRO, investigated hydraulic fracturing operations at 6 gas wells in Queensland to assess effects on air quality, soils, groundwater and waterways. CSIRO found that air quality was not impacted, water treatment was successful in removing chemicals and other pollution caused by fracturing, and some chemicals left in soil samples completely degraded within 2 to 3 days.

### We are ready for the future

- Australia's LNG industry is technologically advanced and a rich environment for further research, development and innovation.
- Australia has excellent relations and a history of close cooperation with Asian markets.
- Australia's proximity to emerging and established markets in Asia means cheaper and faster transport.

**Figure 6:** Average LNG shipping distance between the 3 major LNG exporters and identified high potential Asian markets. Source: Wood Mackenzie (December 2021).



## Australia's LNG trade opportunities to 2050

We have identified 11 markets as Australia's greatest opportunities for LNG trade between now and 2050.

In addition to these markets, we see opportunities for spot trades with European buyers looking to diversify supply sources and build supply chains for renewable gases in the future.

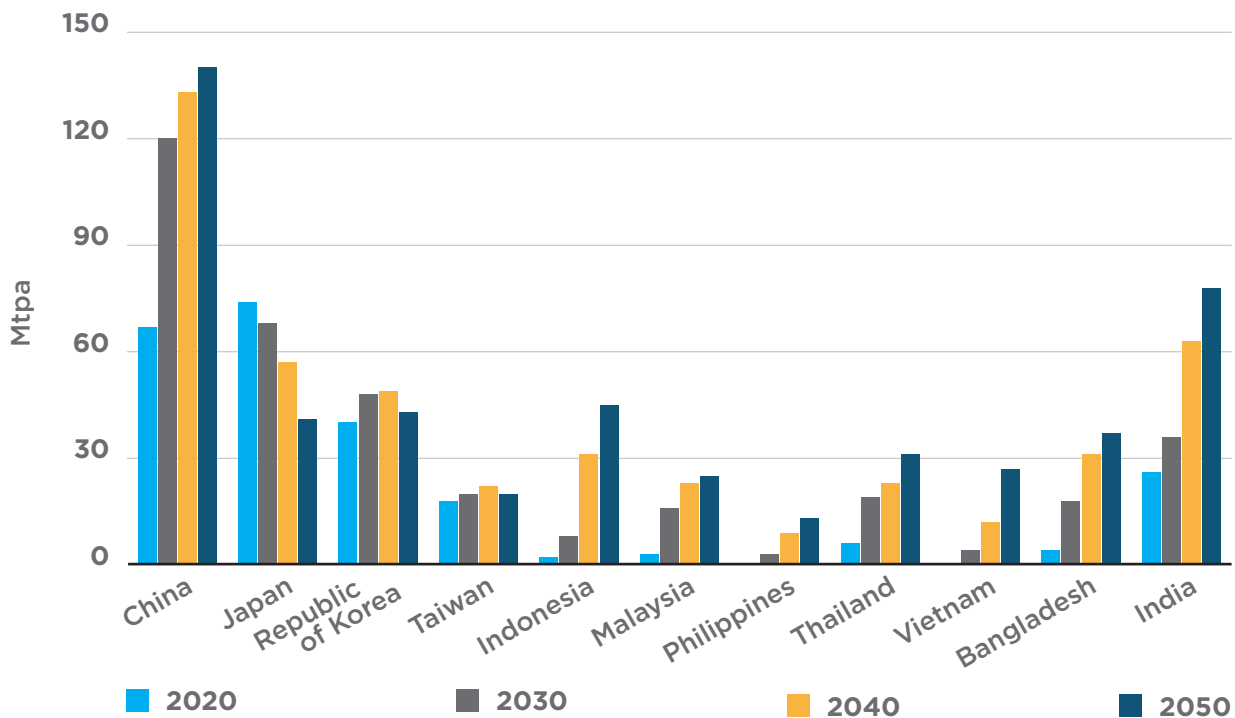
Australia is well placed to grow trade relationships with 7 emerging regional LNG markets:

- India
- Indonesia
- Bangladesh
- Thailand
- Malaysia
- Vietnam
- the Philippines.

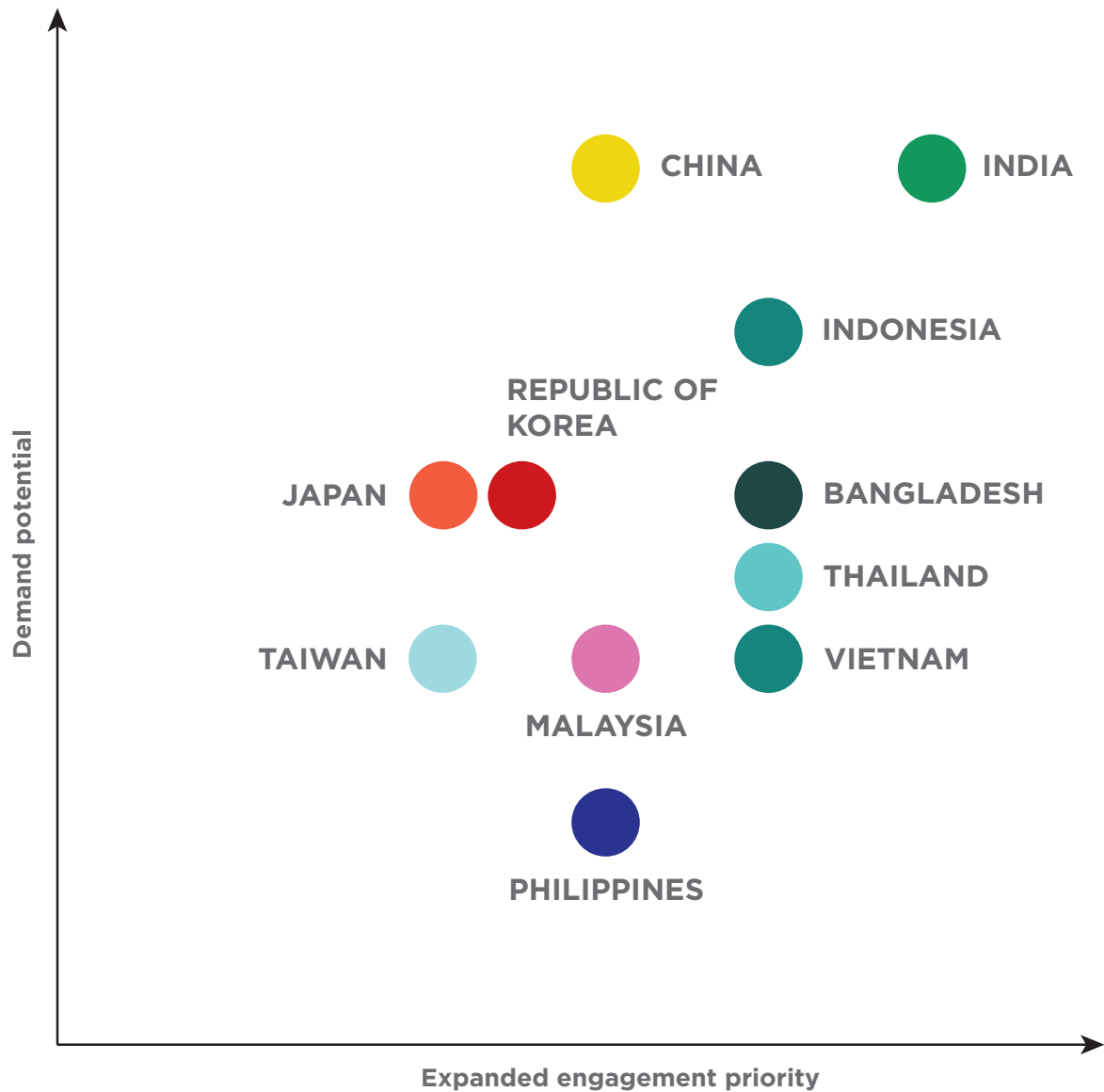
We are equally well placed to maintain our 4 established markets, which will remain large sources of regional demand:

- China
- Korea
- Japan
- Taiwan.

**Figure 7:** Forecasted LNG demand for the 11 identified high potential markets by decade to 2050.  
Source: Wood Mackenzie (December 2021).



**Figure 8:** Demand potential v expanded engagement priority in Australia's 11 high potential LNG markets.



Australia has existing engagement channels with its established markets (China, Japan, Korea and Taiwan). These should be maintained, but additional engagement efforts are likely not required.

In contrast, Australia should step up its engagement efforts with emerging LNG markets. This is especially true for emerging markets with high demand potential in the future (India, Indonesia and Bangladesh).

# THINK LNG, THINK AUSTRALIA

## A message from the Australian Petroleum Production & Exploration Association

The Australian LNG industry has expanded significantly since the start of the 20th century. We are a global power and now compete with Qatar as the top global exporter.

This is a result of significant investment in the industry. In the past decade we have seen:

- a range of LNG projects in Western Australia and the Northern Territory
- a world first CSG-to-LNG industry in Queensland
- a commercial-scale floating LNG facility in Commonwealth waters off Western Australia.

Since 2009, the oil and gas industry has invested around \$475 billion in Australia — around \$305 billion of that investment in the LNG industry. The industry has developed and built new projects while paying more than \$75 billion in taxes to state and federal governments to fund hospitals, schools, roads and services.

Looking forward to 2050, there are 3 key reasons why Australia will remain a major LNG exporter.

### 1. Geographical proximity to Asia

Australia is located very favourably on the doorstep of the Asian markets that will continue to drive LNG demand growth in coming decades.

Australian LNG has held its share of demand from established customers like Japan and Korea and benefited significantly from the rise of China as a significant importer of LNG. Australia's LNG exports to China have increased five-fold in the last 5 years, and China is now our largest LNG customer.

Australia also benefits from being in the same region as other emerging LNG importers like India, Bangladesh and the ASEAN countries. We are well placed to capitalise on the opportunity these countries' growth and demand for cleaner energy presents.

### 2. Stable investment destination

Australia has well-established regulatory processes that govern operations, environmental standards, taxation policies and regulatory approvals processes for LNG developments. We are also blessed with world-class natural gas resources.

This makes Australia a relatively stable destination for LNG investment. Maintaining and enhancing the competitiveness of Australia as an investment destination, and a stable regulatory and risk regime will be vital to seeing Australia continue to attract investment as global oil and gas companies focus on smaller, incremental projects in mature gas basins rather than the greenfield mega-projects that have been a characteristic of the past few decades.


### 3. A key role in a cleaner energy through lower carbon or carbon neutral LNG and as a clean hydrogen supplier

As part of the broader Australian oil and gas industry, LNG producers are committed to reaching net zero emissions by 2050. This will require various innovations to lower greenhouse gas emissions from LNG operations.

Innovations being examined include:

- using carbon capture and storage (CCS) in production
- using renewable energy on site
- environmental offsets that can lead to carbon-neutral LNG cargo.

Australia has been at the forefront of carbon-neutral LNG trade, with the first carbon-neutral cargo shipping in 2020.



The LNG industry will also help develop an industry to export hydrogen (produced from natural gas with CCS) to Asian markets as they transition to a lower carbon world. The LNG industry will do this by using its:

- knowledge and experience of liquefying natural gas
- existing commercial relationships with Asian customers.

### Looking ahead

Over more than 30 years, the Australian LNG industry has distinguished itself as a safe and reliable provider of LNG. It operates under rigorous safety, health and environmental standards and strict regulatory approvals processes and standards.

The Australian LNG industry has been a significant part of the Australian economy since the first LNG shipment was sent to Japan in 1989. The industry has contributed significantly to Australia's economic strength for many decades and continues to play a major role in providing jobs, taxes, royalties and export income.

Given the ongoing demand for LNG from Asia, Australia must enhance its ability to attract global capital investment in LNG projects. Capital is more mobile than ever, and the competition among our competitors is fierce.

Attracting long-term investment to grow Australia's LNG industry in the coming decades will be critical to:

- create local jobs
- support local communities
- ensure competitive energy prices
- generate government revenue.

Capital-intensive projects like LNG represent an ongoing opportunity to create well-paying jobs. LNG projects can take more than 6 years from investment decision to complete, while jobs are created almost immediately after investment decisions are made.

Getting the investment settings right could provide a critical boost to the economy for many decades to come. A strong and successful LNG industry – as part of a strong and successful oil and gas industry – is essential to Australia's ongoing economic recovery and meeting our emissions reductions goals.

Recent estimates have found that if the right investment settings are implemented and a new phase of long term investment is triggered – under what the authors call a “high growth scenario” – national economic output could be boosted by more than \$350 billion. This would help create more than 220,000 jobs over the next 2 decades.

The opportunity for Australia is huge, but so is the appetite of our competitors to snatch it from us.







The following sections explore each of these emerging and established LNG markets. We identify the barriers to trade growth in each market and suggest how they can be overcome.

## EMERGING LNG MARKETS

*We have identified 7 emerging markets where Australia has the greatest opportunity to strengthen LNG trade. Combined, these markets are expected to grow their LNG demand from 40 Mt in 2020 to 255 Mt in 2050.*

As well as increased LNG exports, there are opportunities for Australian participation along the entire LNG value chain in these markets. Opportunities include:

- designing and constructing LNG import terminals and domestic gas distribution networks
- financing emerging LNG industries
- operating gas production and LNG import facilities
- advising on safe and environmentally-friendly practices
- decommissioning retiring gas production facilities and restoring the environment.

# INDIA

Huge potential, tough competition.

## Existing demand

In 2020, natural gas accounted for 6% of the total energy mix in India (IEA 2021b). The Indian government has a target to increase this to 15% by 2030 (MoPaNG 2019).

This target is driven by environmental and economic objectives. Natural gas is seen as a cleaner substitute for emissions-intensive coal for both the power sector and households. India's economic growth trajectory will also mean increased energy demand across all fuels.

Indian domestic production has been in decline, with legacy field production falling and new discoveries not being commercialised.

To meet its 2030 target, India will need to steeply ramp up LNG imports. The Indian government has been trying to attract foreign and private investors to the sector and is considering ways to make the regulatory regime more efficient and transparent.

## Growth outlook

India has been the world's fourth-largest LNG importer since 2013, and its imports are rapidly increasing.

LNG now accounts for more than 50% of India's gas supply, up from 31% 10 years ago (EIA 2020). According to Wood Mackenzie (Flippenko et al 2021; Carson 2021):

'India's LNG demand is forecast to increase to 36 Mtpa by 2030, 63 Mtpa by 2040 and 78 Mtpa by 2050 – representing a near threefold increase from present levels, and matching Australia's current annual LNG production level of 78 Mtpa. At this rate of growth, India is expected to overtake Korea as the third largest Asian LNG market by mid-2030, and to consume as much LNG as Japan by 2040'.

## LNG infrastructure

India is building infrastructure to achieve its 2030 gas target. To ensure availability and an equal distribution of LNG, the government envisages an interconnected 'National Gas Grid'. This involves adding 14,700 km of new gas pipeline to the existing 16,800 km network (The Economic Times 2020). The project will increase gas penetration and connectivity between import terminals and the gas grid.

India is also aggressively expanding its LNG import capacity. It has 6 operating LNG import terminals, with 4 under construction and 6 more proposed. The operational regasification terminals have a total nameplate capacity of 42.5 Mtpa, but only the Dahej and Hazira terminals are fully functional. The others are operating at lower utilisation levels due to insufficient pipeline infrastructure. Regasification nameplate capacity is expected to increase to 76 Mtpa by 2025 as other terminals come online.

With recent increases in spot prices, India may become more interested in securing additional long-term supply contracts. This would protect it from volatility in spot prices, and secure a supply of reliable and affordable LNG.

Many of the import terminals currently proposed or under construction are located on the east coast of India. This will reduce the cost and time of shipping for Australian exporters, allowing more efficient and competitively priced Australian supply in comparison with existing west coast terminals.

India also offers opportunities for Australian businesses to collaborate on:

- regasification infrastructure, technology, research and development partnerships with Indian LNG companies
- capacity-building partnerships with Indian technical training institutions in the LNG sector.

**Figure 9:** India's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



## Considerations

The opportunities for the LNG industry in India come with geographical and commercial challenges.

India's largest operating regasification terminals are on its west coast. This means they are closer to Qatar, Australia's main competitor in global LNG markets. Qatar has an abundance of low-cost resources and has recently made large investments to increase production. This expanded Qatari capacity is expected to come online between 2025 and 2030.

Indian LNG buyers are sensitive to price fluctuations and may seek to renegotiate contracts. For example, from December 2020 to February 2021, Indian buyers picked up spot cargoes when prices were low. They then retreated from March to June 2021 as prices increased.

Attracting Indian equity to Australian LNG projects offers a promising way of meeting Australian and Indian LNG trade expectations.

# INDONESIA

An emerging LNG customer in our backyard.

## From producer to consumer

In 2000, Indonesia had the largest proved natural gas reserves in the Asia-Pacific region (1,985 Mt). They produced the equivalent of 51.9 Mt of gas, exporting 26.9 Mt of it as LNG (BP 2021).

But by 2020, Indonesia's status as an LNG exporter had declined. Despite supplying more than a third of global LNG exports in the 1990s, by 2020 Indonesia was the world's 7th largest LNG exporter (BP2020).

Indonesia's domestic gas production is tied to its capacity for export production. LNG exporters are subject to production share contracts (PSCs), which reserve gas for domestic supply.

In PSCs, costs and risks are shared between:

- private investors
- government funds
- foreign credit from development institutions.

These 3 funding sources are becoming scarcer for Indonesian gas, while domestic demand remains strong.

Indonesia's 2014 National Energy Policy sets long-term energy targets that increase domestic consumption of gas. In 2020, gas accounted for just under 20% of total energy consumption. The Indonesian Government expects it to account for 22% by 2025 and 24% by 2050 (BP 2021; Karim and Oepangat n.d.; MEMR 2021).

Increasing domestic gas production will require investment, but private investment is becoming more difficult to source. State-owned enterprises have typically provided about 27% of funding for gas projects, but this funding is tied to export revenue and other budget sources affected by the COVID-19 economic downturn.

Funding from development institutions like the Asian Development Bank is now unlikely. These institutions are shifting their funding from fossil fuel projects to renewable energy infrastructure (Hurst 2021).

Indonesia's need for gas may also increase if renewable energy production volatility increases. Hydroelectric production is increasingly impacted by changes in rainfall and river discharge patterns and biomass sources are affected by land degradation and rising temperatures (ADB 2020).

LNG is well placed to fill any potential gaps in Indonesia's energy needs. This would create opportunities for Australian producers to increase exports and support our neighbour's energy security.

## LNG import infrastructure

Indonesia has 3 LNG import facilities:

- The Nusantara Regas Satu Terminal, or West Java Floating Storage and Regasification Unit (FSRU), is located in Jakarta Bay and has a capacity of 3 Mtpa.
- The Karunia Dewata FSRU in Bali has a capacity of 3.5 Mtpa.
- The Lampung FSRU off the coast of south-east Sumatra has a capacity of 2.5 Mtpa.

Indonesia has developed its domestic gas infrastructure to serve as a 'virtual pipeline', whereby import terminals process largely domestically produced gas for export to other locations within Indonesia. These import terminals process LNG from domestic feedgas, with small amounts from Angola and Singapore (0.11 Mt collectively in 2020) (BP 2021).

Indonesia has several other FSRU projects proposed or under construction:

- Construction of the 0.6 Mtpa Cilamaya LNG Terminal in West Java started in 2021.
- Construction of the Jawa-1 FSRU also started in 2021. This 2.1 Mtpa project will supply the gas-to-power Jawa-1 project in West Java.
- PT Pertamina has opened tenders for another FSRU in Central Java with a 1.4 Mtpa capacity.

## Australia's geographic advantage

Australia's proximity to Indonesia makes it a competitive choice of LNG supplier.

Darwin's export facility would be a natural choice to supply Indonesia with LNG, particularly if the proposed FSRU terminal on the southern side of Central Java is built.

## International competitors

Malaysia's proximity to Indonesia makes it a convenient LNG supplier. The 2 countries have an existing energy relationship, with Malaysian companies such as CIMB, Maybank and Petronas investing in Indonesian oil and gas projects (Evans 2021). Many long-term Malaysian supply contracts will end over the next decade, leaving a large amount of Malaysian LNG available.

Qatar and the US have a relationship with, and history of investing in, the Indonesian oil and gas industry. However, their relative distance from Indonesia makes it unlikely they can leverage those relationships into LNG supply arrangements.

## Existing trade arrangements

Existing agreements between Australia and Indonesia provide an opportunity for further collaboration on energy transition, security and trade:

- Comprehensive Strategic Partnership
- Indonesia–Australia Comprehensive Economic Partnership Agreement
- Australia–Indonesia Joint Statement on Cooperation on the Green Economy and Energy Transition.

## Financing Australian businesses to take on the world

Export Finance Australia is the Australian Government's export credit agency. It provides commercial finance to support viable exporters and overseas infrastructure development when financing from the private sector is unavailable.

Export Finance Australia has a strong track record of helping businesses in the resources sector grow. They do this by providing:

- loans and guarantees for new contracts
- offshore expansion or export growth

- performance or warranty bonds to support a contract
- buyer finance to sovereigns and overseas companies to help businesses offer a comprehensive solution when tendering.

Export Finance Australia also supports infrastructure projects in the Indo-Pacific that provide positive outcomes for Australia and the region, both now and in the future. This support covers energy, electrification and transportation projects.

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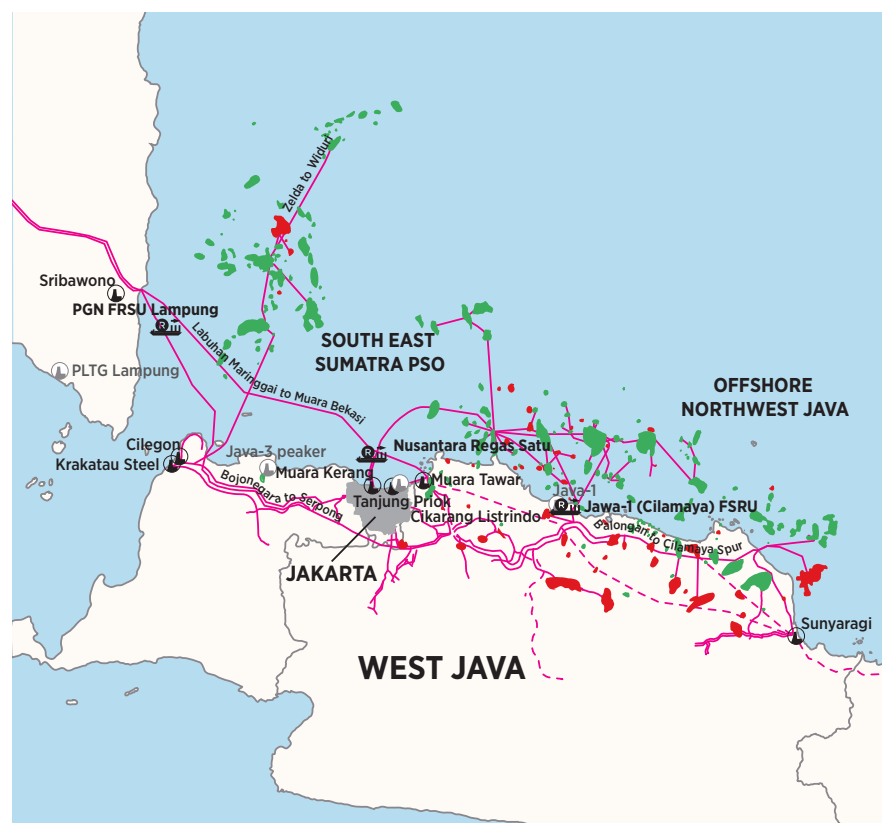
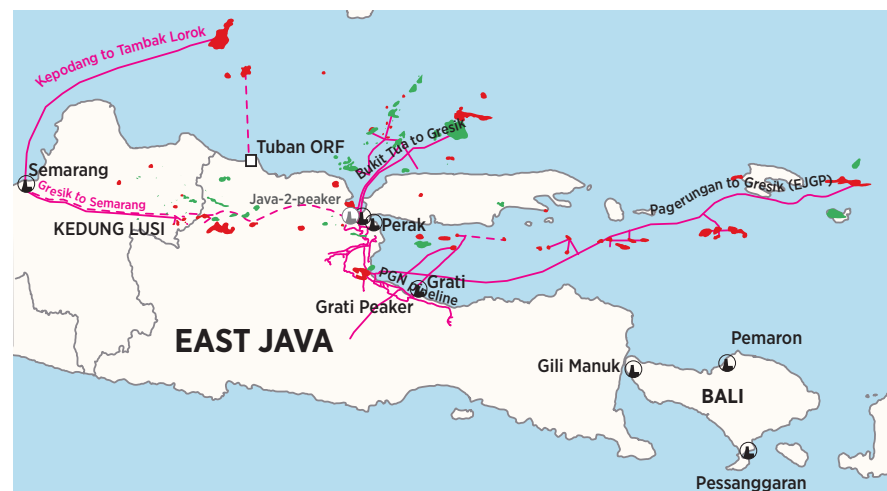
**Figure 10.1:** Indonesia's LNG and gas infrastructure in East Java.  
Source: Wood Mackenzie (December 2021).

Below left

**Figure 10.2:** Indonesia's LNG and gas infrastructure in West Java.  
Source: Wood Mackenzie (December 2021).

Below right

**Figure 10.3:** Indonesia's LNG and gas infrastructure in Sumatra.  
Source: Wood Mackenzie (December 2021).





# BANGLADESH

## A gas-based economy in need of LNG.

Bangladesh has relied on natural gas since the 1970s. Natural gas accounted for 69% of Bangladesh's primary energy consumption in 2020 (BP 2021).

As domestic production declines and demand grows, Australia will have more opportunities to export LNG to Bangladesh to prevent domestic gas shortfalls.

### Domestic production and demand

Bangladesh began domestic gas production in 1972. Production peaked at 19.5 Mt in 2018 and has since declined (BP 2021).

Domestic demand increased along with production. From 1972 to 2020, domestic gas consumption rose 9.2% every year, reaching 22.3 Mt by 2020. To address the shortfall in domestic production, Bangladesh imported LNG for the first time in 2018, and has since been one of the fastest-growing LNG import markets.

Bangladesh has 2 operational LNG regasification terminals and is planning a third:

- Excelerate Energy's FSRU Excellence started operations in April 2018 with capacity of 3.8 Mtpa.
- In April 2019, Excelerate Energy commissioned a second 3.8 Mtpa FSRU terminal on behalf of its owner Summit LNG.
- A third facility is planned for onshore regasification at Matarbri. It will have a capacity of 7.5 Mtpa and is expected to start operation in 2024.

Excelerate delivered the FSRU Excellence as a part of a deal that includes a 15-year supply purchase agreement between QatarGas and Rupantarita Prakritik Gas Company Limited (RPGCL). An onshore gas pipeline connects Excellence to the main demand centre in Chittagong, the second-largest city in Bangladesh. Under the contract, Excelerate will operate the terminal and QatarGas will supply 1.8 Mtpa of LNG between 2018 and 2022 and 2.5 Mtpa between 2023 and 2032. PetroBangla will take over ownership of the FSRU after that.

As well as providing the vessel, Excelerate engineered the terminal's fixed infrastructure components, which include a subsea plug, mooring system and subsea pipeline.

The power sector accounted for 43% of Bangladesh's total gas use in 2019, up 17% from the previous year. Several dual-fuel power plants (with a total capacity of around 650 MW) have recently been converted to gas-fired plants, increasing LNG demand. Bangladesh is expected to commission several combined cycle gas turbine (CCGT) power plants between 2021 and 2025, with a total capacity of 3.4 GW.

Bangladesh has an extensive gas pipeline network in the east and south-east regions. Expansions to the network are underway to improve coverage and ensure an uninterrupted supply of regasified LNG to major consumers. This expansion will need to speed up to meet Bangladesh's forecast natural gas demand.

### Demand outlook

Bangladesh's LNG demand is forecast to reach 18 Mt in 2030, 30 Mt in 2040 and more than 36 Mt by 2050, a nine-fold increase on 2020 levels (Singhal and Farrer 2021). These increases will be enabled by, and depend on, new LNG import infrastructure.

### Domestic energy policy outlook

Bangladesh's energy policies aim to:

- provide affordable energy
- expand energy infrastructure to promote industrialisation.

The government's previous 5-year plan prioritised new LNG import terminals, and an upcoming Power Systems Master Plan is expected to embrace natural gas (Islam 2020).

As old oil-fired power plants reach the end of their usable life, Bangladesh intends to replace them with gas-fired power plants.

### Competitors

Qatar has dominated LNG supply to Bangladesh in the past few years by combining long-term contracts with import infrastructure investment. Bangladesh also imports some LNG from Nigeria, Oman and the US. Australia is yet to export any LNG to Bangladesh.

Bangladesh appears to prefer sourcing LNG through government-to-government arrangements. This is the approach it has taken with Qatar and Oman in the past.

Malaysia is the only major LNG supplier located closer to Bangladesh than Australia. Bangladesh and Malaysia recently signed a memorandum of understanding on cooperation for LNG supply (The Star 2021).

Bangladesh is also exploring a pipeline to distribute gas from an LNG import terminal under construction in Kurkahati, West Bengal, India (Outlook India 2021).

### Australia's opportunity

Bangladesh's fast-growing economy and large middle class presents a large economic opportunity for Australia. Two-way trade between Bangladesh and Australia has grown 550% over the past decade, reaching \$2.6 billion in 2020. Bangladesh's GDP has reached almost US\$320 billion, surpassing India on a per capita basis.

The proximity of Australia's LNG production facilities to Bangladesh's existing and planned import terminals gives Australia an advantage over our competitors. Bangladesh also wants to diversify its LNG supply to improve energy security. Australia's short, stable sea routes and ability to deliver on long-term contracts is an opportunity for Australian LNG exporters.

**Figure 11:** Bangladesh's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



Qatar and Oman have invested significantly in developing Bangladesh's LNG infrastructure and have relationships with domestic utilities. To compete, Australian LNG producers need to improve their understanding of the market and build enduring relationships.

Australia is well placed to supply Bangladesh with LNG. We can also supply the skills and expertise Bangladesh needs to develop its LNG infrastructure.

### The Australia-Bangladesh Trade and Investment Framework Arrangement

The Australia-Bangladesh Trade and Investment Framework Arrangement (TIFA) was signed on 15 September 2021.

Australia will host the inaugural meeting under the agreement in 2022, when the countries will celebrate 50 years of bilateral relations.

The TIFA and its government-to-government consultations will be an avenue to develop a sustained LNG trading relationship, helping Australian LNG producers compete for sales into Bangladesh.

# THAILAND

## LNG hub ambitions.

Thailand's energy consumption has grown steadily over the past few decades as it develops and industrialises, more than doubling between 2000 and 2019 (BP 2021). As well as growing overall capacity, Thailand intends to increase the proportion of gas in its energy mix from 33% in 2020 to 53% by 2037 (Hong CS 2019).

Thailand produces gas and imports it via pipelines and LNG. In 2020, LNG accounted for 16% of total gas consumption (BP 2021). Of the remainder, 14% was pipeline imports from Myanmar, while the rest was produced domestically (BP 2021).

Thailand's gas consumption is expected to increase significantly over the next 5 years as it diversifies its energy mix and uses less coal (US ITA 2021). 57% of Thailand's gas demand was used to generate power in 2021. This is expected to increase to 70% by 2050 (Thiang and Asra 2021).

Thailand is on track to meet its targets for renewable energy infrastructure, especially for solar energy production (Hong CS 2019). The emerging risk of intermittent supply from renewables has not contributed to the predicted increase in LNG demand. Thailand's growth in LNG demand is driven by overall growth in energy use and the planned phase-out of coal.

### Infrastructure

Thailand has 1 LNG import facility and 2 others in development.

The Map Ta Phut import terminal, located approximately 180 km south-east of Bangkok, was established in 2011. The facility's regasification capacity has been incrementally increased from 5 Mtpa to its current capacity of 11.5 Mtpa. Its regasification capacity will be expanded to 16.5 Mtpa by 2025 (Thiang and Asra 2021). Wood Mackenzie forecasts further increase in Thailand's LNG capacity to 27 Mtpa by 2035. Thailand's Energy Ministry plans to promote Thailand as a free-trade hub for LNG using the Map Ta Phut terminal as a storage and export facility (Praiwan 2020).

The Nong Fab import terminal is currently being constructed in south-east Thailand. It will have a capacity of 7.5 Mtpa when completed in 2022.

A third import terminal, with a capacity of 3 Mtpa, is proposed for Surat Thani in south-west Thailand. The project's scope has been revised several times and was downsized from the original proposal of a 5 Mtpa capacity FSRU (Thiang and Asra 2021).

### Considerations

Thailand has existing long-term LNG supply contracts with Qatar (2 Mtpa to 2035) and Malaysia (1.2 Mtpa to 2032).

Thailand is considering a long-term supply contract for 2.6 Mtpa from Mozambique, but this is yet to be signed (Thiang and Asra 2021).

Thailand bought spot cargoes from a range of global suppliers in 2020, including 1.1 Mt from Australia.

Thailand's gas needs are also met by pipeline imports from Myanmar.

In 2020, Thailand imported similar amounts of pipeline gas and LNG (5 Mt and 5.5 Mt respectively). However, pipeline imports have decreased in recent years and LNG imports have increased.

Pipeline imports are supplied from 3 gas fields through a 30-year contract signed in 2010 (IHS Markit 2010). One field, Yetagun, announced a force majeure cessation of production in 2021 due to declining reserves (Yep and Ang 2020). Political instability has affected infrastructure and financing for all 3 gas fields in recent years (Yep and Ang 2020).

### Australia's opportunity

Australia has an opportunity to supply LNG to Thailand despite its existing contracts and relationships with LNG-producing countries.

As with other emerging Asian markets, Australia has the benefit of proximity.

Wood Mackenzie's September 2021 Thailand LNG market outlook predicts Thailand's 4 existing long-term contracts (totalling 5.2 Mtpa) won't cover Thailand's growing gas supply needs from 2022 onwards. Australian LNG exporters could secure supply contracts in Thailand given Thailand's Power Development Plan's expanded role for gas in Thailand's long-term energy balance.

**Figure 12:** Thailand's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



Thailand's LNG hub ambitions could also provide a credible option for Australian supply contracts. Thailand's Energy Ministry plans to promote Thailand as a free-trade hub for LNG using the Map Ta Phut terminal as a storage and export facility (Praiwan 2020), requiring LNG supply to see these plans come to fruition.

Thailand's Energy Regulatory Commission granted 7 import licences for 2020–21. By November 2021, only one licensee had secured a spot cargo, with the remaining 6 licensees yet to pursue this option (Thiang and Asra 2021). The state-owned company PTTEP has also invested in Australian gas assets, a positive sign for future LNG exports (PTTEP n.d.).

# MALAYSIA

A mature LNG market with room for Australia.

## Domestic production

Malaysia has a mature gas and LNG sector. Historically, Malaysia produced enough gas to meet domestic demand and support a profitable export trade. In 2020, Malaysia was the world's fifth-largest LNG exporter.

However, Malaysia's LNG export arrangements, declining reserves and high domestic gas consumption are signs Malaysia may need to increase its imports of LNG in the future.

## Existing demand

In 2020, the Malaysian energy mix was:

- 33% oil
- 33% gas
- 27% coal
- 5% from renewable sources.

90% of the gas consumed in Malaysia in 2021 was domestically produced. 1% was supplied via pipeline from Indonesia, and the remaining 9% was imported as LNG from Australia (1.9 Mt) and Brunei (0.7 Mt).

The energy sector accounts for just under a third of Malaysian gas demand, with the industrial sector the other large user (Asra 2020; Asra 2021a). The remaining demand comes from the residential, transport and commercial sectors (Asra 2021a; Asra 2021b)

## Growth outlook

Gas demand in Malaysia is expected to grow steadily, from 26.7 Mt in 2021 to around 37 Mtpa in the late 2040s before slowly dropping off.

Due to declining reserves, the majority of this demand will be met by LNG imports in future. Malaysia's use of LNG will grow from 17% in 2020 to 42% in 2030 and increase further towards 2050.

Demand growth is expected to be mainly driven by:

- reduced use of high-emissions fuels
- the current slow uptake of renewable energy due to a lack of investment (Vakulchuk et al 2020).

Petronas, the government-owned oil and gas company, may also need to buy LNG to fulfil its export contracts. This is due to declining reserves in offshore Borneo and insufficient investment in new field exploration.

## Infrastructure

Two regasification terminals, Pengerang and Sungai Udang, supply LNG to Peninsular Malaysia and have a combined capacity of 7.3 Mtpa. LNG demand in Peninsular Malaysia is projected to reach 99% of this capacity by 2023 and exceed it by 2025.

In 2021, Petronas opened expressions of interest for a third regasification storage facility at Pengerang to start operations by 2025 (Petronas n.d.). However, this may not be soon enough – with no other import infrastructure being developed, Malaysia may experience gas supply shortages from 2023.

Domestic demand is also predicted to increase in Borneo. However, the island will produce enough gas to meet demand. The government is not considering any import facilities for Borneo.

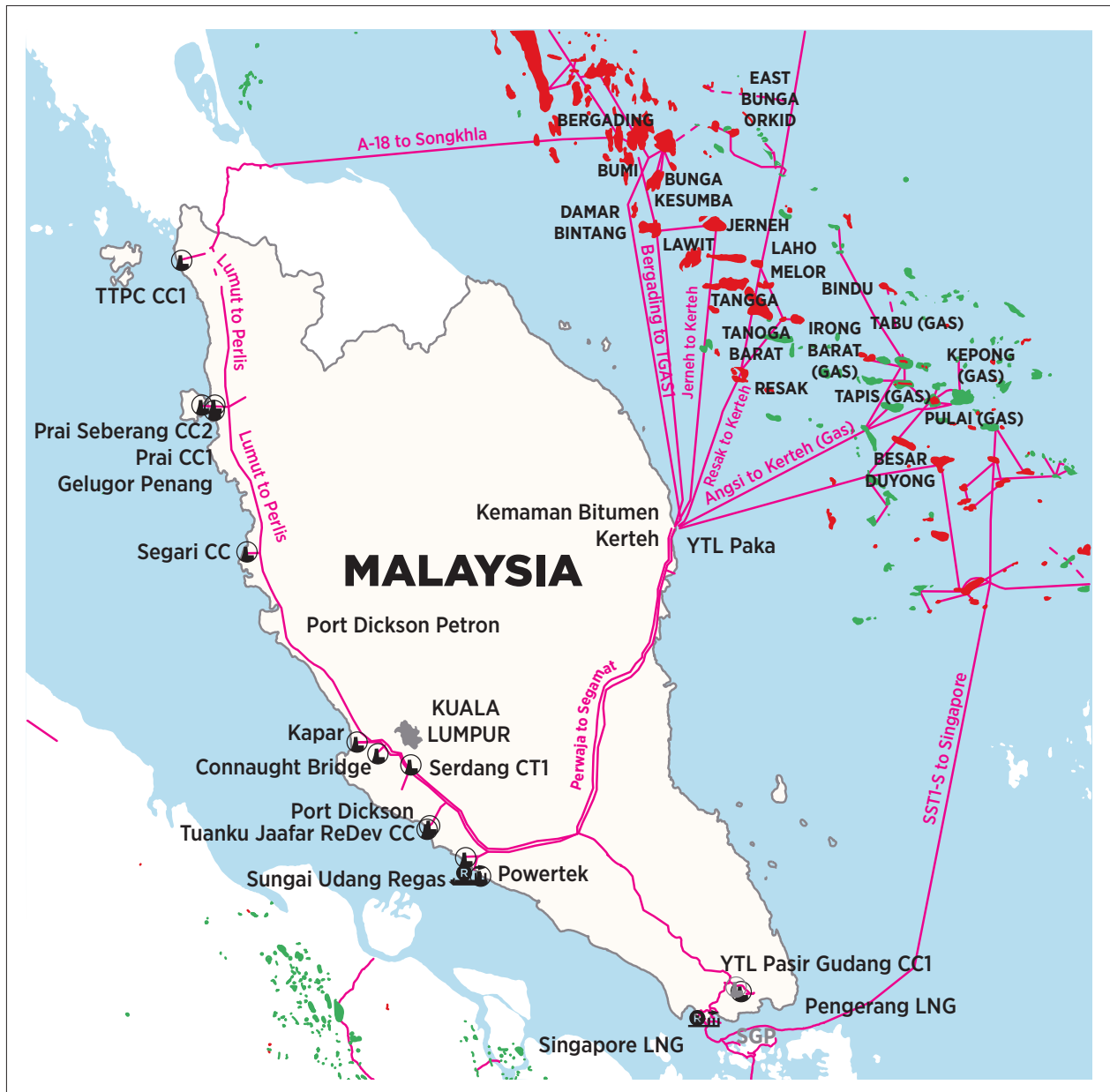
## Australia's opportunity

Despite strong predicted growth for LNG demand over the coming decades, Malaysia's own domestic LNG production in Borneo could service Peninsular Malaysia. Shipping costs between Borneo and Peninsular Malaysia will be minimal, but Malaysian price controls may cause Petronas to consider other markets. Regulatory price controls may also be a barrier for Australian producers.

Existing trade agreements between Australia and Malaysia, like the Australia-Malaysia Comprehensive Strategic Partnership, provide a stable foundation for Australia to increase LNG exports to Malaysia.

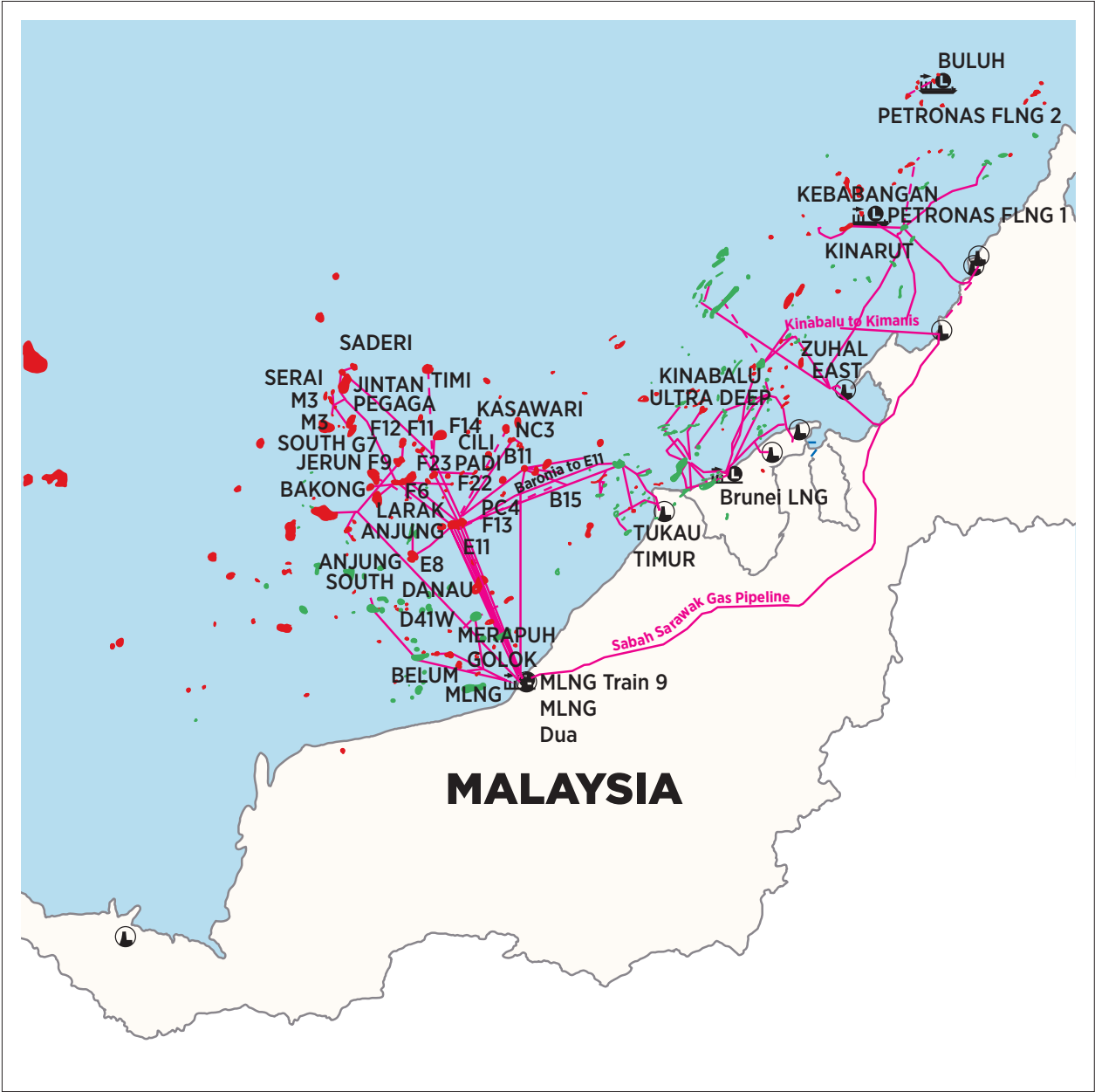
As production in Malaysia declines, Australia could also help decommission export terminals and convert them to import terminals. Physical production assets will need to be disposed of or rehomed, and ecological remediation services may also be required. The Australian resources sector has world-class competencies that could help Malaysia's gas industry transition to its next phase.

**Figure 13.1:** LNG and gas infrastructure in Peninsular Malaysia. Source: Wood Mackenzie (December 2021).





**Figure 13.2:** LNG and gas infrastructure in East Malaysia. Source: Wood Mackenzie (December 2021).



# VIETNAM

A new customer, but the US is a step ahead.

Vietnam does not currently import LNG. But steadily growing electricity demand and a shift away from coal are expected to create opportunities for LNG importers.

The government expects to start importing LNG in 2022, reaching 5 Mt a year in 2025 before increasing to 15 Mt a year by 2035. Vietnam sees LNG as a way to reduce greenhouse gas emissions and ensure energy security. It is counting on both LNG imports and developing new gas resources to compensate for declining domestic production (Kumagai 2021).

Vietnam's LNG market has been attracting interest from investors, particularly in the past 2 years. In addition to 2 LNG projects led by state-controlled PV Gas, several privately led projects are looking to develop new LNG markets in central and north Vietnam.

## Infrastructure and domestic demand

Vietnam is speeding up the development of LNG import terminals and related infrastructure.

Vietnam's first LNG terminal, the Hai Linh terminal, has completed construction and is expected to start commercial operation in 2022.

PetroVietnam's terminal, Thi Vai LNG, is expected to complete construction by the end of 2023.

A third LNG-to-power project, the Son My LNG project, has been approved by the government and is expected to start operation in 2026 (Kumagai 2021).

Vietnam's draft national power development plan VIII (PDP8), published in February 2021, contained plans for up to 41 LNG-to-power plants. The plan aims to grow Vietnam's generating capacity from 7 GW in 2020 to 13.5GW in 2025 and 28 to 33 GW in 2030 (Out-law 2021).

The plan also aims to increase gas's share of power generation from 15% in 2020 to 21% to 23% by 2030 (Burke and Nguyen 2021). New domestic gas sources and LNG imports will fuel an expected 25 GW of new gas-fired power plants by 2030 (Singhal and Asra 2021).

Wood Mackenzie projects Vietnam's gas demand will increase in the 2030s as coal use decreases or stops. Vietnam's LNG demand is forecast to total 13.1 Mt in 2040, increasing to around 24.7 Mtpa of LNG by 2050. This is almost equal to the combined nameplate capacity of all 3 Queensland LNG projects.

While the demand forecasts for gas and LNG are strong, infrastructure development will be key to realising this opportunity.

## Australia's opportunity and international competitors

Australia has secured a commitment from Vietnam to explore opportunities to increase LNG cooperation through the Australia-Vietnam Enhanced Economic Engagement Strategy (see box). That said, Australian LNG exports to Vietnam will face competition from several other suppliers.

In particular, American LNG producers supported by the US Government have made inroads into the Vietnamese LNG market and related power infrastructure development.

In May 2019, the United States Trade and Development Agency (USTDA) approved \$1.4 million for pre-feasibility studies on a US\$1 billion LNG terminal and gas-to-power project in southern Vietnam, part of an agreement with Vietnam Electricity Corporation (EVN). The grant is expected to fund a study on the overall LNG market in Vietnam and select the site for an integrated LNG-to-power project to meet southern Vietnam's impending power deficit (Singhal and Asra 2021).

As well as major US oil and gas companies, many smaller US companies have shown interest in Vietnam's LNG development. Most of the LNG-to-power plants listed in PDP8 feature American investment (Out-law 2021).

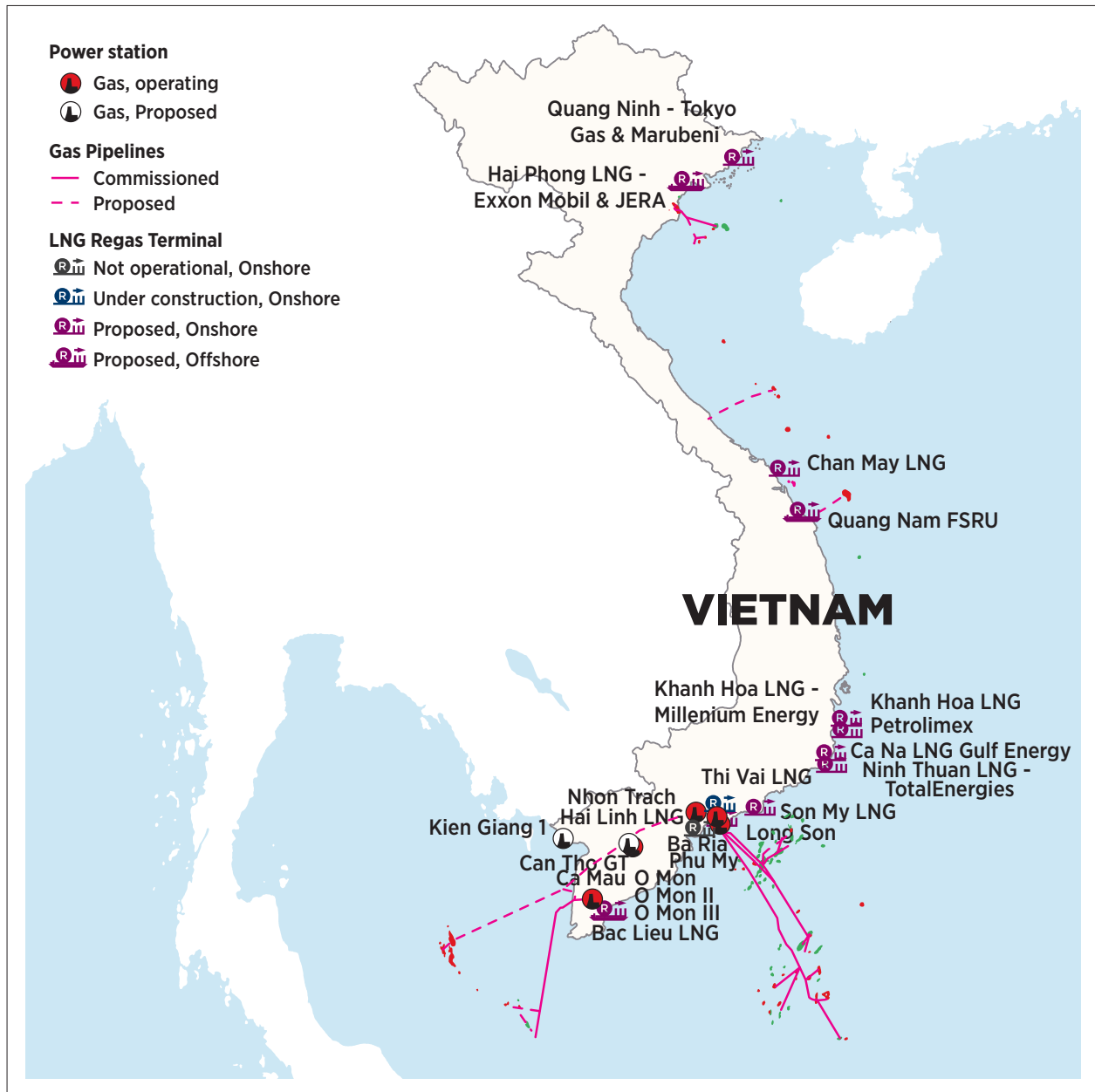
Industry sources indicate that investing in infrastructure in Vietnam as a way of entering the LNG market may not work as intended. Vietnam's LNG supply opportunities are issued by tender separately to infrastructure development. There is no guarantee for commercial entities that funding infrastructure development will result in supply agreements.

## The Australia-Vietnam Enhanced Economic Engagement Strategy

In November 2021, Australia's and Vietnam's Prime Ministers launched the Australia-Vietnam Enhanced Economic Engagement Strategy. AVEES aims to double two-way investment and see both countries become top-ten trading partners.

The resources and energy sectors are important parts of AVEES. The strategy is expected to deliver initiatives like a bilateral ministerial-level dialogue on resources and energy. Amongst other outcomes, this will promote cooperation in the LNG sector, including facilitating Australian investment in terminal and warehousing facilities in Vietnam and exporting LNG to Vietnam.

**Figure 14:** Vietnam's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



While there are emerging opportunities to export LNG to Vietnam, risks include:

- the timely development of LNG receiving infrastructure
- uncertainty around the timing of coal powered generator retirement
- regulatory complexities.

Industry sources cite a lack of clarity on which government ministry is responsible for energy policy and regulation. Vietnam has not established:

- clear policies for approving and regulating LNG import projects
- guidance on the permits required
- a clear pathway for managing LNG import projects.

Vietnam also lacks a pass-through cost mechanism to compensate LNG buyers for the higher cost of LNG imports over domestic gas (Singhal and Asra 2021). Australian governments and companies could build on initiatives like AVEES to help Vietnam to overcome some of these barriers.

# PHILIPPINES

Australia can help build a new customer's infrastructure.

## Domestic demand

The Philippines has met its gas needs domestically since it started producing gas commercially in 2001. It does not currently trade LNG.

Gas consumption has been relatively steady over the past decade, growing 1.2% from 2009 to 2019. Total energy consumption slumped in 2020–21, causing gas consumption to decline 17% compared to 2019 (BP 2021). Gas accounted for 7% of total energy consumption in 2020.

LNG imports will soon be required to meet gas demand. Domestic production comes from a single source, the Malampaya-Camago gas field, whose reserves are predicted to be depleted by 2027 (Asra and Singhal 2021).

Production may stop in 2024 when the current production licence expires.

## Energy policy

The Philippine Energy Plan 2020–2040, updated in 2021, presents 2 scenarios for meeting its energy needs. The scenarios provide baseline and aspirational targets for energy security and emissions reduction.

The baseline scenario assumes business-as-usual policy settings and realistic budgetary considerations. The aspirational target has a faster reduction of fossil fuel use and relies on securing investments and development aid.

In both scenarios, gas is the major transitional fuel as the Philippines phases out coal. Renewable energy is not expected to be a major energy source in the near term due to its costs.

The Philippines Government announced a moratorium on new coal-based projects in 2020. However, coal currently accounts for 57% of power generation, and its use is likely to increase as projects approved before the moratorium provide cheap energy.

LNG demand is expected to start growing from around 2030 once domestic gas production ceases and the effects of the moratorium begin to impact coal availability (Asra and Singhal 2021).

## Infrastructure barriers

A lack of infrastructure will limit LNG growth across the Philippines. This provides an opportunity for the Australian gas industry.

The Philippine Energy Plan 2020–2040 predicts that domestic energy consumption will triple by 2040, with the industry and transport sectors accounting for much of the growth. The government has invested in a range of infrastructure, industry and transport projects through its 2018 Build Build Build program. A lack of midstream and downstream transmission and connectivity infrastructure limits the entry of gas into these markets. If supply infrastructure is developed, gas could provide reliable transitional energy in these areas.

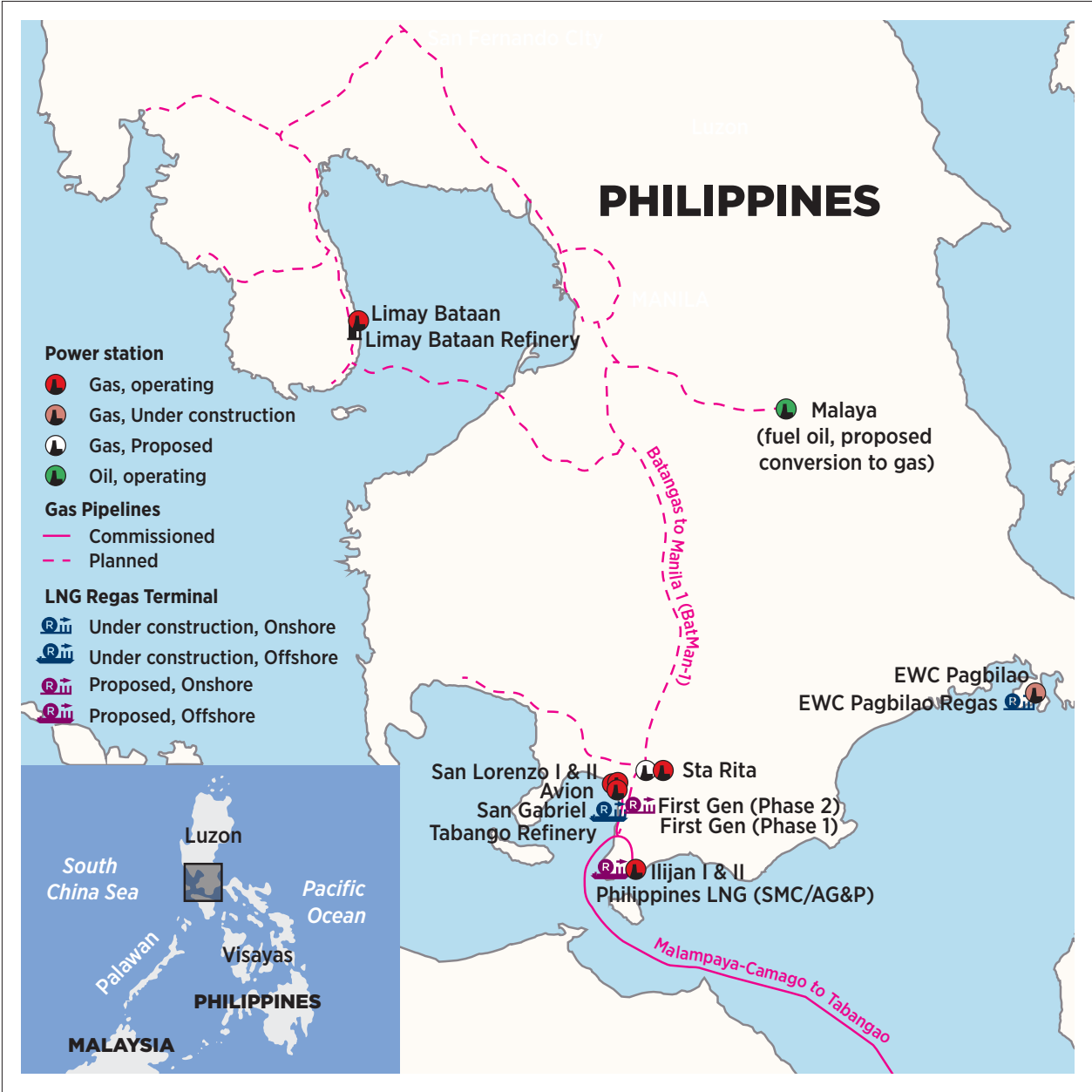
Infrastructure would increase demand in the energy sector. Gas-fired power plants are currently limited by grid transmission capacity, and the Visayas and Mindanao islands have no gas-powered energy supply, relying on coal and diesel.

The Philippine Government has a goal of more equitable access to energy over the next few decades, and is seeking private investment and developmental aid to build the energy sector (DOE 2021). Evolving energy needs in the Visayas and Mindanao account for some of the projected growth in gas demand toward 2050 and assumes the infrastructure will be built.

The need to develop infrastructure provides opportunities for the Australian LNG industry across the supply chain, including skills and expertise in developing transmission networks. Exporting Australian gas industry know-how would provide 2 added benefits for Australian LNG exporters:

- overcoming the infrastructure barriers to greater use of LNG could open the market further
- developing business-to-business relationships would provide a foundation for future supply arrangements.

**Figure 15:** Philippines LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



## Infrastructure development

The Philippine Government supports the development of infrastructure and has ambitions of becoming an LNG trading and trans-shipment hub in the Asia-Pacific (DOE 2021).

The *Midstream Natural Gas Industry Development Act* was filed with the Philippine Senate in May 2021. It aims to attract investment to develop transmission pipelines from LNG terminals under construction, 'provision of third-party access, a single nationwide independent transmission system operator, and a regional distribution or franchise network development' (Asra and Singhal 2021).

Upstream, 7 LNG import terminal projects have been approved with operational target dates between 2022-2025:

- The EWC Pagbilao site is due in 2022 with a planned capacity of 3 Mtpa.
- The First Gen FSRU is due in 2022 and has a planned capacity of 5.26 Mtpa.
- The Excelerate Energy L.P. FRSU is due in 2022 and has an expected capacity of 4.4 Mtpa.
- The Batangas Clean Energy Inc Batangas City site is due in 2025 with a planned capacity of 3 Mtpa.
- The AG&P FSRU is due in 2022 with a planned capacity of 3 Mtpa.
- The Shell Energy Philippines FSRU is due in 2022 with a planned capacity of 3 Mtpa.
- The Vires energy Corporation FSRU is due in 2023 with a planned capacity of 3 Mtpa.

First Gen has also proposed an onshore facility for 2035 with a capacity of 5 Mtpa.

None of these projects had supply contracts as of July 2021.

## Australian LNG export opportunities and actions

Australia already has a strong 2-way trade partnership with the Philippines. Australia benefits from its proximity to the Philippines and our reputation as a supplier of quality materials and services (DFAT n.d.).

Key collaborative opportunities for Australian companies, particularly in public-private partnership, centre on resilience and energy security, technology development and long-term investment. For example, in 2021 the Philippines' Department of Energy signed a memorandum of understanding with Australian company Star Scientific to explore the viability of hydrogen as a fuel source and Australian technology in transitioning power plants away from fossil fuels (DOE 2021). Australia can engage with the Philippines on energy by proposing similar projects and collaborations that align with the Philippines' areas of focus. Public-private engagement with the Philippines could assist industry in overcoming any challenges faced in establishing commercial supply arrangements.

The Philippine Energy Plan also considers transition funding available through its memberships of multilateral forums:

- Association of Southeast Asian Nations (ASEAN)
- East Asia Summit
- Asia-Pacific Economic Cooperation (APEC)
- Brunei Darussalam–Indonesia–Malaysia–Philippines East ASEAN Growth Area (BIMP-EAGA)
- United Nations Framework Convention on Climate Change
- other established economic partnerships and free trade agreements.

The plan particularly highlights the APEC Energy Security Initiative, to which Australia is a major contributor, and programs from ASEAN and BIMP-EAGA to increase energy security and the adoption of renewable energy.

The Australian Government may be able to use its membership of these institutions to:

- propose projects and support decisions to develop energy markets
- increase equitable access to energy consistent with emissions objectives
- generate opportunities for LNG exports to the Philippines.









## ESTABLISHED MARKETS

*Australia has established LNG trade and investment relationships with 4 markets:*

- China
- Japan
- Korea
- Taiwan.

Combined LNG demand from these markets is expected to grow from 200 Mt in 2020 to 243 Mt in 2050.



# CHINA

## Existing demand

China is the world's largest consumer and producer of primary energy. In 2020, China accounted for more than 26% of global primary energy consumption (BP 2021).

Gas is around 8% of the Chinese energy mix. However, the scale and growth of China's energy demand means this translates into large volumes of gas.

China's gas demand increased 13-fold between 2000 and 2020 (BP 2021). In the first half of 2021, strong demand from the power and industrial sectors saw China's gas demand increase 16% compared to the first half of 2020 (Huang 2021).

To meet this large demand, China produces and imports gas, both by pipeline and as LNG.

## Australia's LNG trade

Australia is China's largest source of LNG, accounting for over 40% of LNG imports in 2020 (BP 2021).

The trade relationship has strengthened from the first cargo in 2006 as China imported more LNG. In 2020 China became Australia's largest LNG customer, with exports of more than 29 Mt.

Chinese companies have a history of participating in Australian upstream and LNG projects. China National Offshore Oil Corporation (CNOOC) bought a 5.3% stake in the North West Shelf titles in 2004 and holds a 25% stake in Queensland's Curtis LNG project (Train 1). Sinopec holds an equity stake in the Australian Pacific LNG project.

### Australia-China Natural Gas Technology Partnership Fund

The Australia-China Natural Gas Technology Partnership Fund was established in 2002 to deepen the countries' partnership and enhance mutual understanding of the role and economic benefits of gas. It supported and underpinned the first long-term LNG supply deal from Australia's North West Shelf to China's Guangdong Dapeng LNG, which is valued at \$25 billion over 25 years.

An independent evaluation in 2021 found the fund is successful, represents value for money, and is strategically important for positive and practical collaboration between Australia and China on gas.

The key activities under the fund evolved as China's gas sector developed and matured. During the fund's operation, China transitioned from a new importer of LNG to a world leader in LNG imports, shipbuilding, pipeline development and terminal capacity. The fund has helped strengthen the China-Australia LNG trade and investment relationship.

## Infrastructure

China currently has 22 LNG import terminals with a total receiving capacity of around 81 Mtpa. China's LNG import capacity is forecast to increase to more than 120 Mtpa by 2025 (Liang and Ang 2021).

The China Oil & Gas Pipeline Network Corporation (PipeChina) was formed in 2020, creating China's largest infrastructure company. This was a significant reform to its gas market and is expected to boost competition and increase gas usage. PipeChina aims to:

- provide efficient third-party access to China's pipeline infrastructure
- facilitate market access to suppliers and end consumers
- encourage investment in the sector (Xu and Manekar 2020).

## Demand outlook

Wood Mackenzie forecasts China's LNG imports to increase from 67 Mt in 2020 to:

- 120 Mt in 2030
- 133 Mt in 2040
- 140 Mt in 2050.

China is estimated to have become the largest importer of LNG in 2020, overtaking Japan. Its imports are estimated at 78 Mt, nearly equal to Australia's current annual LNG production level.

The Chinese Government's 14th Five-Year Plan (2021-2025) indicates that gas will play an important role in China's energy transition to meet its pledge to be carbon-neutral by 2060.

## Australia's opportunity

China is expected to remain the world's largest LNG customer. Australia's existing LNG trade relationship with China, geographic proximity, combined with Chinese investment in Australian projects, positions Australia to continue its existing LNG trade and investment relationship with China.

**Figure 16:** China's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



# JAPAN

Japan first imported LNG in 1969. It remained the world's largest LNG importer from 1970 to 2019, importing more than 2,200 Mt of LNG.

While the volume of Japanese LNG imports has kept rising, emerging LNG customers have decreased its market share. In 2000, Japan accounted for more than half of global LNG imports. By 2020 this had reduced to 21% (BP 2021).

## Australia's LNG partnership with Japan

Japanese demand and equity underpinned the development of the Australian LNG industry. Japan was the cornerstone customer for Australia's first LNG project in offshore Western Australia, and received Australia's first LNG export cargo in 1989. Since then, Australia has been a major supplier to Japan, accounting for 39% of Japanese LNG imports in 2020.

Japan has also invested significantly in LNG projects in Australia. Japanese companies have stakes in 8 out of 10 of Australia's LNG projects. These LNG projects in turn have long-term supply agreements with Japanese utilities.

## Infrastructure

Japan has extensive LNG import infrastructure. Its 39 LNG regasification terminals have a combined capacity of 215 Mtpa, the largest in the world.

Japan's regasification terminals are concentrated in central Japan. 36 terminals are in and around Tokyo Bay, Ise Bay and Osaka Bay. A number of terminals also have satellite terminals to provide gas to areas not connected to major pipeline networks.

29 companies in Japan buy LNG on the global market.

Japan had a major role in the development of the LNG industry over the last 5 decades. Today it plays a major role across the LNG supply chain, not only as a customer. Japan is at the forefront of:

- LNG contracting innovation
- supplying LNG carrier vessels
- developing and producing FSRUs.

## Demand outlook

Japan's LNG demand is expected to gradually decline to 2050. This is driven by:

- economic maturity
- competition from other fuels in the power sector
- increasing use of lower carbon fuels.

Japan's Sixth Strategic Energy Plan aims to halve the proportion of fossil fuels in Japan's energy mix by 2030. This would reduce gas to 20% of the energy mix. Fossil fuels will be replaced by renewables, nuclear power and hydrogen or ammonia. Additional gas may be needed as Japan's nuclear power industry restarts.

While the energy plan targets an aggressive reduction in LNG, gas-fired power will still have an important role in the medium term as coal is phased out. In the absence of wide-scale, long-duration battery storage, dispatchable gas-fired power may be needed for grid stability and energy security.

The power sector will remain the main consumer of LNG. But Japan's declining population, mature economy and rising energy efficiency will see power demand remain flat, averaging 0.3% annual growth from 2022 to 2030 (Cullen 2021a).

As well as power generation, Japan's gas is used by residential, commercial and industrial consumers. Demand is expected to decline by an average of 0.8% per year from 2030 to 2040, driven by the same factors reducing power use. Expected demand is 64.4 Mt in 2030 and 55.5 Mt in 2040 (Cullen 2021a).

Gas demand is expected to decline by 1.8% per year from 2040 as the energy transition and 2050 net zero pledges take firmer hold. Japan's LNG demand in 2050 is forecast at 39.2 Mt, around half of its 2020 demand of 73 Mt. However, Japan is expected to be the fifth-largest LNG importer in 2050 and will remain a significant player in the global industry (Cullen 2021a).

## Australia's opportunity

While Japan's LNG demand is expected to reduce over the next 3 decades, it will remain a major global consumer of LNG.

Australia can continue its trade and investment relationship with Japan thanks to:

- our countries' existing relationship
- geographic proximity
- Japan's investment in Australian LNG projects.

Japan has been at the forefront of contracting innovation in LNG agreements and has developed innovative ways of including flexibility in contracts. This could mean changes to contract duration, terms of delivery or price. However, stable and secure supply is one of Australia's traditional strengths and is highly valued by Japanese utilities.

Australia will remain a key supplier of LNG to Japan, and Japan will remain a significant partner to the Australian LNG industry for many decades to come.



**Figure 17:** Japan's LNG and gas infrastructure map. Source: Wood Mackenzie (December 2021).



# REPUBLIC OF KOREA

Korea is the world's third-largest LNG importer and is expected to remain in this position until the mid-2030s. Korea began importing LNG in 1986 and its imports grew rapidly in the early 2010s.

Natural gas accounts for 17% of primary energy use in Korea. With very little domestic gas production and no international pipelines, Korea relies on LNG imports for nearly all its gas. This reliance on imports will increase, with Korea's 2 domestic offshore gas fields expected to stop commercial production in 2021 (Cullen 2021b).

Power generation accounted for 56% of gas consumption in 2020, up 10% from 2010 (Enerdata n.d.). The industrial sector used 14% of gas in 2020 and the residential and commercial sectors accounted for about 28%. The rest was used in the transport sector.

## Infrastructure

Korea is home to 7 LNG import terminals with a total capacity of over 100 Mtpa. Korea also has the largest LNG storage capacity in Asia.

Korea is constructing an additional LNG terminal and has proposed 2 more.

## Demand outlook

LNG demand in Korea will grow thanks to its:

- strong economy
- well-established city gas reticulation infrastructure
- plans to reduce dependence on imported oil and switch to cleaner energy.

Korea's LNG imports are forecast to reach 46.4 Mt in 2030 before peaking at 48.1 Mt in 2039 (Cullen 2021b).

Demand is expected to decline to 42.1 Mt in 2050. However, this is still more than 2020 imports. Korea is expected to be the world's fourth-largest LNG importer in 2050 (Cullen 2021b).

## Energy policy

Korean energy policy supports natural gas as a fuel to improve air quality and reduce emissions.

The Korean Government's 9th Basic Plan for Long-Term Electricity Supply and Demand (2020–2034) reaffirmed gas as the main backup for variable renewable generation in the absence of wide-scale, long-duration battery storage. New infrastructure will see Korea's gas capacity grow from 41 GW today to 55 GW by 2030, including 12.7 GW from coal-to-gas conversion projects (Lee 2021).

In April 2021, Korea's Ministry of Trade, Industry and Energy released its 14th Long-Term Natural Gas Supply Plan. This plan forecasts that gas and LNG demand will reach 42.5 Mt by 2027 and 48 Mt by 2034. It also highlights the importance of gas as a transition fuel through the 2020s and early 2030s.

Korea also wants to secure its future LNG supply by taking equity stakes in international LNG projects. The state-run utility Korea Gas Corporation (KOGAS) wants to move towards medium-term contracts of 5 to 10 years.

Korea's need for LNG may increase if its restart of nuclear power is further delayed. The nuclear units Shin Hanul 1 and 2 were due to come online in late 2019 and 2020, but have been delayed 3 times and are now due at the end of March 2022 and 2023 respectively.

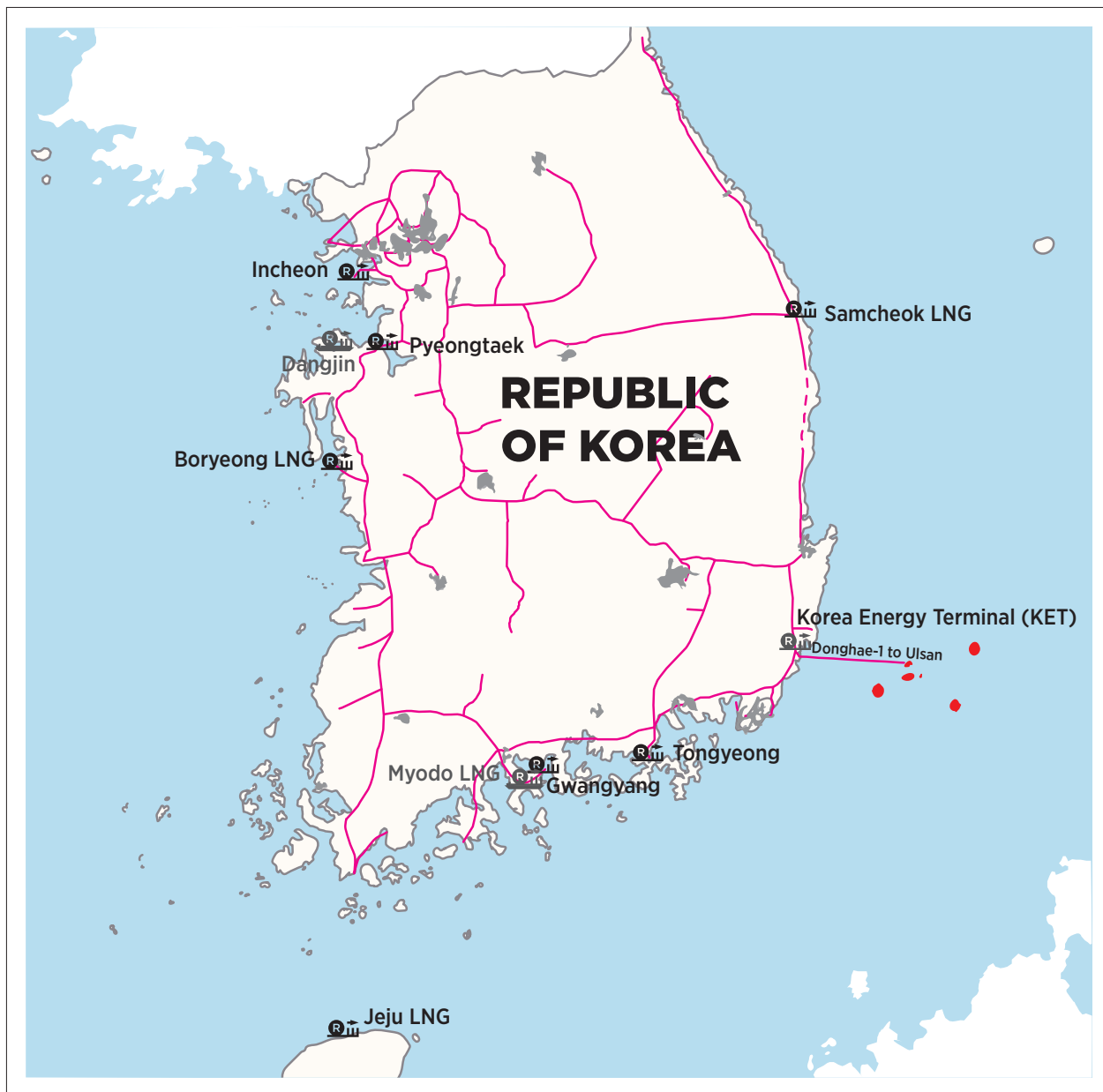
In October 2019, Korea's National Council on Climate and Air Quality proposed measures to cut fine particle emissions by 44% by restricting around a quarter of Korea's coal-fired power capacity during winter (Thompson 2020). Further developments in this area would likely increase demand for LNG.

## Australia's opportunity

Australia and Korea have an established LNG trade relationship, with existing long-term contracts and Korean equity investments in 2 Australian LNG projects. In 2020, Australia accounted for 20% of Korea's LNG imports.

Australia can keep building on this strong LNG trade and investment relationship while supporting Korea's goal of net-zero emissions by 2050. This is thanks to our large natural gas reserves, reputation as a stable and reliable supplier of LNG and geographic proximity to Korea.

**Figure 18:** Korea's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



# TAIWAN

Taiwan relies on imports to meet its energy needs. In 2020, Taiwan's energy consumption was:

- 39% oil
- 18% gas
- 33% coal
- 5% nuclear
- 2% renewable energy (BP 2021).

In 2020, LNG accounted for over 99% of Taiwan's gas consumption.

## Infrastructure

Oil and gas company CPC Corporation owns and operates the 2 LNG import terminals in Taiwan:

- Yung-An LNG began operation in 1990 with a 1.5 Mtpa capacity. After multiple expansions it now has a 13.8 Mtpa capacity.
- Taichung LNG came online in 2009 and operates with a 5 Mtpa capacity (Cullen 2021c).

CPC has proposed a third terminal with a 1.0 Mtpa capacity that will start operation in 2024–25. The project has experienced pushback from environmental groups resulting in a referendum on the site's proposed location. The December 2021 referendum's results have allowed construction to continue as planned (Kao 2021).

Electricity company Taipower is constructing 2 further terminals in Taiwan. These are due to come online in 2023 and 2025 with capacities of 4.0 and 1.8 Mtpa respectively.

## Energy policy

Taiwan has committed to net zero emissions by 2050. To date, the energy transition in Taiwan has, in part, been driven by pragmatic concerns around air quality and energy security. The phasing out of nuclear energy – scheduled to be complete by 2025 – is an area of ongoing debate in Taiwan.

## Demand outlook

In the face of declining domestic gas reserves, growing demand for LNG in Taiwan will mainly be driven by increased power generation. This will see LNG demand increase in the short term, peaking around 2030 (Cullen L 2021c).

After 2030, LNG demand is predicted to return to current demand levels (around 20 Mtpa) as more reliable renewable energy becomes available.

By 2050, demand is forecast to remain steady at around 18 Mtpa. Predicted energy demand to 2050 assumes that nuclear power will be offline by 2025 and no realistic pathway to net zero emissions by 2050 is found (Cullen 2021c).

## International competitors

Taiwan's LNG imports are mostly contracted gas, with 25% to 30% of its annual supply coming from spot markets (Cullen 2021c).

Most LNG is bought by CPC, which is increasingly diversifying its suppliers. CPC has recently signed contracts with QatarEnergy, Chevron and the JV Mozambique Area-1 project. These contracts are for varying lengths of time and indexing price points, and the JV contract is a flexible shared supply arrangement with Japanese company JERA (Pepple, Toleman and Farrer 2021).

## Australia's opportunity

Australia is a major supplier of LNG to Taiwan. We supplied over a quarter (4.9 Mt) of LNG imports to Taiwan in 2020 (BP 2021).

CPC owns a 5% stake in Prelude FLNG and a 2.625% stake in Ichthys LNG (Shell Global n.d.; Macdonald-Smith 2013), demonstrating its commitment to the LNG trade relationship with Australia.

This relationship of secure supply and investment is a solid foundation for Australia to increase its share of Taiwan's LNG market. Several of Taiwan's long-term contracts will end between 2032 and 2037, presenting opportunities for Australia to increase its market share (Cullen 2021c).

Australia and Taiwan hold regular Joint Energy and Minerals Trade Investment Cooperation Consultations. These meetings allow the parties to:

- discuss energy and resources policy interests
- share updates
- identify ways to collaborate for mutual benefit.

**Figure 19:** Taiwan's LNG and gas infrastructure. Source: Wood Mackenzie (December 2021).



# GLOBAL TRENDS AND COMPETITION

*Australia will compete in global LNG markets in the decades to come from a position of strength.*

However, the global LNG industry is competitive. New exporting nations want to enter the market and others are expanding aggressively.

For Australia to continue to compete in global LNG markets, new and existing Australian projects need to secure customers now. The dominance of long and medium term contracting, LNG project development lead times and global demand outlook past 2050 means failing to expand now will mean a missed opportunity for Australia's LNG sector.

Customers' needs and expectations are changing. This section identifies 3 trends expected to shape customer supplier choices to 2050, before looking briefly at Australia's main competitors.

## Trends shaping LNG markets to 2050

### The rise of the spot market

Medium- and long-term contracts continue to dominate global LNG trade. But the global LNG market is evolving into a more liquid spot market with shorter term contracts. LNG spot market trades now account for more than 30% of total LNG trade, compared to less than 20% in 2010.

Increasing demand volatility and uncertainty in established LNG import markets is driving the demand for more flexible supply options like LNG spot cargoes.

This has led to the rise of portfolio players and commodity traders that transact LNG globally. The activity of these players have further fuelled spot market trades and added liquidity to the market.

While long-term contracts with cornerstone customers will likely continue to dominate Australian LNG sales, the rise of spot sales presents risks and opportunities for Australia's LNG sector.

On the risks side, spot markets could increase competition for our existing LNG customers.

As modern LNG carriers have increased their range and affordability, Australia will enjoy increasing opportunities to compete to supply spot cargoes to customers in markets where we have previously been less competitive due to distance, such as Pakistan, Bahrain and Europe. Australian LNG presents a clean, reliable, and competitively priced product to these markets as an alternative to traditional pipeline-based supply.

### Trade diversification

LNG suppliers and customers want to diversify their trade portfolios to avoid relying on any single trade partner. This makes commercial and strategic sense for nations and commercial businesses.

In 2020, Australia exported LNG to 11 markets, with 86% of our exports going to Japan, China and Korea. The large forecast growth in Asian demand is a great opportunity for Australia to grow its exports and diversify into emerging LNG markets.

### Carbon-neutral LNG

Carbon-neutral LNG cargoes use carbon credits to offset emissions generated while producing and delivering the cargo (scope 1 and 2 emissions). In some cases, the emissions associated with LNG consumption (scope 3 emissions) are also offset.

Carbon-neutral LNG cargoes typically reduce scope 1 and 2 emissions as much as commercially possible before seeking offsets.

Carbon-neutral LNG cargoes are becoming more common. At least 17 carbon-neutral cargoes were traded in 2021, more than the previous 2 years combined.

## Qatar

Australian LNG producers face increased competition from Qatar.

To seize opportunities in existing and emerging markets, Australian producers should consider innovative business models that add to Australia's appeal as a supplier.

For example, Qatar is bundling LNG supply arrangements with funding for import terminals or equity stakes in LNG infrastructure. It used this model to provide Bangladesh with FSRUs in the past and has asked Pakistan for permission to establish a stake in an import terminal (Mangi 2021).

Qatar has flagged significant expansion plans in its North Field project as it attempts to increase its exports and remain the largest exporter in the world. By 2025, this expansion, valued at US\$29 billion is expected to add 40 per cent to Qatar's LNG exports capacity increasing it to 110 Mtpa from its current 77 Mtpa. According to Wood Mackenzie this is the largest single LNG project in capacity terms to be ever sanctioned.



## United States

Economic analysts predict the US will become the world's largest exporter of LNG in 2022. This is a remarkable turnaround given the US was a major LNG importer in the early 2000s.

The US has more than 25 LNG projects at different stages of approvals. The combined potential capacity of these projects is more than 200 Mtpa – approximately 2.5 times Australia's current LNG export capacity. While some of these projects are speculative, their scale demonstrates the level of investment in US gas exploration and production, as well as the potential to increase US LNG export capacity.

Over the last few years, the US has focused on Asia and is cultivating a diverse customer base. In 2015, the US exported LNG to 15 markets. By 2020 this had increased to 32 markets, including:

- Korea
- Japan
- China
- India
- Taiwan
- Thailand
- Pakistan
- Singapore

In comparison, Australia exported LNG to 11 markets in 2020, with 86% of exports going to Japan, China and Korea (OPEC 2020).

In the 3 months to November 2021, China signed long-term contracts with US projects for more than 130 Mt of LNG over the next 25 years.

China is increasingly signing long-term contracts with the US because they offer pricing flexibility. US LNG contracts can be indexed to the oil price, the Henry Hub (US) or a combination of indices (Munton, Du and Huang 2021).

In supplying LNG to Asia, the US Gulf coast faces shipping constraints through the Panama Canal. Some uncertainty persists in infrastructure required to deliver natural gas from production fields to LNG terminals being built on the US coast. Overcoming these constraints will be critical to US LNG exports achieving forecast LNG export targets.

## Russia

Russia is the world's second-largest gas producer. Most Russian gas is exported to Europe and China via pipelines, but it also started exporting LNG in 2009.

In 2020, Russia's share of the global LNG market was about 8.3% with exports of 30 Mt (BP 2021).

Russia's LNG market share is backed by strong government support, low-cost resources and abundant skilled labour. The government is supporting LNG developments and has set export targets of 80 to 140 Mtpa by 2035 (Kardas 2021). This would double Russia's LNG export capacity by 2030 compared to 2020 levels.

Wood Mackenzie expects Russia to be the third-largest LNG exporter by 2030, and predicts exports of 130 Mt in 2050.



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