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STUDY ON GLOBAL NATURAL GAS PRICES TO END-USERS

FOR

AUSTRALIAN COMPETITION & CONSUMER COMMISSION

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EXECUTIVE SUMMARY AND STUDY OVERVIEW

The countries in this study cover a wide range of pricing, supply/demand, and tax policies, ranging from countries like the United States which sees very low prices due to abundant supply and low tax rates to countries like Sweden which have very high end-user prices due to limited supply and exceptionally high tax rates. Comparing Eastern Australian natural gas markets to the countries analyzed in this study shows that natural gas prices paid by end users in Eastern Australia mirror those across much of Western Europe.

While the natural gas market in Eastern Australia has its own production, domestic natural gas consumption must compete against natural gas volumes for export via multiple LNG export facilities. The competition between the LNG consumption and domestic consumption markets in Eastern Australia is unlike many of the natural gas markets covered in this analysis and is unique.

MAIN PRICE DRIVERS

The two main factors impacting end-user delivered prices are access to diverse natural gas supply and country-specific tax policy. Countries with abundant and varied supply sources such as domestic production, pipeline imports, and LNG imports tend to see lower natural gas prices than countries which are dependent on just one supply source. Additionally, tax policy plays a major role in delivered end-user prices of natural gas. In several of the high-tax countries, more than 50 percent of end-user prices came from tax components.

Delivered industrial prices tend to track closely with wholesale or citygate prices in nearly all of the countries. These wholesale prices in turn follow global price benchmarks, including Henry Hub in US, NBP/TTF in Europe, JKM in Asia, or the price of Dated Brent for long-term LNG supply. Delivered industrial prices in this sector were generally in the range of 5-15 USD/MMBtu for most countries. Delivered residential prices were usually much higher than delivered industrial prices due to the additional distribution costs and higher tax rates for residential end users. Residential prices were generally in the range of 8-30 USD/MMBtu across most countries in this study. On the other hand, wholesale prices, which excludes operational and end-user distribution costs, were in the range of 3-10 USD/MMBtu.

COMPARISONS TO EASTERN AUSTRALIA

The Eastern Australia natural gas market is unique when compared to many of the countries covered in this analysis – while there are several other net-exporting countries included in this analysis such as US, Canada, Denmark, and Malaysia, each of them have at least one or two key differences with the Eastern Australia natural gas markets. When compared to US, Eastern Australia's size of LNG exports in relation to total gas demand is much larger, the supply/demand balance after accounting for LNG exports is not as oversupplied, and the cost of gas production is higher. These differences are due to the shale oil and gas revolution in US where much of its natural gas supply comes from associated gas from oil wells and is produced because of favorable shale oil drilling economics.

Although it is a net exporter, Eastern Australia shares similarities with many of the net importing countries. In Queensland, LNG liquefaction plants compete with domestic demand and prices are more similar to net-importing countries such as those in Western Europe. In Western Europe, the reliance on pipeline imports from Russia and Northern Africa, and the reliance on LNG imports keeps prices higher in almost all of the Western European markets than in net exporting countries like the US and Canada which have more production than they can consume locally.

On the other hand, Victoria's distance from competing LNG export demand causes lower end-user prices in general closer to those in Peninsular Malaysia and UK.

Natural gas prices in the industrial sector across Eastern Australia range between an estimated 8-11 USD/MMBtu which is comparable to a number of countries in this study such as Malaysia (8 USD/MMBtu), the UK (9 USD/MMBtu), Portugal (9.50 USD/MMBtu), and Denmark (12 USD/MMBtu).

From a gas supply infrastructure and geographical perspective, China and Malaysia are comparable with Eastern Australia. All countries have domestic gas production that is far from their where their demand centers are, Eastern coastal cities for China and the Western Peninsular for Malaysia. The key differences between Eastern Australia and these two countries are the state of pricing regulation and accessibility to the LNG markets via regasification terminals.

If Eastern Australia were to fully develop infrastructure connecting to all possible supply, she would mirror China which connects supply from the Western states to the coastal regions and which also has regasification terminals along the coastal cities. However, this may not be feasible for Eastern Australia being a natural net exporter of gas.

Natural gas prices in the residential sector across Eastern Australia range between 15 USD/MMBtu in Victoria to as high as 30 USD/MMBtu in Queensland. The lower residential price range seen in Victoria is comparable to the US (12 USD/MMBtu) and UK (17 USD/MMBtu). Both of these countries have low tax rates on residential natural gas consumption as well as readily available access to natural gas supply, similar to Victoria. The higher residential prices in New South Wales and Queensland are comparable to residential natural gas prices in Spain (28 USD/MMBtu), Switzerland (30 USD/MMBtu), and Chile (34 USD/MMBtu). These countries have little to no domestic production and are almost entirely reliant on pipeline imports or imports of LNG.

COUNTRY OVERVIEW

The table below provides a list of each country included in this study, average prices for household and industrial natural gas consumption, and a brief overview of price drivers and the natural gas market in each country. Based on the analysis conducted for this study, the Eastern Australian natural gas markets share the most similarities with Western Europe, the United States, Canada, Malaysia, and South Korea.

Country	2018 Delivered Prices (USD/MMBtu)		Pricing and natural gas market context
	Residential	Industrial	
US	\$11.97	\$4.06	Significant low-cost domestic production drives excess supply in U.S. market, leading to rapidly expanding export market from US Gulf Coast
Canada	\$8.30	\$4.68	Abundant production resources in Western Canada combined with relatively low domestic demand keep prices low
Denmark	\$30.98	\$11.70	Despite domestic production exceeding in-country demand, prices remain high due to well-above-average tax rates
Malaysia	\$5.91	\$7.88	East Malaysia provides the largest Asian LNG supply. Peninsular Malaysia is the main demand center and needs to import LNG in the foreseeable future. Taxes are generally low. Peninsular prices are shown here.
Switzerland	\$29.52	\$21.54	Moderate-to-high tax rates keep prices elevated despite substantial cross border pipeline access
Germany	\$22.61	\$8.96	Pipeline interconnections with major supply countries especially Russia through Nord Stream keep prices moderate in largest European demand market, although household natural gas taxes are above average
UK	\$17.44	\$8.92	UK supply comes from LNG and domestic supply, while interconnections with mainland Europe allows for swings in flow direction
Spain	\$28.23	\$8.84	Declining demand due to renewables growth reduces LNG imports, although pipeline imports from Algeria and Morocco remain significant
Netherlands	\$27.65	\$8.63	Home to major gas trading hub (TTF). The Netherlands is a major supplier continental Europe as well as the UK. In-country production likely to be limited in the future due to permitting restrictions
Chile	\$34.43	N/A	Chilean natural gas markets see strong correlation with global prices due to high dependence on LNG imports
Sweden	\$39.45	\$14.06	Natural gas market is very small, subject to high tax rates, and entirely dependent on pipeline imports from Denmark
China	\$11.17	\$12.88	LNG and pipeline imports account for one-quarter and one-fifth of demand respectively while the rest comes from local production. Transitioning to an open market with residential and industrial prices becoming more aligned to market prices.
South Korea	\$17.67	\$12.66	LNG imports account for entirety of domestic supply. Despite rapidly growing power demand, prices remain moderate due to low tax rates, adequate and low-cost LNG supply and regulations on wholesale-to-retail margins
Ireland	\$25.75	\$12.23	Increasing domestic production allows for less reliance on UK pipeline imports; market approximately 1/10 size of UK
Portugal	\$26.26	\$9.45	Supply sourced from single LNG terminal and one pipeline from Spain; demand relatively small
Turkey	\$7.60	\$6.94	Major natural gas consumer that sees relatively low prices due to pipeline supply from Russia and Iran
Mexico	N/A	\$4.53	Declining domestic production and increasing demand leave Mexico increasingly reliant on US pipeline gas and US LNG

Source: IEA, Various Government Agencies, ENN, Platts Analytics

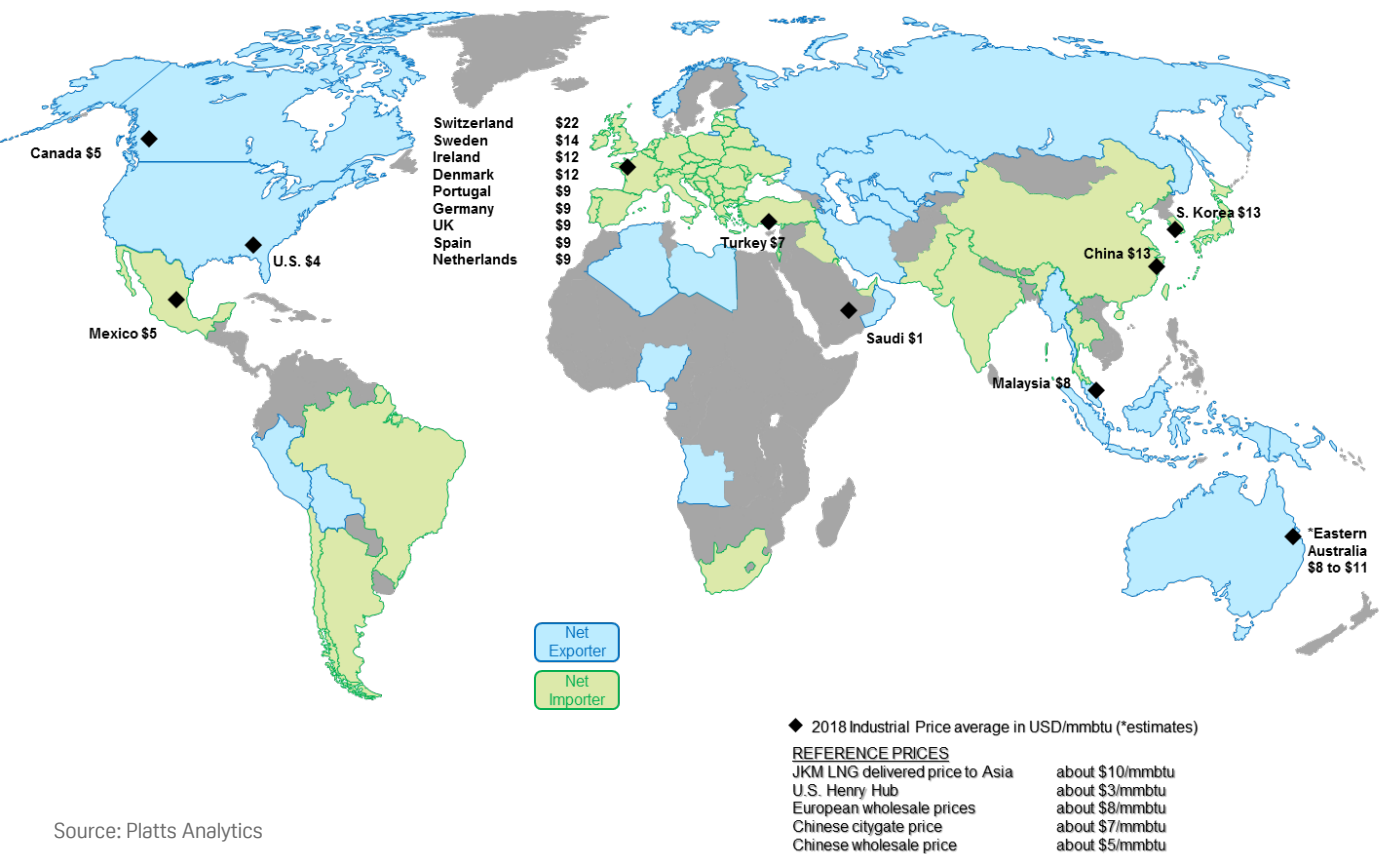
INTRODUCTION

Natural gas, mostly made up of methane, is becoming a global commodity. A few decades ago, natural gas was considered a domestic commodity that stayed within the country or region. Each country's government could manage gas flows and pricing either unilaterally or bilaterally with neighboring countries, without concern for global and other regional events.

Fast forward to today, the individual natural gas markets are now interconnected by the emergence of a vibrant Liquefied Natural Gas (LNG) market. Just as how other major commodities have moved from a local focus to a global market, natural gas has also evolved in similar fashion. With each wave of LNG liquefaction trains and regasification units starting up, the increasing global connectivity can only strengthen the link between domestic and global markets. No longer will natural gas markets stay isolated or insulated from global events and global prices as before.

There are some countries that are trying to buck the trend. These are countries with highly regulated and subsidized gas cost in the residential sector. However, some of these countries are moving gradually towards global prices for reasons which include the long-term sustainability of ever-increasing demand for natural gas and the economic benefits from having an open gas market. The key drawbacks from opening up are dissent from residents paying for higher energy prices and the loss of centralized control of a country's energy assets.

MARKET OVERVIEW



Source: Platts Analytics

The largest producing regions are North America, Middle East, CIS countries, Southeast Asia and Australia. The largest consuming regions of natural gas are North America, Europe, Russia, China and Northeast Asia. North America is both the largest producer and consumer of natural gas however production exceeds consumption. Export infrastructure limits the amount of natural gas and keeps prices there low with arguably the lowest end-user prices among countries who have liberalized their gas and energy markets.

The largest pipeline importing region is Europe with connectivity to Russia, other CIS nations, Northern Africa and Norway. LNG imports forms only a fraction of supply. The largest LNG importing regions include Northeast Asia, China and India accounting for over 70% of LNG imports while the largest LNG exporters are Qatar, Australia, U.S. and Malaysia.

Residential prices vary among countries with absolute prices mostly determined by each county's tax policies although price movements are mostly linked to regional hub prices. The range of wholesale or upstream traded prices was 3-10 USD/MMBtu which industrial prices for each region typically follow. The range of delivered industrial prices was 1-22 USD/MMBtu while that of residential prices was 1-40 USD/MMBtu. Omitting tail-end prices of Saudi Arabia and Switzerland, the range of industrial prices was 5-15 US/MMBtu.

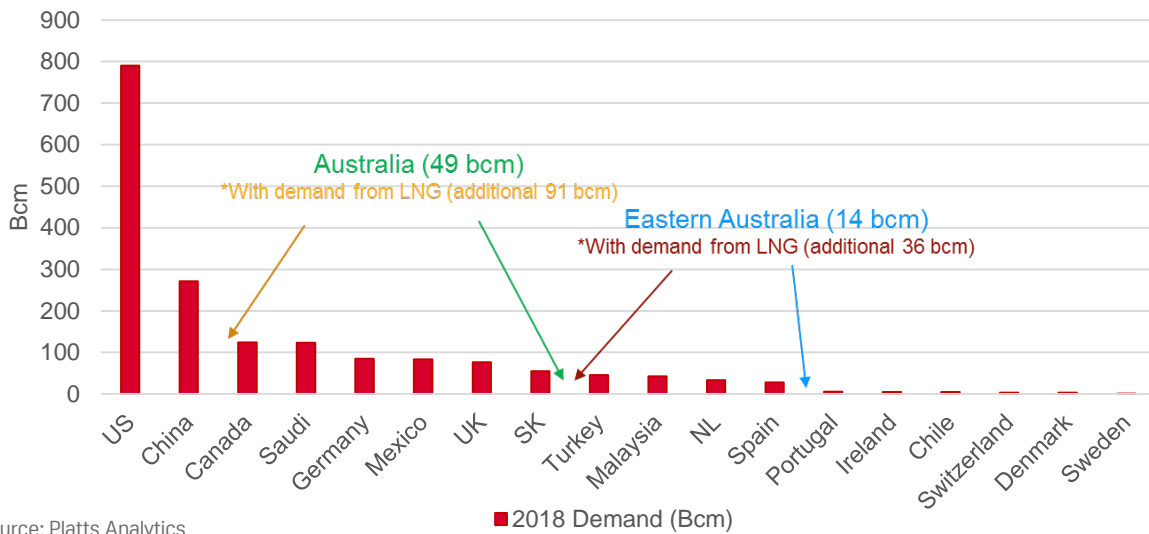
SCOPE OF COUNTRIES COVERED

The countries in this study cover a wide range of pricing, supply/demand, tax policies and end user price scenarios with the objective of having a range of characteristics in which to compare Eastern Australia against. Some of these countries share physical borders with each other but have tariff differences despite being similar to each other.

OVERVIEW OF DEMAND

Focusing on domestic consumption of natural gas in each country (excluding the demand from LNG liquefaction) - Australia and Eastern Australia consumption is 49 bcm and 14 bcm respectively. Including demand from LNG liquefaction, Australia and Eastern Australia would require 140 bcm and 50 bcm respectively. This puts Australia's total demand size in between China and Canada, and Eastern Australia between South Korea and Turkey.

Natural Gas Demand by Country - 2018

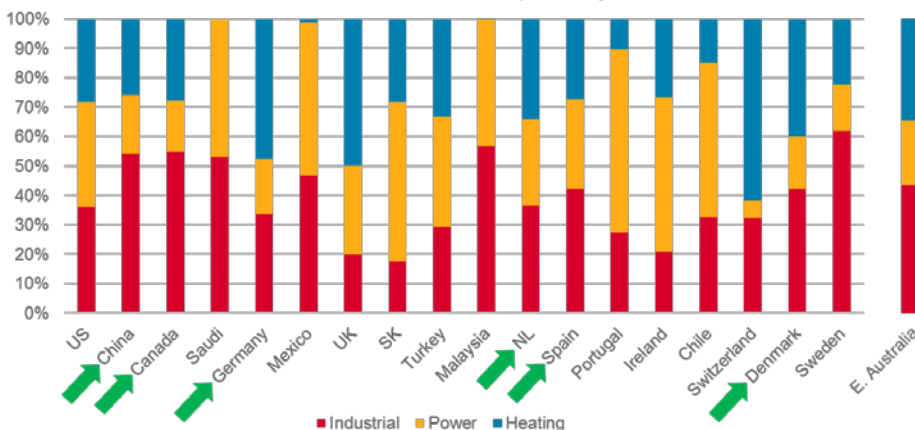


Source: Platts Analytics

Other than LNG liquefaction, natural gas is consumed in industries as a fuel, or as a chemical feedstock such as the production of hydrogen, methanol and fertilizers. It is used in the power generation sector as a generating fuel alongside coal, and as a heating fuel for residential, commercial and public sector use.

In the winter months, the residential and commercial sectors require more heating which directly comes from either natural gas or town gas which may or may not be made up entirely of natural gas. Indirect uses of natural gas come mainly as a generation fuel for power which includes air-conditioning during the warmer months and electric heating. Equatorial countries such as Mexico, Malaysia and Saudi Arabia are countries which require power from generating fuels for cooling and seldom require heating. In general, the further away from the equator, the more heating is required.

Distribution of Natural Gas Consumption by Sector - 2018



Source: Platts Analytics

Eastern Australia has a relatively balanced mix of consumption by sector with a slightly heavier weight of 44% for industries, especially for mining sector use, 35% weight for heating purposes especially in the colder months, and the rest for power generation.

In terms of the sectorial usage ratio, Eastern Australia is most similar to China, Canada, Germany, Netherlands, Spain and Denmark.

COUNTRY PROFILES

Country	Avg Household Price (2018)	Avg Industrial Price (2018)	Supply/Demand Balance	Tax Policy
Chile	\$ 34.43	\$ N/A	Importer	Low
Switzerland	\$ 29.52	\$ 21.54	Importer	Moderate
Sweden	\$ 39.45	\$ 14.06	Importer	High
China	\$ 11.17	\$ 12.88	Importer	Low
South Korea	\$ 17.67	\$ 12.66	Importer	Low
Ireland	\$ 25.75	\$ 12.23	Importer	Moderate
Denmark	\$ 30.98	\$ 11.70	Exporter	High
Portugal	\$ 26.26	\$ 9.45	Importer	Moderate
Germany	\$ 22.61	\$ 8.96	Importer	High
UK	\$ 17.44	\$ 8.92	Importer	Low
Spain	\$ 28.23	\$ 8.84	Importer	Moderate
Netherlands	\$ 27.65	\$ 8.63	Exporter to Importer	High
Malaysia	\$ 5.91	\$ 7.88	Exporter	Low
Turkey	\$ 7.60	\$ 6.94	Importer	Moderate
Canada	\$ 8.30	\$ 4.68	Exporter	Low
Mexico	N/A	\$ 4.53	Importer	Low
US	\$ 11.97	\$ 4.06	Exporter	Low
Saudi Arabia	\$ 1.25	\$ 1.25	Neither	Low

Source: IEA, Various Government Agencies, ENN, Platts Analytics

Prices are in USD/mmbtu

The table above lists the average prices for household and industrial natural gas consumption for each country, alongside whether the country is an importer or exporter of natural gas and the extent of end-user tax policies, sorted in descending order for average industrial prices.

Natural gas prices in importing countries are generally higher than exporters. There are exceptions such as Denmark which has a high tax policy which puts it in the top half of the table for industrial prices. Natural gas prices in the industrial sector across Eastern Australia range between an estimated 8-11 USD/MMBtu which is comparable to the middle half of the table including Malaysia (8 USD/MMBtu), the UK (9 USD/MMBtu), Portugal (9.50 USD/MMBtu), and Denmark (12 USD/MMBtu).

The range of residential prices across Europe mirrors that of Eastern Australia.

Natural gas prices in the residential sector across Eastern Australia are estimated to be between 15 USD/MMBtu in Victoria to as high as 30 USD/MMBtu in Queensland based on local gas retail companies' pricing data. The lower residential price range seen in Victoria is comparable to the US (12 USD/MMBtu) and UK (17 USD/MMBtu). Both of these countries have low tax rates on residential natural gas consumption as well as readily available access to natural gas supply, similar to Victoria.

The higher residential prices in New South Wales and Queensland are comparable to residential natural gas prices in Spain (28 USD/MMBtu), Switzerland (30 USD/MMBtu), and Chile (34 USD/MMBtu). These countries have no domestic production and are entirely reliant on pipeline imports or imports of LNG.

Considering that Eastern Australia is a net exporter of natural gas and has relatively low end-user taxes on gas, the expected residential tariffs would fall within the range of US and Canada and not within the range of European countries which are either net importers or have high end-user tax policies. However, since there is no current policy in Eastern Australian states to prioritize domestic allocation of natural gas, domestic supply squeeze would occur when the LNG industry and upstream natural gas suppliers prioritizes its liquefaction obligations over domestic demand. Eastern Australia's cost of production of natural gas is also higher than those of US and Canada which could explain why prices are not as low as in North America.

NORTH AMERICA

Natural gas prices in North America have seen a dramatic shift over the past decade as a rapid increase in shale gas production from the United States has flipped the country from a net importer to a major exporter of LNG into the global markets. The strong production growth from US shale has impacted prices in Canada as Canadian prices are closely linked to prices in the US due to the amount of natural gas that Canada exports to the US. In Mexico, an increasing reliance on pipeline imports from the United States in the past several years has further linked the natural gas markets of Mexico and the United States.

The growth of low-cost shale production, as well as the rapid increase in dry-gas focused drilling in the US Northeast has allowed for North American gas prices to largely decouple from global pricing benchmarks linked to oil or LNG since the start of the current decade.

UNITED STATES

From 2000 through 2010, wholesale prices measured at the US benchmark Henry Hub largely moved in line with global oil and/or LNG prices as the country was an importer of LNG, bringing in LNG cargoes to multiple LNG regasification facilities along the US Gulf Coast and in the US Northeast demand markets.

In addition to its dependence on imported LNG volumes to supply up to 5 percent of annual demand during the mid-2000s, the US was highly dependent on natural gas production from the US Gulf Coast with the bulk of production coming from the states of Texas and Louisiana. In 2005, combined production volumes from Texas and the US Southeast markets (Louisiana, Alabama, and Mississippi) accounted for 284 Bcm, providing more than 55 percent of total US production.

With the bulk of US production centered near the US Gulf Coast and widespread demand regions in the US Northeast, Mid-Atlantic, and Midwest markets, the US steadily developed a large pipeline transportation grid which historically moved production north to meet demand in the northern half of the country. US demand was primarily centered in the home heating and industrial demand sectors, as the power sector accounted for approximately 25 percent of US demand in 2005.

Shale gas production in the United States began to enter the market in the mid-to-late 2000s in places like the Haynesville shale in Louisiana and Texas. The most significant impact from shale, however, started to appear in 2010 as natural gas production from the Marcellus and Utica shale formations in the US Northeast began to grow rapidly.

The US Northeast produced 35 Bcm in 2010, accounting for just six percent of total US production. By 2018, Northeast natural gas production reached nearly 300 Bcm and accounted for more than 35 percent of US production.

The rapid increase in domestic natural gas production in the United States had a number of impacts on the US natural gas markets. Due to its previous position as an importer of LNG, the US had plenty of infrastructure to import LNG, but no ability to export LNG from the country. While the US exported a small percentage of its production to Mexico via pipeline, that demand source remained at less than 5 percent of the total US demand market.

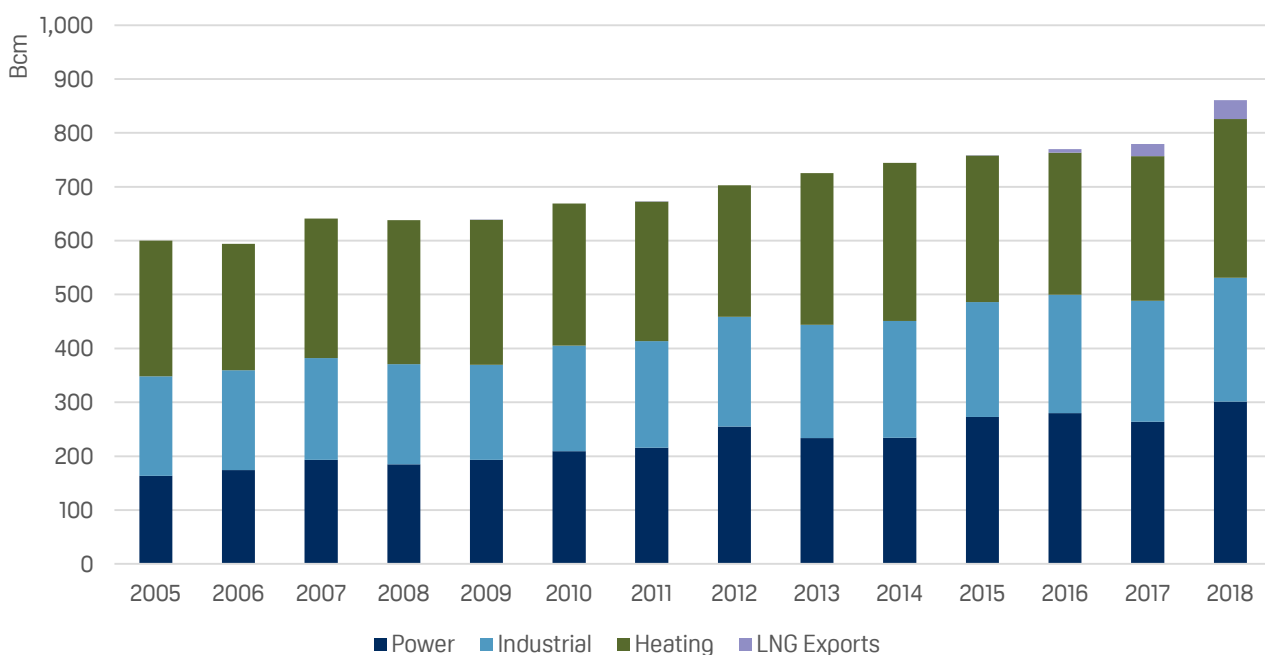
With an excess of supply in the US market and relatively little ability to send that gas into the global markets, natural gas wholesale prices measured at Henry Hub have remained between \$3/MMBtu and \$5/MMBtu for the majority of the past decade, compared to multiple periods that saw prices above \$10/MMBtu between 2000 and 2010.

Lower wholesale prices and a consistently oversupplied market over the past decade have made natural gas for electricity generation more competitive than coal used for electricity generation across much of the United States power sector. As a result, natural gas demand for electricity generation has increased from 185 bcm in 2008 to over 300 bcm in 2018, more than the growth of all other demand sectors combined.

As production in the United States has continued to grow rapidly into the latter half of the decade, significant investments have been made to turn LNG facilities previously used to import natural gas into facilities used to liquefy natural gas and export LNG into the global markets.

This shift in supply and demand dynamics has seen a wave of infrastructure investment in LNG liquefaction facilities along the US Gulf Coast, as well as massive pipeline overhauls and new pipeline construction in order to reverse much of the flow corridors in the United States. With much of the production growth centered in the US Northeast over the past decade, pipeline expansion and reversal projects have been constructed to move gas from north to south, a dramatic shift from the previous decades which saw pipeline natural gas move from the US Gulf Coast into the Midwest and Northeast markets.

Total US Demand



END USER PRICES

Natural gas prices for use in the industrial and power generation sectors in the United States follow very closely to wholesale prices measured at the US Henry Hub. In general, prices for natural gas in the industrial and power generation sectors are 50 percent lower in the current decade compared to 2000 through 2010.

Natural gas prices for household users move directionally with Henry Hub wholesale prices, although they remain approximately two to three times higher than wholesale prices due to additional distribution costs.

Large consumers of natural gas like industrial facilities and natural gas power plants generally source their supply from large, interstate natural gas pipelines which charge transportation and usage tariffs that are regulated at the state and federal level. Household users, which consume substantially less natural gas than industrial or power customers, are served by local distribution companies and utilities which often have their own pipeline distribution networks. The operation and maintenance costs of these local distribution networks are passed onto the consumer, resulting in significantly higher end use prices in the household sector than for industrial or power generation customers.

Furthermore, wholesale prices in the US natural gas markets can vary substantially based on geography, as there are numerous sub-regions of the country’s natural gas markets that have different supply, demand, and infrastructure considerations that can dramatically alter prices. Recently, single day prices in the US Northeast and New England have reached \$100/MMBtu while prices in the Permian basin in West Texas and New Mexico have dipped below \$0/MMBtu for weeks at a time.

CANADA

The Canadian natural gas market is very closely linked to supply and demand fundamentals and price movements in the US natural gas markets. As a result, end users in Canada pay comparable prices to those in the United States due to the infrastructure link between the two countries.

Canada is a major producer of natural gas on a global scale, producing approximately five percent of global natural gas production. Canada's demand market is much smaller than the amount of natural gas it produces each year, which means that the balance of the country's production must be exported via pipeline to the United States through a number of corridors that connect different sub-regions in Canada with various supply and demand markets in the US.

Canada's natural gas market can be split into two distinct zones – the western half of the country which produces nearly all of the country's natural gas and the eastern half of the country which has nearly no production and half of the country's natural gas demand.

Historically, the eastern half of the country saw price premiums relative to the western half of the country due to its distance from and lack of easy access to supply. Pipeline gas into Eastern Canada had to either flow across the entire country from western Canada, or flow up from the US Gulf Coast and price high enough to incentivize natural gas to bypass the major demand markets in the US Midwest and Northeast.

Production growth in the US Northeast has impacted prices in Eastern Canada as well, as a wave of new infrastructure projects to export US gas into Eastern Canada has kept a lid on prices in that demand region. Prices in western Canada remain well below the eastern half of the country due to excess production and infrastructure constraints moving that natural gas to downstream markets.

MEXICO

The Mexican natural gas and energy markets are currently undergoing a significant shift as they move towards a widespread energy market liberalization and away from a state-run pricing regime.

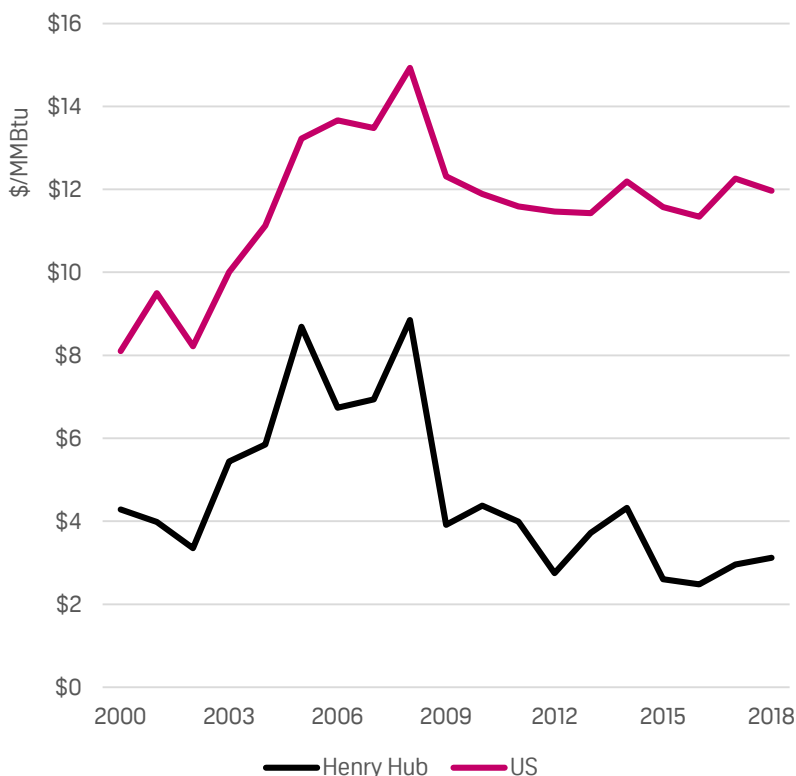
Historically, prices in Mexico were tied to prices in the US, as the state-administered price was linked to Henry Hub with adjustment factors for transportation costs. Despite the added transportation costs of moving natural gas from the Henry Hub in Louisiana, state-regulated wholesale prices in Mexico were often below the Henry Hub price due to subsidization.

By the mid-2010s, the Mexican natural gas and energy markets began to trend towards less top-down regulation, and less state involvement in the price of natural gas. Natural gas demand in the country has been rising steadily for the past two decades, largely driven by the power sector. In particular, recent years have seen a strong shift away from the use of heavily-polluting fuel oil in the power generation sector in favor of cleaner burning natural gas.

At the same time that domestic natural gas consumption has been rising, domestic natural gas production has been falling sharply due to a lack of investment, primarily in offshore drilling programs in the Mexican portion of the Gulf of Mexico. The increase in domestic production combined with the decrease in domestic production has made the natural gas market in Mexico increasingly reliant on pipeline imports from the US as well as imported LNG due to currently inadequate pipeline infrastructure between the US and Mexico.

The increasing imbalance in the Mexican market as well as a move away from a state-run pricing framework has pushed wholesale natural gas prices above slightly Henry Hub in the US, although prices paid by end users in the industrial, power generation, and household sectors remain comparable to the US.

Henry Hub and North American Household NG Prices



Source: Platts Analytics, EIA

EUROPEAN MARKETS

The ten countries included in the European natural gas market analysis cover a wide range of market conditions, based on infrastructure, supply and demand fundamentals, and tax policy. There are a number of factors that impact end-user pricing in Europe, but the two biggest factors are access to diverse sources of supply and tax policy.

Both wholesale and end-user natural gas prices across Europe are higher than those in North America, as the continent's net short position requires natural gas imports via both LNG and pipeline gas. Due to its position as a net importer, Europe must compete in the global market for LNG cargoes which could otherwise route to Northeast Asia, Southeast Asia, Latin America, or other global demand markets.

Europe has a number of varied supply sources, include domestic production in the UK, Norway, and Netherlands, pipeline imports from Russia and Algeria, as well as dozens of LNG import terminals to multiple countries across Europe.

Countries that have diverse sources of supply from multiple streams including pipeline imports, LNG imports, and domestic production as well as low tax rates generally see the lowest end user prices across the industrial, power generation, and household sectors.

Countries in this grouping include the UK and Turkey, which both have multiple sources of imported pipeline gas, multiple LNG import terminals, and low-to-moderate tax rates.

On the other end of the spectrum, countries with limited supply optionality and high tax rates tend to see some of the highest natural gas prices across all end use sectors in the study.

These countries often have no domestic production, are entirely reliant on pipeline imports from a single country, and have tax rates above 20 percent on natural gas for industrial use and above 40 percent for household use. Countries in this grouping include Sweden, Denmark, and Switzerland.

Europe has two major gas pricing hubs that serve as signals to the broader global gas market about the supply and demand conditions in Europe. The Dutch Title Transfer Facility (TTF) hub effectively sits at the center of the European gas market, offering substantial pipeline interconnectivity to much of the rest of the continent, including to the UK. In the wholesale market, much of the gas in Northwest Europe trades at a differential to TTF.

The National Balancing Point (NBP) hub serves as the virtual trading point for the exchange of natural gas in the UK. The difference in pricing between these two hubs can provide an informative signal to indicate the supply and demand balance of Northwest Europe near the TTF hub and the supply and demand balance in the UK via the NBP hub.

Due to the LNG import capabilities of numerous European countries, NBP and TTF can be thought of as European-specific pricing hubs that indicated the relative supply/demand balances on the continent that need to fluctuate enough with global prices to incentivize LNG cargoes to deliver to Europe instead of other competing markets.

UK

The NBP hub in the UK is one of the two most important European hubs in relation to the global market, due to the UK's role as an LNG importer as well as its pipeline interconnectivity with continental Europe. The UK gas markets imports a significant amount of its natural gas supply via its multiple LNG terminals, with LNG imports to the UK serving as the third largest source of supply behind pipeline imports from Norway and domestic production.

While the UK imports a significant amount of gas from Norway and via LNG imports, it also serves as a swing supplier into Belgium via the Interconnector pipeline which has bi-directional flow capabilities to move gas either from the UK to Belgium or from Belgium into the UK. This pipeline physically links the UK and NBP prices to prices in Belgium near the Zeebrugge LNG hub.

The UK's position in the European natural markets makes it well-placed to access multiple sources of supply, as well as serve as a swing supplier into continental Europe. The physical infrastructure in the UK combined with an exceptionally low tax rate compared to much of the rest of Europe allows for natural gas prices to remain on the lower end of the spectrum across Europe. Tax rates on natural gas are substantially below the rest of Europe, hovering near three percent for industrial consumers and five percent for households. This compares favorably to the rest of Europe, where industrial taxes average near 10 percent and household taxes are closer to 20 percent on average.

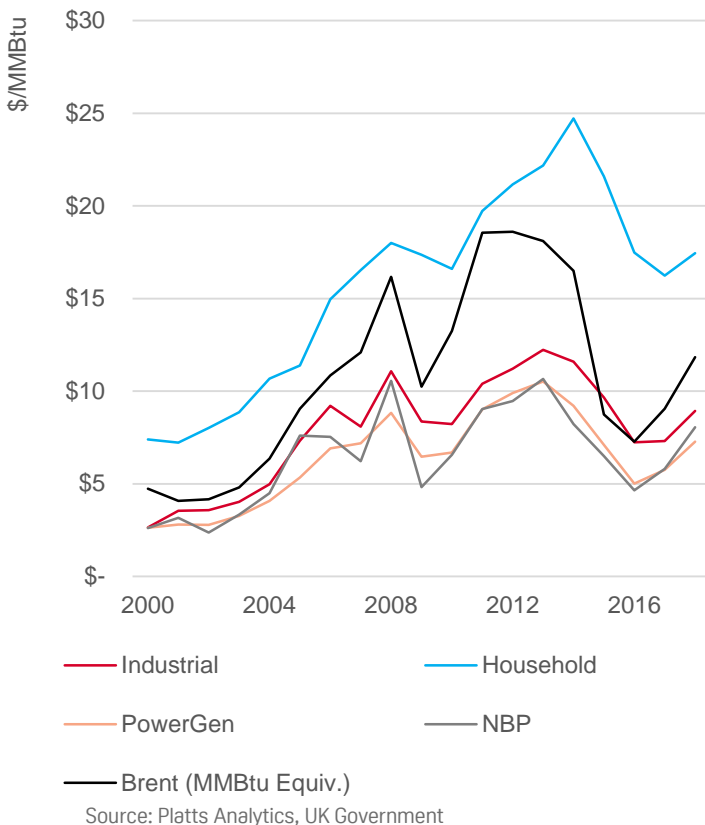
IRELAND

While the UK and Ireland are geographically very close together, the supply/demand balance and infrastructure between the two countries ensures that prices in Ireland nearly always trade at a premium to those in the UK. Prior to 2016, the entirety of Ireland's natural gas supply came via the Moffat pipeline from the UK. With the Irish natural gas market effectively captive to supply sourced via a single pipeline from the UK, Irish prices have tended to float above those in the UK in order to cover the costs of transport from the UK into Ireland.

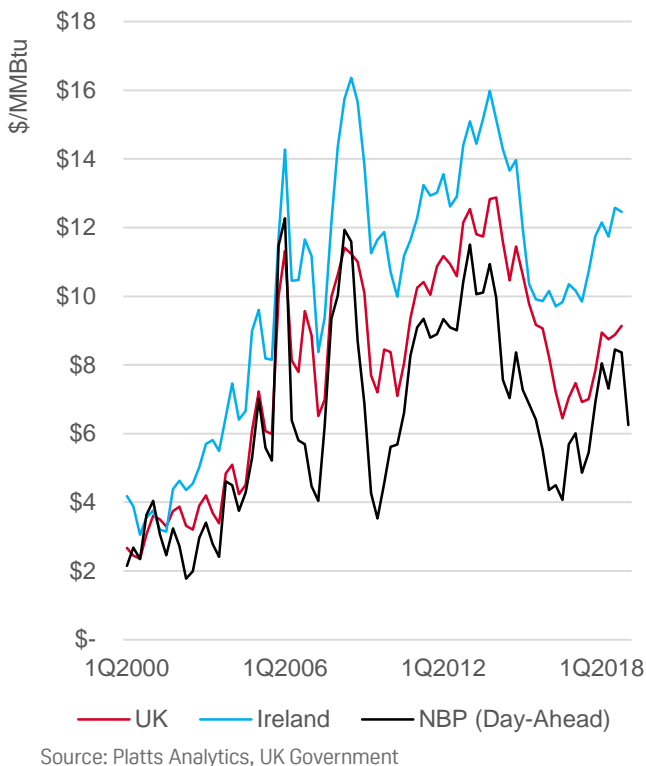
In 2016, Ireland began producing natural gas domestically from the Corrib gas field, lessening its dependence on pipeline imports from the UK. Currently, approximately half of the natural gas consumed in Ireland comes via domestic production at Corrib while the rest is still sourced via pipeline interconnection with the UK.

In spite of the lower reliance on pipeline imports from the UK, end user prices in both the industrial and household end-use sectors tend to trade above those in the UK due to higher tax rates in Ireland. Compared to the three and five percent tax rates and industrial and household natural gas in the UK, Ireland's tax rates of 11 percent on industrial consumption and 17 percent on household consumption are substantially higher. Ireland's growing natural gas consumption combined with concerns about the longevity and resilience of its domestic production suggest that Ireland is likely to remain reliant on pipeline imports from the UK for the foreseeable future, keeping prices above those in the UK.

UK Natural Gas Prices



UK, Ireland Industrial Prices; NBP Hub



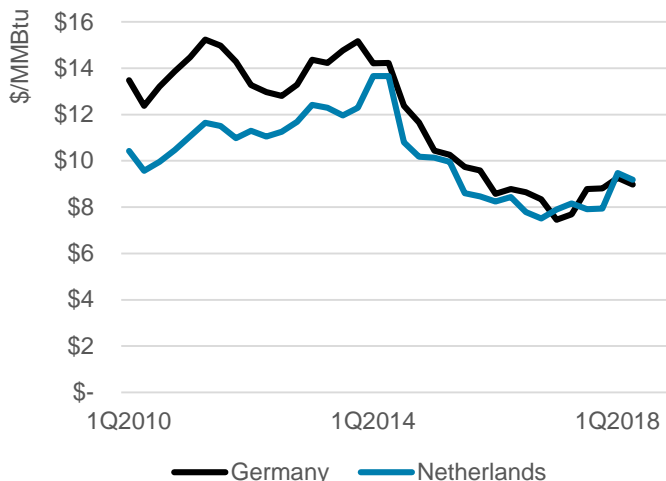
NETHERLANDS

The Netherlands is home to arguably the most important European natural gas hub, the TTF hub which is similar to the NBP in the UK. The TTF hub serves as a bellwether for the supply/demand balance of the European continent, largely due to the interconnectivity of the Netherlands to other countries in Europe, with pipeline interconnects with Belgium, Denmark, Germany, Norway, and the UK, as well as the ability to import LNG at the Gate LNG regasification facility.

Pipeline interconnectivity and supply optionality in the Netherlands is very similar to that of the UK, having numerous pipeline interconnects, domestic production, as well as LNG import capabilities. Domestic production in the Netherlands, however, has been in a sharp decline over the past several years due to permitting restrictions at the Groningen field which has limited domestic production. This reduction in domestic production has slowly changed the Netherlands from a large net exporter to a net importer of gas into the country.

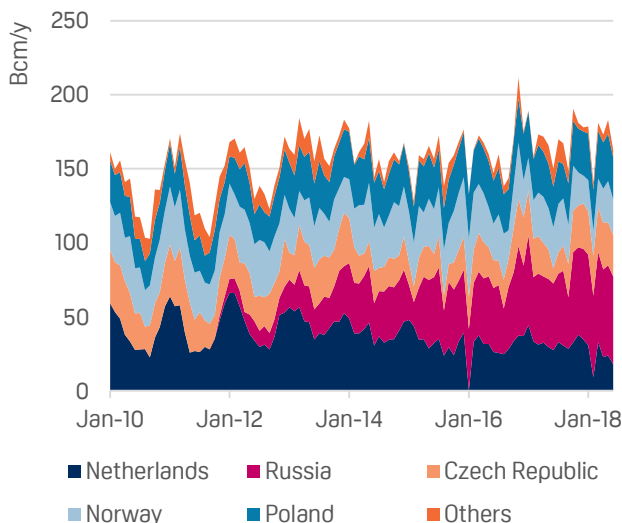
Despite many similarities in infrastructure and supply/demand balance between the UK and the Netherlands, as well as wholesale prices at the NBP and TTF hubs that tend to trade very closely together, end use prices across all sectors are higher in the Netherlands than in the UK. Prices for household natural gas consumption in the Netherlands averaged more than \$25/MMBtu in 2018, despite wholesale prices at the TTF hub averaging less than \$8/MMBtu during the year. Much of the reason for this discrepancy is the high tax rates charges to household natural gas consumers, which has exceeded 50% since 2016.

Germany, Netherlands Industrial Gas Prices



Source: Platts Analytics, Various Government Agencies

German Pipeline Imports



Source: Platts Analytics

GERMANY

Germany is the largest consumer of natural gas in Europe, consuming approximately twice as much natural gas in 2018 as domestic Australian consumption (excluding LNG exports in Australia). Despite its position as the largest natural gas consumer in Europe with minimal domestic production, prices for end users across all industries in the country remain moderate due to substantial pipeline interconnectivity and optionality to source gas via numerous different supply routes.

Historically, Germany imported as much as 30 percent of its natural gas supply from the Netherlands, which linked together prices in those two countries with a price and transportation premium in Germany. In addition to its pipeline interconnection with the Netherlands, Germany is able to source gas from Poland, Norway, and the Czech Republic, as well as a major interconnection with Russia. Germany also has small amounts of pipeline exports to Switzerland, Belgium, and Austria.

Prior to 2015, the largest supplier into the German market was far and away the Netherlands, as five different pipelines brought gas from the Netherlands into Germany. As a result, German industrial natural gas prices often traded at a premium to industrial prices in the Netherlands, as Germany's large demand market sat downstream of supply in the Netherlands. The Nord Stream pipeline from Russia, which entered service in late 2011 and really began ramping up into 2014 and 2015 lessened the need to import pipeline gas, breaking the historic price premium for German gas as compared to gas in the Netherlands. This framework in Germany of high demand but relatively moderate prices highlights that high demand does not necessarily correlate with higher prices, as the largest demand market in Europe has slightly below average prices due to its proximity to multiple, varied supply sources.

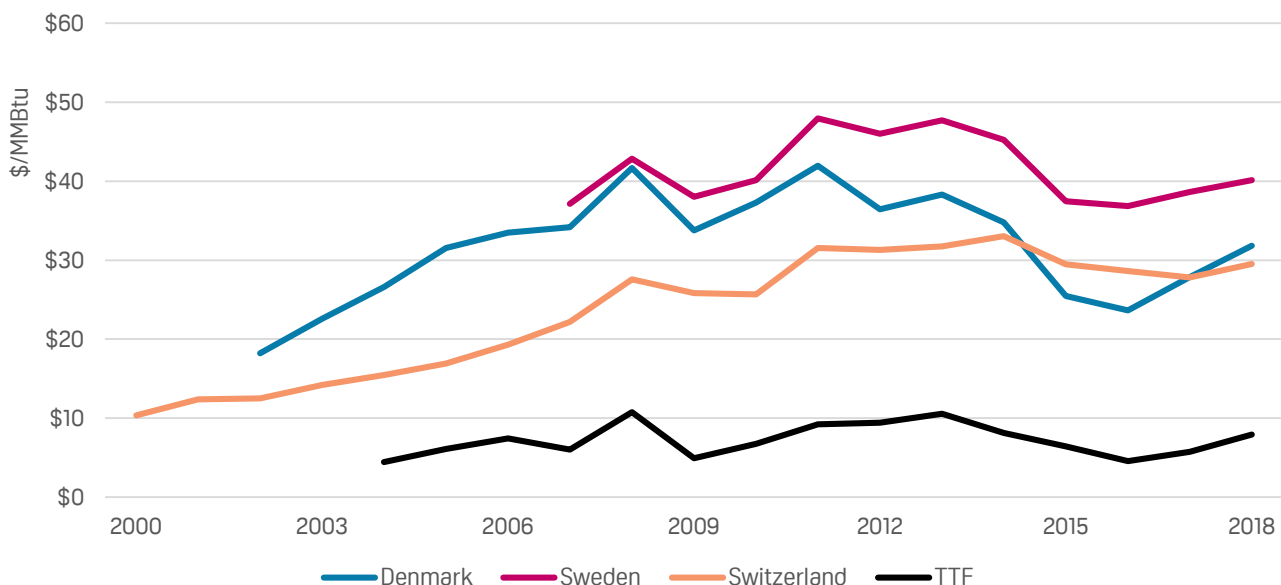
DENMARK

Despite having its own domestic production that outpaces in-country natural gas demand, Denmark’s status as an export country do not guarantee that its natural gas customers see low prices as is the case in many exporting countries. Prices for industrial and household natural gas consumption tend to correlate with movements at the TTF hub in the Netherlands, although absolute prices in Denmark are substantially above average due to high tax rates on both industrial and household natural gas consumption.

In 2018, Denmark’s 25 percent tax rate on industrial natural gas consumption and 55 percent tax rate on household natural gas consumption added significant premiums to the prices that end users in the country pay. Denmark’s tax rates in 2018 put the country at the highest tax rate for industrial and household consumption in the ten-country European study.

Denmark serves as an example of a country with above average supply optionality and domestic production that sees exceptionally high end-user prices as a function of exceptionally high tax rates.

Household NG Prices in Denmark, Sweden, Switzerland



Source: Platts Analytics, Various Government Agencies

SWEDEN

Sweden is a very small natural gas market, with total demand across all sectors of less than 1 bcm in 2018. The Swedish power sector is dominated by nuclear and hydroelectric energy generation, while the home heating market is primarily electric rather than natural gas.

While Swedish prices see some correlation with global benchmark hubs like TTF or Brent, Swedish prices are more closely related to prices in Denmark. Sweden’s only source of natural gas supply comes from Denmark via the Dragor pipeline – Sweden has no LNG import capabilities and no domestic production. Sweden is one of the clearest examples in this study of a country that is entirely captive to supply from a single source – as a result, end-user prices in Sweden can be defined as prices in Denmark plus the cost of transportation on the Dragor pipeline.

SWITZERLAND

Swiss natural gas prices are among the highest in Europe despite a well-connected pipeline grid, with substantial interconnections to the pipeline grids in Germany and France. Due to its connection with both the German and French pipeline grids, prices in Switzerland show some correlation with European benchmarks like TTF in the Netherlands or PSV in Italy, although a steady increase in tax rates over the past decade have somewhat decoupled end user prices from global benchmarks.

Overall, natural gas demand in Switzerland is extremely low, partially due to very high nuclear and hydroelectric electricity generation (similar to Sweden). Switzerland’s tax rate on industrial natural gas consumption exceeded 25 percent in 2018, making it the highest tax rate on industrial demand in this study. In addition to high tax rates for industrial gas and moderate-to-high tax rates on household consumption, industrial and household natural gas consumers are required to contribute a fee for natural gas security.

In the past decade industrial natural gas prices in Switzerland have averaged nearly \$20/MMBtu, approximately \$8/MMBtu higher than in Germany despite Germany being the largest supplier to the Swiss natural gas markets.

SPAIN

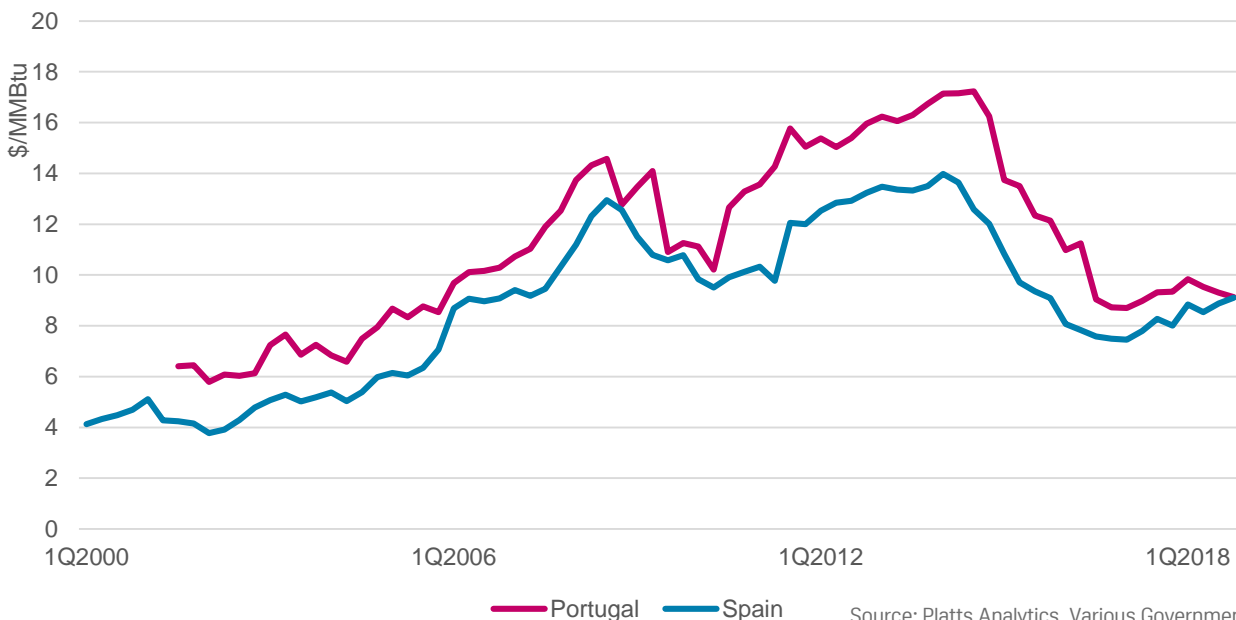
The previous seven countries included in the study of European natural gas prices have all been physically connected to either NBP or TTF, Spain is an outlier in that regard as it shared little direct physical link to gas hubs Northwest Europe or in the UK.

Despite not sharing a substantial direct physical link between Spain and large, liquid natural gas hubs further north, Spain does compete against the NBP and TTF pricing hubs due to the amount of LNG that the country imports. In 2010 approximately 75 percent of the inflows to Spain came via LNG; by 2018 that percentage had fallen to approximately 45 percent of total supply into Spain.

The decrease in LNG’s role in supplying Spain has been more of a function of declining demand in the country as opposed to an alternate source of supply squeezing out LNG imports. While Spain imports a significant amount of its supply via pipeline interconnections with Algeria and Morocco, those volumes have been relatively steady over time.

Total natural gas demand in Spain has been declining for the past decade, as aggressive renewables policy has squeezed natural gas out of the power generation sector.

Spain, Portugal Industrial Gas Prices



PORTUGAL

Natural gas prices in Portugal see a strong linkage to prices in Spain, as the country imports approximately half of its supply via pipeline from Spain while the rest is sourced at the country’s single LNG facility. Portugal’s reliance on Spain to supply pipeline gas is somewhat similar to the relationship between Denmark supplying natural gas to Sweden downstream. In both instances, the downstream customer (Portugal and Sweden) tend to pay more for their natural gas than the upstream supplier (Spain and Denmark).

The comparison is not entirely warranted, however, as Portugal does source a large portion of its total gas consumption from its LNG facility, lessening its reliance and price linkage to Spain. Further, tax prices in Portugal are significantly lower than those in Sweden, showing that countries with similar supply/demand balances can see significantly different end user prices due to tax policies.

TURKEY

In the ten European countries analyzed for this study, Turkey is arguably the most distinct of all ten countries by a wide margin. Turkey’s geographic location largely isolates it from the rest of the European market, as it is almost entirely a net importer of pipeline gas from Russia and Iran, in addition to gas imports sourced via its two LNG terminals.

Despite being entirely reliant on imports via pipeline and LNG, Turkey’s domestic natural gas market has grown steadily over the past decade, largely driven by increasing natural gas consumption in the industrial and household sectors.

Turkey’s growing natural gas demand and reliance on natural gas imports has not adversely impacted the prices paid by natural gas consumers in the country, as the country’s close proximity to production gas from Iran and Russia keeps natural gas prices in all sectors well below prices in Europe and more similar to prices in the US which is a major natural gas exporter.

LATIN AMERICA AND MIDDLE EAST

Along with our analysis of countries in North America and Europe, we also took a look at Chile in Latin America and Saudi Arabia in the Middle East. In addition to being geographically distinct and separate from the North American and European markets, pricing movements in both countries tend to be more nuanced as well.

CHILE

Natural gas prices in Chile see strong correlation with prices in the global market due to the country’s high reliance on imports via its two LNG terminals or from pipeline gas sourced from Argentina. Chile is the fifth-largest consumer of energy on the continent, but unlike other large economies in South America (Argentina, Brazil, etc.) it is a relatively minor producer of fossil fuels. As a result, Chile remains highly dependent on imports to satisfy its domestic consumption needs – Chile’s prices for natural gas in the household market are some of the highest across all countries that we studied for this project.

In the late 1990s, Chile made substantial investments in natural gas pipeline and distribution systems to deliver to its industrial and power generation sectors – very little natural gas use in the home heating market segment Chile sourced nearly all of its natural gas supply from Argentina until the late 2000s, when Argentina began to increase its domestic subsidy for natural gas in the residential sector, thereby increasing demand for natural gas and limiting the amount of gas available for export into Chile.

As a result, Chile began the construction of two LNG import facilities to lessen its reliance on Argentinian natural gas. Chilean natural gas prices tend to track with the global market, as the country largely sources its supply via LNG.

SAUDI ARABIA

For this study, we chose to look at Saudi Arabian prices and policies to serve as a sharp contrast for nearly every other country included in this analysis. While the rest of the countries included in the presentation are partially or entirely deregulated, Saudi Arabia has a very strict, top-down control over the natural gas prices paid across all industries.

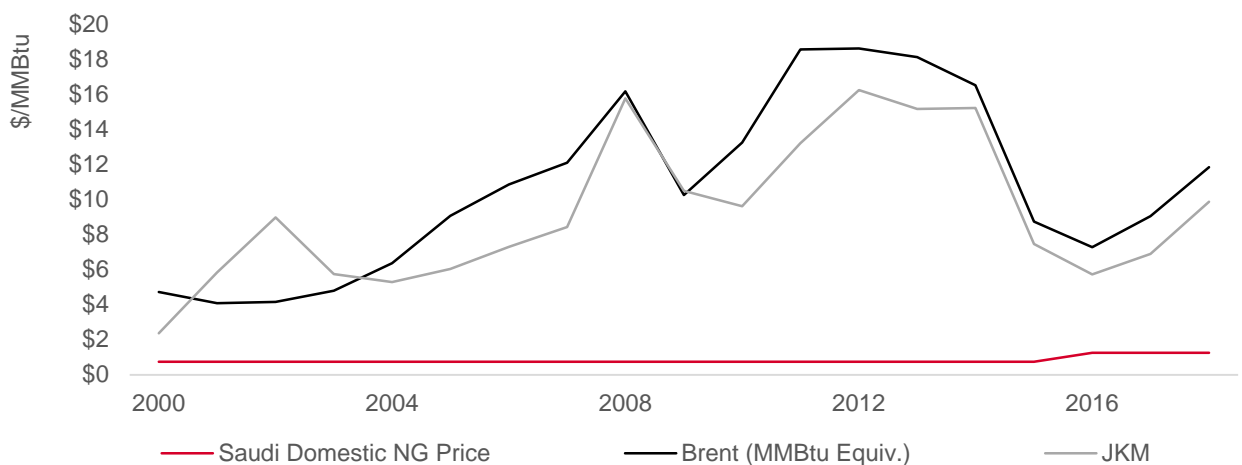
This command and control of domestic natural gas prices spills over into the domestic consumption markets as well. Despite their massive natural gas reserves that place Saudi Arabia among the top reserves in the world, the country does not export significant amounts of natural gas.

As a matter of national policy, Saudi Arabia neither imports nor exports natural gas, choosing to remain self-sufficient by using a rationing structure to allocate natural gas to domestic consumers.

Unlike nearly every other country in this study, Saudi prices show absolutely no correlation with global prices in the rest of the world. For many years, natural gas prices in Saudi Arabia were held at a rate of \$0.75/MMBtu across all industries due to strong domestic subsidization of natural gas and all energy commodity prices within the country

In 2016, policies shifted during an energy industry reform, and the price of natural gas in all industries rose from \$0.75/MMBtu to \$1.25/MMBtu.

Saudi NG Prices and Global Benchmarks



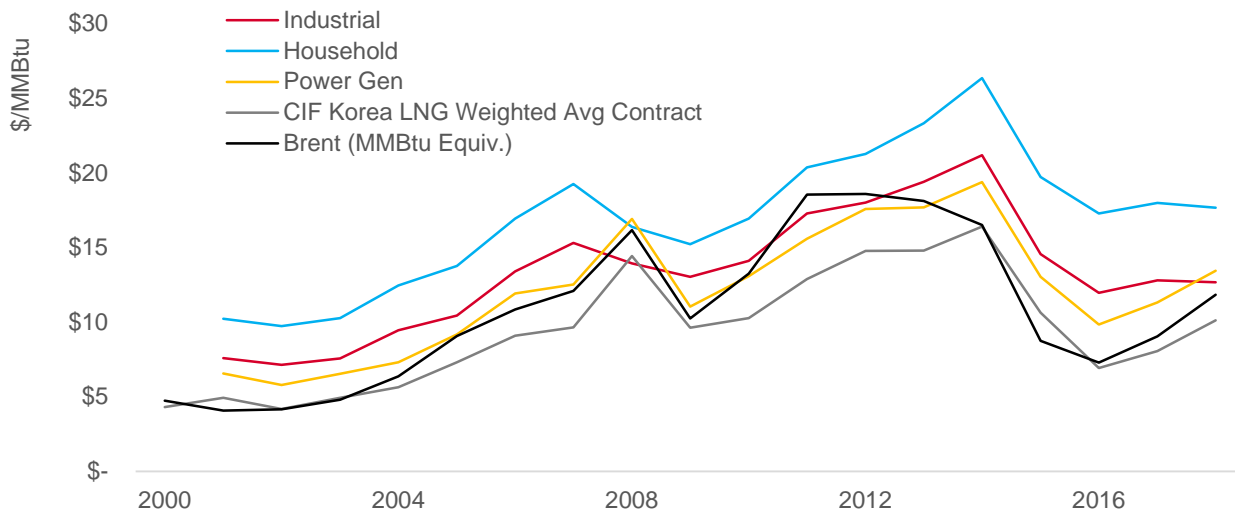
Source: Platts Analytics

ASIA

SOUTH KOREA

South Korea is entirely reliant on LNG imports to feed its natural gas consumption market – it has no international pipelines and negligible domestic production. The country is the 3rd largest LNG importer in the world. South Korea’s natural gas industry is dominated by Korea Gas Corporation (Kogas) which owns three of the country’s four LNG import terminals, the country’s transmission system, and more than 90% of storage capacity, in addition to being a near-monopoly of natural gas imports. Kogas’ bargaining power helps South Korea achieve competitive pricing for its LNG contracts.

South Korean Natural Gas Prices



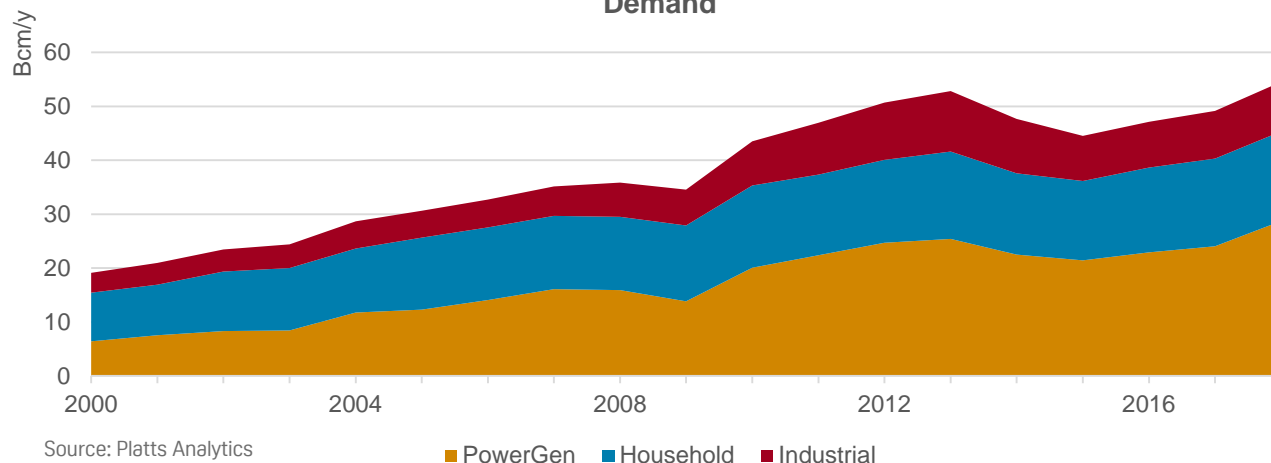
Source: Platts Analytics, KEEI

Across all sectors, prices track the weighted average cost of delivered LNG to Korea, as well as the price of Brent expressed on an MMBtu basis. This is because the Korea City Gas Association regulates wholesale and distribution margins. The largest impact of this policy is on the industrial sector where wholesale prices are subsidized, and such subsidies are essentially passed down to industrial end-users as distribution margins are also regulated.

Despite its reliance on imported LNG to feed its natural gas sector, South Korean natural gas demand has increased from approximately 20 bcm in 2000 to upwards of 50 bcm in 2018 driven largely by increases in the power sector.

Growing natural gas consumption as well as being entirely reliant on LNG imports have not adversely impact prices for natural gas consumers, as end-user prices in Korea are on par with many of the European countries on the lower-end of the pricing spectrum in this study. Much of the reason for lower-than-expected prices are its relatively low-cost LNG contracts and its regulations on price margins despite being heavily reliant on LNG imports and despite the near-monopoly status of its importer.

South Korean Natural Gas Demand



Source: Platts Analytics

■ PowerGen ■ Household ■ Industrial

CHINA

Natural gas prices in China have come a long way. The Chinese market moved from a highly-regulated market to its current state where the government is transitioning into a deregulated market.

BACKGROUND OF CHINESE NATURAL GAS PRICE POLICIES AND REFORMS

Up to 1986, China had a unified wholesale price. In the unified price regime from the 1950s, natural gas prices moved from RMB 0.03/m³ to RMB 0.08/m³ from a policy of promoting natural use at the initial stages to a policy of incentivizing production later on when supply was limited.

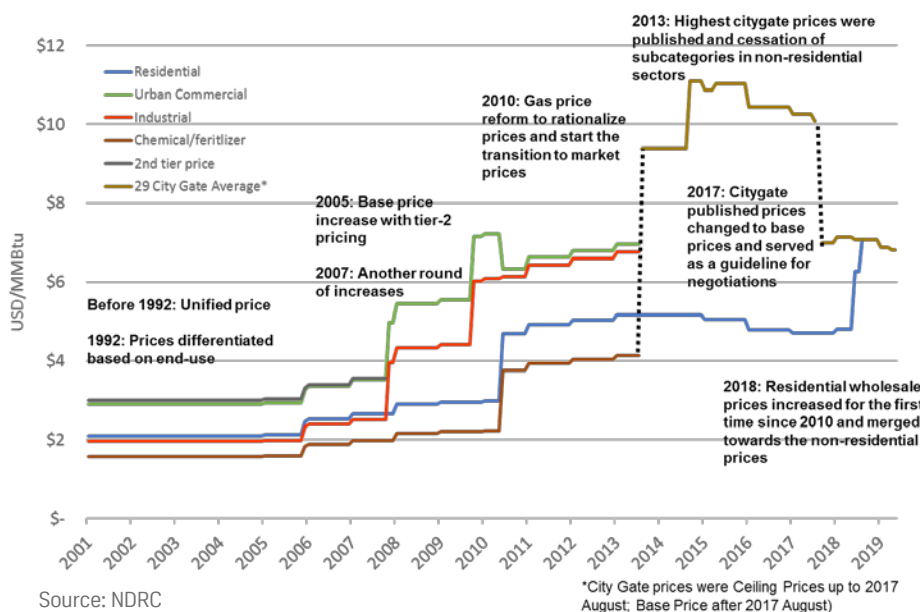
In 1992, there was a move to differentiate prices based on natural gas usage. This was split into Residential, Commercial, Chemicals/Fertilizer and Industrial. Prices for power generation are not transparent and only certain provinces report them sporadically. At this time, tiered-level pricing was introduced which could be charged when there was more demand than the existing production quota. At that time this was RMB 0.90/m³ or almost twice the price of base price.

Certain places such as Sichuan, Guangdong and Guangxi had their own pricing while the rest of China generally followed one regulated price. During the years 1994 to 1997, the Chinese government mandated that Sichuan gas prices converge to the wider Chinese prices. In 1997, despite Sichuan’s prices still being higher than the national regulated prices, the NDRC accepted that Sichuan province had closed the gap. The only marked difference observed in the change was for industrial prices in Sichuan. Sichuan’s industrial gas price was much lower than the national average prior to 1997 resulting in a benefit for businesses to locate their industrial activities there. However since 1997, Sichuan industrial gas prices were above the national average and industries no longer enjoyed this benefit.

In 2005 and 2007, there were further increases in base price and tier-2 prices. The purpose of tier-2 prices were to incentivize producers to increase gas supply and sell more gas. The last round of price increases under this policy regime was in 2010.

In 2009-2012, NDRC performed another round of price reform studies resulting in the policy currently being implemented. The objective of this policy was for prices to match those in the global markets as the Chinese government had concluded that deregulation was the most appropriate course of action. In 2010, during the transition period of price reforms, most regions had already begun to increase tariffs closer to market prices by RMB 0.92-1.55/m³ or 3.75-6.32 USD/MMBtu.

HISTORY OF CHINESE PRICES



Source: NDRC

*City Gate prices were Ceiling Prices up to 2017 August; Base Price after 2017 August)

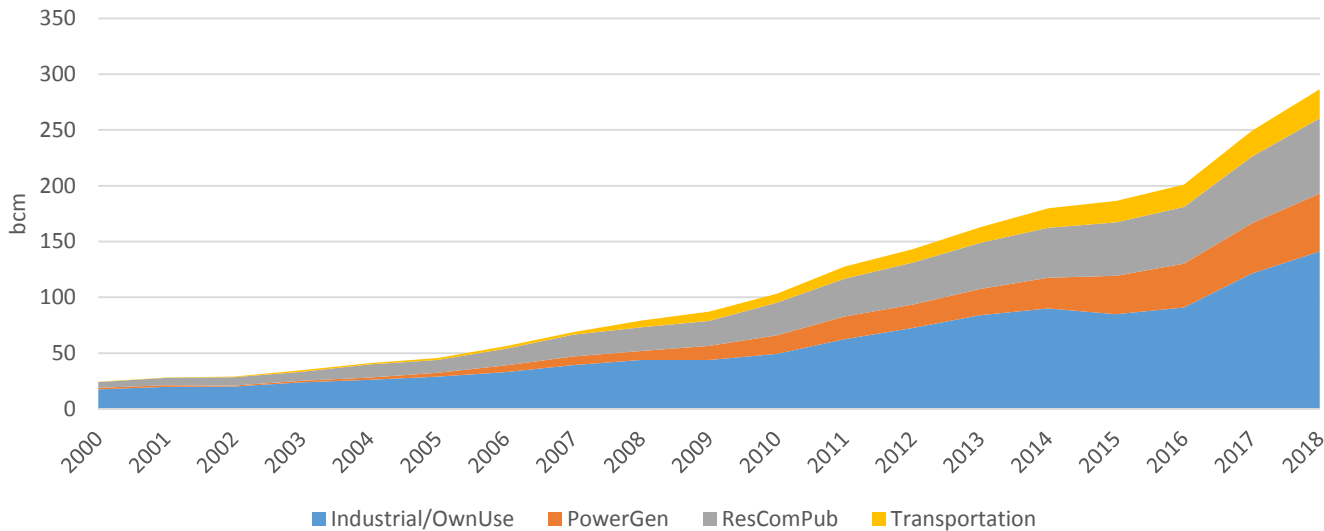
Current price reforms were officially implemented in June 2013. This included a periodic adjustment, usually done on a yearly basis, based on fuel oil/LPG price movements with a 60%/40% weightage respectively. The previous tiered pricing system was gradually and finally abolished in 2015. At this time, Citygate prices that were listed also changed - from a maximum value to a reference value which market participants could use to base their negotiations upon.

Residential prices on the other hand followed a 3-tier tariff system based on the average monthly household usage in each province. In 2017, the NDRC recommended for the increase of residential gas prices by at RMB 0.35/m³ (1.43 USD/MMBtu) before June 2019. Implementation was left to the discretion of each province. The last time that residential prices were increased was in 2010.

Since the 2013 price reforms, prices for 29 citygate locations are published updated almost every year by the NDRC.

CHINA DEMAND SPLIT

CHINA'S DEMAND BY SECTOR

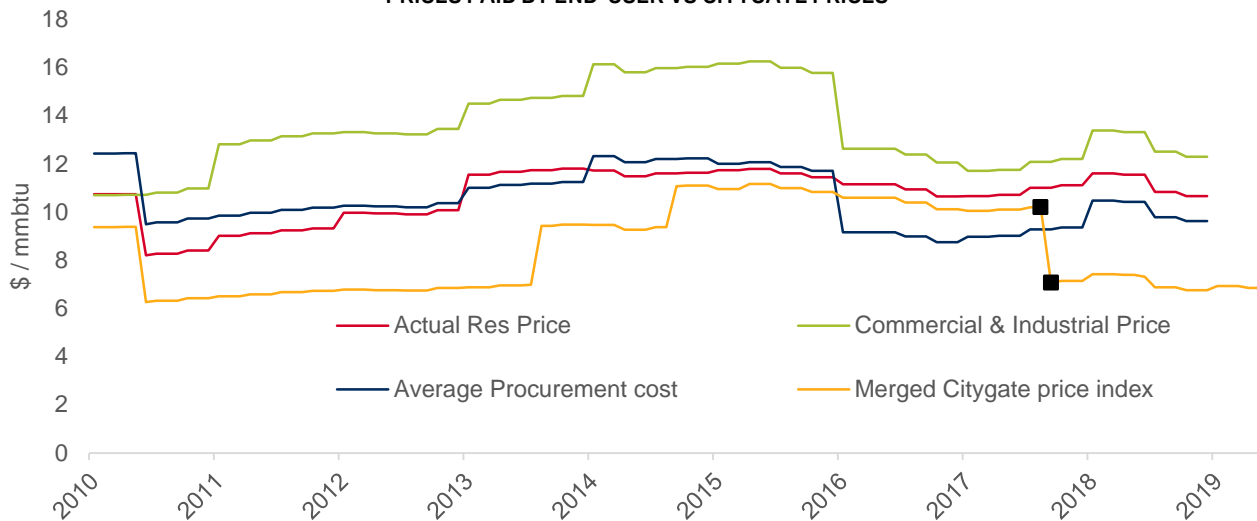


Source: Platts Analytics

Chinese natural gas demand in 2018 is 286 bcm. In 2018 the natural gas portion in the primary energy mix stood at 7.8%. The current Chinese government's target is for natural gas to make up 10% of the total primary energy mix by 2020.

The power sector is still expected to remain heavily coal dependent while the industrial sector is expected to drive the demand growth in natural with a government mandate for more companies to switch from coal to gas.

PRICES PAID BY END-USER VS CITYGATE PRICES



Source: NDRC, ENN, CR Gas

*City Gate prices were Ceiling Prices up to 2017 August and were changed to base prices after that

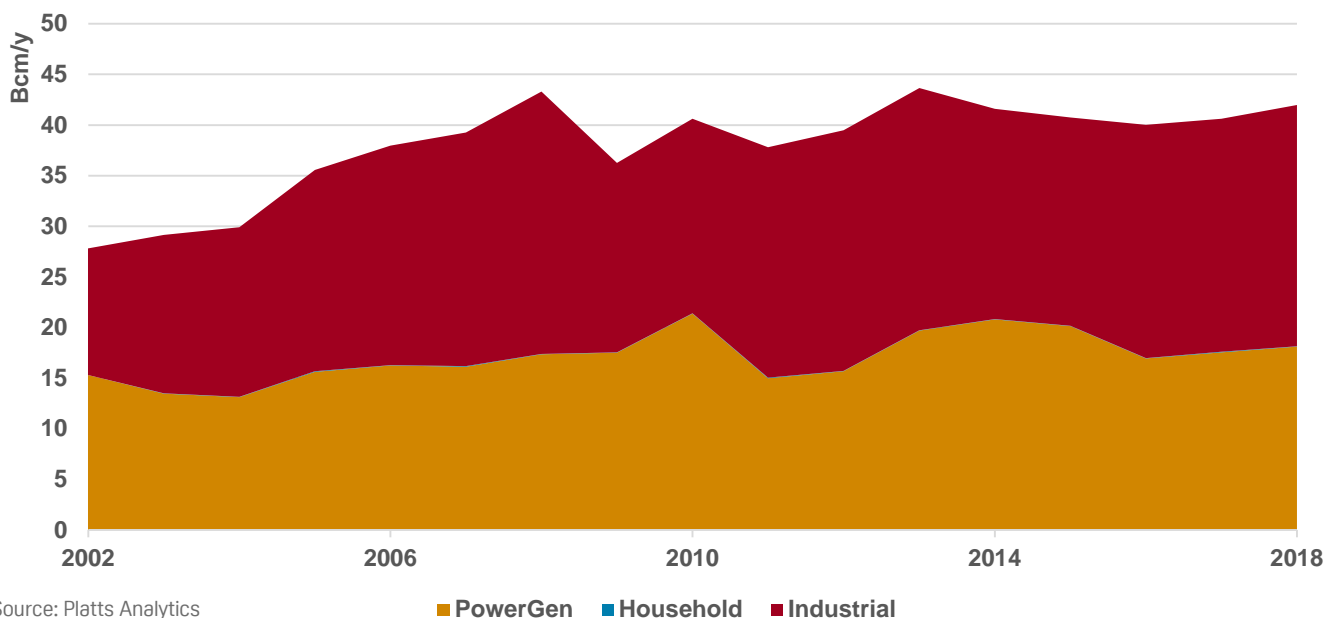
CHINA DISTRIBUTION PRICES

The Chinese retail and distribution market is made up of the state-owned enterprises (SOEs), local private enterprises and Hong Kong-funded enterprises. From the distribution point of view, it seems that natural gas retailers and distributors have enjoyed healthy margins.

Some of the largest natural gas providers, have reported a consistent profit over the past few years of 0.40 to 0.60 RMB/m³ or \$1.60 to \$2.50 USD/MMBtu.

MALAYSIA

Malaysian NG Demand



Source: Platts Analytics

Malaysia is split into two regions: Peninsular Malaysia and East Malaysia. The western peninsular is the main demand center while East Malaysia is a major LNG exporter. Peninsular Malaysia also produces natural gas but supply there falls slightly short of demand, LNG imports, which forms less than 10% of total supply, is still required.

In terms of LNG trade size, East Malaysia’s export volume is more than 10 times Peninsular Malaysia’s LNG import requirements. As a whole, this still makes Malaysia the largest net Asian exporter of LNG.

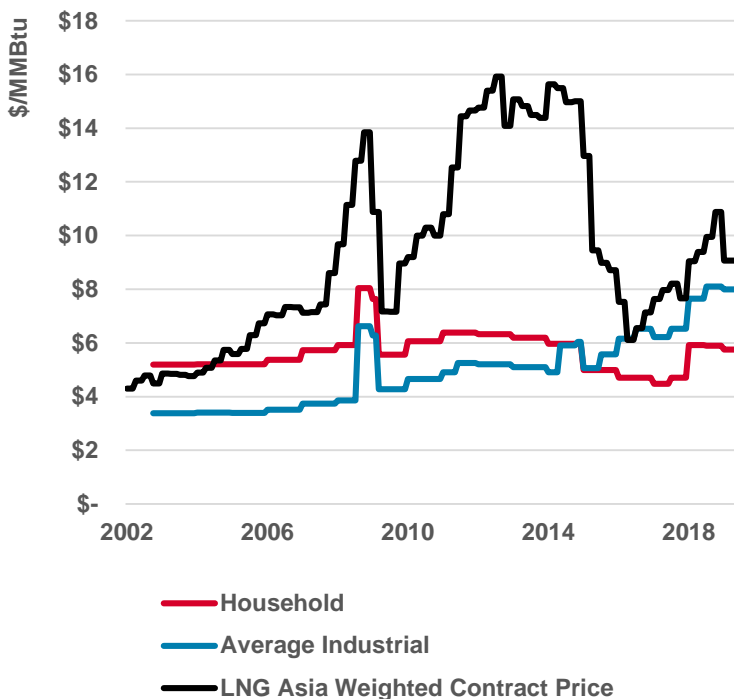
Malaysian residential and industrial prices are among the lowest in the study due to its availability of supply, net exporter status and the market structure.

Upstream domestic supply is almost exclusively from the national oil company, Petronas, and its associated companies. The gas is sold directly to large end-users and to gas distributors.

Up to 2017, Gas Malaysia was the sole company providing pipeline gas to small and medium end-users. However, Malaysia is in the midst of liberalizing its end-use markets and has brought industrial prices in line with global prices after the large disparity during 2010 to 2014. Malaysia has also implemented the Third Party Access (TPA) policy in its Gas Supply Act in 2017 which allows other potential distributors to access the gas infrastructure and provide gas to end users. Since earlier this decade, industrial tariffs were adjusted on a quarterly basis to bring them closer to market prices in preparation for the TPA.

Demand in the residential sector is insignificant when compared to the industrial and power sectors. The primary use for natural gas in households is for cooking and currently most households use bottled LPG.

Malaysian Natural Gas Prices



*Asia Weighted Contract Price is a volume-weighted price, calculated based on customs data for imported LNG into Southeast Asia and Northeast Asia

Source: Malaysian Energy Information Hub, Platts Analytics

SIMILARITIES AND DIFFERENCES TO EASTERN AUSTRALIA

Eastern Australia is unique when compared to the countries covered in this analysis. Although Eastern Australia is a net exporter similar to US, Canada, Denmark, and Malaysia, industrial tariffs are more to Western Europe, a net importing region. In terms of infrastructure and supply geography, China and Malaysia are comparable with Eastern Australia. It is the least similar to the Middle Eastern countries where prices are low and gas prices are regulated.

Eastern Australia is also unique in that there are two possible peaks in the year compared to other countries where only one peak is expected. The two Eastern Australian peaks are during Northern Hemisphere winters which follows JKM prices and Southern Hemisphere winters for domestic use similar to the cold months in Chile.

	Similarities	Differences
Western Europe	End-user prices, distribution premium and range of prices are similar to Europe. On the high side it is similar to Spain, Netherlands, Switzerland, Sweden and Denmark. The lower price range of Eastern Australia is similar to UK and Germany	Piped gas and LNG importing region High interconnectivity
U.S.	Net exporters of LNG. Victoria seems to show similarities in prices and supply/demand balances to Texas which is also a net producer of natural gas. The differences in state policies on energy may be similar to that of Australia	Residential prices in U.S. are lower High interconnectivity; more diverse sources of supply Less than 10% of U.S. natural gas is exported as LNG while Eastern Australian LNG accounts for over two-thirds of gas demand
Canada	Isolated natural gas markets and has its own price movements based on local factors	Has no LNG export facilities and can only export via pipelines to U.S. regions which already are in oversupply
South Korea	Policies encouraging use of natural gas over coal Sensitive to LNG pricing	Net importer of LNG and gets almost all its natural gas via LNG Incentives for importing LNG over coal Wholesale-to-retail margin regulation
Malaysia	Geographic supply and demand regions Net exporter	Low residential and industrial tariffs
China	Geographic supply and demand regions of China may be similar to that of Eastern Australia. Similar tax rates	Low distribution premiums Net importer of LNG and pipeline gas
Mexico	Limited infrastructure; sub-regions which lack adequate access to supply	Has to import both through pipelines and LNG Has lower industrial price despite being a net importer
Chile	Residential prices may be similar to Queensland and NSW	Has to import LNG and pipeline gas from Argentina
Turkey	Similar tax levels to Australia	Imports natural gas High connectivity and has 2 regasification plants Low prices despite moderate tax rates
Saudi Arabia		Extremely low prices which are subsidized Highly regulated Imports natural gas

SUMMARY AND CONCLUSION

Other than markets which are regulated, the key price drivers are seasonal demand and related supply/demand fundamentals. These prices are closely linked to oil, NBP/TTF and JKM.

Price levels in general are determined by each country's end-user tax policies and access to diverse sources of natural gas. Countries' policies on taxes, subsidies and energy preferences generally play a much larger factor on tariffs than the cost of LNG or imported pipeline gas. Residential price premiums of distributed gas to wholesale and to citygate prices vary widely for different countries and Eastern Australia tariffs are similar to those in European countries. Industrial prices are typically close to wholesale or citygate prices. Eastern Australia tariffs are competitive in relation to European countries with lower tariffs but are more expensive than other countries which are net exporters of natural gas or LNG.

The Eastern Australia market is unique with a mixed set of similarities and differences to other countries' gas markets. Even though Eastern Australia is a net exporter, it has some symptoms of an importing nation. Its highest gas demand comes from LNG exports, accounting for over two-thirds of total demand.

In terms of similarities to another developed country where infrastructure considerations strongly impacts prices, Canada or parts of Canada comes the closest. Canada is in essence in an opposite situation where there is too much supply and a dearth of infrastructure to export the gas which causes prices to be low. In the case of Eastern Australia, there is ample infrastructure for gas to be exported to LNG markets. This causes a potential shortage for domestic use with no alternate supply coming from either Western Australia or from regasification terminals.

This leads to Eastern Australia potentially having two peaks each year, different from other countries which normally have one seasonal peak. Eastern Australia potentially peaks during the Northern Hemisphere winters which follows JKM prices and during the Southern Hemisphere winters for domestic use. Eastern Australia is exposed to the upside of global LNG prices but lacks exposure to the downside of global LNG prices.

Although Eastern Australia has similar price linkages to Asian countries via LNG, there is a key difference - most Asian countries have some form of regulation or policies which limit prices to industries and/or residential sectors while Eastern Australia does not.

Finally, if all infrastructure is fully developed and Eastern Australia is connected to all possible gas supply sources, it may have a similar setup to the Chinese coastal cities which has access to domestic gas from the western states and regasification terminals. However, it may not be economically viable for Eastern Australia, which is naturally net surplus on natural gas, to build infrastructure to and connect to all possible supply sources like China. Aside from economic feasibility, the different state laws and policies within Australia also present a hurdle on implementing such projects.

METHODOLOGY

Data of end-user tariffs provided in the study were sourced from publicly-available information, Platts proprietary database and survey data, and were converted to a US dollar per million British units basis. Wherever available, prices were provided for residential, industrial, power and other sectors on a monthly, quarterly or yearly basis.

Delivered end-user prices are defined as the full price that end users would pay including all costs to receive natural gas. Wherever applicable in each country, end-user prices could include the following:

- 1) Production costs of natural gas at the wellhead including royalties and taxes
- 2) Transmission costs of natural gas to the point of wholesale prices
- 3) LNG wholesale prices
- 4) Wholesale natural gas margins
- 5) Transmission and distribution costs to end-users
- 6) Retail margins
- 7) End-user taxes
- 8) Subsidies, regulations and other pricing policies

The three levels of end-user taxes are low, medium and high defined as (i) 10% and under, (ii) between 10-20%, and (iii) above 20% respectively.

If a country exports more natural gas and LNG than it imports, they are considered a net exporter. Conversely, if they import more than they export, they are considered net importers.

All demand and consumption data do not include feed gas consumption from LNG liquefaction terminals unless explicitly stated.

Conversion rates:

1 MMBtu = 1.055 GJ

1 cubic meter of natural gas = 0.0362 MMBtu

Japan has been omitted from the study because 2018 data was not available at the time of the study. It is worth noting that Japanese industrial tariffs are historically similar to South Korean industrial tariffs while Japanese residential tariffs were between \$30/MMBtu and \$40/MMBtu in the recent 10 years where data is available.

All LNG and oil indices including Platts JKM™ and Platts Dated Brent are Platts proprietary data.

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