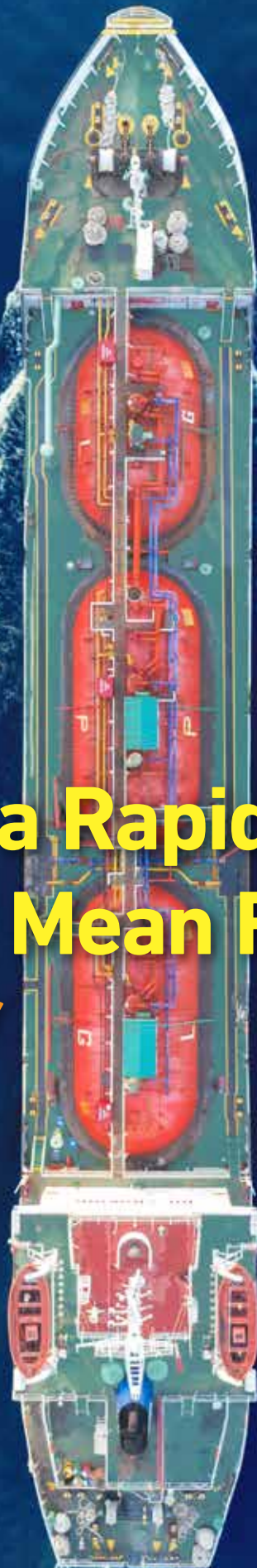


**uni  
per**

# What Does a Rapidly Changing Energy Mix Mean For LNG?

2019 Whitepaper



# What Does a Rapidly Changing Energy Mix Mean For LNG?

Whitepaper process: Key themes and ideas detailed in this document were harvested from a roundtable event hosted by Uniper and under the Chatham House Rule during the ADIPEC Exhibition and Conference in Abu Dhabi in mid-November, 2019

## As 16-year-old Swedish schoolgirl Greta Thunberg continues to roam the world to pressurize governments for their inaction and ineffectiveness on climate change; while other groups such as Extinction Rebellion and Greenpeace take more direct action to promote their global environmental campaign, we can be left in no doubt that our use of the planet's resources and the way we use energy in particular is topping the geopolitical agenda. Such is the sensitivity to the climate and environment issue that some governments believe they will fail if they don't take immediate and drastic action. Germany, for example, is now paying coal producers to stop producing coal. Meanwhile, the UK has announced a net-zero carbon target for 2050 but this relies on using existing renewable technology and not factoring in future carbon capture developments.

Following the Paris Agreement and other climate initiatives adopted by individual countries, the world is in the throes of an energy transition not seen since the industrial revolution and on a far greater scale. It affects every area of economic activity, from agriculture and food production to heavy industry and transportation. And of course, energy markets.

Following the Paris Agreement and other climate initiatives adopted by individual countries, the world is in the throes of an energy transition not seen since the industrial revolution and on a far greater scale. It affects every area of economic activity, from agriculture and food production to heavy industry and transportation. And of course, energy markets.



### Up, Up, Up

As the energy landscape changes from being dominated by coal towards renewables and sustainability, liquefied natural gas (LNG) is increasingly popular, and for good reason. It is a cleaner burning, highly transportable hydrocarbon that could occupy 10% of the world's energy market by 2020. By 2030, the International Energy Agency (IEA) expects gas to be the most important supply source of energy, more than renewables, with LNG the

**310bn cm**  
China's consumption of natural gas in 2019, up 10% from the previous year, making it the largest market in the world, according to the IEA.

## China Ahoy

For now, one of the key markets for LNG is China, though coal is still extensively, even increasingly, used in the country. China is now the top importer of LNG, recently overtaking Japan. China's gas demand could almost double to 550bn cubic meters by 2030, according to the IEA. One of the roundtable participants said that if China converted even a small fraction of what it burns

in coal into burning LNG, "it could absorb all the LNG in the world tomorrow." At the same time, PetroChina is planning to build more gas import terminals as Beijing aims to trim its trade surplus with the US. India also has enormous potential as an LNG market down the line, and is expected to be one of the fastest-growing in the world over the next two decades, according to the IEA.



**"I see LNG as enabling the low carbon transition. It is not the enemy of renewables. It works in harmony with renewables because the system needs stability."**

fastest-growing component of the gas sector. Shell is anticipating an average of 4% growth in LNG to 2030, while Wood Mackenzie came in close behind with its estimate of 3.6%.

The energy transition will have the most disruptive impact on coal production and the use of coal as a generator of power. The nuclear option, in its present format and following the vulnerabilities exposed at Fukushima (causing Germany to abandon its nuclear program), does not seem to have a viable future at scale. Yet the demand for power continues to rise, and with it the demand for and consumption of LNG. According to Shell's LNG Energy Outlook 2019, global energy demand is set to grow by 18% by 2035 with gas to meet around 40% of this additional demand. LNG continues to be the fastest-growing gas supply source with more than half of LNG import growth in Asia where markets like China are hungry for power production to drive a new generation of industries, and the demands of a population of 1.43bn (United Nations 2019).

As a reference, the 2014 global production of crude oil was 92mn b/d. In 1970, global LNG trade was 3bn cubic meters (bcm). In 2011, it

was 331 bcm and the US started exporting LNG in February 2016. US petroleum and natural gas production increased by 16% and by 12%, respectively, in 2018, and these totals combined established a new production record. The United States surpassed Russia in 2011 to become the world's largest producer of natural gas and surpassed Saudi Arabia in 2018 to become the world's largest producer of petroleum. Last year's increase in the United States was one of the largest absolute petroleum and natural gas production increases from a single country in history (US Energy Information Administration).

E&Y projects global LNG demand could hit 400mn tons per year by 2020. If that occurs, the LNG market will be roughly 10% the size of the global crude oil market, and that does not count the vast majority of natural gas, which is delivered via pipeline directly from the well to the consumer. The global trade in LNG, which has increased at a rate of 7.4% per year over the decade from 1995 to 2005, is expected to continue to grow substantially.

Qatar will lose its title as the world's largest exporter of LNG within the next year, as

**45%**  
The US share of the surge in global natural gas production following on from 11.5% growth in domestic shale gas extraction. Shale gas now accounts for 70% of the US' gas production, according to the Global Energy Statistical Yearbook 2019.

**7,000trn**  
Cubic feet is the current worldwide proven natural gas reserves, with 70% in fields with an average breakeven price of less than \$3 per MMBTU, according to the International Gas Union's Global Gas Report 2019.



Australia ramps up production on a slew of multi-billion-dollar export projects. “Australia and Qatar continued to jostle for the title of the world’s largest LNG exporter over the first five months of 2019,” the Australian government said in a recent report.

Australia exported more LNG than Qatar in November 2018 and April 2019. But now, the US’ EIA says Australia is on track to consistently export more LNG than Qatar, as recently commissioned projects such as Wheatstone, Ichthys and Prelude ramp up production.

With the advent and increased production of floating storage regasification units (FSRUs),

new markets are opening up that were previously unserviceable. In Pakistan, for example, the first FSRU delivered in 2015 so impressed the Energy Minister that a second was quickly ordered for delivery in 2016 and around \$100bn is now going to be invested downstream over the next few years. Of the total global LNG fleet, there are 31 FSRUs and five floating storage units. The overall global LNG fleet grew by 11.5% in 2018, as 53 carriers were added to the fleet, including four FSRUs. The global LNG fleet growth was matched by 26.2 MTPA of new liquefaction capacity in 2018 according to the International Gas Union Report 2019.

**70%**  
Of growth in energy demand up to 2035 is to come from 40% gas and 30% renewables to meet the requirements of a global population that will rise from 7.7bn today to 9.8bn by 2050, according to the UN.

## Future Viability?

Is there a long-term future for LNG, which despite its many advantages, is still a hydrocarbon and may one day be in danger of becoming the new coal or oil? With its abundance, global network of supply, relative cleanliness, ease of transport and ability to penetrate new markets with its own self-contained technology, the answer is ‘yes’. This is not bad for a product that was previously flared off at petrochemical refineries. Since liquefaction, a process developed in the US in the 1940s, became commercially available for LNG operations along with the associated specialized ships and infrastructure, LNG prices have been on a

rollercoaster. Supply has moved from relative scarcity to overproduction. Danish atomic scientist, Niels Bohr, famously said “never make predictions, particularly regarding the future”, and he was onto something. Ten years ago, Goldman Sachs predicted that oil would be \$200/bl and LNG at around \$20mn British Thermal Unit (BTU). The current reality is \$60/bl of oil and around \$2.6mn BTU (at the current Henry Hub spot price). In large part, the growth of LNG has arisen because the success of the US shale gas fracking program also made the country the largest gas producer in the world and a net exporter.



**“If I was in the renewables business, I would be looking to encourage gas to balance the system. Otherwise the transition is going to become too costly and the consumers will be left to foot the bill.”**

### Financial Momentum?

The number of long-term Final Investment Decisions (FIDs) for LNG projects, typically multi-billion-dollar investments with recovery schedules of 10 to 15 years, continues to grow. Up to 18mn tons per annum FID’s were recorded between 2018 and H1 2019 – 20% of market capacity – with more FIDs expected in 2020. Two years ago, that market was 7mn tons. According to Wood Mackenzie, based on FID’s so far and what is expected by 2035, there is a 125mn ton per annum gap in the market.

### At Sea

In industry, LNG will evolve into a mainstream player. A new generation of ships with integrated regasification units is already in production and will increase the ability to penetrate new markets, essentially in poorer economies, which lack the investment for expensive LNG installations. These ships will be able to anchor offshore, hook up the supply line and pump gas directly into storage tanks, instead of the cryogenic sludge.

Shipping companies are also investing in LNG powered vessels as IMO 2020 looms, though the transformation process for ships is expected to take a few years to be implemented. IMO 2020 refers to the International Maritime Organization’s (IMO) ruling to reduce sulfur from bunker fuels to 0.5%, from the current 3.5%, from January 1st 2020. It is considered the biggest shift in shipping markets since engines replaced sails in the early 1900s.

### On the Road

More immediately in other transportation sectors, LNG is ready to go in many cases with companies investing in downstream fuel for trucks, bolstered by government subsidies. Commenting on the scale and potential for LNG in the transport market, a gas supplier attending the roundtable said that on a visit to China, he said to his counterpart that his company had 6,000 truck movements across the gate at its regasification plant. The Chinese counterpart nodded and said they had about the same. On discussing this scale – 12,000 trucks movements a day – it became clear that the economies and positive environmental effects of LNG could be enormous. There is certainly a need for it. Vehicular emissions in India are currently ten times the recommended health limit; London is continuously breaking emission rules and being fined by its own government and the EU; and Paris has one of the highest pollution levels on the planet. It is not a “new world” i.e. emerging economies, problem.

### Air Transport

The airline industry has come in for a great deal of criticism in recent years, for contributing to toxic environments around airports, as well as individual carbon footprints. Boeing recently submitted a proposal to NASA as part of an ongoing effort by several aircraft manufacturers to imagine what might be possible in the next generation of airliners, and the use of LNG may be an attractive alternative

**143**  
LNG ships are currently operating worldwide with the number expected to double by 2024, according to the IEA.

**2035**  
A gap in supply in gas production from now until 2035 is 125mn tons per year, according to Wood Mackenzie. This is based on global LNG projects that have already received a FID and those expected in the next 15 years.



## Transport of LNG

LNG is transported in specially designed ships with double hulls protecting the cargo from damage or leaks, with a typical LNG tanker costing around \$200mn. Transportation and supply are an important aspect of the gas business, since natural gas reserves are normally quite far from consumer markets. Natural gas has far more volume than oil to transport, and most gas is transported by pipelines. There is a natural gas

pipeline network in the former Soviet Union, Europe and North America. Natural gas is less dense, even at higher pressures. Natural gas will travel much faster than oil through a high-pressure pipeline but can transmit only about a fifth of the amount of energy per day due to the lower density. Natural gas is usually liquefied to LNG at the end of the pipeline, before shipping.

(Source: US Energy Information Administration)

to traditional fuel thanks to its lower emissions, cost and higher availability. NASA has been pushing companies for designs that could reduce fuel burn by 60% compared to a typical engine used today. Using LNG, Boeing believes it can get the design of a typical engine to 57%, and using open propeller, unducted fan jet engines, the company believes it could achieve a 62% boost according to NASA.

Already used by tens of millions of vehicles around the world as a cleaner alternative to gasoline, compressed natural gas (CNG) and LNG are fuel feedstocks that aircraft could switch to, other than conventional fossil-oil. Turbofans, for instance, can be operated on a number of different fuels, and some have been optimized for use with natural gas. Some aircraft, such as the Tupolev Tu-155, as well as the "SUGAR Freeze" aircraft under NASA's N+4 Advanced Concept Development program (made by Boeing's Subsonic Ultra Green Aircraft Research [SUGAR] team), were designed to run on LNG.

So, on land, sea and air the future of LNG in the world energy mix following the transition – or "the singularity" where oil will have been replaced by renewables and gas, as referred to by Wood Mackenzie, adding that they expect this by 2035 – seems assured. This will help meet carbon targets and energy demands of a growing global population, which is expected to reach 9.8bn by 2050.

Along with LNG, there is expected to be an increasing demand for even greener gases, such as biogas and some forms of hydrogen. But without extensive support from governments, neither of these are currently viable on a commercial scale.

One of the roundtable delegates concluded that: "LNG is not the enemy of renewables; it works in harmony with renewables because the system needs stability. If I was in the renewables business, I would be looking to encourage gas to balance the system. Otherwise the transition is going to become too costly and consumers will be left to foot the bill." ■

## 50mn

**New diesel cars a year have the same sulfur emissions as one very large crude carrier (VLCC) in the same period. The 15 largest ships in the world produce more sulfur oxide than all the cars in the world.**

(Source: James Corbett, Professor of Marine Policy, University of Delaware).

# Uniper LNG Industry Roundtable List Of Attendees

Amaka Edomobi, Senior Associate, Ince & Co Middle East LLP

Calogero Curreri, Senior LNG Trader, BB Energy (Gulf) DMCC

Capt. Walter Purio, Founding Director, LNG Marine Fuel Institute

David Friedman, Business Development Manager, KPLER DMCC

David Galea, Partner, Ince & Co Middle East LLP (Dubai Branch)

David Worrall, International Energy Consultant

Dr. Leila Benali, Chief Economist/ Head of Strategy, Energy Economics & Sustainability, Arab Petroleum Investments Corporation (APICORP)

Dyala Sabbagh, Partner, Gulf Intelligence

Eklavya Sareen, Managing Director & Head of Advisory MEANT, HSBC Bank Middle East Limited

Fatema Al Nuaimi, Chief Executive Officer, ADNOC LNG

George Duke, Director, Duke LNG DMCCO

Iannis Mardell, Strategy & Corporate Development Adviser, ADNOC LNG

Irsat Sureroglu, Director, Corporate Clients, ING Wholesale Banking

John Roper, Chief Executive Officer Middle East, Uniper Global Commodities SE

Keith Martin, CEO, Uniper Global Commodities SE & COO, Uniper SE

Kenneth Foo, Regional Manager, Asia LNG, S&P Global Platts

Laurent Chevalier, Vice-President Middle East, TOTAL

Mike Wakefield, General Manager – KSA, Al Tamimi & Company

Nabil Alnajar, Executive Director Operations and Projects Management Sharjah National Oil Corporation (SNOC)

Rashed Al Mazrouei, Vice President Strategy & Corporate Development (VPSCD), ADNOC

Robin Mills, Chief Executive Officer, Qamar Energy

Sirine Tajer, Managing Director, MENA Energy Partners

Slobodan Jezdimirovic, VP Gas Assets, TOTAL

Stuart Anson, Senior LNG Originator, Shell LNG Trading – Middle East

Syed Adeeb, Senior Contracts Engineer (Fuels), Abu Dhabi Water & Electricity Company (ADWEC)

Tepal Srinivas Dora, Manager – Group International Business Development, ENOC

**uni  
per**