

# World Gas Conference

## Gas as a destination fuel

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- **A gas discussion. A real one.** – Last week we and 12,000 others attended the World Gas Conference in Washington DC. This note records our high-level impressions and takeaways from what was a memorable event.
- **‘Energy transition’ nothing new** – Speaker after speaker highlighted the importance of gas in the global energy mix for its abundance, affordability and reliability. The likelihood of the ‘energy transition’ squeezing gas from the energy chain was roundly dismissed by both the buy-side and the sell-side. Instead, both sides pitched gas as a ‘destination fuel’ for its ability to meet what is expected to remain strong forward developing world demand growth compounded by ongoing pressure to progressively displace coal and oil from the energy supply chain.
- **Sustainability and energy poverty each much deeper debates** – The most striking point of difference to NZ’s recent energy discussion (or rather lack of) was debate around the energy buzzwords of ‘sustainability’ and ‘poverty’. Whereas in first-world NZ ‘sustainable’ tends to be used interchangeably with ‘emissions’ and/or ‘environment’ and ‘energy poverty’ with ‘low income’, discussion at the forum dug much deeper. Focus instead was on the world’s poorest people and how to help lift their living standards while also targeting a net-positive environmental impact. With 40% of the world’s population still cooking their meals on wood, charcoal and/or dung, that challenge is beyond enormous. There was universal agreement however that gas would be a key component of the solution.
- **Another ‘managed transition’. But arguably a more noble one.** – Where discussion at the forum did intersect with that in NZ was in its referencing of a “managed transition”. Interpretations of the term are however very different. In NZ it is the catchphrase government has opted for to sell its surprise move to signal an accelerated wind-down of the supply-side of the domestic oil and gas sector. At the forum talk of transition was pitched as an exercise of sector participants working together to migrate the demand-side from coal and oil and the pollutive footprints that come with each. The North American ‘shale gale’, which is now a decade old, has delivered a staggering array of economic, societal and environmental benefits. While clearly in their interest to do so, US producers are now seeking to extend the reach of those benefits by increasing LNG exports to new markets, with the environmental benefits that gas offers at the core of its sales pitch.
- **NZ read-throughs sobering** – Our takeaways from the event condense largely to an observation that NZ is out of sync with the energy policy approaches being taken by most of its developed nation peers. Whereas NZ’s policy positioning is increasingly angling towards a binary “its either good or its bad” position on fuel, the approach being taken by most other countries reflects that the world is not quite that simple. As the North American example has clearly demonstrated, maintaining energy policy that is sufficiently flexible to accommodate future technology advances is critical. Not taking this approach is likely to result in rushed and/or under-thought policy decisions taken today costing dearly in international competitiveness and domestic energy security terms tomorrow.

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## 2018 World Gas Conference

Last week we attended the week-long *World Gas Conference* in Washington DC. In the gas space, events don't come any bigger than this one. Held only every three years, the forum had somewhat of a United Nations feel to it with 12,000 delegates from 100 countries. Sessions ranged from plenary keynotes and panels of supermajor CEOs and government energy Ministers where big picture visions were shared and discussed through to small working group sessions that dealt with specific subject matter. Across the week 650 speakers spoke their minds across more than separate 100 sessions. Just in case of itchy feet, in the basement was an exhibition area the size of six city blocks.

We attended to get a flavour for how the other 99 countries in the building view the role of gas in their energy futures and set that view against NZ's (in the government's words) "direction of travel".

The location of the event aligns with the home nation of the sitting President of the International Gas Union (the 2015 event was in Paris, the 2021 event will be in Seoul) however it was somewhat prophetic that the Washington running coincided with the 10 year anniversary of the start of the Shale Gale – a breakthrough that has not only tipped the North American O&G sector on its head but also had a heavy and enduring impact on global supply and demand balances.

The event was by some distance the most insightful, constructive and content-rich conference we have attended. Arriving in from what has been an exceptionally poor standard of debate in NZ on fundamental issues of energy supply, security and affordability, it was refreshing to hear from a speaking line up of the seniority and calibre of those present.

This note briefly records our impressions from the event, grouped to four core themes.

### 1. Gas as a destination fuel

"Energy transition" is a term that is used across the globe, usually punctuated in the public debate with some form of sweeping or alarmist conviction statement to make a specific point. For example, that the energy transition will see solar PV directly replace thermal generation, as we noted was the conclusion of one op-ed titled "*Goodbye oil age, hello sun*" that was published in NZ mainstream print media during the week.

Chevron CEO Mike Wirth provided an eloquent take on this by observing that energy transition is a perpetual process that has been going for as long as humans have walked the earth. For centuries people used wood and biomass (principally dried animal dung) to provide energy for their cooking and heating. Over time use has moved forward to include whale blubber, then coal, oil, kerosene and gas. More recently nuclear, wind and solar have also become established. His point was that the human race has been in a continual energy transition and that even after centuries of modern-age energy evolution all of the original forms of energy supply (perhaps with the exception of whale blubber) remain in use today. In fact 3 billion people – a staggering 40% of the world's population – continue to cook their daily meals and heat their houses using wood, coal and/or dung.

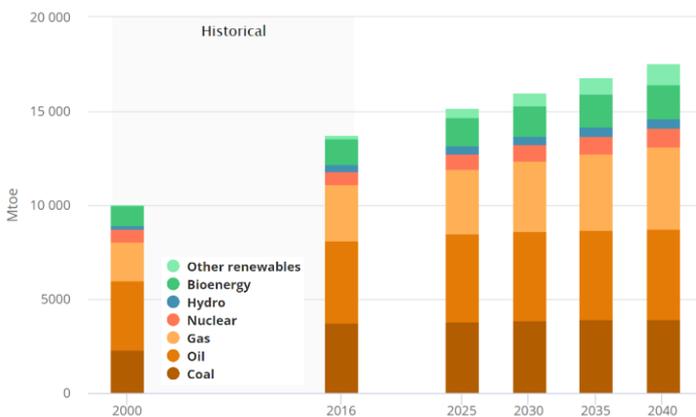
The popular public debate pitches gas as a 'transition fuel' with a role of bridging the world's energy needs as it migrates from hydrocarbons (coal and oil in particular) towards a low or even zero emissions future. The sense in this debate is that gas will itself also be progressively squeezed from the energy chain.

The attitude of those directly involved in the sector is however very different. Most agree in pitching gas as a “destination fuel” rather than a “transition fuel” reflecting the view that gas was likely to remain a backbone of global energy supply for many decades to come. This message was consistent irrespective of lens – supermajor CEOs, developed- and developing-world energy Ministers and politicians, academics, NGOs, environmental groups and consultants all held the same basic view, albeit with slightly different emphases and angles.

Woodside CEO Peter Coleman said his expectation is for gas to continue to gain in market power to the extent that it eventually passes oil – particularly as hydrogen becomes increasingly established.

This view is not one peddled solely by a one-eyed gas sector – every credible independent forecast agency we are aware of (the International Energy Agency [IEA] being probably the one holding the greatest gravitas, its forecasts across its two reference scenarios shown below) is of materially the same view, each having gas remaining a mainstay of the global energy mix for decades to come. In the IEA’s forecasts, gas is expected to overtake coal by 2030 to become the world’s second-largest primary energy source and is expected to overtake oil by 2040 to become largest.

**Figure 1: IEA primary energy demand, all fuels  
New Policies scenario**



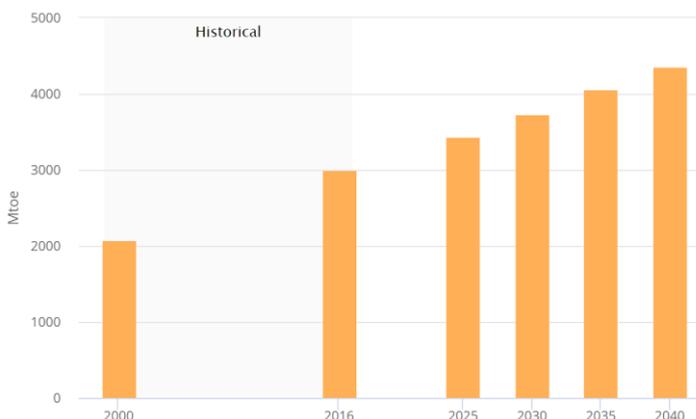
Source: IEA World Energy Outlook 2017

**Figure 2 : IEA primary energy demand, all fuels  
Sustainable Development scenario**



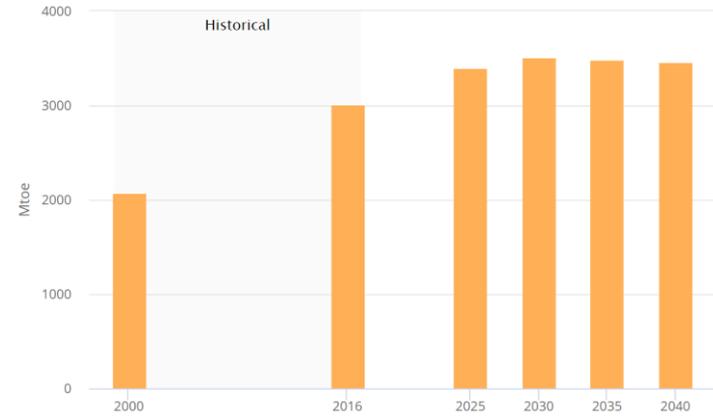
Source: IEA World Energy Outlook 2017

**Figure 3: IEA primary energy demand, gas only  
New Policies scenario**



Source: IEA World Energy Outlook 2017

**Figure 4 : IEA primary energy demand, gas only  
Sustainable Development scenario**



Source: IEA World Energy Outlook 2017

## 2. Sustainability and real energy poverty

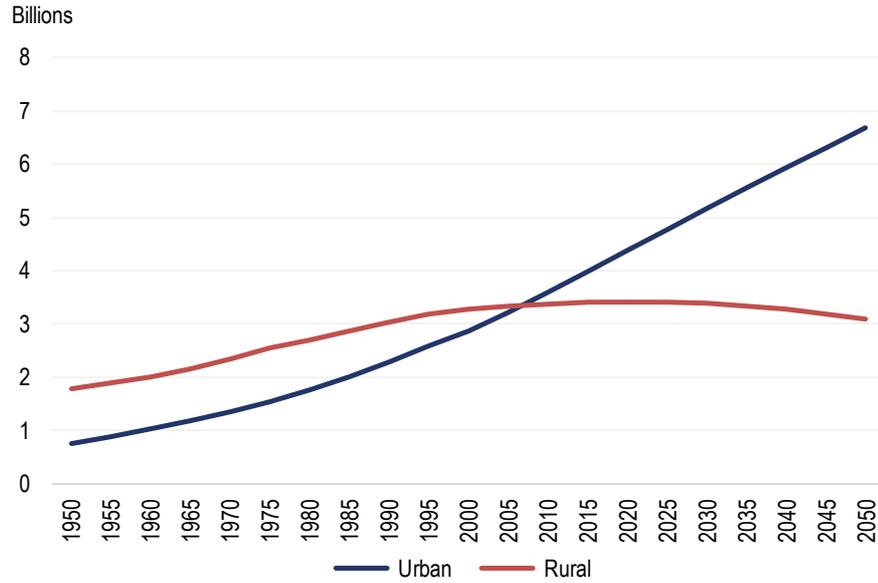
Sustainability was unsurprisingly a major theme of discussion across the event. Unlike in NZ however where talk of ‘sustainability’ tends to focus on the environmental and/or climate change footprint of energy infrastructure, debate at the conference extended across multiple dimensions. These tended to distil to what many termed as ‘the three pillars’ of Energy, Economy and Environment.

A major focus within this was improving living standards and, at the bottom end, lifting people out of energy and economic poverty. A number of speakers provided useful reality checks to a room largely full of developed world energy leaders by impressing the point that energy is largely taken for granted by developed nations, to the extent that when there is a supply outage that lasts for a couple of hours or days people are quick to label the interruption as a “crisis”. It is sobering to compare this to situations like that in Bangladesh, a country of 166m people, where only 8% of the population has access to reliable electricity.

Speakers gave a plethora of facts and statistics to support their collective view that headline energy demand is likely to continue to grow strongly over the next few decades as population growth, urbanisation and the emerging middle class drive consumption. A selection of the most instructive of those:

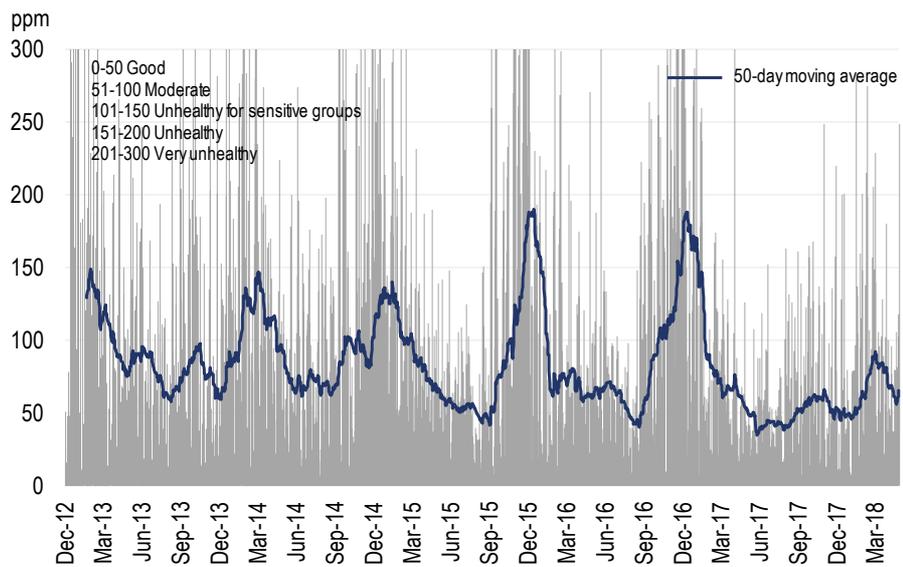
- The UN is forecasting the global population to reach 9.8 bln in 2050, up nearly +30% from its current 7.6 bln. This equates to adding 83m people – equivalent to a country the size of Germany – to the world each year, for each of the next 30 years.
- China is now the world’s largest energy user and coal contributes 60% of its primary energy supply. China’s current Five Year Plan calls for gas to increase from 7% of primary energy supply to 10% by 2020. China’s own forecasting plots demand rising from 237 bcm (8,875 PJ) in 2017 to 300 bcm (11,235 PJ) by 2020 and 400 bcm (14,980 PJ) by 2024. This represents a CAGR out to 2024 of 9.1%.
- India is expected to overtake China as the world’s most populous country by 2024. It remains however well behind China on core economic and development benchmarks such as GDP per capita, infrastructure and proportion of its population living below the poverty line.
- The World Bank says that 1 bln of the world’s poorest population do not have access to electricity. 80% of this number live in sub-Saharan Africa and South Asia, most in rural settings. 2 bln do not have access to a reliable energy supply.
- Nigeria currently has the world’s seventh-largest population at 196m, but the UN expects it to rise to third place by 2050, passing the USA which currently has a population of 327m. Despite its oil and gas wealth, 70% of Nigerians still live below the poverty line.
- 3 bln people continue to cook on wood, coal or biomass and in doing so are caught in a circular poverty trap by needing to spend 6 hours a day gathering unsustainable fuel for cooking. 4m people die each year from poor air quality, largely attributable to domestic air laced with particulates from burning wood/charcoal/biomass, or from poor urban air quality. Air causes more deaths each year than AIDS, malaria and tuberculosis combined.
- Urbanisation is serving to rapidly condense the world’s population. In 1950, 30% of the global population lived in urban areas. Today the equivalent metric is 55%. By 2050 the UN forecasts this will rise to 70%.

**Figure 5: World rural vs urban population concentrations**



Source: UN, Woodward Partners

**Figure 6: Beijing air quality**



Source: Bloomberg, Woodward Partners

With such a profound shift expected towards city living, urban air quality was also a focus of significant discussion at the forum. A couple of speakers pointed out that the popular perception of poor urban air quality being ‘an Asian problem’ is incorrect and that a number of European and North American cities also faced major public health issues. In the case of developed world cities pollutant levels tend to reflect vehicle fleets more than industrial activities, with ExxonMobil CEO Darren Woods noting along this line that mobile energy (ie transport) has now replaced stationary energy (ie industrial processes, electricity generation etc) as the most polluting energy format in the US, in part due to the backing-out of coal-fired generation over the past decade. In the US 134m people – more than 40% of the population – live in air that does not meet environmental standards.

A number of examples (Beijing, Istanbul, Krakow, Santiago, Urumqi and Shanghai included) were given of cities that had taken specific steps to improve air quality towards reducing levels of particulate matter, sulphur dioxide, nitrogen dioxide and ground-level ozone. Each case has seen good success, with most involving aggressive policies of coal-to-gas substitution.

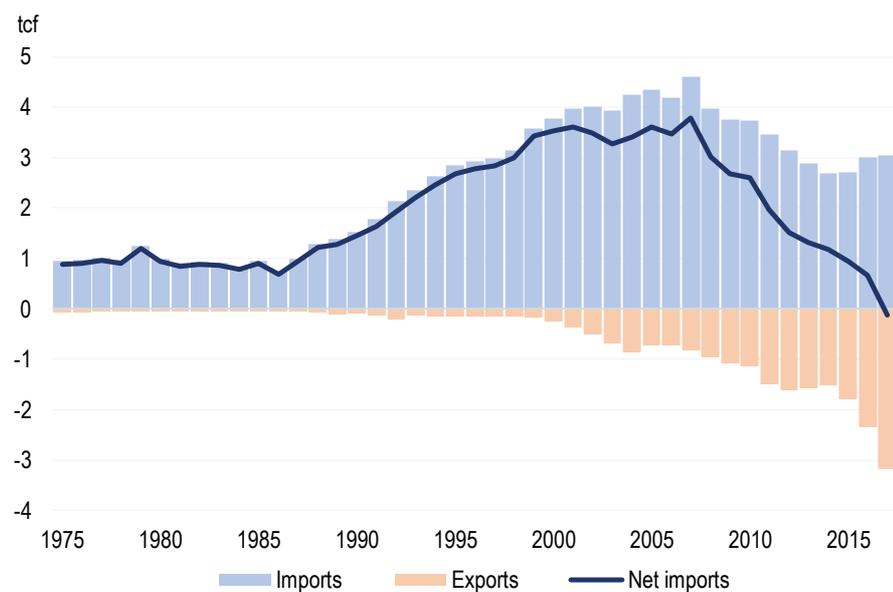
Affected cities are increasingly taking action to address vehicle fleets. Older-model trucks and other heavy vehicle formats are being particularly targeted (it was said that taking one older-model diesel truck off the road is the equivalent of 119 conventional cars). Athens, Copenhagen, London, Madrid, Mexico City and Paris have or are all taking varying steps to progressively ban or apply punitive taxes on diesel vehicles towards eventually exiting them from their city environs.

### 3. 10-years of shale ... and its just the beginning

The near-unanimous view at the forum across all stakeholders (environmental lobby groups included) was of gas having a major long-term role in the global energy mix. Within this theme there was widespread acknowledgement of the impact that the North American 'shale gale' has had on transforming global gas market supply/demand balances and pricing constructs over the past decade.

Pre-shale the US was among the world's largest importers of both oil and gas. A decade later it is the world's largest producer of both oil and gas and in 2017 became a net-exporter of gas for the first time since 1957. Having had no liquefaction capacity in operation as recently as 2016, the US lower-48 states now has 18 mtpa (4x4.5 mtpa trains) of liquefaction online, currently all owned and operated by Cheniere Energy. A further 49 mtpa is currently under construction in the US and due online between 2019 and 2020 and a further 336 mtpa planned. Canada, which has no liquefaction installed, has plans for a further 255 mtpa of new build including multiple projects on Canada's Pacific Coast which, if sanctioned (capex concerns are currently weighing on FIDs) would represent a major step given the far shorter shipping times to the Asian market compared to the US Gulf Coast.

Figure 7: US net gas imports, 1975-2017



Source: EIA, Woodward Partners

### US gas production to keep rising, but productivity gains to slow

US gas production is expected to continue to rise as factory drilling programmes deliver further gross (well count) and net (per-well drilling & completion) productivity increases. The CFO of leading US onshore producer EQT Corporation, which holds a large position in the Marcellus Shale, said that EQT is now drilling lateral sections of 14,000 ft (4,270 m) which is nearly triple the 5,000 ft (1,525 m) of just five years ago. A recent well produced a record 18,300 ft (5,580 m) lateral section. Longer sections and improved completion techniques have delivered substantial productivity gains. In its FY18 EQT averaged drilling & completion of US\$0.37/mmscf, down more than 40% on the US\$0.65/mmscf five years ago.

The industry is now increasingly of the view however that the ‘easy’ drilling & completion productivity gains achieved from “brute force” methods (longer drilling stages, better frac jobs etc) have been largely banked and that gains are likely be more incremental in future. Focus is now very much on enhancing operational performance using data and analytics towards ensuring that “we drill our best well, every time”. One recent step EQT has taken along is to centralise its horizontal directional drilling (HDD) function into a centralised operations centre from where a team remotely monitors and manages well operations across EQT’s drilling portfolio. Previously each rig (EQT is currently operating 10) would have had its own onsite HDD team, numbering 70 employees. The new structure requires a team of only 28. Although only six months in, results have already been extremely positive and EQT is already looking at extending the model to other parts of its operations.

### Benefits run deep

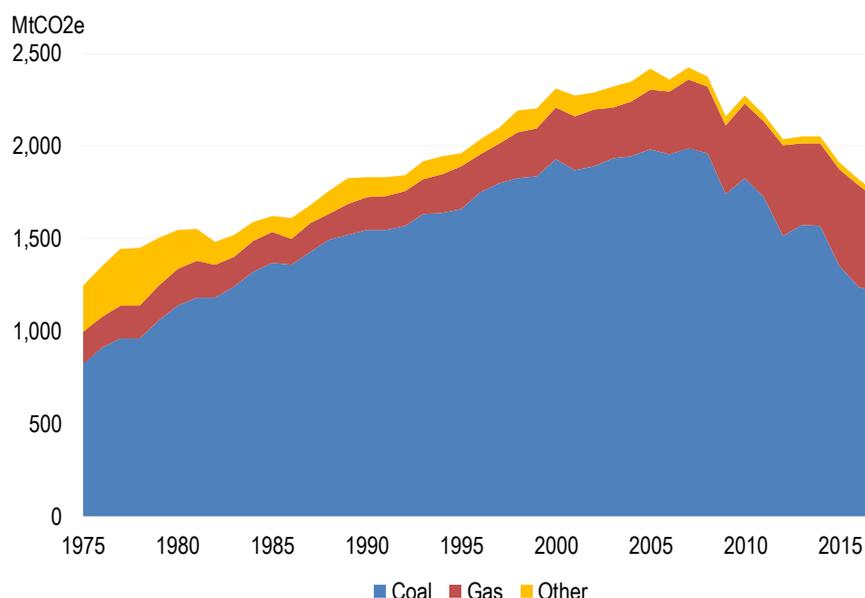
Like gas, US oil production is also expected to continue to grow and by the mid-2020s the US is expected to become an overall energy (not just gas) net exporter – a seemingly unachievable scenario even just a few years ago. The direct and indirect benefits that energy independence has brought to the US are profound. Those US politicians who spoke at the conference (and there were many) were eager to highlight the benefits that energy abundance, affordability and reliability had delivered to all aspects of US society. They cited US gas prices which have fallen dramatically in real terms over the past decade and had increased energy affordability and by doing so had supported economic growth and reduced domestic energy poverty. A study by IHS Economics in 2015 credited shale energy with creating 1.9m new jobs and for increasing average per-household disposable income in the US by US\$1,337 pa.

Looking ahead, with the domestic market saturated US gas producers are looking to expand by growing the export trade. While clearly self-interested in seeking to extend into new markets, producers and politicians each argue that exporting US product to other nations would present a number of commercial and societal benefits. Domestically these would include more jobs and yet-stronger-still economic contribution from the sector. External benefits would include providing developing nations with improved access to affordable low-emission fuel, contributing to reducing energy poverty and reducing the US trade deficit (the US maintains significant trade deficits with 8 of the world’s top 10 LNG importers).

Also highlighted by numerous speakers is the impact to US greenhouse gas (GHG) emissions that has resulted from natural gas displacing coal in electricity generation. In 2017 US GHG emissions from power generation of 1,743 mtCO<sub>2</sub>e was down -28.1% from its 2007 peak, pulling overall US GHG emissions down to levels not seen since the early 1990s. Notable is that it was a policy decision taken in the 1980s that favoured the build of coal-fired generation in preference to gas-fired that led to the mass build of new coal plant during the 1980s and 1990s, much of which is now nearing abandon/reinvest decisions as economic lives mature.

Progress towards reducing emissions has been equally as dramatic in the UK where displacement of coal-fired for alternative (including gas-fired) generation has reduced UK GHG emissions to 38% below 1990 levels and back to what they were in Victorian times, 130 years ago.

**Figure 8: US GHG emissions from electricity generation, 1975-2017**



Source: EIA, Woodward Partners

Across a panel that comprised the CEOs of BP, Total, ConocoPhillips, Qatargas and Equinor (formerly Statoil) there was agreement to the view that gas is the fastest and lowest-cost way available to reduce GHG emissions. Extending US exports would provide a means to broaden the achievements seen with GHG reduction in the US by helping to back-out heavier GHG fuels from the energy mixes of other nations.

## 4. LNG growth, pricing and commoditisation

Global gas demand increased 3.7% in 2017, more than double the 1.5% average growth rate seen over the 2010-16 period and well ahead of the 2.1% growth in total global energy demand in 2017.

Consensus across the numerous sessions that addressed LNG was an expectation of continuing firm forward gas demand growth in both developed and developing nations that will underpin continuing strong LNG demand growth for the foreseeable future. Developing nation growth is expected to out-pace developed nation growth due to a mix of gas-for-coal fuel switching (led by China) and increasing per-capita energy usage as incomes rise.

LNG trade in 2017 increased +13.6% on 2016, to 293mt. KOGAS (Korea Gas Corporation, the world's second-largest LNG buyer) said at the forum that it expects LNG trade to increase by 200mt by 2030, implying a CAGR of 4.1%. KOGAS also said that over this time it expects the number of countries trading LNG to rise from 40 currently to 70-90. Much of this growth is expected to be seen with new deployments of Floating Storage Regasification Units (FSRUs) to support localised, smaller-scale LNG import.

Consensus at the forum was that the LNG market is tightening from where it has been for the past few years as increasing demand has eroded capacity margins. Looking ahead, general opinion appeared to be that mapping planned new capacity against demand growth suggests that a supply gap could emerge from the mid-2020s.

## Pricing

While LNG market balances appear to be tightening, this has been from a relatively loose backdrop over the past 2-3 years during a period that has been defined by a full supply curve. Over this time buyers have begun to see relief on long-established commercial structures and arrangements that had historically favoured sellers.

Although LNG has been commercially produced since 1940 and traded internationally since 1964, trading has been dominated by bilateral sale and purchase arrangements that have delivered an opaque and illiquid market. This is in contrast to oil which has been traded openly for many decades with enormous physical and financial market liquidity and pricing indices that are clear, transparent and open.

Historically LNG pricing has been either explicitly (in the case of bilateral GSAs) or implicitly (spot pricing) linked to crude pricing. The trend over the past few years has been of moving away from this and there is now a broad expectation that LNG will trend increasingly towards crude in the way it is traded. Part of this change is reducing oil-linked volatility within legacy pricing mechanisms. Parties have progressively agreed on a variety of new pricing structures including gas price-linked (eg to Henry Hub) and hybrid structures. At the conference Alaska LNG, which with its Kenai project has been exporting LNG since the 1960s under long-term oil-linked GSAs, announced completion of what it considers to be the first long-term fixed price LNG GSA. With around one-quarter of LNG now trading through the spot market, trading is also now much less concentrated on fixed bilateral arrangements,

Developers of new plant are also said now to be prepared to take a more accommodating approach to contracting. Woodside CEO Peter Coleman said that greenfield projects are now likely to attract GSAs with an initial term of 10-15 years, which is materially shorter in term than in the past. Brownfield contracts can be as little as 3-5 years.

## Commoditisation

Another aspect of broad agreement across major LNG players – both buyers and sellers – is that of LNG as a product becoming increasingly commoditised. There are three main contributing factors to this:

- **Broadening of sell-side** – The arrival of new producers to the market, particularly from Australia and the US, has increased sell-side liquidity which has served to bolster supply margins and reduce existing buyer concern over security of supply and access to product. Looking ahead the pending arrivals of Mozambique and other new increments of discovery-backed supply will further deconsolidate the supply-side of the market.
- **Broadening of buy-side** – The number of countries that buy LNG continues to increase, supported in recent years by the adoption of FSRU technology to enable smaller domgas markets to import LNG on relatively economic terms, in some cases to support existing domgas markets. One relevant example is the East Coast of Australia where developers are progressing a FSRU solution to supplement local market supply.
- **Access to technology** – LNG liquefaction technology has previously been tightly held by a very small number of IP owners. Technology is now much more established and available to project developers with significant savings on time and money.

The trend towards commoditisation makes it critical that plant owner/operators pursue cost-leadership strategies. There were various examples of this referred to during the forum, ranging from capex cost-out (eg Anadarko has cut US\$4 bln from its estimated Mozambique LNG build cost), to shipping (the widening of the Panama Canal will allow bigger LNG tankers through which will cut the voyage time (and, therefore, cost) of cargoes to Asia by around half) and sub-surface efficiency gains.

## NZ read-throughs

Our takeaways for NZ from the event:

- **NZ's lens of 4 million myopic against the needs of 8 billion** – From the outset our main criticism of the government's 12 April announcement has been the flaw in the logic of attempting to address a demand-side problem (being GHGs emitted with certain types of energy consumption) with a supply-side intervention. Discussion at the conference only reinforced this view. NZ's energy resource and infrastructure is the envy of most countries. Part of that resource endowment is gas which looks very likely to contribute as a cornerstone future fuel for the Asia-Pacific region as it strives to achieve the same living standards that NZ and other countries enjoy. Other gas-rich countries have benefitted from bringing new product to market but benefits have also been banked by nations that have integrated additional gas into their energy mixes to improve air quality and displace heavier-GHG (especially coal) demand.
- **Technology trumps policy** – The forum reminded us of the importance of market-led technologic advances in rising to meet commercial and societal objectives. The US did not sign the Kyoto Protocol but it stands as the only nation that would have met targets that would have applied to it. This has not been achieved through drastic policy change – it has been achieved through innovation and technology advances achieved by the private sector.
- **Policy flexibility critical** – The 12 April announcement is a textbook case of government intervening in what was otherwise a functional and increasingly innovative energy market to pick winners (renewable and low-GHG fuel – noting these are not the same thing, particularly given the material GHG footprint of geothermal) and losers (oil, gas and LPG) operating within that market. Whether intended or not the announcement infers an earlier wind-down for the oil and gas sector in NZ than what would otherwise have been the case. As the US experience has shown to dramatic effect, retaining policy flexibility so as not to eliminate future options that might otherwise have delivered positive societal outcomes, is wise policy making.
- **Local advocacy frailties exposed** – Listening to the experiences and work programmes of advocacy bodies in other jurisdictions supports a view that the NZ petroleum sector was caught short in its own work programme by the 12 April announcement. Just as the government has been criticised by not having the evidence, facts and education material to hand to support its decision, the petroleum sector itself can fairly face the same criticism. The result has been a debate that has since been dominated by rhetoric ahead of evidence.
- **LNG a viable gas shortfall option for NZ Inc** – If there ever was to be a domgas shortage in NZ at some future point there are now clearly fit-for-purpose options to import gas that would likely be less expensive and a better fit than has been the case in the past. The likelihood now would be of a FSRU rather than land-based concept.

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