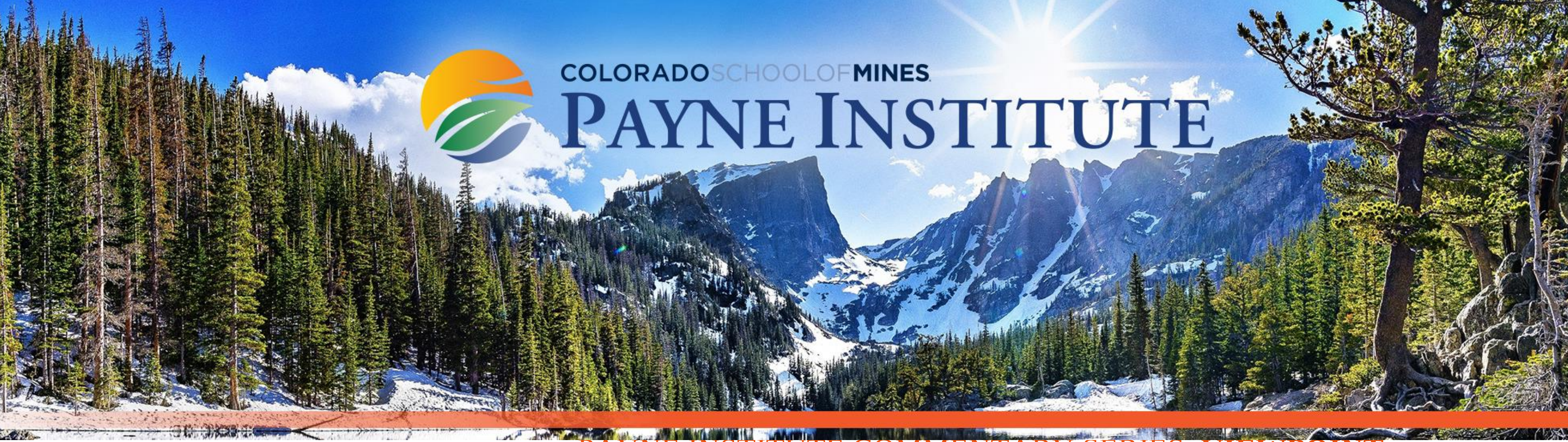

THE FUTURE OF NATURAL GAS:
A TALE OF TWO WORLDS

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OCTOBER 2018

While shale gas has "revolutionized" the energy sector in the United States, and is starting to have an impact on global LNG trade, the picture is very different in other parts of the world. A glance at the global market shows a strong and diverse sector. 2017 was a year of strong demand growth for natural gas, mainly driven by China. Globally, natural gas demand grew by 3%, the highest growth rate since 2010. For the coming five years a more modest expected average annual growth rate of 1.6% is projected. Globally nearly half of all gas is destined for final, direct consumption, the remainder is used for power generation and district heating. In final consumption terms, the shares of buildings and industry are roughly equal (around 40% each), with the remainder (20%) going for feedstock (e.g., ammonia, methanol, and LNG for crackers). Around 90% of gas is delivered by pipeline, 10% is liquefied and delivered as LNG.

These global trends mask diverging regional developments. In this short piece, we take a closer look at Europe as an example. The region accounts for around a fifth of global gas demand, but demand has been declining in recent years. On the supply side, the reserves in the Netherlands and the UK are dwindling with Norway and Russia filling the gap, and thus increasing import dependence.

THE RISK OF STRANDED ASSETS

One key factor that will likely affect the future of natural gas is climate change policy. Natural gas is important in global CO2 emission terms: according to IEA statistics gas combustion accounted for 6.6 Gt CO2 emissions in 2016, which equals around 20% of total energy CO2 emissions. This excludes methane leakages, another potent greenhouse gas, which is a significant area of discussion.

With policies in place, CO2 emissions from natural gas combustion increase to more than 10 Gt by 2050. However, cumulative energy CO2 emissions need to stay below 790 Gt between 2015 and 2100, if we are to meet the climate objective (a two-out-of-three chance of staying below 2 degrees global average temperature change). To meet these goals, these emissions need to fall from 32 Gt in 2015 to less than 10 Gt in 2050, and drop to zero around 2060. That implies that beyond 2060 there is no room left for direct use of natural gas without carbon capture and storage (CCS). However, most natural gas infrastructure has a longer life span that this timeframe, and additionally, more capital stock will come onstream in the coming years. This raises the prospect of "stranded assets", a deterrent for investments.

NATURAL GAS IN EUROPE

European gas prices are significantly higher than those in the United States. At the same time, Europe has many progressive renewable energy policies, and carbon prices were low until recently. The result of which was that coal power production has been largely maintained, and an associated gas "squeeze". This context has started to change with a CO2 price that has risen to 25 Euros per tonne early September. Lignite and hard coal power become non-economic at 25-35 Euros per tonne, and this bodes well for gas in the short-term. In the buildings sector, housing energy efficiency measures are showing their impact. Industry suffers from international competition. Gas intensive activities such as ammonia production or steam cracking of LNG are moving to the U.S. because of gas prices. These latter two trends have a downside effect on gas demand.

Heating of buildings constitutes the largest natural gas market share. A combination of efficiency measures and energy substitution is reducing this demand. Various jurisdictions are also seeing pressure on natural gas demand. As an example, the Dutch law for compulsory natural gas connection for new dwellings has been abolished in July, which puts an end to gas connections for new developments. Europe-wide district heating systems and heatpumps are on the rise, at the expense of gas boilers. In the near-term, electrification of end-uses, notably the massive introduction of heat pumps, may affect natural gas demand. The European Heatpump Association reports a 4% heatpump market share in building stock in 2017. Recent IRENA scenarios for the European Union in 2030 indicate that natural gas demand that may fall by 7% between now and 2030. This might be summarized as: a modest climate policy is beneficial, while a more aggressive climate policy is detrimental for natural gas demand.

CLEAN GAS

Within this paradigm enters the narrative of clean gas: the use of existing natural gas infrastructure for a different type of gas. This includes cleaned biogas, hydrogen, and synthetic natural gas (from hydrogen and CO2). The rationale can be framed as:

- The rapidly falling cost of renewable electricity have changed the narrative for hydrogen economics.
- It is easier to store gas than electricity.
- Gas demand is very seasonal, notably heating demand. Building an electricity infrastructure for such peaks require high investments.
- Clean gas alternatives can allow better use of otherwise redundant gas infrastructure.
- Production of hydrogen and derivative gases is a form of electrification.

Today, the costs of clean gas are relatively high. A recent study of the French energy agency ADEME and the gas transportation utilities estimated around 80 Euros/MWh supply cost for cleaned biogas, EUR 80-120/MWh for hydrogen from renewables, and EUR 160-180/MWh for synthetic natural gas. For comparison, natural gas for large consumers costs around EUR 40/MWh. As one MWh equals 200 kg CO2, a cost gap of 40-140 EUR/MWh translates into EUR 200-700/t CO2. Perhaps technology learning can reduce these costs further. Recent IRENA analysis indicates a target cost of 16 EUR/MWh for hydrogen supply at the pump from offshore wind at 50 EUR/MWh; this option is being considered in Germany and the Netherlands. The Japanese cost target is half the European. This, perhaps optimistic estimate, would push hydrogen cost well below the supply cost for natural gas.

Various studies indicate that cleaned biogas can replace 10-20% of natural gas, so the other clean gas types would have to fill the remainder. In Germany, Power-to-X (PtX) is seen as a core component of the energy transition. The German Energy Agency (DENA) projects 533 to 908 TWh PtX fuels by 2050, which equals 29-45% of German primary energy supply needs. The bulk would likely be imported. Norwegian gas companies are studying the possibility to supply hydrogen from natural gas with CCS, and from renewable power through existing gas pipelines. In various European countries, studies are ongoing how to adjust the gas pipeline system and gas using equipment for new gas mixtures.

NEXT STEPS

Combined with technological developments, there is a strong political interest to find natural gas alternatives. European Ministers gathered in Linz, Austria in September 2018, and signed a declaration to: "collectively aim to maximise the great potentials of sustainable hydrogen technology for the decarbonisation of multiple sectors, the energy system and for the long-term energy security of the EU." In a similar vein, Japan will host a Ministerial hydrogen summit in Tokyo during October, 2018.

The prospects for natural gas are uncertain in a complex energy transition. Technology progress and policy imperatives are shaping its prospects. It will be necessary to continually monitor and adapt to changes, and investment decisions will need to account for this uncertainty. Further research is warranted about how the clean gas (and related PtX) sector will evolve, and how it will relate to the purported "golden age" of natural gas.

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