Economic Analysis

Natural gas in the long-term: facing two paradigms

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The "bridge fuel" paradigm

As news of the vaccine unfolds, and it becomes more evident that the Covid-19 pandemic could be controlled sometime next year, attention will shift back to climate change as one of the most pressing crises of our time. Across the world, the pressure to reduce greenhouse gas (GHG) emissions is mounting. A transition to cleaner energy sources is underway, which is likely to accelerate due to technological progress and government intervention. In the United States, a new administration will place climate change at the top of its priorities, thereby realigning policies with other developed economies.

In this context, natural gas is generally perceived as a "bridge fuel," that is, one that should help the global economy transit from fossil fuels to cleaner forms of energy. While this may be true, some questions remain unanswered. For example, is natural gas a transitional fuel, or can it manage to get a permanent role in the "new energy" paradigm? Could natural gas be entirely displaced by zero-emission energy sources such as hydrogen, nuclear, wind, and solar? What are the implications for the U.S.?

Currently, natural gas accounts for about one-third of U.S. energy demand and one-fourth globally. Natural gas has become a viable alternative to improve air quality and reduce carbon dioxide (CO2) emissions as it emits less CO2 per unit of energy than any other fossil fuel. Besides, it is abundant. According to the Energy Information Administration, the world had an estimated 203.2 trillion cubic meters (Tcm) of total proven gross natural gas reserves, enough to last about 50 years at current production rates. Meanwhile, the U.S. has enough dry gas to last 92 years at current production rates.[1] Advances in drilling and transportation technologies have increased natural gas availability while significantly reduced its cost. As a result, global demand increased by 2.1% per year between 2010 and 2019. Currently, natural gas supports the expansion of wind and solar energy by compensating for periods of intermittency.

Natural gas demand in the long-term

Long-term prospects for natural gas are good. After experiencing a rough 2020, natural gas demand will recover and expand over the next couple of decades. According to the International Energy Agency Stated Policies Scenario (STEPS)[2], demand is projected to grow by an average of 1.2% per year between 2019 and 2040, from 4,026 to 5,221bcm. About 75% of the additional demand will come from developing countries in the Asia Pacific region -most notably China and India- and the Middle East. Countries in these regions will benefit from excess global supply and low prices. Also, policies geared towards displacing coal and promoting infrastructure investments such as import and export terminals, pipelines, storage facilities, and distribution networks will boost demand. Meanwhile, demand in North

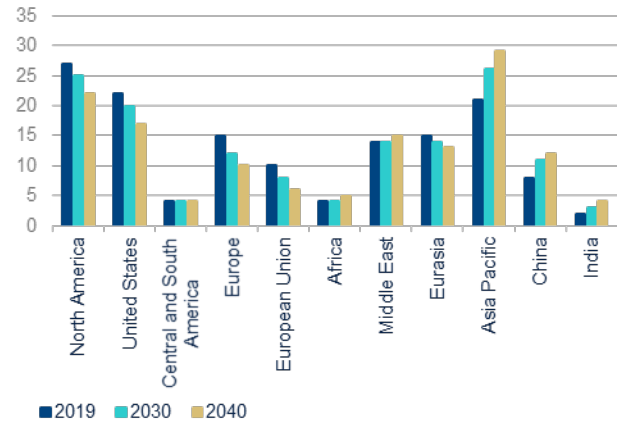
1: Energy Information Administration.
2: International Energy Agency (2020).

America and Europe is expected to grow at a much smaller pace (0.1% and 0.6%, respectively) due to improving efficiency and a growing share of renewables.

Power generation will account for 22% of additional primary demand between 2019 and 2040. In developing countries, increasing demand for electricity and relatively low prices will support natural gas demand in power generation. Meanwhile, in developed countries, coal-to-gas switching will be a crucial driver of demand over the next five years of the forecasting period, after which renewables are expected to increase their market share significantly. In regions where renewables already have a strong presence, like the European Union, the demand for natural gas may never return to 2019 levels.

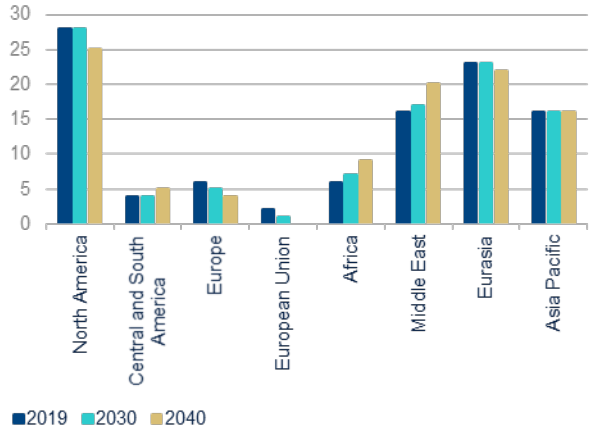
The industrial sector is projected to account for about 60% of natural gas incremental final consumption between 2019 and 2040. Almost all of the additional growth in industry demand comes from emerging markets. Industrial uses of natural gas include process heating, combined heat, power systems, and feedstock to produce chemicals, hydrogen, and ammonia for fertilizers and methanol. Other sectors, like commercial and residential, are expected to account for about a quarter of incremental final consumption. They are likely to face the impact of policies to improve efficiency and reduce CO2 emissions, particularly in advanced economies. At the same time, natural gas in transportation will find an important niche in shipping. In the absence of drastic changes, natural gas will continue to be an essential component of the energy mix, accounting for 25% of total primary energy demand by 2040 vs. 23% in 2019.

Figure 1. **NATURAL GAS DEMAND** (SHARE OF TOTAL, %)



Source: International Energy Agency. World Energy Outlook 2020

Figure 2. **NATURAL GAS PRODUCTION** (SHARE OF TOTAL, %)



Source: International Energy Agency. World Energy Outlook 2020

In this scenario, the primary sources of uncertainty come from the macroeconomic outlook and geopolitics, particularly in emerging markets. Persistent low prices of oil and coal could erode the competitiveness of natural gas and the extent by which public policy allows for opportunities for coal-to-gas switching -a process that may have been slowed down by the Covid-19 pandemic and governments' measures to boost the economic recovery. Another source of uncertainty is the pace at which renewables will continue to gain market share in power generation. At the current stage of technological progress, natural gas will continue adding stability and flexibility to wind and solar energy systems.

Natural gas demand in the "new energy" paradigm

Although the IEA STEPS serves as a baseline and is perhaps the most reliable description of natural gas long-term outlook, it faces a significant challenge. Its realization is inconsistent with the Paris Agreement's goals and some of the U.N. Principles of Sustainable Development, such as access to affordable and clean energy, and climate action.

In particular, preventing the earth from warming 2°C above pre-industrial levels requires more ambitious policies than the ones currently being implemented. In developed countries, policymakers have questioned the role of natural gas in light of net-zero emissions goals and increasing concerns on the adverse effects of methane emissions that can be monitored through satellites. After all, despite being cleaner than other fossil fuels, natural gas production and transportation emit significant amounts of methane (CH4), which has a global warming potential[3] between 28 and 36 times higher than CO2 over 100 years.

Therefore, as countries converge in efforts to bring down GHG emissions, a more realistic outcome implies that natural gas will face more challenging conditions than those stated in the IEA STEPS. This would mean that the major trends affecting the viability of natural gas in the long-run such as environmental policies, the expansion of renewables, improvements in energy efficiency, electrification, and the use of low-carbon alternatives like biofuels or hydrogen, will likely develop at a faster-than-expected pace.

To assess the implications of a rapid energy transition, energy companies, government agencies, and research institutions have developed scenarios consistent with the Paris Agreement's goals. The results vary depending on assumptions made on carbon prices, public policy, industry measures, and consumer behavior. However, most of these exercises have a projected decline in natural gas demand, and the recognition that radical changes are needed to avoid a 2°C increase in average global temperatures from pre-industrial levels. For instance, in the IEA net-zero emissions scenario, more than 50% of total vehicle sales have to be electric by 2050 (compared to 2.6% in 2019). In addition, three-quarters of power generation would have to come from low-carbon sources (compared to less than 40% in 2019), while consumers need to adjust their lifestyles drastically (drive less, use public transportation more, consume less, eat less meat, and recycle more). Moreover, these changes need to happen quickly and all at the same time.

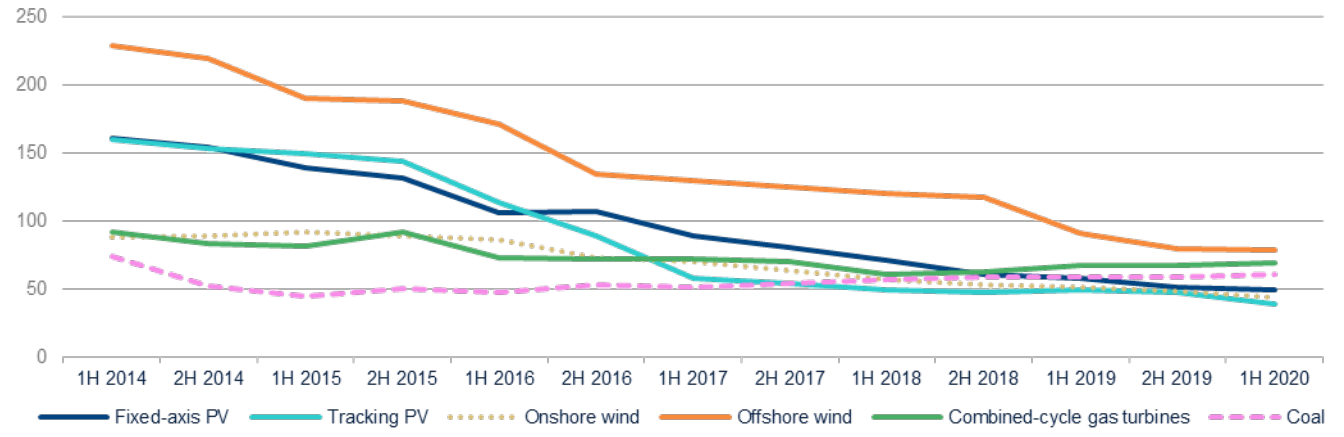
Admittedly, the world is still far from a net-zero emissions path. Therefore, scenarios where natural gas gets a preeminent role in the energy landscape seem as unlikely as those where natural gas is entirely displaced by other sources of energy. Thus a more realistic outlook is something in between, yet so complicated that it cannot be reduced to a single trend. Instead, natural gas demand may follow different trajectories depending on the region and the sector. Simultaneously, some of the expected changes could happen slowly at first but quickly later on once certain thresholds and barriers are crossed.

This implies that natural gas is likely to maintain a competitive advantage in places where it is an incumbent fuel.[4] This would be the case of top producers like the United States, the Middle East, and Russia. For example, in the United States, policymakers will likely consider natural gas as a non-disruptive and cost-efficient alternative to decarbonization. In contrast, natural gas may lose market share at a faster-than-expected pace in developed countries with fewer reserves and more ambitious decarbonization policies like the U.K. or the European Union. China, India, and the rest of Asia Pacific will consolidate as the main markets for natural gas. Still, it is unlikely to achieve a leading

3: U.S. Environmental Protection Agency.
4: Nikos Tsafos (2020)

position due to competition from coal and renewables. In these countries, coal-to-gas policies are not only based on environmental concerns but also on cost-efficiency, meaning that policies supporting a transition from coal to gas could intensify or weaken depending on macroeconomic conditions and market incentives. Meanwhile, developing countries in Latin America or Africa could leverage existing technologies to leapfrog fossil fuels altogether as the most cost-effective and environmental-friendly strategy.

Figure 3. **LEVELIZED COST OF ELECTRICITY BY SOURCE** ($/MWH, 2019 REAL)



Source: Bloomberg New Energy Finance

The industrial sector will be a stronghold for natural gas for several years, given that it is cleaner and often more affordable than coal and oil. Given the difficulty of decarbonizing industries like cement or steel, which operate processes at very high temperatures, using alternatives like hydrogen or biofuels is still expensive and in the early stages of development. However, they could become economically viable by 2040. Biofuels for industrial heat could become cost-competitive in the next decade, particularly in countries where natural gas tends to be more expensive, like India, China, and Japan. Meanwhile, the increasing demand for petrochemical goods will continue supporting natural gas demand in the United States. In contrast, natural gas used by the energy sector could face significant competition from electrification.

Overall, the prospects of natural gas in transportation are clouded by a trend towards electrification. However, there are some niches like trucks, buses, and maritime shipping (due to new regulations on marine fuel's sulfur content) where there is a high potential for substitution. Nonetheless, in the long run, natural gas could compete in the transportation sector through the production of hydrogen, particularly in places like Japan or South Korea that have pioneered the use of cell-fuel vehicles (see "Hydrogen. An Essential Piece of the Clean Energy Puzzle", BBVA Research U.S. Outlook 3Q20).

The prospects for natural gas in buildings are more likely to be mixed. On the one hand, demand is expected to remain robust in developing countries that invest in distribution networks to move the residential sector away from older and more pollutant sources of heat. On the other hand, a push towards energy efficiency and stricter environmental regulations on building construction will increasingly lead to natural gas alternatives such as electric heat pumps and solar thermal. Not to mention that increasingly warmer winters will negatively impact the demand for commercial and

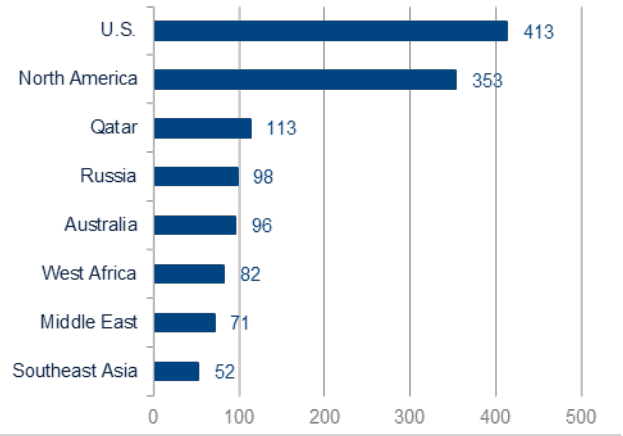
residential use, a trend that will worsen over the years. Natural gas demand could decline if it is mixed with hydrogen or biogas in the not too distant future. However, just as with power generation, natural gas in building construction is likely to show resilience in places where it is already a significant source of heat.

The U.S. as a major supplier

A dozen countries will account for most natural gas supply in the mid- and long-term: Qatar, Russia, United States, Iran, Saudi Arabia, Australia, Canada, Algeria, and Norway. In the IEA STEPS, about half of the projected production growth in these countries will be devoted to exports. Although natural gas has proved more resilient than coal and oil, the Covid-19 pandemic deferred LNG projects equivalent to 200bcm.

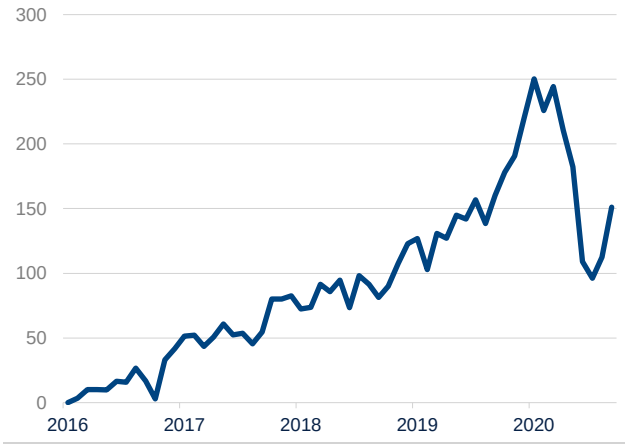
The U.S. is well-positioned to supply liquefied natural gas (LNG) to Asia (which accounts for 70% of demand) and other parts of the world. The country is currently the third-largest exporter of LNG after Australia and Qatar, and it hosts half of all the LNG pending projects around the world. Almost 60% of the expected global growth in LNG demand will be supplied by terminals located in North America.[5]

Figure 4. **LNG PROJECTS, RANKING BY REGION** (AS OCTOBER 2020, MILLION METRIC TONS)



Source: Bloomberg New Energy Finance

Figure 5. **U.S. LNG EXPORTS** (BCF)



Source: Haver Analytics

U.S. natural gas will come from two principal regions: Appalachian and Permian. Further transportation and storage infrastructure projects can be expected in both areas in the following years as more production is geared towards exports. However, just as in the case of demand, a faster-than-expected energy transition could have vast repercussions in the LNG value chain. It could potentially force existing and new facilities to operate under capacity or shutdown before time. Likewise, if demand growth turns out to be slower than expected, prices may not be high enough to compensate investors in LNG projects that usually take years before they pay off. Ambitious and concerted

5: McKinsey & Company (2019).

climate policies could make existing LNG capacity enough to supply the market through the end of the decade, impacting the viability of new projects.

Bottom line:

Natural gas is an essential player in the energy transition. In the following decades, it will contribute to decarbonizing economic activity by providing an affordable and cleaner alternative to coal and oil, particularly in developing countries. Coal-to-gas switching in the power sector will offer many opportunities for the natural gas industry, but not forever as renewables are expected to increase their share in power generation rapidly. In contrast, natural gas will enjoy a solid position in the industrial sector as it is currently the most viable option for hard to abate industries, and demand for petrochemical goods continues to expand. Nevertheless, different scenarios point to increasing competition from renewables, electrification, and low-carbon substitutes like hydrogen or biofuels. Moreover, increasing methane emissions can potentially exclude natural gas from the list of sustainable options. Therefore, to secure a permanent place in the "new energy paradigm," the natural gas industry must eliminate fugitive emissions, venting and flaring while investing in electrification, carbon capture, storage and utilization, and the production of hydrogen. This will consolidate natural gas as a sustainable and cost-effective alternative for lowering GHG emissions in the long-term.

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