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# How Will Natural Gas Fare in the Energy Transition?

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It is hard to know sometimes whether natural gas is in a golden age or a dark age. Gas is often presented as a promising candidate to deliver cleaner air and decarbonization, which are reasons why many outlooks see a continued need for gas to 2040 and beyond, even assuming a rapid energy transition. Others see it as a temporary and expensive solution that we, as a world, must not lock in, lest we undermine our efforts on deep decarbonization. And others still question whether gas should play any role at all in the energy transition, its environmental credentials undercut by fugitive emissions, venting and flaring, and by the fact that it is still a carbon-emitting energy source. In their eyes, the sooner we can phase out gas, the better.

The idea that the world can sharply curtail gas use in the next decade or so and still meet its climate and environmental goals is not very convincing. But equally questionable is the idea that gas must have a privileged position in the energy transition, that a low-carbon future must be good for gas. The reality is somewhere in between. Gas does different things in different markets and at different costs, so broad statements about how gas will fare in the future are unhelpful. In some markets, moving away from gas is a logical decarbonization path; in others, additional gas use will deliver environmental benefits.

To think about the future of natural gas, it is helpful to understand its various uses and how those uses vary by region. Gas is our most versatile fuel. Almost 60 percent of oil demand comes from transportation, so it is easy to think about oil as a transport fuel even though it is more than that. Similarly, over 60 percent of coal use goes into power, so coal is often seen chiefly as a source of electricity, despite its heavy use in industry. Other energy sources mostly go into power, although in a highly electrified world, power will serve diverse energy needs.

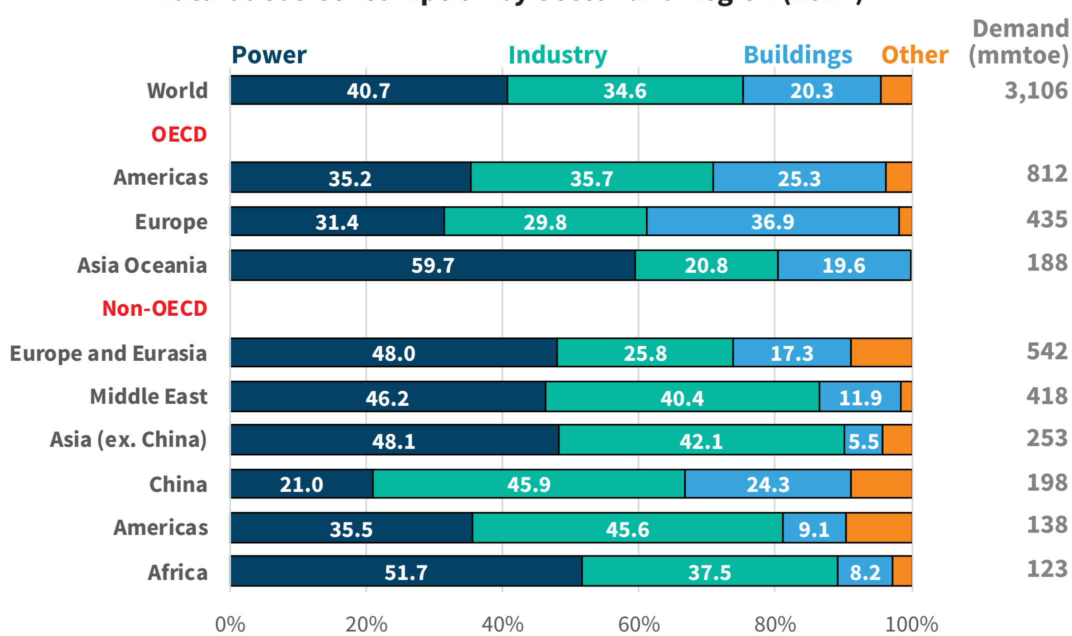
By contrast, only 40 percent of gas consumption goes into electricity. The rest goes mostly into buildings, for space and water heating as well as cooking, and into industry, largely as feedstock or for process heat. These numbers, moreover, vary greatly by region. Outside the countries of the Organization for Economic Cooperation and Development (OECD), 80 percent of gas is consumed in industry or power—only in a few places does gas play a major role in buildings, mostly in China, the former Soviet Union, and some countries in Latin America and South Asia. In OECD countries, buildings account for 28 percent of gas demand, with Europe being the most dependent on gas and Asia Oceania being the least dependent.

We thus need to grapple with gas in all its regional and sectoral complexity. In some places, gas is likely to capture market share against oil or coal or defend market share against competitors. In others, gas might be displaced by alternatives or fail to make inroads. These outcomes may or may not be ideal from a climate or local air pollution perspective: gas might survive in a low-carbon pathway even when it should be phased out, or it might fail to grow even though its growth would help us achieve climate or environmental goals.

This complexity is amplified by two factors. First, there is a difference between gas as it is versus gas as it could be. For instance, if the gas industry could limit fugitive emissions and reduce venting and flaring, the case for gas would be much stronger, especially if these gains could be proven conclusively to a skeptical public. But the case for gas cannot rest solely on hoping that gas is something it is not; its role in a low-carbon future can only be ensured if the externalities from the gas value chain are measured, managed, and mitigated.

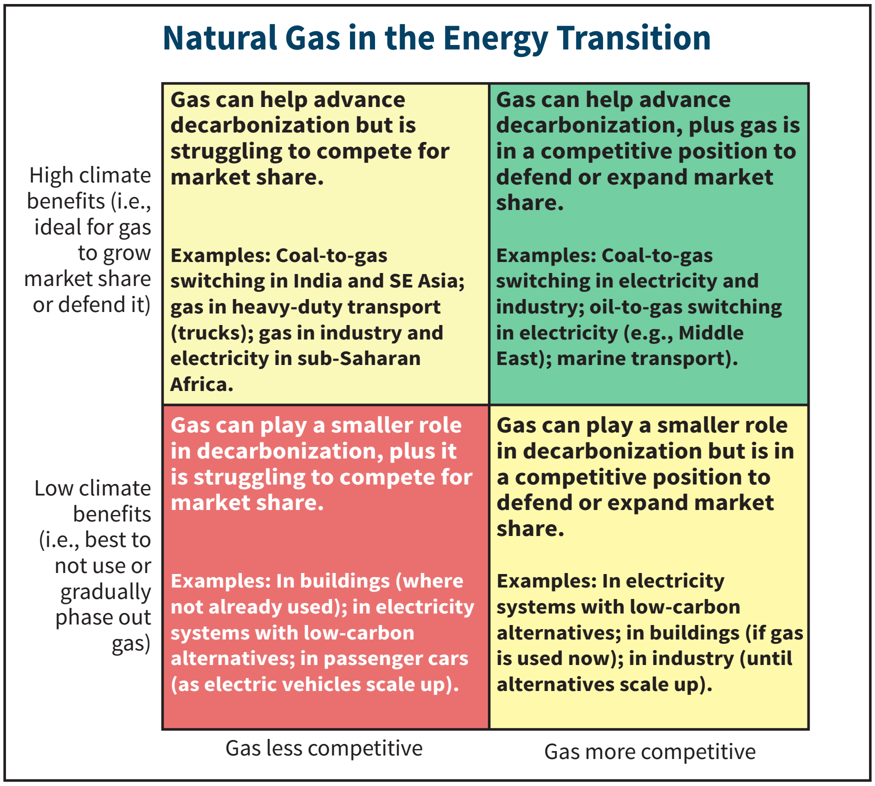
The second factor is that the definition of "gas" will change. Methane extracted from reservoirs underground will commingle with renewable gases from organic matter and with hydrogen, including hydrogen that could be made from gas (with carbon capture and storage). The user experience might be similar, but these value chains will have different technologies and business models, and they will have distinct political and geopolitical dimensions. The scale of this evolution is hard to know; for instance, the International Energy Agency (IEA) estimated in its Sustainable Development Scenario that biomethane and hydrogen could make up 7 percent of total gas supply in 2040, driven by China, the United States, and Europe. So, the definition of gas will change, even though, at least through 2040, methane from underground reservoirs will dominate the supply picture.

**Natural Gas Consumption by Sector and Region (2017)**




Note: OECD = Organization for Economic Cooperation and Development. Mmtoe means million tonnes of oil equivalent. Power generation includes heat. Industry includes non-energy use (feedstock), energy industry own use, and other energy-producing sectors. Buildings includes the residential and commercial sectors. Other sectors are mostly transportation, agriculture, gas works, and statistical differences.
Source: International Energy Agency, *World Energy Balances* (Paris: OECD, 2019), https://www.iea.org/reports/world-energy-balances-2019

Given all these complexities, we can imagine four theoretical quadrants in thinking about how gas will fare in the energy transition. In one quadrant are sectors and countries where gas is likely to either gain market share or defend it, contributing to decarbonization, at least in the short to medium term. In another quadrant are markets where gas is in a strong competitive position but should be phased out eventually in a low-carbon pathway. A third quadrant includes markets where gas could help us achieve climate gains but is unlikely to thrive for various, mostly economic reasons. And the final quadrant is a place where gas is neither helpful in meeting climate goals nor likely to thrive. Which sectors and markets belong in each quadrant? And what might these quadrants tell us about the future of gas in the energy transition?




## *Gas in Electricity*

Electricity is the largest gas consumer in the world, and gas has been instrumental in shifting the world's electricity mix over the past half century. In 1973, during the first oil shock, oil provided almost a quarter of the world's electricity; in 2018, it accounted for just 3 percent. Gas, meanwhile, jumped from 12 to 23 percent even though gas only took off as a power fuel in the 1990s. In the last three decades, there have been countless examples where oil-to-gas switching has led to lower emissions of CO2 and local pollutants. But that transition has mostly happened, so there is limited upside from now on (the one exception is the Middle East, where oil still made up a quarter of the region's electricity production in 2017).

Using gas to displace coal is another clear-cut case of gas delivering environmental gains. In the United States, emissions from coal peaked in 2005 and fell by 43 percent through 2018, largely because cheap gas displaced coal, although renewables have risen as well in recent years (more on that later). And the benefits on local air pollution are clear, too. But a switch from coal to gas in the power sector is a rare occurrence, at least in the form it took in the United States, where the decline in coal more or less matched the rise in gas.

There are maybe 10 OECD countries where a declining share for coal was made possible largely by a rise in gas, and even then, gas was often paired with renewables. In the non-OECD world, there are very few such examples; in fact, it is more common to see coal replace gas than it is to see gas replace coal.

If coal-to-gas switching in the power sector has been rare in the past, we can expect it to be rarer in the future. In the United States, from 2015 to 2018, the growth in gas-fired power was similar to the growth in wind and solar: 134 terawatt hours (TWh) and 126 TWh, respectively. The country still gets more than a quarter of its electricity from coal, but gas and renewables will both vie for that market. In the United Kingdom, the decline in coal use did not lead to a rise in gas use in electricity—it was efficiency and renewable energy that lowered coal use. In many countries, renewables are the chief competitor to coal, and in some cases, renewables are displacing gas. For all the talk about gas being an ideal partner for intermittent renewables, the reality is that the growth in renewable energy has just as often hurt gas as helped it. As renewables become cheaper, that competition will be even more pronounced.

In other words, gas in power generation will straddle several quadrants in our imaginary matrix. In markets where gas is competitive, due to cheap gas or high carbon pricing, gas can displace coal but is unlikely to have a privileged position, and renewables will play a growing role, too. In other markets where gas is less competitive, its role in power generation might shrink or stay small. This is especially likely in emerging markets in Asia, where gas struggled to gain market share. In fact, from 2000 to 2018, Southeast Asia largely phased out oil in power generation, but it was coal, not gas, which made this happen. In other parts of the world, gas is barely entering the power system at all.

The inability to compete in power generation will be a problem for gas in two ways. First, almost half the growth in gas demand since 1971 has come from power generation—if gas cannot compete in power, it risks losing a fundamental pillar that enabled its growing importance in our energy system. Already, the IEA is noting that industry, not power, is the driver of gas demand. The second problem is broader: our energy system is becoming more electrified, a trend that can be supercharged by electric vehicles and the electrification of buildings. As the energy system relies increasingly on electricity, an inability to compete will be a big problem for gas.

This is not to suggest that gas will be phased out in power generation. In many markets, such as North America, the former Soviet Union, or the Middle East, relatively cheap gas will be hard to push out from the system, even if renewables might be more competitive with new gas plants. In other places, gas is playing a seasonally balancing role or acts as a backup to hydropower or intermittent renewables, and its use in power generation will continue. Furthermore, countries that phase out coal or nuclear might turn to gas for some time. But experience shows that we are unlikely to see a lot of coal-to-gas switching in the world—at least absent clear policy support—and that renewable energy will eat into the market share for gas.

## *Gas in Industry*

Industry, in the numbers shown above, covers three clusters. First, it includes gas demand in petrochemicals, as feedstock and for process heat, accounting for almost 10 percent of global gas demand. In a 2018 report, the IEA noted a few steps to a low-carbon pathway for chemicals, and none involved a shift away from gas (p. 101). In fact, a switch from coal to gas would deliver about 25 percent of the reduction in CO2 emissions from a baseline to a low-carbon future. Carbon capture and sequestration (CCS) and efficiency were the other core pillars. Alternative feedstocks made up just 6 percent of the possible delta, while recycling provided 9 percent—a reminder that we do not really have good options to displace fossil fuels. Even in a low-carbon future, gas consumption in petrochemicals will grow.

Second, gas is also used to produce energy, which accounts for about 9 percent of overall gas demand (in oil and gas extraction, oil refineries, and liquefication and regasification facilities). Gas demand here is derivative: if there is less need for oil and gas, there is less gas needed to extract oil and gas, to refine oil, and to liquefy and regasify gas. How this demand evolves will be driven by the demand for oil and gas more broadly, although the link is not entirely linear and is affected by efficiency as well as by efforts to electrify oil and gas upstream operations that could reduce some gas use on site. But, in simple terms, almost 10 percent of gas demand will rise and fall alongside the other 90 percent.

The final cluster is gas used in other industrial operations, accounting for roughly 14 percent of total gas demand in 2017, with three industries alone accounting for roughly 5 percent of total demand: iron and steel, non-metallic minerals (e.g., cement, ceramics, glass, etc.), and food and tobacco. Globally, gas has maintained its market share in industry since 1971, although its position has improved in some geographies and worsened in others. In industry, gas can do well because it is much cleaner than coal and can be cheaper than oil. Even today, coal is the dominant fuel in industry, its market share at 29 percent, although this is largely due to China and less so to India. Excluding these two countries, coal provided 13 percent of industrial energy in 2017 (including process heat in chemicals). Against oil, gas can be more competitive, which is why we continue to see oil-to-gas switching in industry around the world.

The decarbonization of the industrial sector poses a threat to gas, but this is a long-term threat. For heavy industry, which operates at very high temperatures, we have few good alternatives to fossil fuels in general and gas in particular. As one recent study on low-carbon heat options for industry concluded, "Few options exist today to reasonably substitute low-carbon heat sources. Unlike the power sector and light-duty vehicles, the operational requirements of temperature, quality, flux, and high capacity place stringent constraints on viable options. These are further narrowed by geographic limits of natural resources and infrastructure."

Eventually, industry might rely on a mix of CCS, hydrogen, and bioenergy. Hydrogen generated from gas with CCS or from renewables could offer a low-carbon option, but the economics are still challenged. In its 2019 *Future of Hydrogen* report, the IEA noted that "Despite having the potential to eliminate emissions from high-temperature heat for industry, hydrogen remains an expensive alternative to fossil fuels in the context of a low-carbon pathway for the energy system, even when CO2 prices reach USD 100/tCO2." In fact, bioenergy might beat hydrogen in terms of economics; according to the IEA, "Bioenergy is set to become cost-competitive with natural gas as a source of high-temperature heat in 2030 in India, China and Japan, even at the higher end of the bioenergy price range explored (USD 12/GJ)," largely because gas is expensive there.

In other words, industry should be a good market for natural gas because the market for high-temperature heat has no compelling options that could displace gas, although developments along the learning curve could make both hydrogen and bioenergy competitive post 2030. And while gas might be squeezed by low-carbon options, its attractiveness against both coal and oil will remain, offering some potential for near-term fuel switching that benefits gas.

## *Gas in Buildings*

In buildings, the fate of gas will vary by region and by whether gas is an incumbent fuel or not. In a low-carbon world, gas must be phased out from the places where it is currently being used in space heating, water heating, or cooking. The IEA, in a "Faster Transition Scenario" for buildings, described the role of gas:

> By 2050, natural gas use [in buildings] is less than half of the 2017 level, reflecting a number of factors including building envelope improvements as well as ongoing gains in gas technology performance in which all gas use for heating moves at a minimum to condensing gas boilers and then to more efficient gas heat pumps. Additionally, some gas use is replaced by high performance and low-carbon technologies, such as electric heat pumps (e.g. air-to-water units) and solar thermal technology.

In broad terms, this faster transition relies almost equally on: envelope performance, which the IEA defines as "the material components of a building's structure such as insulation, walls, roofs, windows and air sealing" (28 percent of the potential energy savings); technology choice (31 percent), which "represents shifts from one technology, such as a gas boiler, to another, such as a heat pump"; and technology performance (30 percent). The balance is driven by climate and behavior, which "account for lower heating and cooling service demand from climate change impacts as well as other behavioural effects such as moderate changes in temperature setpoint" (p. 41).

This transition scenario, of course, should be understood as an idealized decarbonization pathway, backed by strong policy and incentives (e.g., on building codes, appliance efficiency rules, support for capital turnover, and so on). It is important to note that gas use in buildings is very concentrated, so the question of gas defending market share against other fuels and technologies will, in the end, hinge on what happens in a few places. Almost 75 percent of the gas used in buildings comes from 10 markets, and four countries alone account for half of the total: the United States, Russia, China, and Iran. Three of those countries have ample indigenous resources that underpin demand for gas, and hence pushing gas out might be difficult. China, by contrast, has made a policy push to use gas as an alternative to more polluting options (coal, biomass, and oil), and increasingly relies on imports to meet its needs, so its calculus might be different.

In practice, however, we have no examples of countries fully replacing gas use in buildings, although, to be fair, we had few alternatives to gas until now and no reason to push gas out. Given how rapidly gas displaced other fuels, like heating oil, we should not assume that the shift cannot happen quickly. But the truth remains: there are a few countries that have seen a decline in energy demand for buildings, especially when measured on a per capita basis, and there are some countries where gas use has declined modestly. This reduction has usually come from energy efficiency rather than fuel switching. When gas has lost market share, which has rarely happened, it is usually due to growth in electricity. Rarely do we see an absolute decline in gas use in buildings.

The United Kingdom offers an example of how gas might be affected by aggressive efficiency measures and by a move to new, more efficient appliances. Energy used in space heating in the residential sector declined by almost 13 percent from 2000 to 2018 in the United Kingdom, and on a per household basis, the decline has been sharper, 22 percent. This is largely due to efficient boilers and better insulation. Two-thirds of U.K. homes had efficient boilers in 2017, up from virtually zero in 2000. The share of homes with cavity wall insulation rose, too, from under 35 percent in 2002 to 67 percent a decade later. These numbers should underscore that change can happen quickly, even in a sector that relies on equipment turnover or labor-intensive interventions in existing building stock. And the impact on energy use can be large, even if not transformational.

The current trajectory is nowhere near this idealized version, of course, due to a combination of weak policy support, unfavorable economics, or technology gaps. Heat pumps, for instance, can now operate at low temperatures, which make them a more viable alternative to gas. They are also increasingly competitive with gas for space heating (and cooling) and can yield a lower carbon footprint than gas-based heating. But as one recent study found, heat pumps can be more economic than gas in newbuilds but not in existing ones unless consumers are replacing an air conditioner (and hence need to spend additional capital to keep running on gas). Another study found that heat pumps could compete with gas for new construction in the United States by the 2030s, assuming cost reductions and a commitment to decarbonization (meaning high carbon prices). Meanwhile, sales of heat pumps are growing rapidly, at 10 percent in 2018 per the IEA, and "overall, heat pumps comprise around 2.5% of the sales of global building heating equipment, but this share is growing."

The wide adoption of heat pumps will also put a strain on the grid, however, especially if heat pumps are not part of a smart system to balance load. As the IEA noted in its 2019 *World Energy Outlook*: "The existing peak in winter electricity demand in Europe and some parts of North America would also be heightened by heat pumps consuming more electricity in the winter. For example, if heating in all buildings in Europe was switched to electricity using heat pumps, peak winter electricity demand would increase by more than 60%." In short, the deployment of heat pumps will depend not only on building-level economics but also expanding the grid and making it more flexible, which means that penetration might be slow.

Another long-term competitor to gas in buildings is district heating. Most district heating today is supplied by fossil-fuels, 89 percent per the IEA, but it is possible to run a system based on low-carbon solutions (as Sweden does, relying on biomass and waste). Over the long-term, this transition could provide another alternative to natural gas, possibly leveraging existing gas networks, but progress on this front has been very slow.

Renewable gas is another candidate for displacing conventional gas in markets where gas networks could be repurposed to deliver renewable gas. Biomethane is still expensive, of course; per the IEA, "most biomethane is much more expensive than natural gas and meeting 10% of today's natural gas demand with the cheapest biomethane options available in each region would cost $2-15/MBtu more than natural gas." But renewable gases can deliver significant supply and sizable CO2 reductions at a competitive cost: one study funded by the gas industry calculated significant mitigation potential in the United States at a cost between $55 and $300 per metric ton of CO2. There is, in other words, great potential for renewable gas, although the economics today look challenging.

Hydrogen is another option. At first, hydrogen can be blended into the gas stream, although doing so will require regulatory evolution. Blending can also increase the cost of delivered gas, leading gas to lose out to heat pumps in markets where electricity prices are low and gas is expensive. Even so, one study, covering Victoria, Australia, found that hydrogen could replace gas use at a lower cost than electricity. Gas and hydrogen can be complements in the short and medium term but are probably competitors in the long term. Even so, a move to hydrogen, rather than electricity, could be more conducive to conventional gas demand.

This competition will take place in a setting defined by a push toward greater efficiency, although energy efficiency in buildings is showing insufficient progress against targets. The IEA calculated that "Global investment in energy efficient buildings dipped by 2% to under USD 140 billion in 2018," which is a worrisome sign. More generally, progress in energy efficiency for buildings is not on track. In a 2018 report, the IEA summarized the picture thus:

> Building envelope measures fall short of sustainability targets, despite some progress. Near-zero energy construction shares are typically less than 5% in most markets, and typical renovation rates are around 1-2% of the building stock per year with 10-15% energy intensity improvements. Achieving sustainability targets would require high-performance envelopes to become the global construction standard and for refurbishment rates to double and to avoid the lock-in of inefficient buildings and their subsequent emissions.

Together these forces are one reason why the IEA, even in a faster transition scenario, sees natural gas supplying 18 percent of building energy in 2050 in countries with mature gas networks (versus 37 percent in 2017), a sign that gas will be hard to push out from areas where it already exists. Given the challenges facing many competitors, it will be hard to dislodge gas from buildings in areas where gas is being used already

The role of gas in new markets is a different matter altogether. For one, gas faces a major headwind: demand is shifting to emerging Asia and Africa, and so it is electricity, through air conditioners, that is more likely to meet the needs of new buildings, not gas. Moreover, there are very few countries that are actively constructing new gas networks, and very few are doing so from scratch. In fact, there are only a handful of countries that have introduced gas into the buildings sector since 2000, and their collective demand is minor, a sign that gas remains a niche fuel in those markets. So, while gas might gain some upside in select new markets, the trajectory is against gas as a new fuel for buildings. However, gas should be able to defend its market share against an increasingly formidable array of alternatives.

## *Gas in Transportation*

Gas use in transportation is limited: excluding gas use in pipeline transport, a mere 1.4 percent of global gas went into transportation in 2017. In road transport, gas meets 2 percent of global energy demand, driven by a few countries that have prioritized deployment of compressed natural gas (CNG) vehicles for passenger cars or short-haul trucks or liquefied natural gas (LNG) for heavy-duty trucks. Outside road transport, gas use is even more limited, with a 0.14 percent market share in "domestic navigation" and a 0.003 percent share in "world marine bunkers."

In road transportation, demand is concentrated in a few markets. In fact, seven countries accounted for 80 percent of gas use in road transport: China (43 percent), Iran (15 percent), India (5 percent), Argentina (5 percent), Thailand (4 percent), Brazil (4 percent), and Pakistan (4 percent). Interestingly, in three of those markets, gas use in road transport declined from 2010 to 2017, evidence that some of the early adopters are already moving away from gas. Meanwhile, three other countries—China, Iran, and India—accounted for 90 percent of the growth in gas used for road transport between 2010 and 2017. In other words, the prospects for gas use in transport boil down largely to policy choices in a very small number of countries, which so far seem to favor gas use.

At the same time, neither CNG nor LNG is likely to make a major contribution to a decarbonization path for vehicles. In passenger vehicles, the dramatic growth in electric vehicles means that gas is too slow and is unlikely to be seen as the technology of choice. Gas has a stronger case in trucks, from a local air pollution perspective. However, the prospects for gas in trucking are not very bright. In 2017, the IEA published a report on the future of trucking that included a "modern trucking" scenario, which halved greenhouse gas emissions by 2050 (relative to 2015). The scenario included a number of wedges to drive this reduction, but gas played a very minor role in those wedges. The reason is that the decarbonization case for gas, as opposed to the air pollution case, is small. Also, once the cost of infrastructure is included, CNG and LNG could not compete with alternative options in 2050.

Gas in marine transportation has slightly better prospects in part because LNG can meet the pollution thresholds imposed by IMO 2020 (International Maritime Organization) and because options for deep decarbonization for marine shipping are non-existent. By 2050, the shipping industry has a goal to reduce greenhouse gas emissions by 50 percent relative to 2008. A recent report by DNV GL showed that LNG could be the dominant maritime fuel in 2050 to meet that target, with the help of strong efficiency gains and zero-carbon technologies. These alternative options will have to overcome various obstacles, like cost, infrastructure, and energy density. A recent report by Lloyds summarized the energy density challenge:

> Electro-fuels such as hydrogen, ammonia and methanol are less dense energy fuels, requiring ships using them to hold greater quantities on board. Therefore, ships running on these fuels may require a fundamental change to their operating profile and gradually through this decade ships would be designed to store less energy on board and bunker more frequently accordingly with the growing availability of these fuels.

The challenges to LNG use in marine shipping remain significant. By DNV GL's estimates, a mere 3 percent of the vessel orderbook is to be powered by LNG. But infrastructure providers, and increasingly gas suppliers, understand that maritime shipping presents a rare growth market for LNG, offering clear benefits in terms of local air pollution and important gains regarding carbon emissions, all in a sector that has few real alternatives to oil-based products. Maritime shipping is a market that LNG can do well in, although this will depend on a more aggressive infrastructure rollout and more support for conversions than we have seen so far.

## *The Future: Cost, Incumbency, and Emissions*

If we return to our matrix, we can detect several clusters. One way to group the data is by region. In simple terms, gas will be hard to dislodge where it is cheap, a description that applies to North America, the former Soviet Union, and the Middle East. In Europe, where gas is expensive, and where the push for decarbonization is greatest, gas can be squeezed out of power generation and eventually buildings but will be harder to replace in industry. In Asia, the role of gas is most precarious. It might do well in industry and buildings, where it is being currently deployed, but its contribution in power generation is unlikely to grow much and might even shrink. Most countries in Asia are willing to subsidize renewables but not gas; it is entirely possible to see a coal-plus-renewables model spreading across Asia. In sub-Saharan Africa, gas is likely to remain a niche fuel that finds pockets of opportunity to spread. So even though gas could provide a solution to energy poverty in the region, it is unlikely to play a central role in that effort.

From a sectoral perspective, industry seems to provide the most solid footing for gas, followed by buildings and then power generation. Once again, cost and incumbency will matter—it is one thing to push out gas and it is another thing to try to introduce it into a system. In transportation, we are likely to see a select few markets continue to bet on CNG and LNG, but the market may be limited. In marine transport, there is strong potential and few alternatives to oil-based fuels. Gas can do well only if the industry is willing to invest in new infrastructure and if the policy environment favors gas. Despite these challenges, it is hard to see a more promising growth market for gas today than marine shipping.

The intersection between gas and climate is more nuanced. First, the carbon footprint of gas should be understood in the context of the readily available alternatives in each market and sector; as discussed already, this requires granular view in what gas does in each market. Second, it is important to affix a time horizon: eventually we should capture the carbon emitted from gas combustion or phase out methane, but we can still rely on gas for decarbonization over the next 10 to 20 years. That said, any areas where gas is being introduced will give gas an incumbency advantage. And it will be hard to justify heavy infrastructure with a short payback period. Finally, there is an inherent tension between gas as it is versus gas as it should be—gas with methane emissions as we now understand them versus an idealized version of gas where the environmental side effects of gas have been well managed. It is okay to try to make gas better as long as we do not forget that gas is not there yet.

Even so, the climate math on gas is complicated. For one, not all gas is the same. Some is easy to produce and might be consumed near its production source. Other gas travels thousands of miles from the wellhead to the burner tip and might be liquefied and regasified in the process. The IEA estimates the greenhouse gas intensity of gas can vary by as much as a factor of 10. That said, our estimates on how much gas is released into the atmosphere are highly imperfect, although getting better. And of course it matters whether one looks at the global warming potential of gas on a 20-year or a 100-year timeframe, with the shorter timeframe making gas look less compelling to combat climate change, even though gas generally beats coal in power generation.

At the same time, the environmental case for gas should be put in its proper context. There are clearly markets where gas has been pushed to alleviate concerns over local air pollution, and in some cases, like China, a country has been willing to pay a premium for that. In most other areas, however, the green credentials for gas have been a rationalization rather than a driver for demand. In the United States, gas triumphed because it is cheap, not because it is clean, even though its ability to help lower emissions has provided an ex-post rationalization for using more gas. In Europe, where there is a clear commitment to decarbonization, gas is already seen as a problem, and issues like methane emissions merely offer extra impetus that will make a difference on the margin. And in many markets, lifecycle emissions are less important than keeping the lights on or fighting local air pollution.

In short, gas will do well where it is cheap or where incumbency gives it an advantage, whether or not this demand is consistent with a decarbonization pathway. There are many markets where gas could deliver environmental benefits, like coal-to-gas switching in Asia, but gas is currently too expensive to compete absent some other driver or policy support. There are also some markets—such as petrochemicals, industry, marine shipping—where gas will do well and can help deliver on a lower-carbon future. Lumping all these disparate stories together is unhelpful, as is a narrative about gas that glosses over this complexity and nuance. Gas is not a climate savior, but it also is not going anywhere any time soon. This is not the golden age for gas, but it is not the dark age either.

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