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How to dismantle a gas bridge?

Abstract

The European Union has long presented itself as the leader in combating unsustainable practices of which climate change poses the greatest and most complex issue. Recently, the European Commission and the governments of member states have reaffirmed their commitment to decarbonisation, which they have to begin by reconfiguring the EU's energy system. Supporting renewables and electrification is half of this story, while many see hydrogen as a fix for the other half. A renewable-based – potentially decentralised – hydrogen society offers the fundamental reconfiguration of energy producer-consumer relations. This is poised to have wide-ranging geopolitical implications as it severs fossil fuel-based capitalist relations between governments, fossil fuel enterprises, and consumers. There is another side to this same coin: hydrogen produced from fossil fuels, offering the continuance of the status quo. It is readily scalable and maintains the fossil fuel-based relations of production and trade within the EU and between the EU and third parties, averting radical transformation. EU policy-makers must heed attention to the deeply politicised nature their decision regarding the form of hydrogen carries and thereby its links to socio-political stability in the region.

Introduction

Hydrogen has been touted as "the missing link in the energy transition" (van Hulst, 2018) leading the European Commission (2020) and other European countries to develop respective strategies. Experts widely expect hydrogen to complement electricity in delivering a non-emitting source of energy to power European society. It is crucial how hydrogen will penetrate the European energy scene, as it will not only reconfigure infrastructure requirements or the legal-technical governance framework, but adopting it will carry wide-ranging socio-political ramifications. This paper explores the geopolitical implications of hydrogen's uptake in the European Union (EU), highlighting how different modes of its production – renewable- versus natural gas-based – may lead the international political economics of the region onto diverging paths. I explore this role by historically contextualising hydrogen in relation to the consumption of what may be turn out to become its predecessor, natural gas. This played a prominent role in normalising East-West relations during the Cold War the repercussions of which have lasted to date, but the specific form of hydrogen the EU moves to adopt may disrupt, alter, or reinforce what Thane Gustafson (2020) has referred to as the *gas bridge*.

I. The geopolitics of natural gas and its link to hydrogen

Hydrogen is an energy carrier. First it has to be produced, for consumers to subsequently extract and harness the energy it embodies. Broadly speaking, there are two ways by which we are able to currently produce the fuel: electrolysis or from fossil fuels. Electrolysis uses electricity and water to produce hydrogen. If electricity is renewable-based (e.g. solar photovoltaics or wind power plants) then this is a sustainable mode of energy production, leading to *green hydrogen*. Alternatively, hydrogen can be produced from fossil fuels. The most popular and cost-effective method for this is steam methane reforming, which uses the methane in natural gas as feedstock,

yielding *grey hydrogen*. Hydrogen produced from fossil fuels without leading to emissions is called *blue hydrogen*. Combining steam methane reforming with carbon capture and storage (CCS) offers the most promise, but alternatives, such as methane pyrolysis are also being developed (Equinor, 2020; Shiryaevskaya, 2018). Blue hydrogen is not sustainable, but it is low carbon.

Natural gas and hydrogen are closely interlinked, since a lot of applications experts envision hydrogen to play a role in is currently met via natural gas (I will return to this in section II.). Thus, the geopolitics of hydrogen are closely tied to the geopolitics of natural gas for two reasons: if green hydrogen production accelerates it can substitute natural gas reliance, deteriorating geopolitical relations based on its trade. If, however, hydrogen production continues to be reliant on methane, then it consolidates the current geopolitical disposition and fortifies existing structures of reliance. Both trajectories are pertinent to consider in the EU's policy planning. We need to explore the historical role natural gas has played in regional political economics to contextualise the implications of the EU's actions. I will do this by discussing Thane Gustafson's (2020) *The Bridge: Natural Gas in a Redivided Europe*.

Natural gas has underpinned EU-Russia producer-consumer relations involving governments, private enterprises, and consumers since the Cold War. The gas bridge connecting the Eastern and the Western blocs was initiated by Austrian, West German, and Soviet delegations in 1967 and has since grown to a vast energy system composed of infrastructure traversing the continent, a political-legal apparatus and codices regulating its trade, deeply entrenched producer-consumer relations, as well as deep-seated consumption practices. At the center of this complex ensemble is a molecule: methane. Gustafson lyrically describes it as having "something appealing in its purity, its elegance of understatement. When it mates with oxygen it burns cleanly, with a bright blue flame, and then vanishes, leaving only water and carbon dioxide, the stuff of soda water. […] Oil, by comparison, is a sludge of chains and hexagons that is largely useless until refined and sorted out, disciplined, so to speak. Coal is even worse. *Natural gas is a princess* [emphasis added]" (Gustafson, 2020, p. 29).

Natural gas' favourable qualities have led governments and companies to support its uptake *in lieu* of other fossil fuels. British government officials took to the fuel to substitute coal after the Great Smog of 1952, while it was also a clear winner during the 1970s in Europe when oil crises weighed on crude demand and a growing environmental movement impeded coal consumption (Arapostathis et al., 2013; Högselius, 2013). It was not only cleaner than its counterparts, but it was "the next new thing, the virtuous fuel, the welcome liberator of kitchens and happy housewives, the magic source of warm baths and hot showers at the mere touch of a button, not to mention its benefits to industry" (Gustafson, 2020, p. 20). This appeal continues to date and is focal to understanding the fuel's role in society. Economics, politics, and strategy is reliant on the deeply entrenched notion that natural gas is a preferable fossil fuel, supporting the expansion of its consumption and thereby the consolidation of the gas bridge.

The Eastern and the Western blocs established the gas bridge in a historical setting that was characterised by high levels of mutual distrust. Natural gas brought the two sides together. The Soviet Union was in search of hard currency to finance its imports and technology – mostly pipelines and compressor stations – to facilitate domestic natural gas consumption. In turn, it

promised seemingly unending quantities of natural gas from its immense fields located in West Siberia. Simultaneously, European buyers sought to offset dwindling domestic energy production and reduce their reliance on Middle Eastern oil. A process of trust-building began between political leaders and corporate executives, which was accompanied by the Soviets learning the tradecraft prevalent in Western Europe: negotiations, contracts, price-setting mechanisms, and so on.

Austria was the first Western European country that came to an agreement with the Soviets, but Soviets were after a bigger fish: West Germany, which soon followed suit, substantially expanding the natural gas bridge and establishing the trade ties that continue to be the backbone of German-Russian cooperation. On the Soviet side, Alexey Kortunov was the architect of the gas bridge by developing supply and demand in tandem, in addition to providing the infrastructure (pipelines, contracts, bureaucracies, etc.) necessary to enable a functioning market. The trust he and his Western counterparts developed through personal ties enabled the vast commitments necessary to construct a cross-continental pipeline systems. Parties involved took to long-term agreements that assured buyers that their volumes will be taken by consumers for years to come and the investment that they ploughed into production and transport infrastructure will not go to waste. This system also ensured buyers could rely on a stable flow of energy.

After introducing the formation of natural gas-based ties, Gustafson turns to how ideas reshaped the gas bridge. He traces how neoliberal ideas from a Thatcherite UK were transposed into the objectives of the Delors Commission. The Commission's creation of a Single European Market entailed the need to dismantle trade barriers and facilitate market integration. The combination of these also paved the way for the liberalisation of the EU's natural gas markets. The gas bridge permanently changed. In the 1970s it was a beam bridge, where the piers were the trust-based long-term agreements holding up trade relations between the East and the West. Liberalisation and the shift to what were deemed by policy-makers to establish self-regulating markets were closer to a cantilever bridge, with cantilevers taking on the role of the regulations establishing the framework necessary to trade the fuel. Ideas in themselves were not sufficient for the sweeping changes, but the growing complexity of the market, new entrants, market integration, growing supply, the spread of information technology, the proliferation of non-contracted volumes all drove the development of a free market.

Liberalisation was met with fierce resistance from sectoral incumbents, which feared losing control over their infrastructure and the business it sustained. Moreover, they vehemently argued, to some extent justly, that they constituted a key component of European integration, which would be undone if market principles were instituted. After all, they constructed the arteries and capillaries of a system that pumped the energy necessary for European production. However, they did more than that, as their endeavours, in their view, overcame the geopolitical animosity and rivalry, establishing cooperation in the pursuit of profit – cooperation that would outlast and overcome political tensions. Russian Gazprom, reluctantly, but adapted to the changing environment. It adhered to the EU's competition laws, but in spirit – like most companies in capitalism – it never deviated from its bid to dominate its markets and establish monopoly.

Gustafson argues that "[d]espite the fears of many in the West [especially the USA], the gas bridge was not viewed in the Soviet Union as an instrument of geopolitical leverage over the

West, although it definitely played that role in the Soviet Union's relations with its Eastern European satellites" (Gustafson, 2020, p. 19) This is a crucial point not only with respect to strategies during the Cold War, but continue to apply natural gas relations following the collapse of the Iron Curtain. It can also be instructive for hydrogen-based relations, since the EU would continue to heavily rely on Russia-source methane in supporting the uptake of blue hydrogen. Interdependence between Europe and Russia would sustain in this case, but risks would primarily pertain to economic matters (including corruption see e.g. (Balmaceda, 2013)) as opposed to geopolitical.

Despite Gazprom's close links to the Kremlin, it has overwhelmingly sought to gain market power and hefty profits in Western Europe. Gustafson illustrates this point by arguing that the Russian-German gas bridge never really wavered due to political tensions; instead, it was reinforced with the Yamal–Europe pipeline and then Nord Stream. Geopolitical relations between countries may have declined following Russia's illegal annexation of Crimea and activities in Ukraine, but their natural gas trade has continued to strive. And now, their bridge will grow with Nord Stream 2 planned to be completed towards the end of 2020 or in early-2021. In Central and Eastern Europe the picture is somewhat more convoluted, as Russia still uses resources and energy technology to maintain close relations with some countries in the region – Poland is the outlier as it seeks to reduce its reliance on Russian resources. As these countries have become integrated into a broader EU (via interconnectors) and global (via LNG) natural gas market, their relative supply security has increased, but their choice to rely on Russian natural gas has not wavered. Economics still generally continue to support their importation of Russian piped gas, shaping their bilateral relations with Russia as well.

The natural gas bridge between Russia and the EU so far survived. Despite the continuously changing political climate, Gustafson drives the point home that the natural gas bridge has remained intact, but "[u]nlike the situation in the Cold War, when the gas bridge served a stabilizing and confidence-building function based on mutual economic interest and long acquaintance, today's gas relationships, despite the gas trade's present prosperity, are vulnerable to growing East-West tensions" (Gustafson, 2020, p. 768). Its role as a stabiliser in geopolitical relations has been curbed as ties based on mutual trust have been substituted for trade on a faceless market. Nonetheless, the bridge sustains, providing a buffer given the fuel's deep entrenchment in industrial fossil fuel-based capitalism, leading government officials to compartmentalise the trade of the fuel and frosty political relations.

II. Hydrogen and strategy

The stabilising role of natural gas in European-Russian political economic relations is being reconfigured as the EU pursues its decarbonisation agenda. What shape this will take is not quite clear, just yet. Hydrogen – a key source of energy in a decarbonised EU – production is set to be reliant on either methane, renewables, or a combination of the two. The specific choice will carry significant geopolitical implications. The European Commission's (2020) Hydrogen Strategy only addresses the geopolitics of the fuel to a very limited extent. In doing so, it avoids the elephant in the room: Russia. Addressing this is essential given its grave impact on the long-standing gas bridge that has been at the core of EU-Russia relations in the past five decades. To

better understand the geopolitical implications of the fuel, I will first broadly sketch out its current and planned role in the EU.

Hydrogen is already a widely used resource, but primarily in industrial processes and not as an energy carrier. Oil refineries and fertiliser plants have been its prime producers and consumers. 2018 dedicated pure hydrogen production amounted to 73.9 million tonnes globally, which was consumed by the oil refining (52%), ammonia production (43%), and other (5%) sectors (IEA, 2019). The overwhelming majority of this was produced from fossil fuels yielding emissions throughout the process. The case is similar in the EU, where only 4% of hydrogen production is renewable energy-based, with the remainder reliant on fossil fuels, leading to 70-100 million tonnes of CO_2 emissions per annum (FCH JU, 2019). This already indicates the strong links between the fossil fuel industry and hydrogen production.

Hydrogen has a number of potentially useful applications as an energy carrier, since it has a high power density and does not emit greenhouse gases upon combustion. Much like natural gas, its industrial and heating-related applications are the most prominent. It is poised to play a focal role in decarbonising crucial activities ranging from steel manufacturing to cement production. Hydrogen is also set to play a key role in storing energy by overcoming the gap in seasonal energy demand and supply. Simply put, popular renewables, such as solar PV, operate at substantially higher utilisation rates in the summer months, while consumer energy demand tends to be higher in the winter (think of heating needs). Hydrogen bridges this shortcoming by offering a tool to carry the energy produced (potentially from renewables) during the summer to help meet demand during the winter. Lastly, infrastructure necessary to transport hydrogen costs a tenth to a twentieth of electricity making it an economic alternative that can draw on an extensive natural gas pipeline infrastructure (Vermeulen, 2017); although, many questions linger as to what can be repurposed, how, and at what cost (ACER, 2020).

The EU's Hydrogen Strategy proposes to increase hydrogen's share in its energy mix from 2% in 2018 to 13%–14% by 2050. Growing its relative share by 11–12 percentage points in just over thirty years is an extremely ambitious target. To contextualise this, solar PV and wind provided 0.7% and 2.0% of total energy supply in 2018, after receiving close to a decade of ample government support (Eurostat, 2020). Energy transitions tend to be slow (Smil, 2016). To overcome this, the Commission seeks to have ventures install 6 GW of renewable hydrogen electrolysers by 2024 and 40 GW by 2030, significantly up from the 1.5–2.3 GW of projects announced or under construction. These objectives prioritise the use of green hydrogen, while acknowledging the need to rely on grey and blue hydrogen as green hydrogen is scaled. The paradox is that fossil fuel-based hydrogen is not available at scale and if society builds a dependence on them, it is questionable how the EU will overcome its lock-in the long run (Szabo, 2020).

Hydrogen can be readily captured by fossil fuel interests. For one, costs are still in their favour, as fossil fuel based hydrogen stands at €1.5/kg, €2/kg when paired with carbon capture and storage (CCS), in comparison to €2.5–€5.5/kg for renewable-based variants (European Commission, 2020). It is unsurprising that the EU's major natural gas suppliers, such as Equinor or Gazprom, have already begun to take action, develop strategies, fund research and development, and attempt to capture these markets. To have fossil fuel-based hydrogen

producers install CCS, the Commission estimates that CO_2 prices on the EU ETS would have to rise to €55–€90 – much higher than the €30 at the time of writing (Sandbag, 2020). Moreover, CCS remains in its infancy and has faced numerous setbacks (European Court of Auditors, 2018), in addition to which fossil fuels have recently hit record low prices as the market tipped into oversupply and demand plummeted with the COVID-19 pandemic. This hints at the challenge supporting green hydrogen vis-à-vis its grey and blue counterparts entails or the costs this would entail.

Meanwhile, renewable-based hydrogen prices are reliant on electrolyser costs declining and their relative sizes increasing. To this end, existing and planned facilities have to be utilised at relatively high rates, which can be achieved, if there is abundant electricity generation from renewables (IEA, 2019). Hydrogen production would absorb surplus production when renewable-based energy production puts downward pressure on electricity prices, but without the surplus and the low electricity prices they may yield, electrolysers are not an economic endeavour. The EU can address this by diffusing renewables, but investment in this area has seen a decline recently (IEA, 2020). Without the acceleration of renewable deployment, the EU will have to continue to rely on blue hydrogen (at best) impeding the ambition of the strategy to only use fossil fuel-based hydrogen as an intermediary to green hydrogen.

III. Should the EU take the green or the blue pill?

In recent years it has become unequivocal that "fossil fuels, including natural gas, can have no substantial role in an EU 2°C energy system beyond 2035" (Anderson and Broderick, 2017, p. 45). Meaning that a quarter of European energy supply has to be altered in some shape or form (Eurostat, 2020), threatening the sheer existence of the gas bridge. In-turn this jeopardises its role in stabilising political economic relations in European-Russian context as well. As a first step, naturally, one should ask whether Europe will succumb to the continuance of a fossil fuel-based hydrogen paradigm or wander onto uncharted territories that renewable-based hydrogen would entail? While contemplating these futures and beginning to take action, it also needs to consider how to dampen the political economic implications of its actions and the repercussions this may carry with regard to EU–Russia relations.

Dismantling the gas bridge and relying on renewable-based hydrogen goes well-beyond the socio-technical change that experts tend to emphasise in the energy transition, and will carry critical geopolitical implications. It's key role in maintaining EU–Russia cooperation and dialogue will be suspended, which, in a context of already souring relations between the two parties, can lead to further deterioration. Not only would stranded fossil fuel assets become points of tension, but the suspension of resource-based trade would negatively impact the Kremlin's budget, possibly prompting a reduction in government spending and leading to social unrest. EU climate action directly undermine the Russian petrostate, a challenge that the government in Moscow is clearly not ready to meet.

The "easy" way out of such a geopolitical debacle would be for the EU to accept the push from its suppliers to build a reliance on methane-based hydrogen. The Commission's Hydrogen Strategy already indicates that it may be acceptable to rely on blue hydrogen during the transition to a renewable energy society. However, if this were the course of action, the lock-ins of natural

gas would not be overcome, they would only be slightly altered and postponed. The fuel would be adapted to meet the needs of a decarbonised society and without fundamentally disrupting the political economic relations linked to it. If carbon neutrality is achieved in this manner, the voices of those pushing for a renewable and sustainable future could be stymied: some may argue that with the absence of greenhouse gas emissions and thus the risk of climate change, why enact further (urgent) change? The ambition of sustainability can be downgraded to one of carbon neutrality. This "blue hydrogen path" would largely maintain the gas bridge and the international political economic relations that it has upheld.

A path focused on green hydrogen would require all-encompassing change. Expanding renewable generation capacities and developing electrolysers are crucial technological questions to achieve this objective. It is crucial to note that these are not only questions of technology and the scale of production, but, as argued above, are intricately linked to the political economics and geopolitics of the region: if the EU pursues this path it will severe the gas bridge. A "green hydrogen path" would likely reduce the EU's reliance on imported energy, carrying the potential to increase its energy security while turning its energy system into a sustainable one. As it expands renewable-based hydrogen's role, it can reduce the role of imported methane in its energy mix. This trade-off presumes that other polluting sources of energy (e.g. coal) have already been phased out of the EU's energy mix, which is far from trivial. However, it seems likely that a green hydrogen versus methane trade off will take shape in the future.

Opting for the green path would be a challenge that requires the EU to thoroughly consider the geopolitical implications of its actions. The Commission's Hydrogen Strategy indicates that this will be the path the bloc will pursue in the long-term, but along that road it needs to brace itself for division given its member states' variegated relations with Russia. The European Commission needs to develop a clear and comprehensive anti-methane strategy to severe the gas bridge. Until now, it has frequently avoided directly addressing fuels and has opted for a technology neutral approach, since, in principle, it does not have jurisdiction over the energy mixes of member states. It can only intervene in energy consumption patterns indirectly by *inter alia* subsidising renewables and influencing carbon prices on the EU ETS. Shaping natural gas consumption is set to pose an enormous challenge, given that it is not only domestic political groups that are key but external forces and bilateral relations as well. And these will look to exert power, if policy-makers are seeking to make a decision between green and blue hydrogen.

The European Commission should already begin to engage with both member states, neighbouring countries, and key political economic partners entangled in this web of power relations to devise a plan for a post-carbon world. The EU cannot pursue carbon neutrality or renewable targets without regard to its neighbours or by leaving events to be mediated via the *market*. It needs to undertake its market-engineering in a manner that thoroughly considers the historical embeddedness of its actions and thereby consider how what may seem to be technological or economic interventions are deeply (geo)political. By developing such a strategy can the EU push for an accelerated energy transition that reconfigures its energy system – and thus the gas bridge – in a manner that dampens the blow for those involved and maintains some form of stability despite the radical change this action entails.

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