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UNCERTAIN PAST, UNCERTAIN FUTURE: HOW ASSUMPTIONS ABOUT THE PAST SHAPE ENERGY TRANSITION EXPECTATIONS

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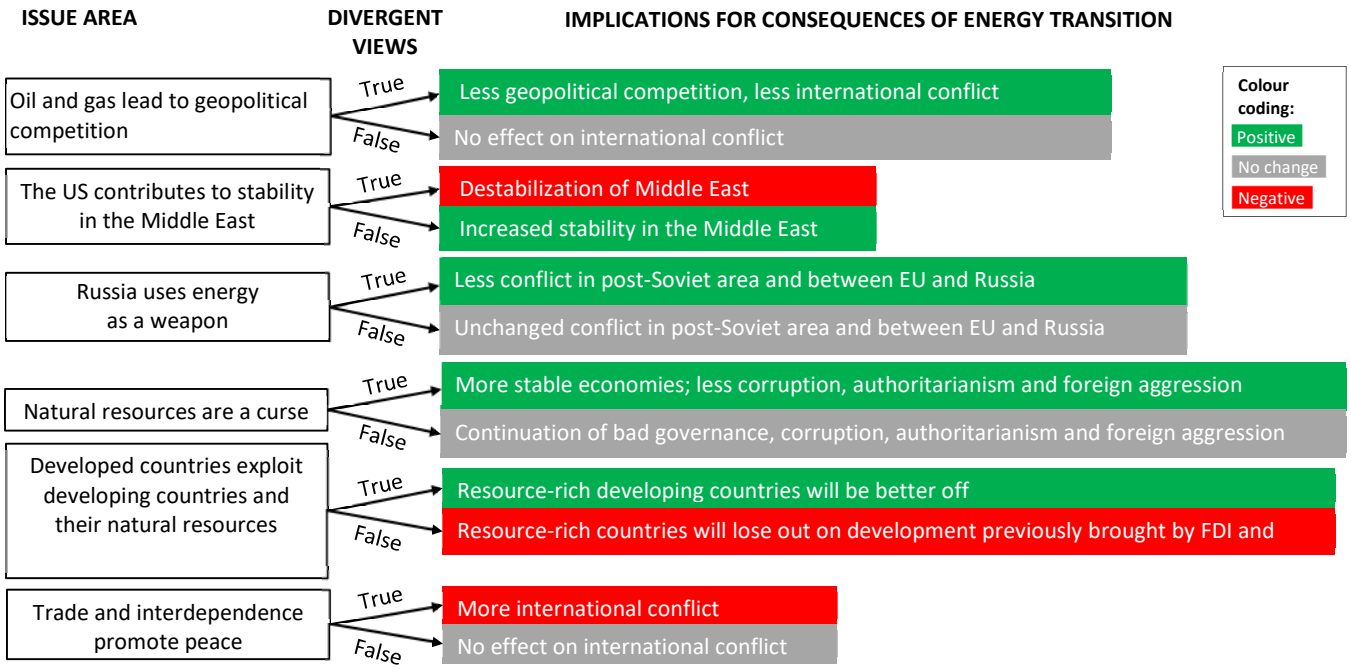
The burgeoning literature on the geopolitics of the energy transition now numbers more than 200 publications (*Vakulchuk et al, 2020*). Many of these works conjecture boldly about how the replacement of fossil fuels by renewable energy will affect international affairs. However, many of these conjectures rest on unstated assumptions about the global energy system of the past, which is more contested than it is made out to be. Figure 1 presents six areas where one's interpretation of past and current issues are decisive for how one thinks about the changes that will be wrought by the energy transition. The rest of this article reviews each of them.

Figure 1. Implications of views on the past energy system for the consequences of energy transition



Geopolitical competition over oil and gas

A common assertion in recent decades is that oil and gas resources are geopolitically important and therefore subject to intense international competition. From this perspective, the American invasions of Iraq were all about oil, African and Latin American countries are subject to intense competition between China and Western countries driven by competition over oil and other natural resources, and the Arctic is a hotspot of territorial rivalry.

This geopolitical mindset harks back to the classical works of Halford Mackinder, Rudolf Kjellén, and Friedrich Ratzel, whose names geopolitical enthusiasts like to invoke to give themselves historical weight and credibility. However, if one actually reads these classics, it is clear that they represent a simplistic and deterministic social science that no longer has much credibility.

Admittedly, geopolitical competition was decisive during the colonial era and the First and Second World Wars. Then, great powers engaged in continuously expanding, cumulative, winner-takes-all competition over strategically valuable natural resources and locations. The great power with the most men (territories), tanks (steel), and diesel (oil) had a good chance of winning. The more geopolitical advantages a country could amass, the more likely it was to prevail over its competitors further down the line. Hence the fierceness of the Battle of Stalingrad (which was located on the supply route for Caspian oil) and the bombing of Pearl Harbour (which was partly triggered by competition over South-East Asian natural resources, especially oil).

However, since the advent of the nuclear bomb, it is not clear that maximum access to oil would be as decisive in a direct military confrontation between great powers. Furthermore, the end of colonialism means that there are no more 'white spots on the map' to compete over. Occasionally it is still possible to occupy a territory, and some states can be made military or economic clients, but that is a far cry from the classical geopolitical race.

If oil has not had the geopolitical value during the post-war period that some have thought, the transition to renewable energy might not usher in the era of peace and goodwill between great-power states that someone seeing the world through a geopolitical lens might expect. By contrast, if the geopolitical interpretation of the recent decades does makes sense after all, a transition from fossil fuels to renewable energy should greatly reduce tensions in the international arena. The United States should lose interest in the Middle East, competition between China and Western countries over client states in Africa and Latin America should soften, and oil-fuelled geopolitical hotspots such as the Arctic, the Persian Gulf, and the Caspian and South China Seas should lose some of their lustre.

It is not necessary to draw a final conclusion here on who is right about past geopolitics, just to recognize that the role of geopolitics in the oil-based international energy system is contestable—and that one's choice of perspective has implications for how one envisages the geopolitical consequences of the energy transition.

US engagement in the Middle East

The most important piece in the putative puzzle of petroleum geopolitics is the Persian Gulf and the wider Middle East and North Africa region. Here, another set of assumptions comes into play. Apart from the question of how robust the argument is that geopolitical interest in oil is a *cause* of American engagement in the region, there is also the question of what the *consequences* are of that engagement. Has the US been a stabilizing or destabilizing factor in the Middle East, or both? Has it contributed to more or less democracy among the Muslim states? Clearly, those are contentious questions. The views one adopts lay the premises for how one thinks about the consequences of declining Western interest in Middle Eastern oil and gas and whether it will entail more chaos or stability and more authoritarianism or democracy.

Russia's energy weapon

The Russian Federation is seen by some as having used its natural gas resources as a foreign policy tool or even a weapon. Proponents of this viewpoint to not only the disruption of gas supplies to Ukraine and other countries straying from Russia's orbit, but also the use of discounted energy supplies to entice countries to stay close to Moscow.

However, while many see Russia using its fossil fuel resources to maintain a semblance of the Soviet Union, others see the opposite: the modernization, increasingly commercial orientation, and independence of post-Soviet Russia. From this viewpoint, if Russia's neighbours want to continue using Russian energy resources, they must now pay the real cost, and their reluctance and/or inability to do so—not any heavy-handedness on Russia's part—is the real problem.

Which of these two opposing views one adopts has implications for how one thinks about the consequences of the energy transition for international affairs in the post-Communist area. Those who perceive that Russian has been using energy as a weapon might expect the energy transition to disarm Russia. Those who do not subscribe to this view will not expect to see

much change in terms of international security, just the loss of an important source of revenue for Russia.

The resource curse

A vast literature sees natural resource wealth as a curse, bringing corruption, bad governance, authoritarianism, and domestic and international conflict. In many contexts it is taken for granted that the resource curse is a real phenomenon and constitutes a major obstacle to development in resource-rich countries.

However, there is also an antithetical literature, which has been growing since around 2008. It argues that much of the resource curse analysis has been based on flawed statistical analyses and that the curse does not exist. In this view, the problems that many resource-rich countries grapple with must be due to climate, culture, religion, colonialism, or something else.

Which of these perspectives one adopts influences how one thinks about the consequences for development of declining oil demand. From the resource-curse perspective, authoritarian and/or underdeveloped petroleum-exporting countries may be freed of a burden and finally flower. Countries such as Angola, Russia, and Saudi Arabia should then have a greater chance to become democratic, reduce corruption, and maintain peace with their neighbours. By contrast, from the resource-curse-sceptic perspective, energy transition should not bring much change in this area.

Dependency theory

Dependency theory used to be widely taught in Western universities in various guises, including neo-Marxism, world systems theory, and periphery capitalism. The central idea of dependency theory is that 'central' (wealthy, Western) states exploit 'peripheral' (poor, non-Western) states, draining their natural resources and ensuring by political, military, and economic means that they are unable to develop. Obviously, dependency theory never gained much popularity among people holding free-market, pro-Western views, who see underdevelopment as mainly caused by internal problems such as bad governance, corruption, weak institutions, and authoritarianism.

After the collapse of Communism, dependency theory lost much of its popularity. However, many people—including academics—continue to believe explicitly or implicitly that poor countries are poor because they are subjugated and exploited by wealthy countries. From this perspective, a transition to renewable energy and the concomitant reduced interest in the fossil fuel resources of developing countries should improve the lot of poor countries, as wealthy countries will have less interest in exploiting them. By contrast, those who do not see dependency theory as having much explanatory power might not expect the energy transition to unlock developing countries' supposedly thwarted powers of self-determination.

Potential of trade and interdependence to promote peace

It has frequently been argued that globalization and growing trade and interdependence between countries promotes peace, for example by Keohane and Nye in their international-relations classic '*Power and interdependence*'. They envisaged that growing trade would create multiple 'channels' between countries while also reducing the importance of war in international affairs, leading to greater emphasis on economic tools and relations and opening the field to a more diverse set of actors. This liberal argument was energy-centred from the start and was thought to be supported by the oil crisis of 1973. It was intended as a critique of realist approaches to international relations, in which military force and physical resources had primacy.

Both perspectives live on today and provide opposing starting points for interpreting the consequences of the energy transition. From a realist perspective, the transition should reduce international tension. As countries become 'prosumers' that produce and consume their own energy from domestic renewable resources, they should become less dependent on the world's hydrocarbon resources and should therefore have less reason to compete over them.

By contrast, from the liberal perspective of complex interdependency, growing reliance on domestic renewable energy resources should *increase* the risk of international conflict, as prosumer countries will be less dependent on one another and have fewer interlinkages to dampen their bellicosity. Peace-loving, pro-renewables liberals may find this counter-intuitive, but it is the result of a linear extension of the logic of complex interdependence to the clean-energy era.

Conclusion

These points indicate that existing projections of the consequences of the energy transition are more uncertain than they appear. But they also have implications for scenario-building, prediction, and foresight studies more broadly. Predicting future developments and events is challenging even when one agrees on the past. When the past is open to conflicting interpretations, prediction is yet more difficult. More attention needs to be paid to how interpretations of the past and present shape our predictions of the future, both regarding the geopolitics of the energy transition and beyond.

IS THIS RUSSIA'S KODAK MOMENT?

Indra Overland

In 2003, Kodak was over 100 years old, had one of the world's most recognized brand names, employed 145,000 people, and had a turnover of US$13 billion. The important moments in life—such as weddings and birthday parties—were recorded on Kodak film, hence the advertising slogan 'a Kodak moment'. The company believed that digital photography would remain a niche product and decided to stick to traditional photographic film. Nine years later, Kodak filed for bankruptcy.

Is Russia similarly failing to see the accelerating changes in the global energy system brought on by climate policy and energy technology learning curves? Is it prepared for the impact of these changes on demand for Russian fossil fuel exports?

As the world's largest fossil fuel exporter, Russia will be affected by the energy transition more than any other country. Unlike Saudi Arabia—with which it vies for pre-eminence as the world's largest oil exporter—Russia is also the world's largest gas exporter and third-largest coal exporter. Fossil fuels play a pivotal role in Russia's income, employment, power on the international stage, and identity. Russia also has the world's second-largest nuclear arsenal and the world's largest territory, giving it a major presence in Asia, Europe, and the Middle East alike. There is, therefore, also no other country whose fate in the global energy transition will matter as much to the rest of the world.

Do Russian decision-makers know?

There are several reasons why one might think that Russian actors are not particularly well prepared for the ongoing changes in the global energy sector. Firstly, the Russian petroleum industry is one of the oldest and most entrenched in the world. It dates back to 1745, with the first oil well and refinery in the town of Ukhta producing kerosene for lamps in churches and monasteries (*Poussenkova and Overland, 2018*). Since then, hydrocarbons have played a central role in the country's development. Baku (then part of the Russian empire) produced half of the world's oil in 1900; the west Siberian oil and gas fields buoyed the Soviet economy in the 1970s, and Russian President Vladimir Putin drew on rising oil prices to firm up his power in the 2000s. As a result, hydrocarbons play an important role in Russia's higher education system, government apparatus, physical infrastructure, and corporations. According to theories of path dependency, social and technical co-evolution, and carbon lock-in, a country such as Russia is unlikely to handle changes in the energy sector well.

Secondly, Russian actors have a weak track record of anticipating and preparing for change in the energy sector. The Communist Party was unprepared for the oil price instability in the 1980s, which contributed to the unravelling of the Soviet Union. In the 2000s, Russian actors continued to deny the significance of the shale revolution, as it shook first international natural gas and then oil markets. The deputy head of Gazprom, Alexander Medvedev, referred to shale gas as a bubble, and CEO Alexey Miller argued that shale gas would remain a luxurious side-dish: 'If you like *foie gras*, that doesn't mean you no longer need a regular steak' (*cited in Elder, 2012*).

Thirdly, the Russian government sends out mixed climate policy signals. Compared to China or the USA, the Russian state has been relatively supportive of international climate policy in the past. Unlike those two countries, Russia ratified the Kyoto Protocol, ensuring the necessary number of ratifications for the protocol to come into force. Russia subsequently over-fulfilled its emissions-reduction targets, thus helping compensate for countries that did not fulfil their own targets.

However, Russia has remained a laggard on climate change in many other respects. Moscow was the last major greenhouse gas emitter to ratify the Paris Agreement. Like their American counterparts, many prominent Russians have expressed deeply climate-sceptical views in public. After visiting Franz Josef Land in the Arctic, President Putin declared that climate change was not due to human activity (*Farand, 2017*). Also the country's second-most powerful person, politician and oil executive Igor Sechin, has publicly expressed strong climate-sceptic views, denying that the effect of anthropogenic greenhouse gas emissions could compare to those of volcano eruptions or rotting algae, and stating that climate change is largely due to 30-million-year climatic cycles (*cited in Armitage, 2015*).

Similar to former US President Donald Trump's statement that climate change is a Chinese hoax, some major Russian media have cast climate change as a foreign plot to undermine Russian energy exports or as 'US weapon aimed at Russia' (*Davydova, 2017*). The implications of climate policy for energy markets do not seem to have fully registered either. Russian Minister of Energy Alexander Novak has predicted that electric vehicles will make up only 1 per cent of all cars in the world by 2035, and therefore will not have much impact on oil demand (Novak, 'Intervyu Aleksandra Novaka Radiostantsii Ekho Mosvky' [Interview of Alexander Novak by the radio program Echo of Moscow], *Ekho Moskvy, 2016*).

The official energy strategy of the Russian Federation foresees a significant rise in the country's fossil fuel exports. It expects that only crude oil exports will decline, and that is because the government plans to refine more oil domestically and export higher-value refined products instead. In its most bullish scenario, it expects up to 86 per cent growth in coal exports, 373 per cent growth for petrol, and 603 per cent for liquified natural gas. Even in the government's most modest scenario, substantial growth is expected.

As a result of such signals, some of the literature on the Russian energy sector takes a dim view of the country's ability to adapt to the ongoing changes. Andreas Kraemer writes, 'In the new geopolitics of renewable energy, post-fossil Russia does not have a value proposition . . . . Oil addiction is hard to cure, and Russia is not even trying' (*Kraemer, 2017*).

Consequences of the global energy transition for Russia

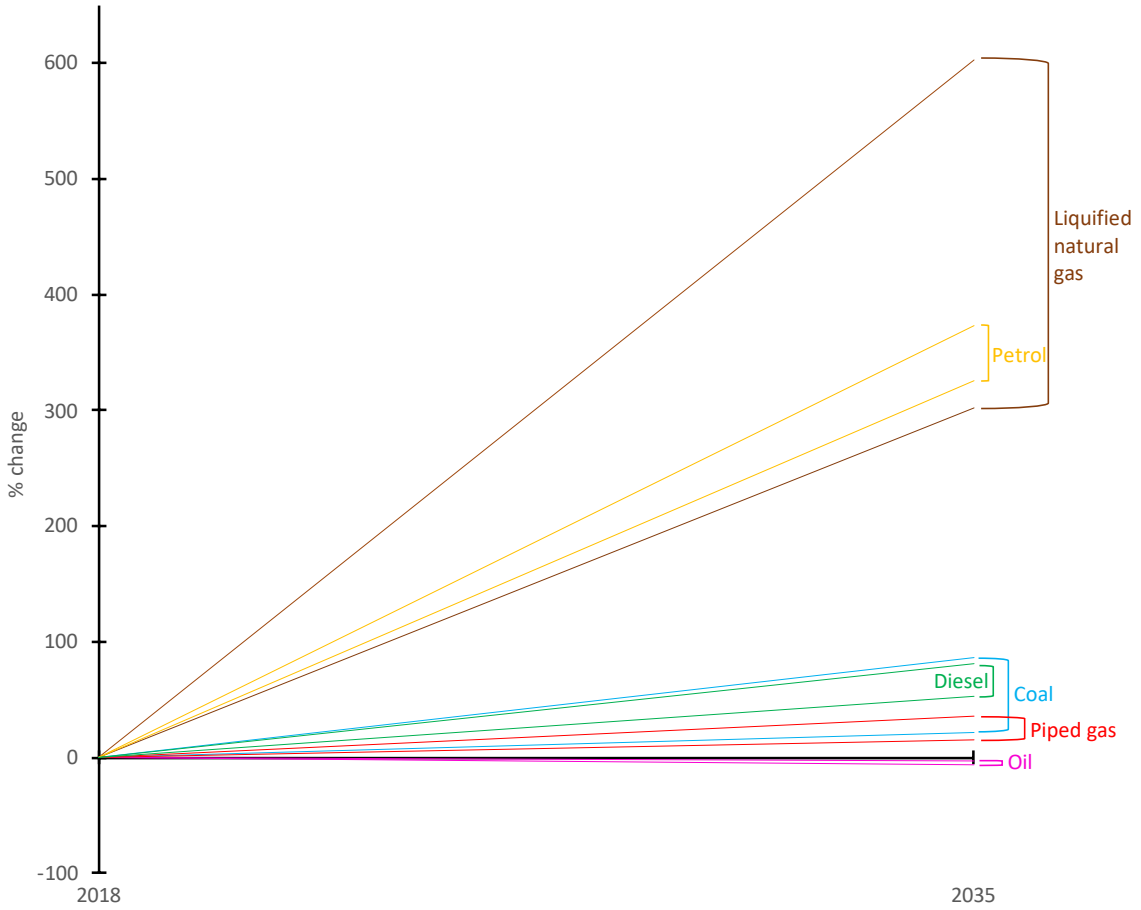
It has been estimated that global climate-related action will lower Russia's economic growth rate by about a third (*Makarov et al, 2020*). Such calculations are inevitably based on assumptions that are moving targets, subject to changes in politics, policy, and technology. Currently, in all three areas, there are signs of acceleration that might cause even greater losses to the Russian economy: the pro-climate political momentum is stronger than ever; serious new climate measures are being planned; solar power, wind power, and batteries are all evolving rapidly and their cost declining precipitously.

One of Russia's main decarbonization bets is on natural gas as a transition fuel and on the EU needing to import more of it to replace its own declining production. A decade and a half ago, this line of thinking was dominant in the EU, too. However, more and more EU countries are placing their bets on renewables, electric vehicles, and green hydrogen rather than natural gas.

The price of emissions allowances in the European Emissions Trading System rose 665 per cent between 2017 and 2021 (Daily EU ETS carbon market price (Euros), *Ember, accessed 10 January 2021*). The EU's proposed Green Deal involves further raising the price of greenhouse gas emissions substantially. To maintain a reasonably level playing field for European industry and avoid carbon leakage from the EU, this will need to be accompanied by some form of carbon border adjustment measure (CBAM). This means that companies exporting to the EU will face similar emissions costs as those based within the EU. Without CBAM, the EU will not be able to raise the price of its own emissions sufficiently to achieve the cuts it needs to contribute to the mitigation of climate change. In other words, either EU climate policy will fail, or Russia will face an effective CBAM.

Russia has proved highly resilient to oil and gas price volatility because of the popularity of its government, strong macroeconomic governance, and the automatic relief provided by the drop in the value of the Russian rouble when the oil price drops. However, dealing with a permanent drop in fossil fuel revenue would be different from dealing with oil price fluctuations. The economy would have to be diversified in earnest, which in turn might require changes in the ways the elites operate and in the upholding of property rights. Military spending and foreign affairs initiatives might have to be curtailed substantially. An alternative would be to cut back on healthcare, education, and other social services, but the patience of even the Russian population has limits. A dwindling Russian economic pie might also lead to more infighting among the country's elites. Cities and regions where the oil and gas industry is concentrated would be hard hit, including Nefteyugansk, Surgut, and Tyumen. Especially in coal mining regions such as Kuzbass and Kansk-Achinsk, much of the labour is low-skilled and immobile, leaving workers particularly vulnerable to a downturn.

Projected fossil fuel exports through 2035 according to the Russian Energy Strategy, low- and high-growth scenarios



Source: Government of the Russian Federation, *Energeticheskaya strategiya Rossiyskoy Federatsii do 2035 goda* [Energy Strategy of the Russian Federation until 2035], adopted 9 June 2020, https://minenergo.gov.ru/node/1026

Is Russia worse positioned than others?

Many countries and actors have also been slow to recognize the prospects for an energy transition, among them international oil companies. ExxonMobil's denial of climate change has received particular attention. However, many international oil companies—including BP, Equinor, Shell, and Total—are now beginning to shift capital expenditure from the petroleum sector to solar and wind power. Their Russian counterparts also have some clean energy projects, but on a much smaller scale.

While the United States has some entrenched oil companies, it is also home to some of the world's leading clean-energy companies, such as First Solar, NextEra Energy, QuantumScape, and Tesla. Similarly, although China continues to build new coal power plants, its portfolio of clean-energy companies—such as Goldwind, JinkoSolar, NIO, and Xpeng—is also impressive. Russia's corporate ecosystem is less diverse, leaving it more weakly positioned to seize the opportunities brought by the energy transition.

What are Russia's options?

If it starts dealing more proactively with the looming threat of decarbonization, what strengths can Russia leverage in a decarbonizing world?

Cheap oil

Russia's large West Siberian oil and gas fields have some of the world's lowest lifting costs. As the prices oil producers are able to obtain decline due to reduced demand and/or rising carbon prices and companies go out of business, Russia should be one of the last producers standing. This means that Russia may have more time to adapt than oil and gas producers with higher costs. However, it postpones the problem rather than solving it and Russia's deep dependency on multiple fossil fuels—coal, natural gas, and oil—means that it is more vulnerable than most countries that only export one type of fossil fuel.

Renewable energy

Russia is richly endowed with renewable energy resources. It has the world's largest solar power resources, second-largest wind power resources, and fourth-largest hydropower resources (*Overland et al., 2019*). Only two G20 countries have greater renewable energy resources per capita than Russia: Australia and Canada. Accordingly, Russia could produce renewable energy for export, in the form of electricity or hydrogen or embedded in energy-intensive goods.

However, Russia is not leading on the relevant technologies and is held back by its passive climate policy and abundance of fossil fuels and nuclear power. Furthermore, Russia's renewable energy resources are a function of its large size and low population density. This is an advantage in terms of not-in-my-backyard responses, which are becoming increasingly salient for renewable energy installations as they occupy land and (in the case of wind power) generate noise. However, this also means that Russia's renewable energy resources are highly dispersed and located far from infrastructure and markets.

Critical energy transition materials

As the country with the world's largest surface area, Russia is inevitably also rich in minerals. While fuel for renewable energy is free, the equipment for generating it requires vast amounts of metals and industrial minerals, and this is one of the main decarbonization bottlenecks. Russia has the world's third-largest reserves of nickel (a key component in electric vehicle batteries), fourth-largest of copper (used for electric turbines, motors, and cables), fourth-largest of rare earths (used for several technologies), and seventh-largest of uranium (used for nuclear power). In terms of minerals and mining, Russia clearly has a contribution to make to the energy transition.

Blue and turquoise hydrogen

One of the most salient energy transition questions concerns the role of hydrogen and how it will be produced. The prospects for large-scale adoption of hydrogen-fuelled passenger cars have waned, but hydrogen remains a likely solution for industrial processes and grid-scale storage to handle the intermittency of solar and wind power. If green hydrogen (from electrolysis powered by renewables) turns out to be the most cost-efficient, it may represent a new export opportunity for Russia and its vast renewable energy resources, but there will also be many strong competitors, for example in North Africa.

However, if blue hydrogen (from steam methane reforming with carbon capture and storage in old oil and gas fields) or turquoise hydrogen (from methane pyrolysis) is the winner, Russia will have a bigger role to play. In fact, no other country in the world has as much vested interest in the success of blue/turquoise hydrogen as Russia. Russia has the world's largest natural gas reserves; the world's second-largest gas pipeline network, connecting it to both China and Western Europe; high-tech LNG export facilities; and conveniently located depleted oil and gas fields that could be used for CO_2 storage. If blue or turquoise hydrogen can become sufficiently cost-efficient to compete with solar and wind power plus storage, and if natural gas pipelines can be repurposed for hydrogen, Russia could go from being a major victim of decarbonization to becoming its saviour. The energy transition is indeed a high-stakes game for Russia.