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Geopolitics of hydrogen

Abstract: Successful implementation of hydrogen strategy by the EU needs to solve two geopolitical constraints: *Technology* (nowadays mostly invented in the United States and built in China) and *Raw materials* (avoiding new dependencies on unstable/unfriendly countries). The impact of Europe's energy transition on present oil and gas exporters is another angle the EU has to take into account.

Introduction

What a difference a single year can make. Twelve months ago, a book published in the EU to promote hydrogen energy would probably not include a chapter on geopolitical risks. Nowadays, no serious publication can ignore the security implications of our energy transition. Increasing dependency on technologies invented in the United States and built in China, shrinking European industrial capacities, growing need of imported raw materials – the year 2020 did not create any of these risks, they have been with us for quite some time. COVID-19 forces us to see them.

Our direction has not changed. The European Union is doubling down on renewables and new technologies, including hydrogen. Post-Covid recovery offers unique opportunity to build whole new industries, rather than repair faltering ones. What has changed is our broader view of security. At the height of the pandemics, European governments learned the hard way that our continent stopped making many basic things. We have spent weeks and months waiting for deliveries of medical material (both elementary and hi-tech) from other parts of the world. Much of the needed equipment did not arrive in time, because the producing countries blocked/postponed export to us.

We need to decrease our present dependencies, not to create new ones. That is why the next two parts are called *Technology* and *Raw Materials*. We also have to understand that our energy transition threatens the livelihood of present oil and gas exporters. We are not going to abandon our effort because of them, but we have to think how to mitigate the new perils. The final part is called *Losers* for a reason.

Technology

In September 2017, as Hurricane Irma neared Florida and the authorities ordered mass evacuation, Elon Musk made a gesture: He increased the range of some models of Tesla cars in Florida for a week. "That's due to Tesla using an unforeseen feature of

their over-the-air software update system,” the article innocently reported in Electrek magazine [1]. The anecdote did not make headlines – mass media, as usual, showed pictures of torn roofs, bent palms, and flooded streets. They missed *the* story of Hurricane Irma.

Yet, we should pay close attention. For in that moment, we got a glimpse of not-so-distant future. Or, as they found out in Florida, the future has already arrived.

Here is a serious warning for Europe: we are introducing technologies, whose authors (and source codes) are beyond the EU borders. Our data, our privacy, even the functioning of our machines and industries increasingly depends on outside players. They may be friendly today. They also may turn against us in the next crisis. Thus the broader context of energy transition is positioning Europe in the world of new technologies.

In the past thirty years, personal computer, internet, and mobile communication transformed our industries and our workplaces beyond recognition; they also changed us in the process, while giving immense amount of profit and control to a handful of companies. None of the Googles and Facebooks of today is a European company – and we are only slowly coming to realize how powerful these firms became.

Next decades will bring widespread use of artificial intelligence, big data, and quantum computing. Owners of these technologies could dwarf the giants of today. For Europe to succeed, the less vulnerable we will be the better.

The connection between new energy systems and advanced software is not always visible at first sight. A case in point is the wind energy. Intermittent by its nature: The wind blows when it wants to. We have no way of predicting whether a particular wind turbine will produce electricity an hour from now, hence the need for back up sources. Yet this is not the whole picture. Over the years, with amassed data about weather patterns from around the globe, our predictions have become more and more precise: There is only limited amount of cloud configurations and pressure differences in the atmosphere, while our computing power is becoming limitless. The truly important question remaining is whether the computers running wind farms in Europe’s coastal waters will have our know-how, or depend on outside knowledge.

The greatest opportunity for hydrogen comes in the area of energy storage. This is the weakest point of the whole energy transition so far: We can harvest a lot of Sun’s energy – the problem is how to keep it from day to night, let alone from summer to winter. The same applies to wind energy – apart from pumped-water hydropower, we lack means to stockpile the excessive electricity made on weekends or during nights. Hydrogen could be the answer.

These systems will be based on technologies often not yet developed: From new processes to produce hydrogen to novel ways of storage, we need *European* know-how. It will not be easy to get there: The Commission’s Hydrogen Strategy [2] is a good start when it comes to investment and government policies; however, we also need to scale up our scientific capacities. Our best universities are lagging behind

their US counterparts. We are only slowly creating an European response to the American network of US National laboratories [3]. We need many more CERNs to become truly competitive. The list of present Nobel laureates in physics is mostly an American affair – especially in the “Affiliation at the time of the award” column [4]. It may sound strange from a security guy, but the major recommendation to our Governments and the Union as whole is to significantly increase funding for science and research – not only in the area of hydrogen or broadly energy transition.

In recent years, we started to talk about EU’s *strategic sovereignty*: It is about guns and intel and foreign policy, but increasingly also about science and research capabilities. Since many conflicts in this world originate from struggle for resources, here is a great opportunity for European science – not to allow the energy transition to fall into the trap of new dependencies on outside resources.

Raw materials

Discussing raw materials may seem unnecessary in a book about hydrogen energy. After all, hydrogen is the most common element in the universe. Yet harvesting its potential here on the Earth’s demands the use of other elements, many rather scarce.

One area where hydrogen may play very important role is energy storage. Here are the limitations of other technologies already visible. A good example is the presently most common batteries of the Lithium-ion sort (Li-ion). Lithium is not a problem; there are many deposits in different parts of the world. Crucial component for Li-ion batteries is cobalt – and here lies a trio of issues: War, child labor, and China.

In 2019, more than 70% of global cobalt production came from Democratic Republic of Congo (DRC) [5]. A country tormented recently by two conflicts, dubbed *Africa’s First World War* (1996–1997) and *Great African War* (1998–2003). The latter claimed 5.4 million lives, the biggest bloodshed since WW2. Diamonds, gold, and cobalt were the main spoils of war. The slogan “No blood for oil” is a great one, yet switching to present electric cars (using Li-ion batteries) makes these words hollow.

Child labor is another aspect of cobalt production we do not want to hear about. One third of DRC cobalt is mined by children [6]. A recent lawsuit filed by human rights’ non-profit accuses five major computer and Internet companies (Tesla, Apple, Alphabet, Dell, and Microsoft) of being complicit in death/crippling of 14 children in cobalt mines of Congo [7].

The final problem with cobalt is dominance by a single country: In 2019, half of global production was refined in China [8]. Increasing our dependency on the “systemic rival” (term used in recent EU strategy document [9]) is not a smart thing to do.

This is even more true in case of the rare earth metals, vital elements for much of modern technologies. Here, the Middle Kingdom simply calls the shots: “As of 2019, China still produced roughly 85 percent of the world’s rare earth oxides and approximately 90 percent of rare earth metals, alloys, and permanent magnets,” sums up the report from US think-tank CSIS [10].

We are only at the beginning of the road to fully use hydrogen. We can still make the right choices – and the crucial ones will be how to avoid technologies and processes that would tie us to things we can not live with. I believe in European energy transition, but do not want one based on child labor.

Here is a suggestion to the hydrogen community: Avoid, whenever possible, raw materials linked to human suffering. Sure, money is important and costs are fundamental, but momentum for the whole energy transition is not economy-based. If money was our highest objective, we would keep burning coal for another century. Leaving fossil fuels is based on the fundamental willingness of Europeans to suffer a bit of discomfort today for the benefit of future generations. People feel good about it. Should they find out that their feel-good technologies are based on massive abuse of human rights elsewhere, they might turn against the whole project. You can neither put a price tag on climate change nor on child labor.

Beyond morality, there is also a hard security angle. To put it very bluntly, one of the reasons we are undertaking journey away from CO₂ is to get rid of our reliance on oil and gas producers. We are leaving Persian Gulf. It would make no sense to leave the Gulf for Congo. And even less sense to leave Riyadh for Beijing.

Losers

When I tell students at the College of Europe that our energy transition will bring huge economic loss to many countries, their first reaction is disbelief. European Union is *Angelus pacis*, the biggest peace project in history – surely no harm can come from our good intentions?

Yes, it can. Not deliberately, of course; but that does not make it any less real. And the sooner we realize this, the better.

When deciding to leave oil and gas behind, one of the key factors were costs– in normal times, the EU spends roughly 400 billion euros/year on imports of fossil fuels [11]. Moving to domestic and renewables sources will save us a lot of money. By the same token, these 400 billion euros/year will be sorely missed by those who supply us with oil and gas today. What should they do? Our usual response is to tell them “diversify your economy, get rid of dependency on oil and gas.” It’s a great advice – if you are in Berlin or Lisbon or Prague. However, it ignores the size of the problem. The TOP 20 oil and gas economies are [12] as follows:

- Iraq
- Libya
- Venezuela
- Algeria
- Brunei
- South Sudan
- Kuwait
- Azerbaijan
- Qatar
- Nigeria
- Saudi Arabia
- Oman
- Russia
- Kazakhstan
- Iran
- Colombia
- Norway
- United Arab Emirates
- Bahrain
- Bolivia

From Iraq to Saudi Arabia, these countries have more than 85% of state income from oil/gas; the rest a bit less (e.g. Russia “only” 75%), but still more than half. Telling them to diversify their economy away from oil is easy; we should be more concerned what happens to those who fail to do so (because of laziness, incompetence, or civil war). Most of these states unfortunately are not like Norway with its stable democracy, clean politics, and ability to save today’s income for future generations.

Throughout history, severe decline in living standards often resulted in economic collapse, which in turn led to collapse of the state. The European Union is surrounded by countries which view *Green Deal* as a major security threat. From Algeria and Libya to Middle East and post-Soviet space (Azerbaijan, Kazakhstan, Russia), these are all our neighbors; their problems can quickly become ours. Looking at a global scale, there is a certain irony here: From the above-mentioned TOP 20, China has in its proximity a single country (Brunei), while the United States has three (Venezuela, Colombia, Bolivia). It is Europe who has a real problem – yet does not want to acknowledge it.

The present pandemics provide an unexpected insight: The global demand for oil dropped 30% in spring of 2020 and the overall yearly contraction will be around 10%. Such decrease was expected by the greenest scenarios in fifteen years; it is here already (albeit probably not permanently). The negative rate event (–40 dollars/barrel, Cushing, Oklahoma on April 20, 2020) was one-off, limited to a single location and a specific type of contract [13]. Nevertheless, the slowdown of global

economy and subsequent diminished need for oil is here to stay for at least a couple of years. We can study in real time what the plunging income from oil will do to oil-dependent economies. And what steps will be needed to keep Europe prosperous and safe. Most likely, they will include hard security (both as deterrent against failing states and to protect our borders), as well as more emboldened diplomacy.

A year ago, we thought we have time to think about those security consequences later: It seemed that “peak oil” is decades away and threat to oil/gas exporters from our policies is a long-term one. With global economic trouble due to COVID-19 comes a realization that trouble for oil economies is here – and might not go away.

Coda

Our endeavor to drastically alter energy landscape is one of the biggest projects ever of the European Union. Its success is far from guaranteed: We will need technologies not yet existing and processes not yet developed, with costs not yet fully known. It is in moments like this that I like to quote Václav Havel: “Hope, in this deep and powerful sense, is not the same as joy that things are going well, or willingness to invest in enterprises that are obviously headed for early success, but rather an ability to work for something because it is good, not just because it stands a chance to succeed.” [14].

References

- [1] “Tesla remotely extends range of vehicles for free in Florida to help owners escape Hurricane Irma”. Electrek Magazine, September 9, 2017. (Accessed September 23, 2017, at <https://electrek.co/2017/09/09/tesla-extends-range-vehicles-for-free-in-florida-escape-hurricane-irma>.)
- [2] “A hydrogen strategy for a climate-neutral Europe”, Communication from the European Commission to the European Parliament, The Council, etc. Brussels, July 8, 2020. (Accessed July 8, 2020, at https://ec.europa.eu/energy/sites/ener/files/hydrogen_strategy.pdf.)
- [3] National Laboratories, Index of U.S. Agencies and Departments: Department of Energy, Washington, DC. (Accessed May 29, 2020, <https://www.usa.gov/federal-agencies/national-laboratories>.)
- [4] “All Nobel Prizes in Physics”, The Nobel Foundation, Stockholm. (Accessed June 5, 2020, at <https://www.nobelprize.org/prizes/lists/all-nobel-prizes-in-physics>.)
- [5] “The world’s top 10 largest cobalt producers in 2019”, Mines and Metal Magazine, May 5, 2020. (Accessed July 10, 2020, at <https://www.minesandmetals.com/2020/05/the-worlds-top-10-largest-cobalt-producers-in-2019/>.)
- [6] Good overview is at US Department of Labour site, in their “Child Labor and Forced Labor Reports”. Bureau of International Labor Affairs, Department of Labour, Washington, DC. (Accessed March 5, 2020, at <https://www.dol.gov/agencies/ilab/resources/reports/child->

- labor/congo-democratic-republic-drc.). UNICEF recently released global overview “The toxic truth”. UNICEF and Pure Earth, (July 2020. Accessed July 29, 2020 at <https://www.unicef.org/reports/toxic-truth-childrens-exposure-to-lead-pollution-2020>.) Intriguingly, the original UNICEF report “Pounding rock and crushing potential: Child labour in DR Congo” published June 12, 2009, was taken off the UNICEF webpage (originally https://www.unicef.org/protection/drcongo_49979.html, still can be found via internet archives. Accessed on September 23, 2020, at <https://reliefweb.int/report/democratic-republic-congo/pounding-rock-and-crushing-potential-child-labour-dr-congo>.) For more impassioned account, visit The Good Shepherd International Foundation. (Accessed July 5, 2020, at <https://www.fondazionebuonpastore.org/congo/>.)
- [7] “US tech giants sued over DRC cobalt mine child labour deaths”, Al-Jazeera TV and web, December 17, 2019. (Accessed March 5, 2020, at <https://www.aljazeera.com/news/2019/12/tech-giants-sued-drc-cobalt-child-labour-deaths-191217172719468.html>.)
 - [8] “Leading countries based on annual cobalt refinery capacity”, Statista, Hamburg, September 1, 2020. (Accessed September 10, 2020, at <https://www.statista.com/statistics/339798/annual-cobalt-refinery-capacity-by-country/>.)
 - [9] “EU-China – A strategic outlook”, European Commission and HR/VP contribution to the European Council. Brussels, March 12, 2019. (Accessed April 20, 2019, at <https://ec.europa.eu/commission/sites/beta-political/files/communication-eu-china-a-strategic-outlook.pdf>.)
 - [10] “Does China Pose a Threat to Global Rare Earth Supply Chains?”. Center for Strategic & International Studies (CSIS), China Power Project: Washington, DC., July 17, (2020. Accessed August 10, 2020, at <https://chinapower.csis.org/china-rare-earths/>.)
 - [11] “Opening Speech – EU Energy Policy and Competitiveness”, remarks by Maroš Šefčovič, the Vice-President of the European Commission for Energy Union. Brussels, Conference on EU Energy Policy and Competitiveness, November 17, 2014. (Accessed July 10, 2020, at https://ec.europa.eu/commission/presscorner/detail/fr/SPEECH_14_1883.)
 - [12] Credible statistics are hard to come by in this field – many countries that live off oil and gas are not exactly beacons of transparency. For basic orientation, the WEF analysis is a good starting point: “Which economies are most reliant on oil?”, World Economic Forum, May 10, 2016. (Accessed March 5, 2020, at <https://www.weforum.org/agenda/2016/05/which-economies-are-most-reliant-on-oil/>.) For individual countries, it is highly recommended comparing national statistics with data from World Bank/International Monetary Fund, United Nations, and the International Energy Agency.
 - [13] “US oil prices turn negative as demand dries up”, BBC, April 21, 2020. (Accessed April 21, 2020, at <https://www.bbc.com/news/business-52350082>.)
 - [14] Havel V Disturbing the Peace (in Czech original: Dálkový výslech). Václav Havel Library Foundation, Prague. (Accessed July 10, 2020, at <https://www.vhlf.org/havel-quotes/disturbing-the-peace/>.)