The green hydrogen scenario during a global health and energy contingency

Discussion on resilience and faster economic recovery based on massive green hydrogen availability

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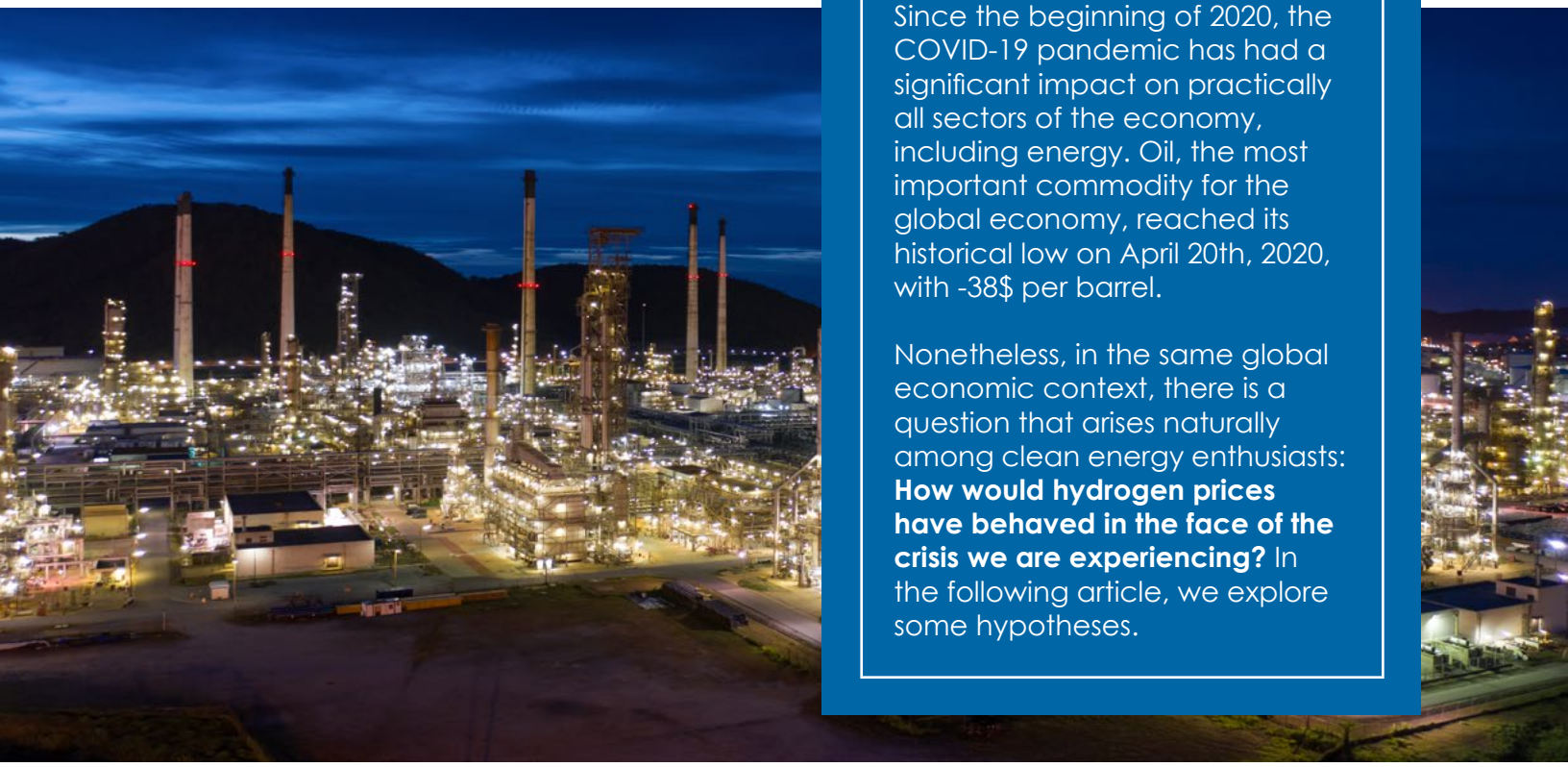
HINICIO S.A.



Since the beginning of 2020, the COVID-19 pandemic has had a significant impact on practically all sectors of the economy, including energy. Oil, the most important commodity for the global economy, reached its historical low on April 20th, 2020, with -38$ per barrel.

Nonetheless, in the same global economic context, there is a question that arises naturally among clean energy enthusiasts: **How would hydrogen prices have behaved in the face of the crisis we are experiencing?** In the following article, we explore some hypotheses.

In the past, when facing other economic crises derived from public health issues or other social phenomena, many governments adopted subsidiary policies to address fuel and energy prices as a measure of economic recovery. The general strategy behind that was to keep oil prices low to support major productive sectors, thus, reactivate their national economies. However, the challenge presented by the current situation is much more complex and extended. The global economy faces an unprecedented threat of economic recession in a more populated world and with an environment more deteriorated by carbon emissions.

Fortunately, multiple countries and regions have maintained their interest in the decarbonization of their economies and their effort to migrate towards renewable energies despite the crisis. That is the case of the European Union, which in its first post-quarantine days, announced the Hydrogen strategy for a climate-neutral Europe. The plan estimates collective investments from the public and the private sector up to €180-€470 billion to develop the needed capacities for the EU energy transition prospects by 2050.

Political support is also observable in countries like China, Korea, Australia, and Japan, in which new policies and financial instruments to promote hydrogen development were announced despite the current economic uncertainty. That responds to the fact that hydrogen will play a vital role in the energy future for several reasons:

Enabling the integration of further renewable energies:

Currently, renewable energies such as wind and solar photovoltaic have prices per MWh that make them very competitive (in some cases, as lower as 13 US$/MWh). These sources, coupled with hydrogen production and storage systems, could improve their integration into the national matrices for electricity generation and mitigate the effects of the natural intermittency that characterises them.

Decarbonisation of heavy transport:

Hydrogen as an energy vector is a viable option for the decarbonization of heavy transport, such as trucks, trains, mining vehicles, and even airplanes and ships through the production of synthetic fuels.

Industry decarbonisation:

In addition to the use of green hydrogen as energy (hydrogen produced from renewable energy), this one can replace grey hydrogen (obtained from the natural gas reforming process) in applications such as ammonia synthesis, glass production, steel, refining etc.

Energy independence:

Hydrogen is a molecule that can be produced from any renewable energy resource, It can be stored over long periods of time to create strategic reserves.

New commodity:

Since hydrogen is a gas that can be stored and transported over long distances (trough liquid hydrogen, ammonia, methanol, or liquid organic hydrogen carriers), it could become an international commodity. It can be acquired through multiple suppliers within a market governed by the Law of the Supply and Demand between countries that can produce it at low cost, and those that could not but still would need it to decarbonise their economies.

Although hydrogen technologies started to gain worldwide acceptance, there are still several challenges to overcome in order to position them as the central energy vector of a low-carbon future. Nonetheless, in the same global economic context, there is a question that arises naturally: How would hydrogen prices have behaved in the face of the crisis we are experiencing?

To answer this, in Hinicio, we prepared different hypotheses that will help to envision a scenario where hydrogen is considered the leading global energy resource in similar conditions as it is oil nowadays. Before that, it is also necessary to review some of the reasons why oil prices fluctuate during periods of economic, political and now global public health crisis, and contrast them with some of the hydrogen potentialities:

Uncertainty in the availability:

Oil is a finite resource of which only global reserves estimates are available. The concept of proven reserves gives us an idea to be able to establish prices under the law of Supply and Demand. However, this is a calculated statistical quantity, not a measured one. In the case of hydrogen, its universal presence, multiple means of production, and renewable capabilities would significantly reduce the impact of the "availability variable" in the market price.

Less speculation:

The development of hydrogen production capacity at the national or supranational level is a planning process that is visible and closely linked to their renewable energy potential. As a result, the supply of hydrogen will be known and predictable, which translates into less speculation about the availability of the final energetic resource. That does not eliminate price fluctuation, but it will reduce the ranges in which they could vary.

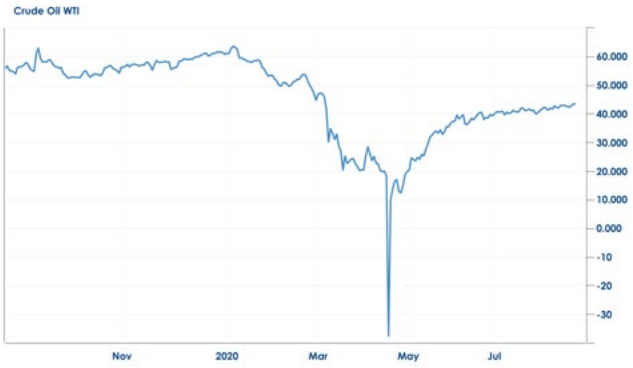


Figure 1: WTI crude oil prices from August 2019 to August 2020.
Source: www.tradingeconomics.com

Modularity:

In a scenario of an abrupt fall in demand, commodity markets tend to adjust supply downward to maintain control over price. Unlike crude oil production, the infrastructure used to produce hydrogen is decentralised and modular, hence, controlling and safeguarding its production represents less technical obstacles.

Storage:

Although hydrogen storage still presents some technological challenges, underground storage in salt caverns has been considered to be a viable option. For example, Europe has the potential to store up to 84.8 petawatt-hours of hydrogen equivalent, which –according to the International Energy Agency (IEA) data – is 3.2 times the world's energy consumption in 2019. Furthermore, it will be necessary to develop the required infrastructure to take advantage of this potential; however, current data allows us to foresee it as a feasible alternative to solve gas storage for contingencies.

Taking into account these considerations in a global health crisis, it is reasonable to assume that the energy markets could have been less severely affected if they were based on renewable energies and with the widespread use of hydrogen as an energy carrier.

Under this scenario, the law of supply and demand would continue to set its prices. Nonetheless, the certainty and predictability of the hydrogen production capacity would have established the oscillations in narrower ranges. Instead of oil varying between 60 and -38 US$/barrel, theoretically, we could have seen hydrogen varying between 1 and 3 US$/kg in a similar scenario.

According to the IEA's recent study to determine the global potential for green hydrogen production from solar photovoltaic or wind energy, regions such as Europe or Asia are not the only ones with the capability to lead hydrogen development at an international scale. In Latin America, Chile has the highest potential to produce green hydrogen in the near future, followed by Argentina, Peru, and Mexico, while other countries such as Uruguay, Costa Rica and Colombia are already formulating their national roadmaps and pilot projects to demonstrate the benefits of this technology for the energy transition.

Finally, it is imperative to remember that outside of the current health contingency and the economic instability expected during the rest of 2020 and perhaps the first quarter of 2021, climate change is an ongoing issue that still requires joining forces towards the migration to

Figure 2: Countries of the world that have plans, roadmaps, or strategies around hydrogen. Source: IEA – Hydrogen Policy Database 2019

sustainable energy resources. That goes beyond the regulation and limitation to the use of non-renewable resources but also the significant reduction of pollution, especially in urban environments where the high population density has become a considerable challenge to tackle the pandemic spread. Recent studies by Harvard University have shown that an increase of 1mg/m3 of particulate matter of 2.5 microns (PM 2.5) in the cities air rises the COVID-19's death rate by 8%. Poor air quality is a public health problem that local entities in charge of monitoring and control must seek to mitigate in order to ensure a sustainable economic recovery.

In a scenario where hydrogen would be the central vector of the energy system, the quality of air in urban environments would also improve significantly, given the positive effect that its use has on industry and transport decarbonisation in displacing current consumption of diesel, kerosene, or coal. Only through the decarbonisation of the world economy, the use of renewable energies with supporting technologies such as hydrogen and batteries, as well as fostering the establishment of circular economy principles and strategies, it would be possible to have a healthier and more sustainable future to face new upcoming global challenges.

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Juan Antonio is a Mexican chemical engineer from the Universidad Nacional Autonoma de México. He works in Hinicio as a consultant specialized in hydrogen technologies with more than 5 years of experience working with alkaline and PEM electrolysers and fuel cells for mobile applications. From Mexico, Juan Antonio has worked pushing up hydrogen technologies for Latin America through his corporate consultancy services to companies that are looking for opportunities in this field as well as different governmental entities.

If you are interested in knowing more about the business opportunities that hydrogen represents on a global, regional and national scale, we invite you to visit our new Service Suites or our Taylor-Made Consulting services, and get in touch with our experts at servicesuites@hinicio.com.