Research Article

THE ENCOURAGING PROSPECTS OF A "NEW GENERATION" OF THE SYNTHETIC FUELS

DOI: 10.58867/IQEE9652

The scarcity of resources, the tendency towards the fragmentation of the globalized world into semi-autonomous blocks, and the "third world war in pieces" require an acceleration in developing alternative products. Alternative fuels can complement or, in the future, replace traditional ones, allowing the same freedom of movement of people and commodities. Investments in developing e-fuels and HVO (Hydrotreated Vegetable Oil) diesel are increasing, and this suggests a growth of the market by 2030 because many plants will go into operation. These "new-generation" and green synthetic fuels have the advantage of reconciling the ambitious decarbonization objectives with energy security and freedom of movement; furthermore, unlike electric ones, they do not require a new engine – and related infrastructures – but can be fully integrated with the internal combustion engines currently in use. Finally, the availability of a valid and ready-to-use alternative to increasingly expensive traditional fuels is part of a broader strategy to govern the current phase of global turbulence.

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Keywords: Energy Transformation, HVO, Scarcity, Synthetic Fuels, Third World.

TPQ
Summer 2024
Change, Security, and Sustainability in Energy

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For last two years, Russia and the West have been competing in a destructive war. The first year of the war in Palestine is approaching, and the siege of Gaza brings new horrors every day. Lebanon has once again become a frontline, and the blockade of Suez and the substantial energy costs lead to the strangulation of European productive systems; on the other hand, sustainability is an objective that can no longer be postponed but it is difficult to reconcile it with energy independence. However, it cannot just be forgotten that we must find alternatives that allow us to maintain a standard of well-being. A concrete policy is needed, in line with the current phase, which starts from the principle of technological neutrality and favours the development of all energetical technologies and reserves. Given the international division labour and the unequal distribution of resources, it is practically impossible to achieve complete self-sufficiency; however, the fragmentation of the world into semi-autonomous blocks casts dark omens in the years to come, requiring the development of programs to integrate or replace some of the products or goods available to date (energy, fuels, food etc.). It is a pressing need, especially for transformation economies, such as the German and Italian ones (firmly integrated), which were based on the constant importation of raw materials they generally lack (low-priced gas, minerals etc.) to guarantee the population's well-being. It is not a simple path because it requires an abrupt transition to a completely different eco-social model. The guidelines must be to replace, save, produce, and eventually research.

To date, giving up the internal combustion engine is still prohibitive despite the encouraging prospects of electromotor. In the twentieth century, the choice to move towards the internal combustion engine, to the detriment of the electric one, was dictated by geopolitical reasons or by the wide availability of hydrocarbons made possible by controlling oil fields and pipelines. It is no coincidence that China, the "systemic adversary" of the United States, is the country that invests the most in electric motor development: a choice that is not only technological but truly geopolitical. Furthermore, it is complex to achieve the ambitious decarbonisation objectives set by the European Union without substantial intervention in the transport and mobility sector; but a new and more radical question has arisen: how to replace fuels more stably, given the ever-increasing costs and global supply chains becoming increasingly insecure? Moreover, the forced passage of Suez plays a central role in the supplies of oil and liquefied natural gas (LNG). From January to October 2023, according to the International Energy Agency, approximately 7.5 million barrels per day of oil and 36 billion cubic meters of LNG passed through the Suez Canal, approximately 10 percent and 8 percent respectively of maritime trade. This defeat situation may be an opportunity to review the policies of extreme dependence on imports, given the impossibility of replacing everything currently imported shortly.

Alternative Fuels: An Overview

Synthetic fuels have a long history. They can be obtained from coal, natural gas or biomass through a conversion process that can be direct or indirect, i.e., when the resource is first converted into syngas, and then becomes the final fuel. During the twentieth century, some processes were successfully applied to produce surrogate petroleum products, as in the case of the hydrogenation – using the Bergius Process – of coal or lignite, possibly also of bitumen and mineral oils (more widespread since the 1950s with catalytic hydrogenation). Since then, a critical issue has emerged: the high consumption of raw materials (for example, around 10 tons of coal overall for one ton of synthetic fuel). This process became obsolete after the Second World War due to the greater availability of low-cost hydrocarbons.

Today there is an entirely different situation, with prices which, in the two years 2020-2022, have grown by over 300 percent. Indeed, car, net of increasing costs (fuels, repairs, insurance etc.), will remain the most widespread and reliable means of guaranteeing freedom of movement. The internal combustion engine is still irreplaceable, having achieved a high-efficiency level thanks to technical perfection. Furthermore, the actual costs of electric cars are prohibitive for a large part of consumers compared to traditional ones, but there are also two further limits: the need for considerable investments in electric charging infrastructures, the technical limit in long-distance travel, the need to produce and accumulate additional electricity in a time of scarcity, the high costs of both the car and charging long charging, while outside temperature can affect battery performance. All this makes cars with internal combustion engines still useful and irreplaceable. However, if the engine cannot be replaced, the fuel can be replaced and if coal can no longer be used as a source for synthetic fuels, other sources can be used.

A concrete answer to the problem lies in the use of synthetic but green fuels. The prospects for developing alternative fuels are also promising owing to the substantial investments planned by international companies. They also make it possible to accompany the transition to electric, towards which all car manufacturers are moving with huge and long-term investments, in a softer way and without repercussions, safeguarding businesses, iconic brands and jobs.

Uses, Characteristics, and Critical Issues of the "New Generation" of Synthetic Fuels

There is a second generation of synthetic fuels, and the prospects for industrial development are encouraging. One of the most promising fuels is HVO (Hydrotreated Vegetable Oil) diesel: it is generated by a hydrogenation process of vegetables or fats that contain triglycerides or fats. To produce HVO you can use vegetable oil (palm

oil, rapeseed oil, used cooking oil, tall oil) or animal fat. The hydrogenation process removes all the oxygen present and highly purifies the oil (in this it differs from the less refined biodiesel). The product is a high-quality biofuel similar to traditional diesel but has some strengths and differences. From the evidence currently available it seems that, in addition to reducing CO2 emissions, this fuel, which is compatible with engines, also has less "impact" on the engine itself: the high cetane (70 points compared to 55 for the traditional one) improves the power on; It is also particularly suitable for colder temperatures. There are also structural limits to what is and remains a substitute, however excellent: the slightly higher consumption (around 3 percent) especially in medium-long distances and the lower lubrication of the engine due to the absence of sulphur. HVO is spreading in heavy transport, especially on extra-urban journeys. Neste Oil is currently the leader in global production with 4 plants and a capacity of 2.4 million tons. At the same time, Eni has launched Ecofining technology to develop biofuels, aiming to reach 2 million tons by 2025. According to Greenea estimates, global production can grow to around 30 million tons next year.

The production of hydrogen is more complex. This element is extremely widespread on Earth but rarely in pure form, so it must be produced. In this case, the process is unique: electrolysis, which can be with a renewable source, producing "green" hydrogen, or non-renewable; in this case, the hydrogen is "grey". Therefore, production requires not only a large quantity of energy but also a large quantity of water, to be drawn for example from the sea through desalination plants. Furthermore, technological and scientific development has not yet found an answer to the distribution, transport and marketing (unlike petrol it must be compressed) of this very useful, widespread and "difficult" element. This represents the main obstacle even if investments continue and the results are promising: last March, the first commercial-scale e-fuels plant became operational in Texas, producing fuel from green hydrogen for trucks Amazon.

It is worth underlining that in both cases a resource must be "extracted", be it vegetable oil, coming from plantations that require soil consumption, or hydrogen, with a process which, although it leads to a positive balance in CO2 emissions, does not represent a real alternative. Just as hydrocarbons are extracted, oils are "extracted": the underlying logic is the same, even if there are no processes or transformations that do not require a tax of some kind. However, this is not the objective of synthetic fuels which must replace traditional ones in a time of scarcity, high costs and a crisis in global trade. One of the great advantages of synthetic fuels is their compatibility with the engines currently in use: for example, Stellantis has stated that e-fuels are compatible with 24 families of endothermic engines sold in Europe in 2014, essentially 24 million vehicles they do not require any modification; furthermore, there would be an exponential reduction in emissions: up to 400 million tonnes by 2024. The European Commission's growing openness towards synthetic fuels also

derives from these considerations.

In any case, there are many projects and many production plants that will see the light by 2028, as eFuel Alliance informs while others are already operational or will reach full production by 2023: the Bell Bay project produces (2024) 70 thousand tons of e-methanol, the CAC Synfuel Plant has the objective of reaching one million tonnes (e-gasoline and e-kerosene), also very encouraging are the prospects of the NEOM plant which aims to produce green hydrogen via electrolysis (650 tonnes per day in 2026, together with 1.2 million tonnes of ammonia).

Conclusions

A historical cycle that began in 1945 is ending, with the violence that only history reserves for these phases. Hunger and war will characterize the coming years, as was the case in the 1930s, which was a preparatory time for the hegemonic war from which this structure was born. The directions are marked: inflation, which pulverizes savings, overflowing growth of public debt with severe risks of default, collapse of the world market, regionalization of the economy, and rampant social instability. The culmination is the new "piecemeal" world war, perhaps awaited by a new leap in violence, which will determine the new structure, with a leading country. These circumstances are leading to an evolution in technological and energy policies, with an ever-greater focus on self-sufficiency. As for transport, the electric will gain an important portion of the market in the medium term. China has invested over 200 billion in the electric industry, thus attempting to break the Western primacy of the car. From a shorter-term perspective, spendable alternatives to oil are needed to accompany the restructuring phase. New-generation synthetic fuels allow us to avoid oil costs and have much less impact on the environment, safeguarding the internal combustion engine. Just as LNG is the ready-to-use alternative to gas via pipeline, e-fuels and HVO are the most expendable alternative in the short term to replace fuels derived from hydrocarbons. Investments in the construction of plants, a regulatory framework to regulate the conscious and respectful use of resources and raising consumer awareness to "consume less" and "consume differently" will be fundamental. It is the era of scarcity.