

The Economics of the Fuel of the Future

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Introduction

Let's look forward to a clean energy source that can change our future. Most commonly thoughts will turn towards solar panels or windmills. There is however a source of energy that is very much different. It has barely entered our life but experts believe it could bring a whole new revolution. That is none other than hydrogen. However, this source comes not without problem. Pure hydrogen does not exist on earth abundantly. Most of them are in the water or mixed with other hydrocarbons.

Thus the task is essentially to manufacture it.

How can we manufacture hydrogen?

What are its advantages?

Does it at all have a future based on the present technological development?

Answers to the above questions are what this article is about.

Economical Cost of Sources

To start hydrogen has been in use for many years. Main uses include it in the metallurgical industry, in refineries, electronics and in the production of ammonia. There is however a new use of hydrogen which has so far gone unnoticed- hydrogen as electrical energy. The idea has started gaining momentum with the invention of hydrogen

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fuel cells. It functions similarly to that of a lithium-ion battery cell, except instead of getting recharged by electricity it gets charged by liquid hydrogen.

That brings us to the main question: *How can we manufacture Hydrogen?*

The answer, well, it depends. Based on the source producing hydrogen it can be of three types. They are:

- 1) Gray Hydrogen.
- 2) Blue Hydrogen.
- 3) Green Hydrogen.

Let us start with grey. Surely, the name itself does not invoke any feeling of cleanliness. That is correct because grey means simply the burning up of fossil fuels to produce hydrogen. It is not a clean source of energy. It is however the recent practice. Not to create electricity but mostly for industrial purposes. One of the biggest advantages of this process consists of is the low private cost of producing hydrogen (approximately 1 dollar per kilogram of hydrogen). The main question however is about the social cost.

Basically, to get hydrogen from a fossil fuel like coal a process called coal gasification is used. The process creates pollutants that can be taken care of in two ways. One, releasing it in the atmosphere with no regards to the climate. Two, storing the pollutant in an underground reservoir. The latter while at first seems to be a better option, does come with its disadvantages. To begin with, the process is quite costly. Moreover, it runs the risk of leaks or creating seismic movements.

This is precisely why blue hydrogen is a much better alternative. Blue hydrogen refers to the process of burning natural gas to get blue flames, which contain hydrogen. In present times it is the most viable alternative. This is simply because the abundance of natural gas is too high. In many cases, oil-producing countries are forced to burn natural gas instead of exploiting it. For example, World Bank 2018

estimates show that almost 5.1 Billion Cubic Feet of Natural Gas was burned worldwide. If it had been used, it could have covered the energy consumption of France, Germany and Belgium! The problem however again lies in the social cost. The pollutant emissions of natural gas are also very harmful and not at all clean.

Thus so far clean hydrogen manufacturing has not been possible. However, there is still one source of hydrogen not covered yet. This is where green hydrogen comes into play.

The reality of the Future

So what exactly is green hydrogen? It refers to the process of breaking down water molecules into hydrogen and oxygen atoms with electrolysis. If the electricity for electrolysis comes from renewable energies then what we have in our hand is completely clean. The problem lies in the private cost of producing hydrogen in this manner. It would take approximately 3 to 7 dollars per kilogram of hydrogen produced with renewable.

Now the good news is the cost of having renewable energies is getting lower every day. With technological progress correctly done green hydrogen can very well become the fuel of the future. It is here precisely that the next main question arises: Does it at all have a future based on the present technological development?

The market for the Future Fuel

The answer again is it depends. To understand let's take the example of personal cars. The cost structure of manufacturing up hydrogen car with green hydrogen is twice that of an electric car. Moreover, hydrogen car does not have the benefit of the economics of scale. This is mostly due to the absence of the necessary infrastructures required before the personal car market could boom.

However, now let's talk about large transportation systems like buses, merchant ships and aeroplanes. So far applicability of electrical buses or aeroplanes has turned out to non-economical with limited usage. One of the most common reasons pointed out is that the battery size

needed to move a large transportation system is so big that it will take up most of the space. Hydrogen on the other hand can be fitted in an appropriately small container and get used for long-distance travel. This makes it economical as well providing the economics of scale from the existing infrastructure. Moreover, having a pollutant less air, water and road travel is an added incentive.

Now, at the very end, it should be noted that while hydrogen might soon make a place in the future market it has a very important use right now. That is instead of using it for electricity purposes it can be used to store renewable energy itself. Thus, hydrogen can cover up a major limitation of renewable energy namely the temporary nature of the sources of renewable energy. For example, winds are not always strong enough to generate adequate energy. However, if hydrogen can store the surplus energy, then it allows for a continuous supply of renewable energy helping to develop another source of clean energy.

Therefore, it can be easily said that hydrogen is soon going to be a game-changer.

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The true sign of intelligence is not knowledge,
but imagination.

- Albert Einstein

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