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'Hydrogen is the only sensible solution for becoming CO2-neutral'

Hydrogen is necessary to achieve Europe's climate goals. But this requires co-operation with countries like Russia and China, says Rainer Quitzow

When it comes to the climate-neutral restructuring of the economy, right now there is no alternative to hydrogen. Is this a hype that will run its course, or is it really the magic potion of climate and energy policy?

To some extent, the focus on hydrogen is indeed a hype. There is currently activity in many other areas. The most important of all, of course, is the expansion of renewable energies. We still have a lot to do there. Only then can green hydrogen play any meaningful role. In producing green hydrogen, the electricity for electrolysis comes from renewable energies such as wind or solar power. At the same time, a new field of technology naturally requires a critical mass of political measures and investments. So it makes sense to set a big agenda early on, as is happening now.

In some areas, hydrogen is the only sensible solution for becoming CO2-neutral at all. In other areas, things are different. For example, wherever the direct use of electricity is possible, that's almost always a better option because the efficiency is simply higher. But where the direct use of electricity is not an option, hydrogen is needed as a solution.

The benefits of hydrogen have long been debated. But for quite some time, little has happened. Why is the breakthrough coming right now?

Because now you really want to do business in a climate-neutral way. 2050 is approaching. In Germany, climate neutrality is to be achieved as early as 2045. To do that, hydrogen is also needed.

With regard to costs, where does hydrogen stand today when competing with other energy sources?

Compared to natural gas in the heating sector, the price of CO2 would actually have to be very high for hydrogen to be competitive. But if we assume that we also must achieve zero CO2 emissions in the heating sector, then this question may not arise at all. In that case, the issue is how to achieve this goal, and not which one is cheaper.

At the same time, in the heating sector there is competition from heat pumps. These cause little or no CO2 emissions. And thus the question of cost definitely arises. Therefore, it makes sense to give more thought to heat pumps. However, they usually require more extensive retrofitting of the heating supply in buildings. Hydrogen could play a role in the transition phase where not everything is completely replaced.

This is already an intense debate: Where should the still extremely scarce and also expensive green hydrogen actually be used? There are many possibilities. What makes the most sense?

The first issue to look at is where hydrogen is already being used today. This is mainly the case in the chemical industry, for example in the production of nitrogen fertilisers, and occasionally also in other industrial processes. Up to now, this hydrogen has mostly been obtained from natural gas. We are talking about grey hydrogen here. So far, very little hydrogen has been produced with renewable energies. Therefore, this conventional hydrogen causes CO2 emissions. This is where we need to switch to green hydrogen. As a second step, we should look at the sectors in which more efficient alternatives, such as the direct use of electricity, offer no or only very limited possibilities for decarbonisation. For example in the steel sector.

There is concern that energy-intensive sectors such as the steel industry could be forced to relocate if production in Europe becomes massively expensive. How can this be prevented?

Yes, this question clearly comes up. We should not expect to undertake a complete transformation of industry and still keep everything as it is. We also need to think about whether there aren't more suitable locations for energy-intensive production – locations where renewable energies are available. It wouldn't be a bad thing if, for example, neighbouring countries in the Mediterranean region benefited from investments of this kind, whether in Europe or in northern Africa. Ultimately, it is also in our interest for economic development to take place in these regions.

So you see the partners as being in the geographical vicinity? With that

said, however, Australia in particular is massively positioning itself as a producer of green hydrogen. Chile is also being discussed. Of course, one wonders what the cost of transport actually is.

In my estimation, physical proximity will definitely play a role. The transport is likely to have a significant influence on the final price. Delivery via pipelines is probably the most cost-effective option. And it would also be good if preliminary inputs were produced nearby.

By the way, China is an example in this regard. The idea of connectivity between China and the economic areas close to the People's Republic is being aggressively pursued and promoted. I think the European Union must also give more serious thought to such categories in the future: How can an economic area emerge that will secure and strengthen Europe's position over the long term? That should be a central question.

Many countries in the Middle East and North Africa are themselves suffering from energy poverty and increasing water shortages. And water is what is needed to produce hydrogen. Do you nevertheless advocate the export of hydrogen to Europe by these regions in order to contribute to economic development?

Eastern Europe and Russia will also play a major role, and not just North Africa or the Middle East. But I don't think that in general, North Africa suffers from energy poverty. That becomes an issue further south. In the northern countries of Africa, the population definitely has access to electricity. But of course you have to look at individual cases, especially in the transitional phase. If Morocco today has a predominantly fossil-fuel-driven and import-dependent electricity industry, the question really arises as to whether it makes sense to invest heavily in green hydrogen there in order to then export it. As a result, the decarbonisation of the electricity industry in the country itself could proceed more slowly. That's an important consideration. But in principle I would not rule out the possibility of economic prospects for such countries as well. This is especially true if one doesn't assume only the export of hydrogen, but that there will be a stronger integration into new local value chains.

You mentioned Eastern Europe and Russia. The new Nord Stream 2 pipeline is still the subject of heated debate. Proponents argue that it could also transport hydrogen in the future. Will Russia remain our most important energy trading partner even in the hydrogen age?

That might well be the case. Russia has enormous resources in the field of renewable energies. These could be used to produce green hydrogen. As for Nord Stream 2, there should have been debate in

that direction. In the meantime, Nord Stream 2 has now been completed and gas will probably flow. I would have liked to see the use of the pipeline made conditional on starting and promoting decarbonisation in Russia and Europe.

How do you rate the use of gas in general? Clearly, green hydrogen is best. But right now, what little there is of it is expensive. Should gas-based hydrogen be used for the transition? Or is that a mistake, because doing so would establish the use of gas for decades to come by building the infrastructure?

I think you first have to differentiate quite clearly between blue and turquoise hydrogen. Blue hydrogen is hydrogen whose CO2 is separated and stored during the production process. This is known as Carbon Capture and Storage, CCS. The CO2 generated during hydrogen production is therefore not released into the atmosphere. Turquoise hydrogen is hydrogen that was produced through methane pyrolysis. Instead of CO2, solid carbon is produced.

In the case of blue hydrogen, the carbon footprint is difficult to assess at the moment because there aren't many studies available yet. The important thing is how many emissions are released during the extraction and transport of natural gas. That varies greatly from region to region. However, it is not entirely clear to me why CCS should be used in hydrogen production. There needs to be an intensive debate on this: if we want to use CCS, why then in the hydrogen area and not in other areas where it might make more sense? If there is support for the process, it should also be used to in power generation, if necessary. Actually, CCS has long been off the table in Germany, but in the case of blue hydrogen it's suddenly o.k. to talk about it again. This is strange.

And what about turquoise hydrogen?

Russia has a very strong interest in turquoise hydrogen produced by methane pyrolysis, because this technology continues to enable the use of natural gas without producing emissions during hydrogen production. However, Russia certainly has decades of natural gas usage in mind here, and this involves considerable emissions of methane, a very harmful greenhouse gas, during extraction and transport. So this is a double-edged sword. But if, in a transitional phase, the use of turquoise hydrogen could be linked to a reduction in these methane emissions, then that might also be positive for climate protection. We should not completely reject the idea of turquoise hydrogen.

Germany wants to become the world champion of hydrogen. Do you think that's realistic? Who is it competing against?

Yes, that seems realistic to me. The competitor is always China, of course. Europe and Germany have a good position in some areas of the value chain. We need to look carefully at which segments of the value chain can realistically be developed in Europe. This would have to be analysed in more detail.

Are the European member states all at a similar level or are certain ones leading the way?

Germany is definitely at the forefront – with regard to the volume of investment via state subsidies as well. But of course there are also other countries that have ambitions, for example Portugal. In Europe, however, more attention should be paid to coordinating the individual strategies of the member states more closely with one another.

What course must now be set in order to advance the promotion of hydrogen in Europe?

At the moment larger projects, including collaborative projects, are being funded at the European level. In this way, different clusters are to be created. This is a sensible approach. But there is also a huge discussion about which forms of hydrogen will be used. The debate about blue hydrogen and carbon capture and storage (CCS) would have to be conducted openly and honestly. At the moment Germany has turned away from the CCS option, while accepting that this strategy will be pursued elsewhere. It cannot be sensible to implicitly promote things and at the same time not explicitly be open to this topic. This discussion still needs to take place. We are also seeing this in the field of nuclear energy.

Some European member states want to declare hydrogen generated from nuclear power as low-emission and make it an important part of climate policy. This is the case with France and certain Eastern European countries, for example. Are we facing polarised debates at the European level?

Of course. Germany made the decision not to use nuclear energy. Other member states have done this – Italy, for example. Other countries such as France still rely heavily on nuclear energy, even if it is slowly being scaled back. Germany cannot force France to abolish atomic energy, and conversely, France cannot force Germany to accept it. But because of the energy transition, the two countries will probably work more closely together in the energy and electricity

sectors in the future. That could also mean that ultimately they will end up supporting nuclear energy. This is one of those contradictions in the European Union that are no longer capable of being resolved.



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