On the Right Path – “All Systems Go” for Hydrogen Infrastructure

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On the Right Path – "All Systems Go" for Hydrogen Infrastructure

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1 Summary

In his speech, Wolfgang Reitzle describes the dawning age of hydrogen as the third, "green" industrial revolution. Thanks to its unique properties and advantages, hydrogen is the logical next step in the "decarbonisation" of energy supply and personal mobility. It is the only fuel that can deliver everyday mobility from renewable and sustainable sources, and give cars sufficient range and the flexibility of rapid refuelling. The technology is there, but widespread introduction requires the collaboration of all players. The H_2 Mobility initiative, including Daimler and Linde, among others, will play a major role in this process. The partners are committed to build an infrastructure of hydrogen filling stations that will be sufficient to supply the first series-produced cars with fuel cells that will hit the market from 2015 onwards. Linde will support this growing infrastructure by delivering the enabling technologies such as high-pressure cryogenic pumps and ionic compression systems. At the same time, Linde is working toward the generation of hydrogen from renewable energy sources such as the sun, wind and regenerative raw materials or biological waste. Moreover, this environmentally friendly technology is a growth market and a source of new jobs.

2 Speech

Dear Minister-President Dr. Rüttgers, Dear Minister Dr. Ramsauer, Ladies and gentlemen,

I would also like to extend the warmest welcome to the World Hydrogen Energy Conference 2010 here in Essen.

I would like to start by quoting a study conducted by the Stanford Research Institute:

"Hydrogen would not be likely to gain favour until fuel options more compatible with existing corporate, societal and governmental institutions have been exploited and, perhaps, nearly exhausted. The reason is that a transition from our present gasoline system to a hydrogen system would require an enormous degree of effort, expense and coordination. It would be no minor evolutionary change, but the overturning of the existing system by one that was entirely new - a revolution, in short."

As you can probably imagine, these sceptical projections are not recent. They date back to 1977. And since then, we have experienced numerous revolutions and watersheds across socio-political, economic and technology milieus.

We also live in a time of change. The fossil fuel age, as it came to be known, is drawing to a close. One of the biggest challenges facing society is the need to tap new, zero-carbon sources of energy and build up a low-carbon economy. So are we on the brink of another revolution?

Well, I certainly think so. Over the next few decades, we will see a series of radical changes, driven by the third, “green” industrial revolution. To meet the challenges of our times, we will be called upon to make far-reaching decisions over the next few years.

As an engineer, I can say to you today that I am convinced we can solve the energy problem!

- We have the right technologies,
- they work in real life,
- they are affordable,
- and they will change our world – following in the footsteps of the steam engine, electricity and the Internet.

There are many reasons why I feel so optimistic. Hydrogen is definitely one of them, because it is the source of energy with the greatest potential for the future. We can manufacture it from any primary source of energy, store it safely in a format that fits individual needs and combust it as a fuel without releasing any harmful emissions. As such, hydrogen is redefining personal mobility – which is one of the cornerstones of our modern and open society.

Just as the Internet changed the world of IT by giving any-time, any-place access to knowledge to everyone, a global, hydrogen-enabled energy network has the capacity to become a defining milestone on the journey towards a global society.

But I have skipped ahead to the end of a long story that started out with the quest for energy. The decarbonisation story if you like. A tale of how wood, coal, oil and gas were turned into hydrogen. A chain of events that can be likened to the IT story, which started out with Moses and the stone tablets, moving on to the first printing press and the telephone and culminating in the virtual world of the computer.

I suppose that is what we would call the big picture. Now I would like to zoom in on what is happening today. Where exactly are we – in the year 2010 – in this great, extended development chain?

My view is that we are right at the start. No more – and no less either. The point is, we can make change happen now – if we want to, that is. Yet we must all want to. That is the true crux of the matter.

Success hinges on effective networking across all branches and levels of industry, science and politics. And the WHEC here in Essen is an excellent example of how that collaboration can work.

For me there is no doubt – if we want to move ahead quickly, we must strengthen these ties and network more efficiently. What we have often seen in the past is the art of passing the buck. And this has gone on for too long. It is the classic chicken and egg scenario. Everyone is expecting someone else to make the first move – and everyone has become very skilled at justifying their inaction. This is why I am particularly happy that this problem is being tackled and resolved on at least one front – and a very important one at that. I am referring to the new hydrogen infrastructure for cars. In Germany, we already have a few dozen hydrogen stations in operation. A couple of these are operated under the umbrella of regular, public filling stations. This makes Germany the absolute pioneer in Europe.

In acknowledgement of progress in this area, the H_2 Mobility project recently received an award. And rightly so, it is a major landmark on the path to a nationwide hydrogen infrastructure in Germany.

Last year, the H_2 Mobility project was kicked off by Daimler, EnBW, NOW, OMV, Shell, Total, Vattenfall and The Linde Group. At this point, we can say that the first series-produced cars with fuel cells will be seen on Germany's roads in 2015. The automotive industry has committed to that target.

And these cars will be able to refuel at one of the stations in the German hydrogen network. Oil and energy players – The Linde Group included – have committed to that target. Building on this initial commitment, the density of the German refuelling network will then increase, in synch with the number of hydrogen-powered vehicles on the road.

Linde has more than 100 years of experience in the industrial production, transport and varied application of hydrogen. We are the largest engineer of hydrogen plants and the world's leading supplier of hardware for hydrogen refuelling stations, which partly accounts for our optimism at the dawn of the next hydrogen chapter. A solution has been found to the infrastructure problem – in particular the basic challenge involved in refuelling hydrogen-powered vehicles. H_2 Mobility has paved the way for cost-effective expansion of this infrastructure.

We are supporting this growing infrastructure by delivering the enabling technologies such as high-pressure cryogenic pumps and ionic compression systems. Combined, these innovative products and processes give drivers a full tank of compressed gaseous hydrogen at 700 bar in just three minutes. In addition, they cut maintenance effort and thus help to further reduce the cost involved in constructing and operating hydrogen refuelling stations. In Germany alone, a further two public refuelling stations featuring these technologies are set to open in Berlin and Hamburg by the start of next year.

However, ladies and gentleman, we are very much aware that the secure, cost-efficient storage, transport and delivery of hydrogen is just one side of the story. We also realise that "green" hydrogen is the way forward. Current conventional methods of producing hydrogen from natural gas and other fossil fuels can already reduce CO_2 emissions along the entire value chain (from well to wheel) by up to 30 percent. Nevertheless, we are working toward another long-term objective – the generation of hydrogen from renewable energy sources such as the sun, wind and regenerative raw materials or biological waste.

And there are already promising concepts and concrete projects for all of these scenarios. Just take our new pilot plant in Leuna, for example. It produces hydrogen from glycerine, a by-product of bio diesel manufacture. Powering vehicles with hydrogen produced in this way cuts carbon dioxide emissions by up to 90 percent per car compared with conventional fuels. Furthermore, glycerine produced from biogenic substances does not impact food production.

And that is just one concrete example of a project generating "green" hydrogen – the list of possibilities is almost endless. Our engineers and scientists are working hard to develop innovative, viable concepts aimed at a sustainable hydrogen supply. As we move forward, hydrogen will also be used to store energy gained from other renewable sources.

If we combine conventionally manufactured and surplus hydrogen with new, innovative processes for regenerative sourcing, we are looking at a secure flow of hydrogen. In short,

hydrogen is getting ready to make its mark. It is the only fuel that can deliver everyday mobility from renewable and sustainable sources, and give cars sufficient range and the flexibility of rapid refuelling.

Yet hydrogen's success also hinges on a concerted approach and support from political circles. The H_2 Mobility project is a prime example of how industry and politics are working towards a common goal. Under the umbrella of this project, companies from different industries have joined forces to advance hydrogen technology with support from the German Federal Ministry of Transport. The Federal Government has issued a clear statement to this effect: "Our goal is to establish a nationwide hydrogen network that will enable the introduction of series-produced fuel-cell cars across Germany by 2015."

However, here at The Linde Group we firmly believe that the dawn of a new energy era cannot hinge on one technology alone. We must support *all* developments aimed at helping us realign our energy base. It is therefore not a question of securing political support for fuel cells *or* batteries *or* bio energy. We need to garner support from politicians and society as a whole for *all* of these alternative sources of energy. In order to move forward, action needs to be taken on a number of fronts. We therefore believe that the current move toward wide-scale promotion of electro mobility is a step in the right direction and one that should be pushed faster than has previously been the case.

Ladies and Gentleman, Victor Hugo, was right when he said "All the forces in the world are not so powerful as an idea whose time has come." And hydrogen's time has come. After decades of research, development and testing, we now know that hydrogen technologies work, that they are affordable and capable of widespread deployment, and that they also enjoy broad political support.

The green revolution is just around the corner and I am certain it will come faster than many of us today expect. This is because it makes sound economic sense. Environmentally friendly technology is a growth market and a source of new jobs. The additional investment required to achieve climate protection and energy policy objectives will create around 500,000 jobs by 2020 in Germany alone.

In other words, the green revolution not only heralds the dawn of a new energy era and a solution to the climate catastrophe, it also promises to be an engine for growth and prosperity.

I personally see this as a huge opportunity. And if the considerable interest shown here in Essen is anything to go by, I am certain that we will make the most of this opportunity – right here and right now.

Thank you very much for your time and attention.