



Every two months, Prof. Dr. Thorsten Arnhold, IECEX Chairman 2014-2019, provides an update on developments within the organisation.

**F**or the last few weeks, coronavirus has been dominating both political agendas and media headlines around the world. For me, the crisis is clearly showing both the global interdependencies and vulnerabilities of our societies.

Sometimes I think that a little more consideration of “old values” and a little more control of the worldwide traffic of persons and products could be good for the balance of our liberal life. On the other hand, if I remember my previous stay in Shanghai last October, I think that even extensive control in the country would not have prevented the outbreak of the disease. Maybe something in between could be the best solution – something which is already employed by international organisations, such as the conformity assessment of IEC or ISO. The last few weeks have clearly demonstrated that global issues such as the coronavirus can only be solved with global cooperation.

Another major issue, which is now in the background but remains very urgent, is the matter of energy supply in the future. Even if one is not sharing the alarmist mood among broad parts of western societies regarding anthropogenic causes of the climate change, it is a fact that we have to protect the environment better and we have to find

## Hydrogen is the solution

new technologies for energy supply in the post-fossil fuel age.

In Germany, we decided to shut down nuclear power plants following the Fukushima disaster in 2011. Now, Germany has also decided to shut down its coal-fuelled power stations by 2038. The idea behind this is to provide the majority of German power by so-called renewable sources, i.e. wind and solar power (due to our geography we do not have significant resources of water power). So far, so good (but not in a physical sense).

Too often we forget that Germany is not a typical sunshine state and most of the wind can just be harvested offshore. To buffer the volatility of both energy sources, Germany would need huge storage capacities. A good image to visualise this is that if Germany built a pumped-storage power plant to cover the whole country's energy needs during the night and windless days, it would require a storage facility with a capacity the size of Lake Constance (Bodensee) lifted to around 800m high.

**Establishing such huge, new hydrogen supply chains cannot be a matter of individual countries – it is a global challenge**

Too often in western industrial countries, we forget that fossil fuels are not just leading causes of pollution and other environmental problems. The major reason for much improved lifestyles around the world since the industrial revolution lies in the energy supply of coal, oil and gas! To illustrate this fact, I want to make a short calculation. The energy content of a barrel of crude oil is equivalent to the working power of 16 strong men for a whole year (without sleep or rest)!

If we estimate the total production and consumption of fossil fuels during the last 150 years, we can roughly calculate that in total mankind has used the energy equivalent of 700 billion people! Compared with the estimated figure of 100 billion people who have ever lived, this is an impressive figure. But what does this figure tell us? It means that if we want to continue our comfortable lives in the future, we have to increase the efficiency of our power supply chains significantly, reduce the amount of waste dramatically, and we have to find a new carrier for all the energy we need.

Now, I come to my preferred topic and the reason why I am writing this column for Hazardex – hydrogen is the solution! Hydrogen has an energy content of 33.3 kWh/kg which is almost 3 times higher than the energy content of 1kg of crude oil. Remember the energy equivalent of crude being 16 strong men for a year? With hydrogen, that figure is tripled. Even if we take the 30% power consumption away for the liquefaction or the pressurisation of the hydrogen gas, we still have 32 strong men left. Hydrogen and all the products which can be produced out of it, such as Methane, Methanol, synthetic fuels etc., are all flammable and explosive.

There is currently an annual global hydrogen production of around 50 million tonnes. In the future, this production will increase significantly, and the technology will change. Green hydrogen will dominate based on electrolysis driven by nuclear energy, water, wind and solar energy. To transport it, the gas must be liquefied or pressurised. To use it, we need networks of supply stations and we need efficient fuel cells. In the whole value-chain, there is a certain need for appropriate safety concepts including explosion protection. Establishing such huge, new hydrogen supply chains cannot be a matter of individual countries – it is a global challenge. It needs international efforts and solutions and it needs international standards and conformity assessment systems. ■