“Spain could lead the hydrogen economy in the next ten years”

Interview with Javier Brey, Chairman of the Spanish Hydrogen Association

On October 6, the Council of Ministers approved the ‘Hydrogen Roadmap,’ an action plan by the Spanish Government of Spain to promote hydrogen as an energy vector and position the country as an international market benchmark. .’ Javier Brey, Chairman of the Spanish Hydrogen Association, tells us about the current situation and the promising future of this element.

- ***When did the institution to which you belong arise, and what is its main task?***

The Spanish Hydrogen Association was born almost 20 years ago, when a group of professionals sat around a table to find a way to promote their technology in our country. So, although from a technical point of view it was already prepared, it had not reached the market as a business. During these twenty years we have been collaborating, working and making it known, disseminating its benefits with the aim of fostering, promoting and boosting the industrial development of hydrogen in Spain. We have met with national, regional and local governments. 15 years ago the association became international and began to collaborate with its counterparts in other countries, signing bilateral agreements with embassies and foreign entities, representing and defending the interests of the sector not only in Spain, but also in Europe and the rest of the world.

- ***Hydrogen is emerging as one of the elements that will contribute to changing the world’s energy landscape. Could you explain what are the features giving it value as an energy vector?***

Hydrogen can be produced in a renewable way, such as by electrolysis if we use a renewable source as electrical energy of origin: photovoltaic, wind, etc. When used in a turbine engine or fuel cell, it does not emit carbon dioxide into the atmosphere. In other words, it is a clean fuel, from production to its use.

Another outstanding advantage is that it is very versatile, and can be a solution for all sectors: energy, transport, industry and residential. This global response is not given by other alternatives.

In the Energy sector, there is talk about green hydrogen, blue hydrogen and gray hydrogen, where does this differentiation lie?
What is known as gray (or brown) hydrogen is the reforming of natural gas, and it is obtained from a process that combines it with water vapor. At a suitable temperature and pressure, in the presence of a catalyst, the gas molecule is broken, hydrogen is removed and CO2 is released into

the atmosphere. The result is the one being mostly used today in the industrial sector. When that CO2 is captured, generating low emissions, it is called blue hydrogen.

However, the most desirable option is green -or renewable- hydrogen, which is produced from renewable energy sources (in a direct way, through a water electrolyzer), biofuels or biogas.

- ***Which of these variants is the one most commonly produced today and who are its main producers?***

Today 95% is gray or brown, although, little by little, we are seeing how the promotion of renewables and the interest in decarbonizing the industry favor the advance of green hydrogen. The roadmap approved by the Council of Ministers on October 6 includes national objectives for the implementation of green hydrogen by 2030. It is established, among other things, that for that year we will have between 5,000 and 7,500 vehicles, between 100 and 150 service stations, the installation of 4 GW of installed power of electrolyzers, and that 25% of industrial hydrogen will be of renewable origin. In other words, feasible levels are beginning to be set in the market.

The main producer at the moment is the chemical and petrochemical industry. Meaning that it is basically produced by those who use it, by those who need it. But the positive aspect in this hydrogen scheme as an alternative fuel is that, like renewables, small producers may emerge. In the same way that now we see individuals installing photovoltaic plants and selling kilowatts, kilograms of green hydrogen could be sold. So that it is not necessarily a business exclusively for large companies.

- ***Does its production and handling present particularities in relation to other fuels in terms of safety?***

All fuels, from diesel or gasoline that move cars to natural gas or propane whatever their use, require a certain care at handling, and this one too. Therefore, hydrogen technologies are perfectly proven to be used with the same safety conditions as any other fuel.

- ***Hydrogen can be used as a fuel directly and as an energy vector for energy storage. Has the technological evolution for its development been homogeneous in both applications?***

Yes, from a technological point of view. However, there are more advanced businesses in the market than others. There are already service stations and many other applications, but their use in homes as an alternative to natural gas is further away than the possibility of purchasing a hydrogen vehicle. Penetration in the different sectors -industrial, transport, energy and residential- will come from the market and how its technologies are being implemented and deployed.

From an industrial point of view, everything is ready. There are turbines, large-scale production systems… In these years of interest in decarbonization, much progress has been made, and there have been two milestones around renewable hydrogen: on the one hand, electrolyzers are becoming more competitive, cheaper, efficient and safe. On the other, renewables have dropped in price dramatically, and this production requires affordable electricity, and renewables in ten

years have divided the cost per kilowatt hour by ten. These aspects have made green hydrogen an ideal solution for the decarbonization challenge.

- ***Regarding its application as a fuel, which industries have pioneered its use and what is the current situation?***

The industries that have traditionally been using hydrogen are the ones I named at the beginning: within the chemical sector: petrochemicals to refine gasoline, the manufacture of methanol, the production of ammonia and fertilizers. On a smaller scale, the glass, crystal, conductor steel industry; and, on an even smaller scale, the food and pharmaceutical industry. Although we continue talking, mostly in these cases, of gray hydrogen.

If we focus on green, we can affirm that the most important companies in the world are working with it. For example, in the transport sector, prototypes of airplanes, ships, trains, buses are being announced, and even the acquisition of some of them.

And in relation to its use as an energy vector for storage, what potential does it have and at what level of development are we?
The potential is enormous: we are talking about storing all the energy that Spain would have left over the first 180 days of the year – and which we could obtain in a 100% renewable way – to use it for the next 180 days of the year. It is a huge storage and its development goes hand in hand with the installation of renewables. The Integrated National Plan for Energy and Climate (PNIEC) warns that, by 2030, we will need to install 59 GW of renewables and close to 14 GW of non-renewable. As we go down this path, we will need more and more energy management. And thus more hydrogen-based solutions for that storage (large-scale and seasonal). This is not happening now, but the technology is ready.

- ***In your opinion, what great challenges does hydrogen have to overcome in order to consolidate itself in the energy sector?***

It is fundamentally a problem of regulation and strategy. I mean, it's more about paper than an issue of development. And although we still lack regulation and rules, we can say that the country's strategy has been approved with the Hydrogen Roadmap, because it gives directions to companies, universities, users and institutions for its development. What comes next? Rules and regulations. But I insist: from a technological point of view, we are prepared. Now is the time for use to begin to normalize.

- ***What large projects, completed or in progress, based on the use of hydrogen could you highlight?***

In Spain, a call was made for large projects, simply to find out the interest they aroused, and 28 proposals were received from 26 companies. These proposals covered the entire chain, from the production of renewable hydrogen to its use in different areas in transport, fleets, industrial, as an alternative fuel, etc. In other words, there is great interest in Spain at the moment. The roadmap figures the investments for the next ten years at 8.9 billion euros.

Europe has opted for renewable hydrogen, but it cannot produce all it needs, so they will have to import. However, in the case of Spain it is not only possible to produce what is required for self-sufficiency; we will be able to export to northern Europe. And not only product, but also technology and equipment, because we have the entire value chain. In addition, that arriving from Africa will do so through our country, which will become a point of entry.

- ***What headlines do you think hydrogen will monopolize in ten years? What development prospects do the experts foresee?***

The development prospects are precisely those appearing in the 'Road Map.' It is established that we are going to have, as I said before, around 7,500 vehicles, two train lines and 25% of the industry will be green or renewable. In other words, we have an excellent breeding ground to lead the hydrogen economy in the next ten years, not only in Europe but in the world.

Javier Brey is an Engineer from the University of Seville, and a Doctor from the Pablo de Olavide University, in Seville; his doctoral thesis was about Hydrogen Economics.

In 1998, he began his professional career in the field of hydrogen and fuel cells at the Abengoa company. In 2016, he left Abengoa to create and lead H2B2, a technology company focused on clean production through polymer electrolysis.

He is the Chairman of the Spanish Hydrogen Association (AeH2), Vice Chairman of the European Hydrogen Association (EHA), Vice Chairman of the Spanish Fuel Cells Association (Appice), and Secretary of the Spanish Technology Platform for Hydrogen and Fuel Cells (PTE-HPC).

He is an Associate Professor at the Loyola University Andalusia, where he teaches students the advantages of the Hydrogen Economy.