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Interview to Jose Serra: “We have it all: technology and renewable resources. It is an opportunity for Spain and this time we only need to do it, get on the train of the third industrial revolution”

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The Group Leader Jose M. Serra Alfaro talks about the use of hydrogen in rail transport in an interview offered by EL PAIS.

You can read the news if you click this LINK (SPANISH) <https://elpais.com/sociedad/2022-06-03/el-tren-del-hidrogeno-a-toda-maquina.html>

ENGLISH:

The Hydrogen Train, at full speed

On the 30th anniversary of the AVE, Spain consolidates its railway leadership with the development of trains powered by renewable hydrogen, and leads the revolution of this new energy vector

The (truly) zero emissions train is finally here, a decisive step towards decarbonising rail transport. The hydrogen train is so sustainable that it only emits water and heat. It will work just like an electric train, since it is this energy that moves its locomotive, but instead of receiving it from conventional catenaries, it will obtain it from a renewable hydrogen battery. The capacity to store this gas and the power of the battery will determine its autonomy and speed.

"The decarbonization of heavy transport will have a huge impact on CO₂ emissions and environmental quality," says José Manuel Serra, a hydrogen researcher at the Institute of Chemical Technology (CSIC-UPV).

The versatility of hydrogen, capable of storing energy to be released gradually, makes it an exceptional ally for industry to decarbonise its activities. It can be used to manufacture some of its derivatives, such as ammonia and methanol, directly in fuel cells or as a raw material to make synthetic fuels. But first you have to produce it, because it is not a primary source of energy like the sun or the wind, but a manufactured product. Today, the challenge is to generate more renewable hydrogen through electrolysis, a technology based on the use of renewable electricity and water.

Rush to research

Updating its Hydrogen Strategy, the European Union has just added 200 million euros in financing to the REPowerEU plan for hydrogen technological research, and the European Commission (EC) undertakes to evaluate this summer the first projects that are presented. Because the EC wants 20% of the trains that run on diesel today to run on renewable hydrogen by the end of the decade, when the Spanish government intends to have at least two commercial train lines powered by this sustainable fuel.

“We have it all: technology and renewable resources. It is an opportunity for Spain and this time we only need to do it, get on the train of the third industrial revolution”

J. M. Serra, researcher at the Instituto de Tecnología Química (CSIC-UPV)

"The use of hydrogen in rail transport is an emission-free alternative for non-electrified lines where diesel trains now run, taking into account that the exhaust gases from hydrogen traction are water vapour", explains Emilio García, director of Talgo innovation.

Its operation can be explained in four steps. The train carries the hydrogen in tanks located on the outer roof. When passing through the fuel cell, the contact of this hydrogen with the oxygen in the air produces a reaction that generates electricity and releases water vapour. An electrical tension booster increases said tension for its supply to the conventional traction equipment. As a complement, lithium batteries are used for special cases of more power needs or as a substitute traction element. Current research is focused on reducing the large storage volume required for hydrogen, using liquid carriers, and improving the fuel cell.

Vital-One, in testing phase

In Spain, one of the most innovative projects in the sector is that of Talgo and Repsol, which have been working for some time on the development of a dual hydrogen-electric train. It is up to the railway company to design, manufacture and start up these trains of the future, and to the energy company, to generate renewable hydrogen and take care of the supply logistics that will make this project a reality. With its own technology for storage and generation of energy from this sustainable gas, the tests of the traction chain at the National Hydrogen Center were successfully completed. Dynamic tests with a laboratory train have already begun, first at its factory facilities in Las Matas (Madrid) and later in Extremadura.

Talgo has designed the Vital-One for Commuter and Medium-Distance lines, and its natural application would be on long stretches of tracks that have not yet been electrified. Today, Spain has 5,617 kilometers of railway lines that have not been electrified, nor are they planning to do so, since it would cost around 2,810 million euros. Diesel locomotives circulate through them, and as a result, only 60% of the energy consumed by our railway sector is electric, according to data from the consulting firm Deloitte.

The case of Spain is not unique. Projects are being built all over the planet that apply the energy vector of the future to rail transport. China launched its first hydrogen fuel cell locomotive last year (paradoxically, to transport coal...), Germany plans that the Mireo Plus H from Siemens Mobility and Deutsche Bahn will replace a diesel train with regular passenger service between the cities of Pforzheim, Tübingen and Horb du Néckar in 2024, and the Canadian Pacific also plans to cover some North American routes with hydrogen locomotives.

Europe looks at Spain. The European Hydrogen Congress was held in Madrid in May with the presence of the President of the European Commission, Ursula von der Leyen, who described our country as "global European leader in decarbonisation and green hydrogen".

Short term goals

Von der Leyen thus verified the potential of Spanish wind and photovoltaic energies to generate an extraordinary production of renewable hydrogen. In the same act, the Minister for the Ecological Transition, Teresa Ribera, reiterated the official purpose of installing 4 gigawatts (GW) of electrolyzers and the mobilization of 8,900 million euros between public and private investment so that, in 2030, 25% of industrial hydrogen consumption is renewable and hydrogen plants, trains and heavy transport vehicles powered by this product are implemented.

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Tomás Malango, Director of Hydrogen at Repsol

"We have the industrial, technological and climatic capacity to make hydrogen at a competitive cost", highlights Tomás Malango, Director of Hydrogen at Repsol. "Spain is the country in the European Union with the largest available renewable resources. To produce one megawatt of hydrogen, three megawatts of renewable energy are needed, so we will have to install three times as much renewable energy as there is hydrogen production capacity. From there, we will be able to export."

Scientist José Manuel Serra confirms this vision: "We have everything: technology and renewable resources. A global boost is needed, not only political but also industrial, like the one being carried out by Talgo and the energy companies that are committed to renewables. It is an opportunity for Spain and this time we only need to do it, get on the train of the third industrial revolution".