CDTI-NEDO online Joint Workshop on Hydrogen Technology
- Green Hydrogen Production & Mobility -

# Vittal One Train

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**Talgo**

@CDTIoficial

# Company

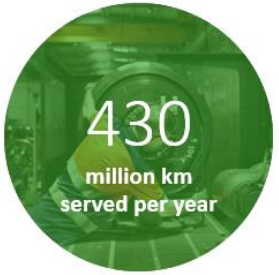
- Our story so far

- ✓ 1942: two pioneers meet and decide to bring new ideas and to disrupt the century-old rolling stock manufacturing
- ✓ 1968: Talgo creates the world's first international train with automatic variable gauge.
- ✓ In 1973 the first naturally tilting train is developed. Coaches automatically adapt to curves, compensating cant deficiency: passenger comfort is enhanced and travel times are reduced by 25%... with no investment on infras
- ✓ 1989: Talgo goes global, with the introduction of new services in Germany and later in the USA
- ✓ During the late 1990s Talgo develops a new generation very high-speed train, ready to compete face-to-face with Siemens and Alstom
- ✓ In 2010 Talgo develops the world's first interoperable train
- ✓ Talgo creates the first wide-bodyshell VHS train able to offer 3+2 seating under the UIC standard loading gauge

# Company

- Global player
  - Permanent industrial presence in some of the most relevant rail markets
- Talgo in short
  - A mid-sized company focused about quality and with the right costs-capabilities balance






Germany
Spain
Uzbekistan
USA
Kazakhstan
KSA
Russia

# Products, services, technologies of the company

- ✓ High Speed (Speed range: 250-360 kph)

Talgo 350

- ✓ **Sturdy and Efficient at High Speed**
- ✓ **More than 16 km of Talgo 350 trains** have been built over the last 15 years
- ✓ **46 units** in service **in Spain** and another **36 in Saudi Arabia**

- ✓ **Maximum Versatility at High Speed**
- ✓ Variable track-gauge and signaling systems, plus tilting technology to enable **the train to run faster through curves** in conventional lines
- ✓ **Bi-mode**, Talgo 250 Dual can operate **with or without electrification**

Talgo 250

# Products, services, technologies of the company

✓ Renfe S106/S122 - THE MOST COMPETITIVE, ENERGY-EFFICIENT VHS TRAIN

- 30 full TSI-compliant units contracted, including 30-year full maintenance
- Whole train at platform level, with room for **521 passengers (2 classes)**
- Half of the fleet (15 units) will mount **very high-speed automatic track-gauge change**, once again a Talgo world's fist
- A third (10 units) will be equipped and certified to operate also in **France** legacy lines
- First unit already in the **final manufacturing** stage, with power heads being built at Las Matas II and coaches in Rivabellosa
- Line test expected to start in late **2020**, with commercial operation set for **2021**

# Products, services, technologies of the company

## ✓ Deutsche Bahn's Talgo Ecx

- **Certified in 3 countries**. 17 passenger coaches
- **Framework contract**: 100 passenger sets w/ multi-system locos. First block: 23 full trains with 1 loco, cab-car (550 M€)
- First DB train setting a **new standard**: from now on, all new stock will require accesible, customer-friendly entrances like Talgo's



## ✓ Talgo Vittal Commuter/Regional

- **Make cities more accessible. Commuter/Regional Trains with Maximum Accessibility**
- Unequaled acceleration and a complete options range ready to increase the payload w/o ramping up maintenance costs
- Designed for multiple-system operation where needed.
- Optional **hybrid-hydrogen-power pack** also available

# Products, services, technologies of the company

- ✓ VITTAL ONE
  - Hybrid train development with flexible functioning (hydrogen or electric) designed for Talgo Vittal Commuter/Regional platform.
  - Expansible solution with plug & play concept that it can be used in other trains models and in diesel to hydrogen restructuring.

- **Max. speed:**
  - Electric mode: 220 Km/h
  - Hydrogen mode: 140 Km/h
- Hydrogen mode range: 800 km
- Energy use: 0,25 Kg hydrogen/Km

**MAIN PARTNER**
Centro Nacional del Hidrógeno

## PHASE 1: 2019-2021

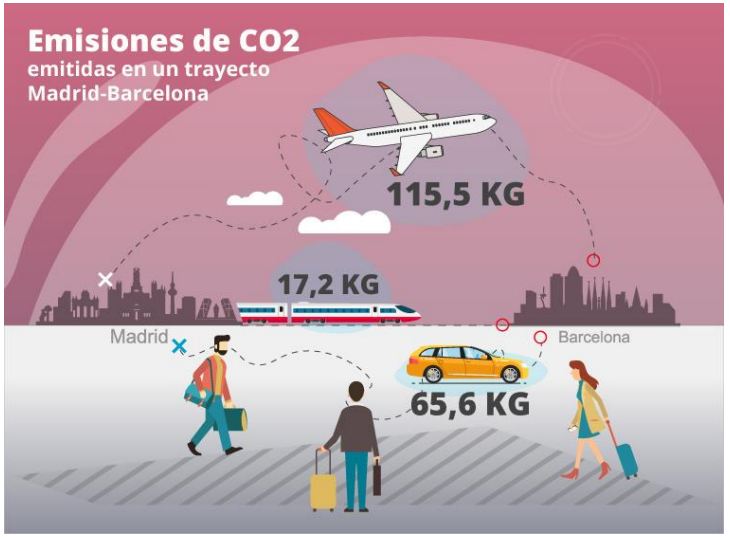
**VALIDATION ON TRACK**
OF HYDROGEN TECHNOLOGY IN AN EXISTING TALGO TRAIN


## PHASE 2: 2021-2023

ONCE TECHNOLOGY HAS BEEN TESTED, IT WILL BE INSTALL IN THE NEW TALGO VITTAL ONE TRAIN

# Products, services, technologies of the company

- ✓ VITTAL ONE
  - Vittal One means cost savings by eliminating the need to electrify the tracks. The use of clean energies will make it possible to eliminate the use of hydrocarbon combustion on non-electrified lines (**40% in Europe and 55% in Spain**). Electrifying the entire current rail network **would cost at least 2,810 million euros**, which is too high a cost for both the economy and sustainability.
  - Faced with the challenge that climate emergency presents, railways have responded with indisputable data, becoming a key player in the energy transition in mobility.
  - As a more representative example in our country, on a Madrid-Barcelona route, the footprint of the **aeroplane is 115.5 kilograms of $CO_2$ per passenger**, and that of **the car varies between 65.6 and 88.9**; the **train**, on the other hand, demonstrates its undisputed supremacy in terms of sustainability with **17.2 kilograms of $CO_2$** per passenger: unbeatable.



# Main challenges and solutions in the project/case presented

- Development of fuel cells with higher power (500 kW) and a longer life (30 years) for the railway sector. Optimisation of cooling equipment and auxiliary consumption.
- Development of more compact and lighter fuel cells for application in the railway sector.
- Development of traction batteries at higher voltages (1500 Vdc).
- Development of on-board hydrogen, without the need to transport $H_2$ in the train at high pressures and achieve autonomies of more than 1000 km.

## Ideas for a Japan – Spain collaboration

- Country-wide $H_2$ logistics network
- Increased production/availability of green $H_2$ versus grey $H_2$.
- Studies of the risks of $H_2$ leaks in long tunnels or heavy traffic in large cities and their alternatives.
- Alternatives to gaseous $H_2$ that are easier to transport (liquid $H_2$).
- We are currently in the midst of developing a new technology and challenges are constantly emerging...

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# THANK YOU

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