

## RAIL DE-REGULATION in the 2020 horizon



### DESTINATION

The railway gathers momentum in Colombia



### INTERVIEW

Carlo Borghini, Executive Director of Shift2Rail Joint Undertaking.



### MAFEX INFORMS

Rail Live! 2019 closes the edition with highly positive figures.

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**RAIL LIVE! 2019 CLOSES THE EDITION  
WITH HIGHLY POSITIVE FIGURES**

Participation rates grew both at the  
congress, with 230 speakers from more  
than 80 countries, as well as in the  
exhibition area with 176 companies.



**NORDIC NATIONS: NEW PATHWAYS  
FOR SPANISH RAILWAY TECHNOLOGY**

The technological mission had as  
its aim discovering first-hand the  
challenges and priorities in matters of  
R&D in these countries.

**NEW MAFEX PARTNERS: 3M,  
FOREST TRAFIC, NEXT GENERATION  
TECHNOLOGIES AND SIGMA RAIL**

The association continues to grow in  
terms of partner numbers with the  
incorporation of four new companies.

**AGREEMENT BETWEEN  
METROTENERIFE AND MAFEX TO  
BOLSTER THE INTERNATIONALISATION  
OF THE SPANISH RAILWAY SECTOR**

The aim is to undertake joint actions to  
boost this mode of transport.

**AGREEMENT BETWEEN RENFE  
OPERADORA AND MAFEX  
TO PROMOTE AND BACK THE  
INTERNATIONALISATION OF THE  
SPANISH RAILWAY SECTOR**

Both parties will collaborate  
to promote this sector abroad,  
alongside innovation and improved  
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devices for  
urban paths

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## Mafex advances its strategy to boost the railway sector

Dear Friends,

We are moving towards the middle of 2019 with an intense working agenda that is proving particularly fruitful. In this issue we bring you the latest news, along with the numerous activities being carried out to foster the railway sector.

In Mafex Informa, a comprehensive summary of the highlights of the second edition of Rail Live! which has gone far beyond all expectations is offered. The data reflects the great reception that this professional appointment has had, which has attracted more than 3,000 visitors. Furthermore, participation has increased both in the congress, with 230 speakers from more than 80 countries, as well as in the exhibition area which reached 1,825 square metres, boasting the participation of 176 companies. Once its doors finally closed, tasks were already being performed on the forthcoming edition in 2020, which this time will be held in Madrid.

In this section we also inform you that the association continues with its path of growth with the incorporation of four new partners. From here we give you our warmest welcome and we hope to share with you all the activities and services that are available to all of you.

It should also be noted that Mafex has just signed two important agreements with Renfe Operadora and Metrotenerife to promote and back the internationalisation of the Spanish rail sector, as well as to support and encourage collaboration in terms of innovation and competitive improvement.

Regarding actions to boost innovation, a new technological mission has been carried out to the Nordic

countries to learn about the challenges and priorities in the field of R&D, as well as to analyse new opportunities for collaboration in this field. The mission entailed a complete agenda of meetings with the main stakeholders of the transport sector in Sweden and Norway.

Also, in these pages you can learn more about a new initiative in the association: MAFEX Awards-International Railway Awards. These awards aim to highlight and publicly acknowledge the contribution or input of a national / international company, body or personality of the railway sector.

"Partner news" includes the latest development on 23 companies, while Colombia is the protagonist of the "Destination" section. The country is immersed in the reactivation of its infrastructure plans to turn this means of transport into a growth engine.

The "In-Depth" section is dedicated to analysing the imminent rail passenger de-regulation process and all the changes involved in opening this market to competition. Finally, in "Innovation", 12 Mafex partners explain the latest technological innovations they have developed in the railway field.

To the foregoing, an extensive report on the advances made by the sector as a whole in terms of sustainability with the aim of contributing to a means of transport that is more respectful of the environment must also be added.

Once again we hope that the wide content of the Mafex Magazine will be useful to know the current affairs of the sector, investments and trends, alongside the main topics of general interest.

### MANAGEMENT: MAFEX.

**MAFEX COMMUNICATION COMMITTEE:** Albatros, Alstom Transporte, ArcelorMittal, Bombardier Transportation Spain, CAF Signalling, Idom, Indra Sistemas, Ingeteam, La Farga Yourcoopersolutions, Patentes Talgo, Siemens Spain, Thales Spain and Stadler Rail Valencia **ADMINISTRATION:** comunicacion@mafex.es. **ADVERTISING:** comunicacion@mafex.es.

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# Rail Live! 2019 closes the edition with highly positive figures

**R**ail Live! 2019 has closed its second edition with highly positive results. The data reflects the widespread reception that this professional event has displayed, which has already become the national rail transport trade fair and congress with the broadest international participation.

Throughout the days that the event lasted, from 5 to 7 March, at the BEC, Bilbao Exhibition Centre, it was attended by more than 3,000 people. Furthermore, the participation in the congress has expanded, with 230 speakers from more than 80 countries (80 more than in 2018), alongside growth in the exhibition area. In this area, which has increased by 157% to reach 1,825 square metres, 176 companies have unveiled their innovations and technological advances in the field of transport.

This participation is 87% higher than that obtained in the debut event. The event counted once again on the support of the Basque Government. The SPRI Group, ETS, Euskotren and Metro Bilbao collaborated in its organisation. The event itself was visited



by the Head of the Basque Government, the Lehendakari, thus showing its support for the Basque railway industry. The exhibition also boasted the backing of Adif and Renfe. The most standout topics under analysis revolved around the advances of the industry in the digitisation

of railways, mobility as a service, along with smart infrastructures. In addition, visitors have shown special interest in knowing the latest technology and projects in the field of metropolitan, long distance and high speed rail.

This professional platform is of special relevance for the industry, since it takes place at a key moment for a future that is marked by major changes such as the de-regulation of the sector. It also serves to boost the role of this means of transport in terms of sustainability, since it is the most respectful with the environment since it only emits 0.7% of total CO2 emissions compared to other modes that emit 22%.

From Mafex, it is stressed that "solely through promoting this mode of transport as a backbone of national transport policies and sustainable mobility, can the environmental objectives set by the European Union

and widely assumed by the international community be wholly achieved." Added to this environmental aspect is the low rate of accidents and rail accidents when compared to other modes of transport.

Furthermore, Mafex highlights that, to continue promoting this medium, along with platforms such as Rail Live! the support of the Public Administrations is also needed.

## State political consensus

The association requests a commitment and political consensus of the State, "to define a long-term investment plan, based on a global and stable transport strategy; that is not modified by economic cycles, nor by political changes; and, that, in

The next edition of RailLive! - Madrid will be held from March 31 to April 2, 2020.

# RAIL LIVE!

no case, affect projects and tenders already underway. A strategy, which has as its central axis the railway sector, in which intermodality plays a decisive role."

In this regard, it is recalled that neighbouring countries such as Germany, France and the United Kingdom have been backing a policy of "sustained investment for a long time". Finally, it is worth highlighting that trade fairs

like Rail Live! serve to put the international focus on the Spanish railway sector as "a worldwide technological reference-point."

In Europe, this industry employs more than 400,000 people directly (25% of the world total) in companies that provide rail products and services. A figure where the Spanish contribution is of the utmost importance. 🚂

## Nordic countries: a new direction for Spanish railway technology

**T**he technological advances of the Spanish railway sector continue to cross borders. In this context of international interest, the Spanish Railway Association (Mafex) organised a technological mission to the Nordic countries to learn about the challenges and priorities in R&D, as well as to analyse new opportunities for collaboration in this field.

## Meetings schedule

The mission had a complete agenda of meetings with the main stakeholders from the transport sector of Sweden and Norway. Amongst them, Norwegian Railway Directorate, Bane Nor, NSB, Trafikverket, Business Sweden and the research organisations SINTEF, TOI, KTH alongside others.

The result of the technological mission was highly satisfactory, offering the opportunity to understand the local ecosystem that supports the innovation of both countries, to receive



real-time information on projects / prototypes / business plans, as well as explore and meet potential partners.

Research, development and innovation of the elements and of the railway systems themselves are key activities to guaranteeing the subsistence and efficiency of the railway of the future.

The mission has therefore offered an opportunity to the participating Spanish companies to present their technology and service to the firms and bodies from Sweden and


Norway previously mentioned, in order to generate future projects involving technological collaboration. Along with internationalisation, innovation plays an essential role as a differentiating element and as an axis of competitive improvement. Both factors must be those that allow the Spanish industry to maintain its global leadership. The technological mission has been for many of the participating companies a first contact with the entities of both countries, being the beginning of a deep-rooted collaboration. 🚂





## New Mafex partners: 3M, Forest Trafic, Next Generation Rail Technologies and Sigma Rail

**5** new partners have joined Mafex in the last two months, thus forming a total of 84 members, the Association firmly committed to the promotion of

actions and conferences that aim to seek synergies between different entities, thus sharing information and promote cooperation. 



3M España, SL is the subsidiary in Spain of the 3M Group, which is a global innovation company based on science, devoted to the development of products that improve the daily lives of people in a multitude of ways.



Cunext in the way to continuous development has created the entire cable product range for overhead line electrification adapting at any speed from local transport to high speed line.



SigmaRail offers solutions to the railway industry through artificial vision techniques. With references in the geo-localisation of railway assets as well as the automatic inspection of infrastructures.



Forest Trafic manufactures technical panels with characteristics of insulation and behaviour on fire for use in various areas of the MR. It develops finished pieces on these panels to minimise operating costs, facilitating the management of the supply chain by grouping multiple processes in a single supplier.



NGRT focuses on railway safety, works with rail regulators helping infrastructure managers and operators to secure their infrastructure and operations. It brings innovative products and solutions to the market, in order to increase safety, and train operations, reducing risks at a significantly lower cost.

## Agreement between Metrotenerife and Mafex to bolster the internationalisation of the Spanish railway sector


**T**he Managing Director of Metrotenerife, Andrés Muñoz de Dios Rodríguez and the President of the Spanish Railway Association (Mafex), Víctor Ruiz Piñero, have signed a collaborative agreement to carry out joint actions to boost rail transport.

The signing of the agreement was made in the course of the fair and international congress on rail transport 'Rail Live!', Held at the beginning of March in Bilbao and which has enjoyed the assistance of the main operators and companies of the railway sector from throughout the world.

### Aims

The aim of this alliance is to establish a framework of stable collaboration between Metrotenerife and Mafex

with the purpose of supporting the competitive improvement and internationalisation of both bodies, as well as the companies associated with the latter.

The aim is to promote, through this alliance, the joint and collaborative development of the Spanish railway industry inside and outside the national territory. 



## Renfe Operadora and Mafex to promote and support the internationalisation of the Spanish railway sector


**A**mongst the numerous acts carried out in parallel to the congress programme and the Rail Live trade fair!2019, It is also worth mentioning the signing of an agreement between Renfe Operadora and Mafex carried out by the President of Renfe Operadora Isaías Táboas and the President of Mafex, Víctor Ruiz.

### The agreement's aims

The purpose of the agreement is to establish general lines of collaboration between the Association and the entity to promote and support the internationalisation of the Spanish railway sector, as well as to support and encourage collaboration in inno-

vation and competitive improvement between the companies associated with Mafex, the actual association and both bodies. The volume of activity of the associated companies

in Mafex, which brings together the most relevant companies and representative of the sector, reflects the importance of the Spanish rail sector and its export profile. The more than eighty associated companies invoiced materials and services on railway ventures totalling more than 5 billion euros last year and represent 75% of exports of the rail sector.

Renfe, on the other hand, with extensive experience in international cooperation, maintains open lines of collaboration with other foreign railway companies. 




**Power & Automation**



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Energy storage systems

 LOCOMOTIVES
 REGIONALS
 SUBURBANS
 TRAMS
 METROS
 HIGH SPEED



## Iñaki Barrón de Angoiti, presented with the "MAFEX Awards - International Railway Awards" in its inaugural edition

The Spanish Railway Association (Mafex) held on March 6th the first edition of the "MAFEX Awards - International Railway Awards" which aim to highlight and publicly acknowledge the contribution or contribution of an entity, body or personality national / international railway sector. The award went to Iñaki Barrón de Angoiti, Renfe's current Head of International Projects, for his contribution in national and international forums to the reference of Spain as a leading country in the international railway sector, for its technological developments, efficiency, innovation and sustainability.

The event, which was held in San Mamés, within the framework of celebrating RAIL LIVE! 2019, was attended by numerous representatives of the field of transport and institutions that met in the first edition of some awards that will be given annually.

### A prestigious jury

The jury in charge of awarding this prize is formed by the 16 member companies of the Management Committee of Mafex, Alamys, UNIFE, CEOE, FFE, and Agex Group.

Iñaki Barrón de Angoiti has a long-running professional career linked to the railway sector. He is a Civil Engineer and holds an MBA from IESE Business School of Madrid. In 1981 he joined Renfe Operadora where he held several positions of responsibility as Project Manager in the Directorate of Planning and Control of Management, Head of Technical Studies in Communication Management, in charge of Business for Latin America in the Directorate of International Affairs, Head of Terminal Operations and Terminals Manager,



in the Business Unit of Large Passenger Stations. He has also been director of High Speed, Metric Track and Coordina-

tor of the Latin American Region of the International Union of Railways and director of the Passengers Department of the UIC. 🚂



## Metro de Málaga, cutting edge of new technology



JUNTA DE ANDALUCÍA

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**Alstom Spain to supply 34 new regional trains to CFL in Luxemburg**

**ALSTOM SPAIN**  
Alstom has been awarded a contract to supply 34 regional high-capacity double-deck trains from the Coradia range to CFL . The new fleet will include 80-metre and 160-metre long trains to be delivered from December

2021 onwards. The trains, which will be able to reach a maximum speed of 160 km/h, will run on the national network, as well as in Belgium and France. he trains, whose development and design will involve experts from 5 different countries (Germany, Belgium, Spain, France and Italy), will be manufactured at Alstom's site in Barce-

lona (Spain). The trains for CFL, that boast the latest technologies offering the best possible experience to both passengers and CFL staff, belong to Alstom's Coradia range of modular trains, which boast over 30 years of expertise. Over 2,300 Coradia trains are currently in operation in 9 European countries, as well as Canada.

**CAF Signalling has been awarded two new contracts in New Zealand and the United Kingdom**

**CAF SIGNALLING**  
Auckland Transport has awarded CAF Signaling a new contract to equip 72 electrical units (EMUs) with its on-board system "AURIGA OBS BL 2 ERTMS / ETCS + ATO" in New Zealand. Furthermore, the company has signed with Keolis Amey (Wales and Borders Rail Franchise) in the United Kingdom the installation in another 21 EMU units of the "AURIGA OBS BL 3 R 2 ERTMS / ETCS" on-board system. AURIGA is the comprehensive solution developed by CAF Signaling for the European Rail Traffic Management System (ERTMS). On the one hand, AURIGA OBS ERTMS has been designed to carry out a safe supervision of the move-



ment of the train with high availability and fail-safe operation, while the AURIGA ATO performs predictable train driving that adheres to the timetables planned to maximise energy savings and enhance passenger comfort. It should be noted that the AURIGA OBS system has already been chosen for a significant number of projects

such as 118 Civity EMUs for NS (Holland), 98 Civity EMUs and DMUs for Northern-Arriva (UK), 30 civity EMUs for the Interurban Train of Mexico Toluca (Mexico) and the Oaris, the very high speed train operated by for RENFE (Spain). With these two new contracts, CAF Signaling bolsters its presence in the international market.

**Rail Baltica selects Ardanuy Ingenieria and INECO for the Energy Subsystem Study for the future Rail Baltica Network**

**ARDANUY INGENIERÍA**  
RB Rail AS' choice of Ardanuy Ingenieria and INECO to complete the "Rail Baltica" Railway Project is due to the fact that both Companies "have demonstrated their solid experience in the railway sector, especially in the energy field". The contract was signed in January of 2019 and the results of the study are expected to be completed by the end of this year. The main objective of the study is to develop a safe, efficient and interoperable Energy Subsystem. Additionally, this Subsystem is meant to be "as robust as possible in order to guarantee continuous railway operation which is capable of adapting to operational changes. This Subsystem must also be flexible enough to meet traffic demands and efficient in terms of capacity, maintenance and energy use". For RB Rail AS, this Subsystem is a long term investment. Therefore, in order to identify the most advantageous solution, a thorough analysis is requested in which the best available technologies will be evaluated, and a

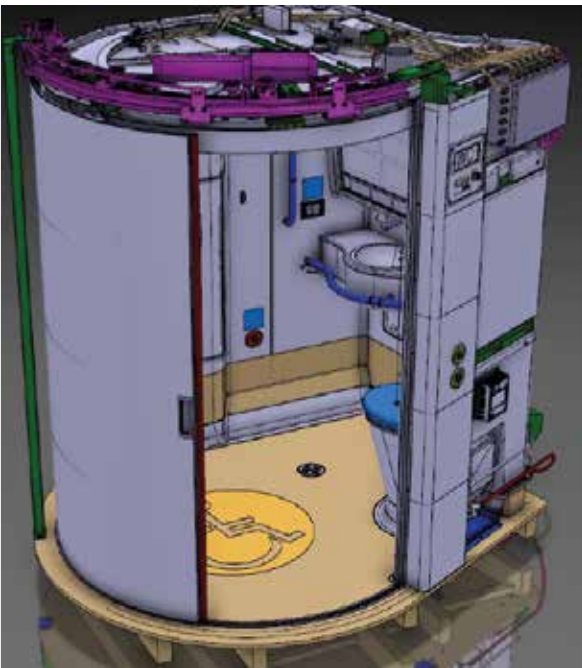


design created whose aim will be to reduce life cycle costs. Among other aspects, the study will include an evaluation of railway energy demand, as well as its distribution throughout the network in accordance with planned train traffic and also the assessment of electricity suppliers in the Baltic Region. The technological options of the traction subsystem will also be evaluated, and a multifactorial analysis of the transmission and other technological networks of the overhead catenary system and the deployment strategy will be carried out. All of this will be accompanied

by a survey regarding the conditions of the suppliers' market. **Energy Efficiency and the Environment**  
The Project will include an analysis in which indications are given as to how to minimize the environmental impact during the design and construction phases, as well as in the commercial operation and maintenance of the network. To do this, we will be keeping in mind new technologies, innovations in monitoring, as well as optimizing the use of energy with more sustainable options (decentralized production, renewable energies, etc.).

**COLWAY Ferroviaria develops a new business line of restroom modules**

**COLWAY**  
COLWAY Ferroviaria has developed a business line of toilet modules complying with the TSI, which meet UIC and EN standards. The modules offer a great flexibility according to the customer's demand. The product includes the vacuum system, the PLC unit with the TCMS and, if required, the automatic door. COLWAY has invested in its premises in order to enhance the production capacity, perform tests in every module and improve efficiency. The company supports its products with full documentation including LCC and RAMS, and whenever required, recyclability studies.







**Bombardier will supply 18 FLEXITY trams to Austria**

**BOMBARDIER SPAIN**  
Bombardier Transportation has signed a contract valued at 94 million euros with the Austrian company Wiener Lokalbahnen, to supply 18 FLEXITY trams to Vienna. The order includes the FlexCare system to provide maintenance services to the

trams during the next 24 years. The Bombardier FlexCare maintenance system is known for its easy integration into existing processes, its high availability, its stability and its stable costs. To this same FLEXITY family belongs the 44 trams that circulate through Valencia and Alicante, which were

awarded by FGV in December 2004. Initially, FGV awarded Bombardier the contract to manufacture 30 tram units, with the option of an extension. In April 2008, the acquisition of another 14 new trams for the Metrovalencia and TRAM networks of Alicante of Ferrocarrils of the Generalitat Valenciana (FGV) was exercised.

**Bombardier will be responsible for the maintenance of 92 commuter trains**

**BOMBARDIER SPAIN**  
Bombardier has renewed, for the next four years, a maintenance contract for 78 commuter trains and 14 medium-distance trains, through BTren, the joint venture between the Canadian company (51% shareholder) and Renfe (49%). For the commuter trains (Series 446), the contract with Renfe is responsible for the maintenance, in the workshops of Madrid, of the power supply equipment, as well as the propulsion and traction equipment; and for the medium-distance ones (Series 470) it is responsible for the integral maintenance, in Barcelona, and for the track assistance of the vehicles. Currently, BTren is also responsible for the maintenance of 75 locomotives of the TRAXX family of Bom-

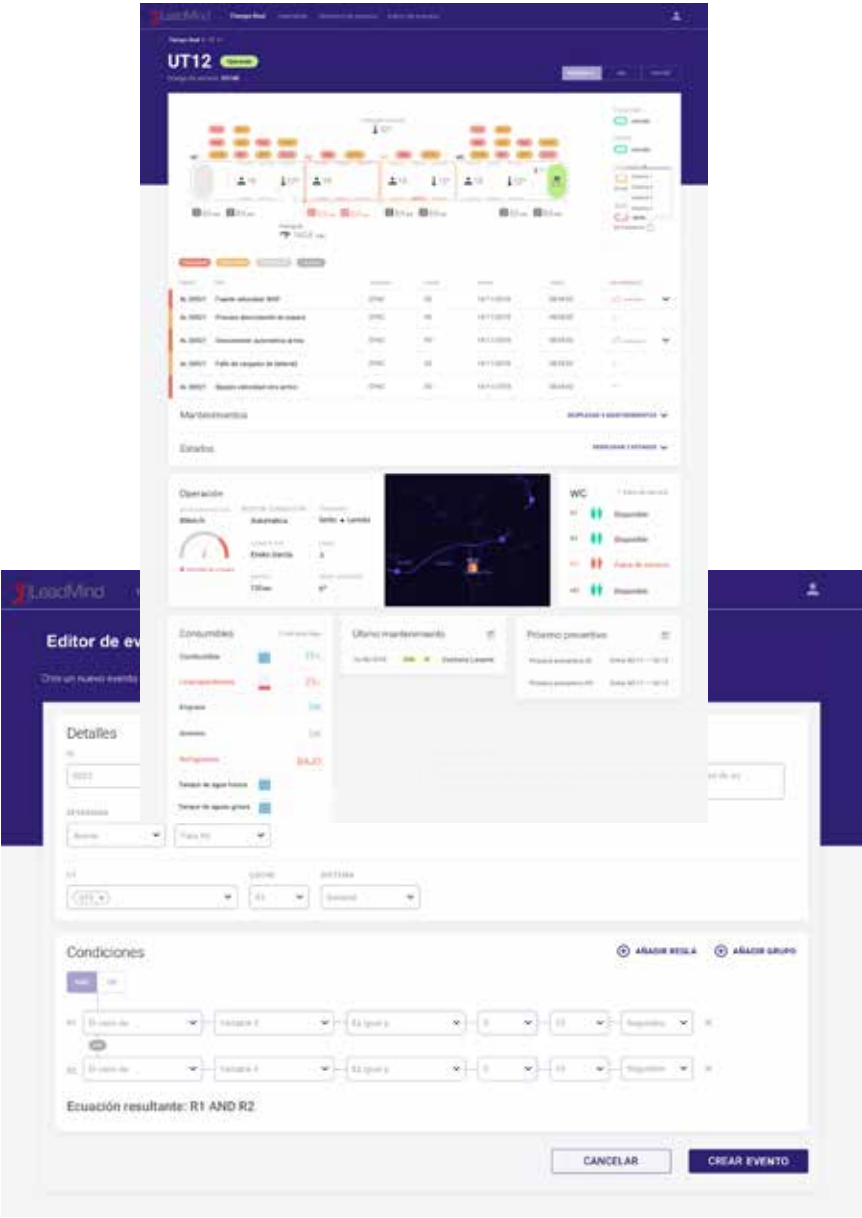


bombardier for the transport of goods in Madrid and Barcelona, as well as of 3 CAPTRAIN Spain locomotives, of the tractor units of the 46 AVE

trains S102 and S112 and of the 45 trains AVE S130 / 730, which has in consortium with Talgo in Malaga, Barcelona and Madrid.

**SPA -LeadMind, easing the way to future mobility-CAF**

CAF's digital solution, LeadMind, provides the best tools to digitalise the maintenance processes creating a new generation of more competitive services throughout the value chain, from the development phase to the operation and maintenance of the railway system. LeadMind is able to show train events and their associated variables in real time, allowing for an analysis of the information with different functionalities. One of LeadMind's latest successes has been Northern UK franchise's award to CAF for the installation of the System to provide Real Time Remote Monitoring and Condition Based Maintenance (CBM). The project scope is the supply of Real Time and Advanced Analytics Functionalities for the 101 regional trains Civity UK Platform and for the Legacy Fleet Class 170 and 158. The total monitored cars add up to a total amount of 431. This client joins others such as: Euskotren, Trenitalia, Metro de Santiago, SAR, GVB or Zaragoza tram, among others.

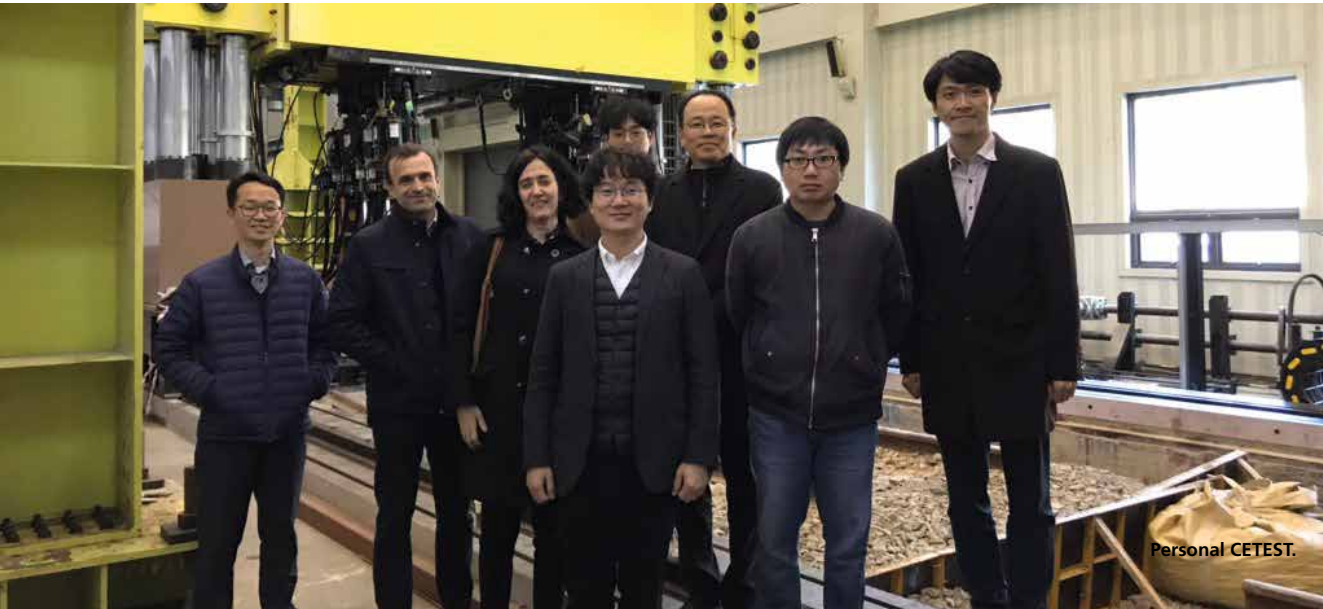


**Record of CAF order intake in 2018**

**CAF**  
CAF's order intake last year was € 2,902 million, compared to € 1,514 million in the previous year. The high level of order intake and the incorporation of Solaris to CAF Group caused the backlog to reach historical maximums of the company. Specifically, this has been 7,716 million euros. In terms of revenue, the net consolidated turnover amounted to 2,048 million euros and the EBITDA margin at the end of December 2018 stood at 201 million euros. Lastly, the Profit before Corporation Tax in 2018 was 81 million euros and the Net Year Profit after Corporate Tax was 40 million euros.







**COMSA joins forces with Korea's leading R&D centre to develop a high-durability synthetic ballast**

**COMSA**  
The construction company COMSA and the Korea Railroad Research Institute, which forms part of the country's main R&D entity, the National Research Council of Science and Technology, have joined forces through the Ballaxt project to create

a new optimised ballast from synthetic materials with the aim of improving its resistance and durability, as well as reducing the costs associated with railway maintenance. Infrastructure currently accounts for about one-third of railway operating costs and there is a great deal of interest on the part of managers in ensuring that the elements that make up the track are of high quality and have a longer life cycle. Against this back-

ground, COMSA and the Korean technology centre will jointly research new types of materials to create an artificial ballast, adaptable in shape, size, weight and composition, and more resistant, which improves mechanical behaviour, increases the useful life of the railway bed and reduces track maintenance costs. This product will also limit the environmental impact of working increasingly scarce natural rock quarries.

**COMSA shows its centennial railway experience in Exporail (Mexico)**

**COMSA**  
COMSA participated as an exhibitor in the 18th edition of Exporail, the main fair in the railway industry in Mexico, held on 26 and 27 March in the country's capital. At its stand, the company exhibited its portfolio of integrated services for high-speed, conventional lines, metros and tramways, which includes from the initial study to the construction of the infrastructure itself, its installations and systems, as well as its subsequent maintenance. With more than 125 years of specialisation in this field, in recent times, the company has exported its knowledge to strategic markets, such as Mexico, where it has already taken on relevant projects



such as the refurbishment on line 12 of the Mexico City metro and the maintenance on line A of the same locality. COMSA is currently

constructing a double-track section to connect the Port of Veracruz with the neighbouring district of Santa Fe.



**The DENEVA'S pilot starts in euskotren**

**ICON MULTIMEDIA**  
ICON Multimedia has set up the first pilot of its Comprehensive Communication System, DENEVA, in the old town metro lines (Zazpikaleak) in Bilbao. The modernization of the new dynamic advertising formats

is administered by COMUNITAC, whose contents management is carried out in a centralised and real time manner through the DENEVA platform. This new technology will be introduced as a new communication channel whose displays allow advertising and travel tips displays,

letting third-parties exploitation, as well as a more efficient management of alarms and notices. Besides, the digital circuit will integrate the Smart Cities data-entry, including FEVE and Bilbobus intermodal information, own or third-party social networks and cultural information of the city in several languages.



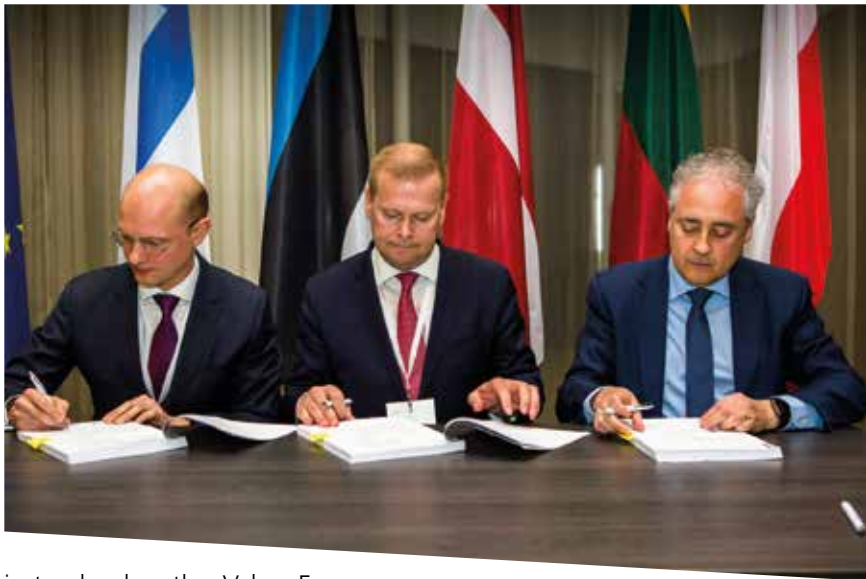


New high-performance trans-European rail connection

IDOM

Rail Baltica is the project with a goal to integrate the Baltic States in the European rail network: Poland, Lithuania, Latvia, Estonia and indirectly Finland also.

Last February, Rail Baltica announced that IDOM won the design of the first two sections Pärnu-Rapla and Kaunas-Ramygala (Estonia and Lithuania, respectively). As a result, IDOM is responsible for both these sections of the trans-European railway project, in total 150 km of high-performance rail (also for freight trains), 17% of the entire line. Both contracts have been signed in Tallinn and Vilnius, respectively. The scope of the work of IDOM



is to develop the Value Engineering and Basic & Detailed Design of the entire infrastructure and superstructure of the track, including the conceptual design of other subsystems, such as electrification, railway signaling, etc. In addition, once the design has been approved, IDOM will carry out the design supervision during the construction period.

New Medellin Metro Depot

IDOM

Since its inception, the principal objective of Metro de Medellín has been to improve the quality of life of the inhabitants of the Metropolitan Area of the Aburrá Valley, by offering them an efficient and safe massive transport system.



The increase in passenger demand on many Lines, as well as the forecast of growth for the future, has led to Metro de Medellín increasing its fleet of rail vehicles by 30 additional units. As a result, it is now necessary to extend the depot and maintenance facility for rolling stock.

The Municipality of Bello, to the north of Medellín, is the location of the current operative garages. The adjoining plot, in Tulio Ospina, will be the location not just for the extension, but also for commercial areas, public spaces and a new natural park. IDOM is developing this project, combining our experience and expertise in designing Metro systems in perfect synergy with architecture, urbanism and landscaping.

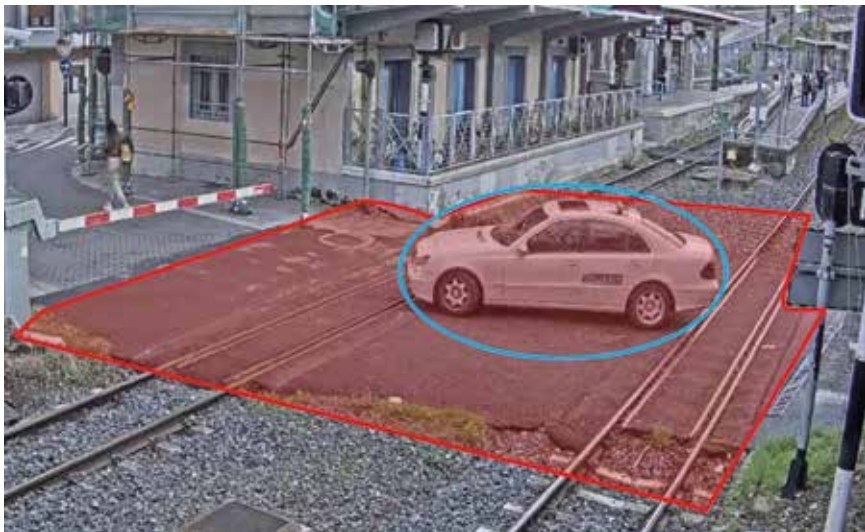
Indra and Begirale will apply analytical video and artificial intelligence to improve railway safety

INDRA

Indra and Begirale, company specialized in technology for control risks part of Dominion, have signed a collaboration agreement through which Indra will incorporate to its railway safety projects throughout the world the artificial vision and advanced analytical video solutions of this scaleup.

In particular, Indra will reinforce its offer of security solutions for transport, MovaProtect, with the Begi-crossing and Begirail products, state-of-the-art solutions that improve the safety of the vulnerable points of the railway track, such as the level crossings and the sections of the road with special risk through the use of artificial intelligence and computer vision.

With this agreement, Begirale has an ally to give a strong boost to the commercialization of its products, thanks to the numerous projects for the railway sector that Indra undertakes in the five continents.



Traction platform for Multi-Voltage special Vehicles, Based on INGETRAC Low Power

INGETEAM

INGETEAM has developed a traction system platform for multi-voltage special vehicles, which is based on its standardized low power basic power modules. This new approach will cover the new requirements of the vehicle's manufacturers. The new traction concept assumptions are that the vehicles will require different primary energy sources (AC&DC catenary, Diesel and battery), the fulfillment of market standards(TSI, noise, fire, EMC...) and the reduced dimensions to allow more space for the tools needed ( laboratory, maintenance, rescue..)

The traction system has been designed from an INGETRAC Low Power traction converter configuration, and has been already proved in diagnostic vehicles in Europe.

Main Characteristics:  
AFE & Inverter Topology: 2-Level  
Max. Power : 2\* 550 kW  
Cooling: Liquid





**La Farga presents a new, unique continuous copper casting line**  
**LA FARGA**

La Farga presented on February 6 its latest technological breakthrough, a marked commitment to its future and long-term sustainability with a continuous casting production line, after a total investment of 15 million euros.

This new, unique continuous copper casting line, has been specifically designed and manufactured for the La Farga facilities.

Its main benefits include an increased productive capacity of 15 t/h to 20 t/h, increased reliability, a significant advance in terms of safety, and finally the fact that it also follows the company's ecological and sustainable strategies. According to Inka Guixà, General Manager of La Farga, "the new line means that the company is now



the second largest copper casting centre in Europe".

**TRIA opens a new company and an office in Doncaster, United Kingdom**  
**TRIA**

Last January, Tria SA set a new company named Tria Rail Ltd in the UK which will face the rail challenges in Britain from HS2 to Crossrail 2 and so all the developments in the country.

To get this path, Tria has signed several agreements with top three manufacturers: Tecnival, leader in market boards, signs and owner of one of the most innovative ones in the sector, NANOTEC.

BigM, GIS and BIM specialist, with an integrator web platform - systems, projects, videos, orthopix...- that will allow control and measure the efficiency of every worker and job.

Arruti, catenary manufacturer based in the Pais Vasco but with international presence and the highest quality product will be represented in the UK and Australia exclusively.



**Aluminum Composite Panel, the best Safety Signaling in tunnels**  
**IMPLASER**

Due to its suitability for use outdoors and in other harsh environments, IMPLASER recommends aluminum composite panel for signaling in tunnels, mines or areas with salt water environments.

Aluminum Composite Panel is a material that, thanks to its high performance and user-friendly shape, is being widely used in the construction sector; it is mainly used to build architectural facades and also as a support for corporate images, for indoor and

outdoor decoration or in other works located in harsher settings such as tunnel cladding.

*So why should you use it for Safety Signaling in tunnels?*

Aluminum Composite Panel (ACP) is a sandwich type composite material, formed by two thin sheets of aluminum, joined to a thermoplastic core of polyethylene type LDPE (low density) that provides a high rigidity to bending at a very low weight.

It is approved for use in architectural elements in many countries, which guarantees its performance and durability in different climatic condi-

tions; it has excellent fire, weather, acid, alkaline and corrosion resistance, which is why it is also being used in the signaling industry as an alternative to heavier or more expensive materials.

Unlike the usual aluminum or galvanized steel, Aluminum Composite Panel offers a series of advantages: it is as light as it is rigid, it is easier to handle, transport and install. In addition, paneling extends the life of your signaling, as it dampens the vibrations that occur in inside tunnels. It does not contain halogens and has a low environmental impact since it is 100% recyclable.

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LUZNOR enters the Slovenian railway market

**LUZNOR**  
The national Slovenian railway company Slovenske železnice acquired LR series professional rechargeable torches from LUZNOR to be used for security beacon. The model LRT-1R contains a single high-efficiency high-power LED as main light source and 12x red LEDs as rear signalling function. Besides, the torch has three levels of constant lighting and three types of intermittency on the front part. LUZNOR used the most modern technology in its design and construction in order to achieve both a pleasant ergonomics and aesthetics as well as great resistance and reliability. The torch has been delivered together with a special fast intelligent charger for power supply of 24 DC that recharges the battery of the torch within 4 hours.



New Driving Simulator Training center in BTS Skytrain

**LANDER**  
The drivers of the famous Bangkok Skytrain are already being trained in their new simulator training center developed by Lander. The 1st phase

of the custom made simulator system was successfully installed and commissioned by a Lander technical team in Bangkok last March. Currently the Skytrain operation consists of two lines and two different trains, and it will be expanded by the addition of two track

extensions and two more rolling stock models. Such an operation demands a versatile and adaptable training system and this is exactly what Lander has developed for BTSC: a versatile and multipurpose simulator system, adapted 100% to the needs of the operator.

BKV Budapest reaffirms its commitment to simulation

**LANDER**  
BKV Budapest recently inaugurated its new training room with LANDER driving simulators. The company recently added a simulator for the Tatra T5C5K model to the existing CAF Urbos 3 tram simulator delivered by

LANDER several years ago. The Tatra T5C5K tram is the most frequently used on the lines in the Hungarian capital with a fleet of more than 150 vehicles. The addition of this new tram simulator doubles BKV's training capacity as it strives to respond to the burgeoning demand for training within

the company for both new and experienced drivers. Thanks to the scalable design of LANDER simulators, this new simulator has been integrated within the existing simulation architecture, making it possible to control and monitor both driving stations from a single instructor station.



Porto Alegre Metro modernizes its communications system with TETRA network provided by Teltronic

**TELTRONIC**  
Teltronic has signed contract with TRENSURB, the Urban Trains Company of Porto Alegre S/A, to provide latest TETRA communications system to the metro of the capital city of the state of Rio Grande do Sul, Brazil. The TETRA communications system will be provided and deployed by one of Teltronic's delegations in Brazil. The system is based on the Teltronic Nebula System, composed of one main controller and one redundant, six base stations, eighty train borne radios, and a CeCoCo integrated command and control solution. The new system will modernize voice and data communication along the metro lines, replacing the legacy analogue system. It fully meets the requirements of ANATEL, Brazilian National Telecommunications Agency, and more functionalities



are made available, such as GPS positioning, transmission of data messages, and secure and efficient communication.





### Siemens Mobility advises Zeleros about technology applicable to hyperloop project

SIEMENS

Siemens Mobility Spain signed an advisory agreement with Zeleros last February. The aim of the agreement is to technologically advise the Valencian company for the Hyperloop project, which proposes the transport of passengers and merchandi-

se in vacuum tubes at high speed. Siemens Mobility Spain as leader in high speed trains contributes with its wide know how to support Zeleros with technology for vehicle location. This scope comprises a system to know the vehicle position through the tube based on balises and other positioning devices as well as the study about the limitations in catenary above 500 km/h.

This collaboration will take several months and responds to Siemens Mobility's commitment to innovation. Agustín Escobar, CEO of Siemens Mobility Spain "with this agreement we want to follow and observe from the first row the evolution of Hyperloop technology through one of the most recognized startups in relation to this development".

### OHL and Siemens Mobility launch the Marmaray project in Turkey

SIEMENS

The Ministry of Transport and Infrastructure of the Republic of Turkey recently inaugurated the commissioning of the main phase of the Marmaray project, an initiative to connect the Asia-Europe corridor. The project was carried out by the joint venture formed by OHL (70%) and Siemens (30%) and represents an important construction and communication milestone at a global level.

Siemens Mobility has installed the signaling and control system, the communication as well as the SCADA system. Technologically unique, the line is equipped with ERTMS (European Railway Traffic Management System) and CBTC (Communications Based Train Control System) systems. The advanced solution provided by Siemens Mobility Spain includes the ERTMS FUTUR technology that is already in service on the Turkish high-speed line of

Ankara and Konya, as well as the Trainguard system in service on the Downtown line of the Singapore subway.

The line connects 43 km on the Asian side of the peninsula and 19 km on the European side, to the 14 km tunnel under the Bosphorus Strait. It will provide a mixed commuter and subway service for the metropolitan area of Istanbul, as

well as the integration of the Gebze-Halkali section in the Ankara-Istanbul high-speed corridor and a freight link, which will provide greater availability for travelers they cross the continents.

OHL has undertaken the design, the complete replacement of the two tracks existing and its replacement in three new tracks of 62 km from the 76 km of the project.



### SICE will deliver the Communication Systems for the Finch West LRT project in Canada

SICE

Mosaic Transit Group has subcontracted SICE to deliver the Communication Systems for the Finch West Light Rail Transit Project in Toronto. Mosaic Transit Group was selected using a competitive process by

Metrolinx and Infrastructure Ontario to design, construct, finance and maintain for 30 years the Finch West Light Rail Project that includes 11 km dedicated line, 18 stops and a maintenance and storage facility. SICE's scope includes but is not limited to the Backbone communications network, Telephone, intercom, Public Address, Voice and Data Radio, CCTV, Emergency Trip, SCADA,

Central Alarm Monitoring, Master Clock, Intrusion Access Control, Guideway Intrusion Detection, Passenger Information and Advertising Systems.

SICE is also currently working in the supply of the backbone communication network of the Eglinton Crosstown LRT. Those two projects strengthen SICE's position in the North American Railways market.

### SICE-ENYSE to supply 6 new Interlockings to ADIF in the section Torrelavega-Santander

SICE

ADIF (the Spanish railways operator) has awarded to SICE-ENYSE the Design, Built and Maintenance contract of the signaling and communications package of the Torrelavega-Santander section of the Palencia-Santander line.

With a budget of more than 19.5 million Euros, the scope includes the replacement of 6 old electrical interlocks by the electronic interlocking of ENYSE (EiS23) and the deployment along the line of all the field equipment, reliable power to the signaling equipment, fixed telecommunications and auxiliary systems. It also involves the construction of



new technical buildings to house the new Signaling and Communication devices.

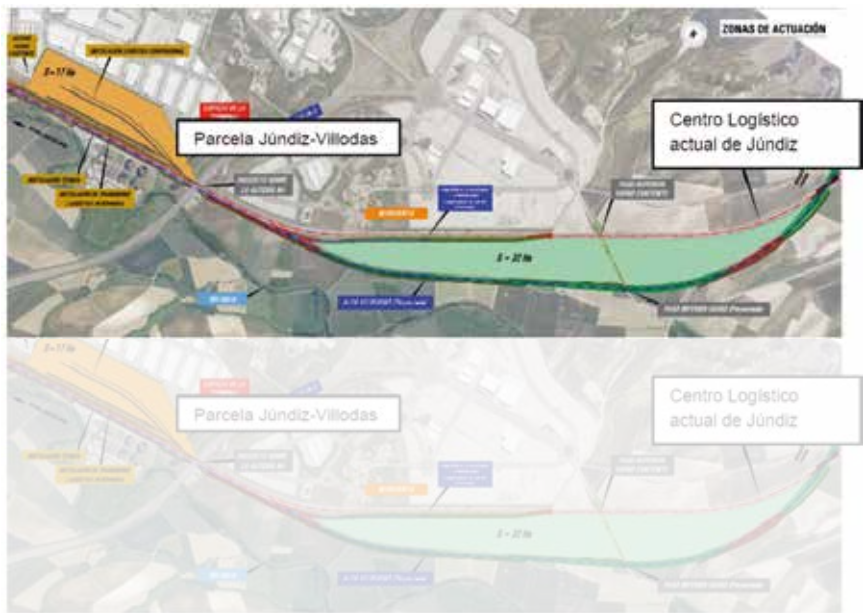
30 months is the expected term of the works for the installation and 20 years for the maintenance.



TPF GETINSA EUROESTUDIOS confirms its leading role in Spain's rail link projects

TPF GETINSA EUROESTUDIOS

In February, the JV TPF Getinsa Euroestudios, S. L. – TRN Taryet, S. A., signed a contract to carry out the detailed design for Phase I of the Júndiz multimodal logistics centre project in Vitoria-Gasteiz (Phase I), including a standard-gauge rail link to the Atlantic Corridor, and the functional design for the implementation of a new rolling highway terminal. Since its commissioning in 1994, the Júndiz Logistics Centre has been used for managing rail-freight traffic operations, clearly linked to the business activity in the surrounding area, covering mainly the transportation of intermodal (containers) and conventional freight related to the automotive sector.



The project involves doubling the narrow-gauge track section between the halt at La Carrera and the Pola de Siero station. The scope of the work covers the track formation, superstructure and electrification of the section, as well as the works required on the stations. The assignment will be completed within 12 months.

Stadler Valencia wins contract for sixty locomotives from VR Group

STADLER

Finland's VR Group and Stadler have signed a contract for the supply of 60 new diesel-electric locomotives to improve the operational efficiency in marshalling yards, freight terminals and on non-electrified lines which make up 45% of the Finnish network. The new central-cab locomotives can be used as shunting locomotives and for hauling freight and passenger trains. The contract includes an option for up to 100 additional locomotives, as well as the possibility to buy locomotive maintenance from Stadler. According to the contract, the first five locomotives are expected to enter into service in 2022, and the remaining locomotives will be gradually delivered until the end of 2025.



These new locomotives clearly outperform the old diesel locomotives to be replaced in terms of emissions, energy efficiency, innovation, safety and reliability. Stadler has well proven experience in customizing locomoti-

ves for the demanding climatic conditions in Finland. The locomotives will be manufactured to withstand the effects of the snow and ice and to operate at temperatures as low as -40° C.

NEM Solutions' A.U.R.A. technology has landed in Korea

NEM SOLUTIONS

NEM Solutions has landed in Korea with great projection together with Metro Seoul. This new project will provide rail transport operators with accurate and real-time information and analytics to drive predictive maintenance actions. This project will implement the predictive technology A.U.R.A., in the main depot of Metro Seoul. Metro Seoul team visited NEM Solutions HQ recently to strengthen the relationship and to meet the team behind the predictive technology. It was a great opportunity for Metro Seoul team to meet A.U.R.A. advocates from Spain, to learn from their real success stories in order to scale up to a real predictive maintenance.



Stadler to deliver 71 new trains for Wales & Borders

STADLER

In 2018 Wales & Borders franchise was awarded to Keolis Amey Wales consortium, trading as Transport for Wales Rail Services, which will oversee a large investment into local rail services, including 36 CITYLINK UK Tram-Trains and 35 FLIRT trains. Of these ones, 11 will be diesel-operated and the other 24 FLIRT units will be tri-mode, capable of running on

diesel, overhead electric wires and battery power. The 36 CITYLINK UK tram-trains to operate on the Core Valley Line relying on 25 kV as well as battery power will be developed and manufactured by Stadler Valencia. The bidirectional three-car light rail vehicles cover tramway applications and full train regional operations at 100 km/h and have been adapted to the particularities of the network in South Wales Metro. With

a length of 40 m and capacity for 257 passengers, the vehicles offer spacious, bright and air-conditioned passenger compartment with 6 multifunctional areas for bicycles or for PRM. The use of batteries on tram-trains and tri-modes is an innovative and cost-effective way of providing a fully electric, environmentally-friendly service north of Cardiff by enabling 'smart electrification' of the infrastructure.





# The railway gathers momentum in Colombia

ITS INFRASTRUCTURE PLANS TO TURN TRANSPORTATION INTO A GROWTH DRIVER. THE AIM IS TO PROMOTE INTERNATIONAL TRADE IN FREIGHT AND INTERNAL CONNECTIONS.

Colombia, with a surface area of 1,147,748 km<sup>2</sup>, is the fourth largest territory in South America and the third most populated area with 48 million inhabitants. It has land borders with Panama, Venezuela, Brazil, Peru and Ecuador, a strategic position that has turned the country into a key core for commercial transactions by land and sea that has more than 4,500 maritime export rou-

tes and access to 680 ports spread all over the globe.

The growth recorded in recent years, a period in which the economy increased by an average of 5.3% per year, places it also in position 32 in the ranking of the world's largest economies and fourth in Latin America. In this context of improvement and aware of the importance of having competitive and strategic infras-





From the administration outwards, work is being carried out on the global boost to transport networks.

tructures, the administration is working on the global boost to transport networks; an aim in which there are also plans to recover the railway after years in which numerous lines have remained disused.

#### The railway sector

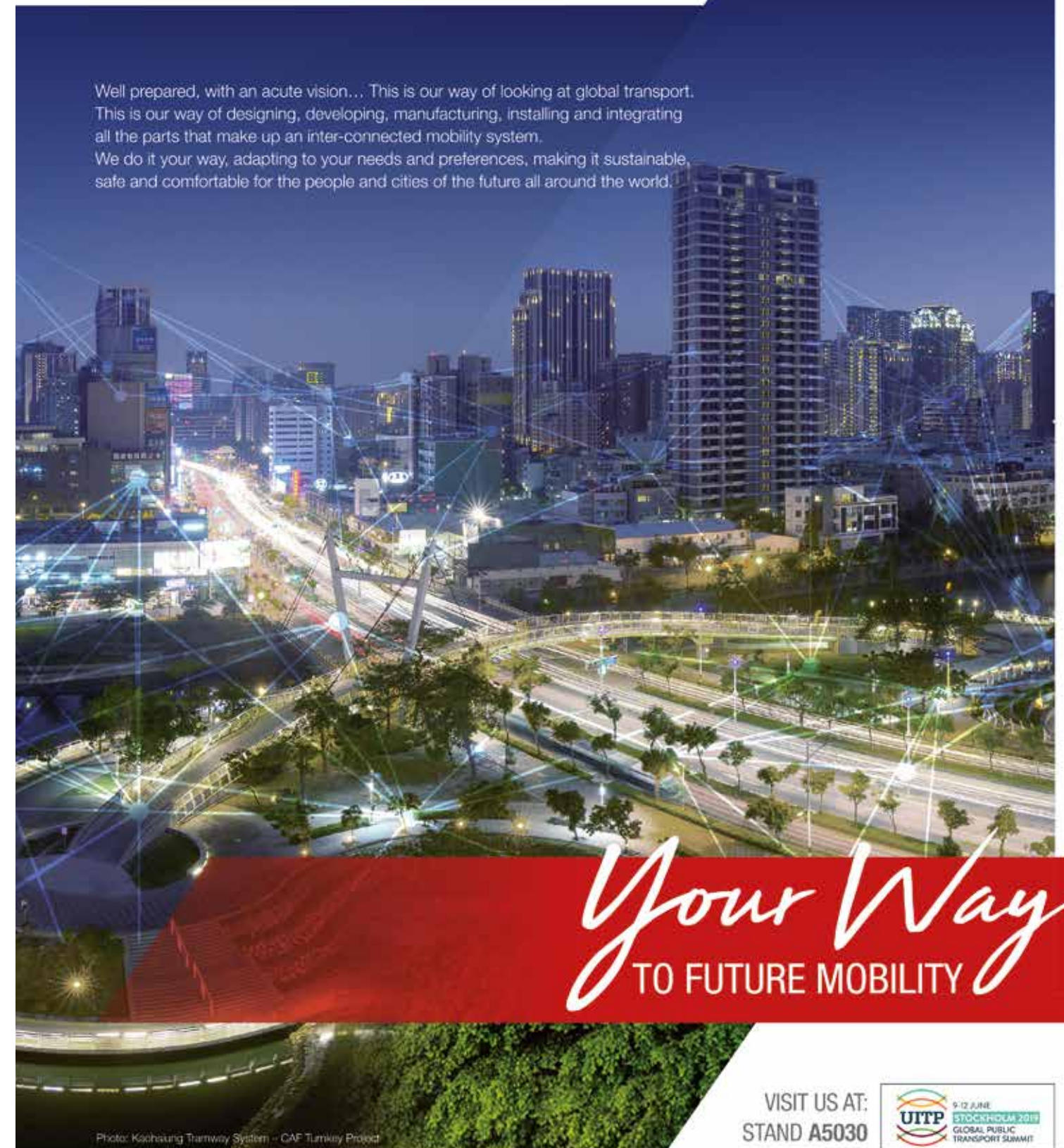
The railway network of Colombia has more than 3,300 kilometres of track laid. Of these, 150 are of standard width (1,435 mm) of the branch that connects the coal mining area of Cerrejón (Department of La Guajira) with the seaport of Puerto Bolívar, in Portete Bay. The other 3,154 kilometres are

narrow gauge (914 mm), and 2,611 kilometres of them have fallen into disuse. The lines in operation are mostly intended for freight transport, while the passenger services are tourist routes, for example, the Tren de la Sabana between Bogotá and Zipaquirá. Due to the geographical conditions of the country, the natural corridors go in the South-North direction and two of them correspond to the great valleys of Cauca and Magdalena. In turn, the eastern route passes through Bogotá. In this system there are two corridors with significant potential. The first of them, the Atlantic Railway Net-



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Photo: Kooheung Tramway System - CAF Tramway Project





Image of the La Dorada - Puerto de Santa Marta stretch.

The Government is committed to public-private partnership (PPP) as a key instrument to undertake new investments in infrastructure.

As stated in the report entitled "Challenges faced by freight rail transport in Colombia", the Pacific tender has had in the last 10 years different shareholders who pledged to provide additional capital and resume operations. Although the average traffic has been weak (around 200,000 tons per year), a growing trend is now detected with the arrival of the Swiss group Impala Trafigura. This company has within its short-term goals the transportation of one million tons per year. To achieve this, it has already invested 1 billion dollars. With these funds, it is transforming the Magdalena River into a multimodal transport logistics corri-

dor. A completely multimodal logistics chain connects the main coastal ports with the economic heartland. Coal, oil and other liquid products in bulk, containers and basic articles are transported to the main Colombian ports in the Caribbean Sea. Furthermore, for this purpose, a river port has been built in Barrancabermeja that acts as a consolidation centre, connecting the fluvial, road and railway loads.

The efforts are now focused on recovering disused lines and progressively activating this transport network. By the end of 2018, notable advances had already been made in the railway network with 1,769 operating

work, which covers an area of 1,493 kilometres and passes through the departments of Cesar, Magdalena, Santander, Boyacá, Antioquia, Cundinamarca and Caldas. Its route travels from the city of Bogotá (Cundinamarca) to Santa Marta (Magdalena), with two branches: Bogotá - Belencito and Bogotá - Lenguaque. The infrastructure contains the following stretches: Chiriguana - Ciénaga; Ciénaga - Santa Marta, Bogotá - Belencito, La Caro - Lenguaque, Bogotá - Dorada, Dorada - Barrancabermeja, Barrancabermeja - Chiriguana and Puerto Berrío - Medellín (Bello) Chiriguana - Ciénaga, Ciénaga - Santa Marta. This network is one of the most important in terms of freight transport. In 2017, 89.4 million tons of coal were transported in the country, of which 60% were mobilised by Fenoco, the operator of part of this connection.

The activity of this company centres the route between Chiriguana and Santa Marta, measuring 245 kilometres, used to export around 40 million tons of coal per year. Furthermore, for the transport of this mineral there are another 150 kilometres of private property that Drummond operates in the department of La Guajira.

At the end of 2018, rail transport of coffee started from La Dorada (Caldas) to the Santa Marta Port Authority along a route running 767 kilometres. The aim of the test expedition of this

"coffee train" was, as the Government has indicated, "analyse the conditions and capacity of the infrastructure, as well as the logistical needs, journey times and the cost in comparison with other means." The idea is to foster these routes as a motor for the development of the regions and expand the export routes.

In second place is the Pacific Railway Network, with 498 kilometres, which runs between Buenaventura - Cali Zarzal - La Tebaida in the departments of Caldas.

The "Master Plan for Intermodal Transport 2015-2035", featuring an investment of €69.3 Bn, includes numerous improvements in airports, road, rail and river networks.

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INVITATIONS TO BID ON RAILWAY CORRIDORS

**Bogotá- Belencito Corridors**  
317 km  
72 critical spots

**La Dorada-Chiriguana**  
558 km  
50 critical spots



Within the "National Development Plan 2018-2022" amongst the most noteworthy initiatives is the reactivation of rail transport.

kilometres, a process in which work continues in the country to make this means of transport competitive. The Government is committed to public-private partnership (PPP) as a key instrument to undertake new investments in infrastructural aspects in the country.

**Sectorial Structure**  
Amongst the main challenges they will have to face in order to promote the railway are the current routes, many of which would have to be re-designed to get the most out of the network, and the non-standard gauge. Until 1991, the lines were managed by the

company Ferrocarriles Nacionales de Colombia that operated 2,600 kilometres of track. Afterwards, and until 2004, it was transferred to the Colombian Railways Company (Ferrovías). Currently, since 2011, the National Infrastructure Agency (ANI) is in charge of tender operations. The company also structures the intermodality and logistics PPP projects. The National Planning Department of the Ministry of Transport is entrusted with defining and implementing investment programmes in infrastructures. Another important player in the sector is the operator Fenoco (Ferrocarriles del Norte de Colombia), which has a 30-year concession for the Chiriguana (Cesar) - Santa Marta section of the Atlantic rail network. For its part, the Ibines - Férreo consortium is responsible for the rehabilitation and operation of the railway corridors now in tender. As for urban passenger transport, it is worth highlighting the firm named

"Empresa de Transporte Masivo del Valle de Aburrá Ltda, "Metro de Medellín Ltda" entrusted with the running of the Medellín Metropolitan Railway, the Ayacucho tram and the Metrocable cable car system, as well as the "Empresa Metro de Bogotá SA (EMB SA) that will manage this future network.

Investments

The recent completion of the National Development Plan 2014-2018 has achieved the goal that was set out in the field of infrastructure and transport, namely to: "increase the competitiveness of cargo transport and consolidate a multimodal network that encourages the use of the rail, river and air modes of transport." Together with the investments already made, which meant that 1,121 kilometres were added to the network at the end of last year, the new line recovery plans are now being followed, as detailed in the "2018-2022 National Development Plan".

INTERMODAL TRANSPORT MASTER PLAN 2015-2035 FIRST DECADE

Project	Kilometres	Cost (Bill COP/M€)
Pacific Train	410	2,70/766
Bogotá-Belencito Train (with bypasses)	257	0,70/19,8
La Dorada-Chiriguana Train	522	0,70/19,8
TOTAL		1.189/ 337,3

INTERMODAL TRANSPORT MASTER PLAN 2015-2035 SECOND DECADE

Carare Train (Belencito-Vizcaina)	400	5,00/1.418
San Juan del Cesar-Puerto Dibulla Train	160	1,00/283,7
TOTAL		6,00/1.702

\*Source: PMTI 2015-2035

Among the most outstanding initiatives is the reactivation of freight transport, to promote intermodality, in the corridors Dorada-Chiriguana, Bogotá-Belencito and the railroad network of the Pacific, as well as support for regional initiatives (Cundinamarca, Antioquia, Valle and Caribbean Region). These three projects are detailed in the "Master Plan for Intermodal

Transport: 2015-2035" endowed with an investment of 69.3 billion dollars (61.55 billion euros) for numerous improvements to airports, road, rail and river networks. The PMTI is a long-term commitment of the State of Colombia, which in its first module includes a roadmap of the most important intermodal infrastructure projects for the country.



Colombia reactiva el transporte multimodal.



LA DORADA-CHIRIGUANÁ CORRIDOR

In the central corridor La Dorada-Chiriguaná, key to foreign trade, investments of around 212,000 million dollars (188,303 million euros) have been made to date in two public works contracts running from 2013 to 2018. It is a strategic rail line for the connectivity of the centre of the country with the ports of the Atlantic Coast.

In April 2018, a train test operation was carried out, covering a distance of 522 kilometres, from Chiriguaná (Cesar) to La Dorada (Caldas), with some 700 tons of steel and cement. The train already has the ability to move freight in a real way. In this branch there is also passenger transport. The Ibines Férreo consortium coordinates six authorised routes



that connect Barrancabermeja (Santander) with Puerto Berrio (Antioquia) and on which around 76,000 passengers a year travel.

BOGOTÁ-BELENCITO CORRIDOR



The rail corridor that connects Bogotá with Belencito, in Boyacá, is another strategic network that is being modernised. It has 257 kilometres currently operational to provide services of regular mobilisation of goods and freight. For its reactivation, the La Caro-Zipacquirá and Bogotá-Facatativá stretches have been repaired, especially with regard to Bogotá-Belencito. The commissioning of this corridor will also boost passenger transport.

PM TI 2015-2035: FEATURED RAILWAY PROJECTS

- Magdalena Valley Energy Train
- Northern Bogotá Commuter Train
- Bogotá Metropolitan Railway Line
- Villavicencio - Rubiales
- Pto. Carreño-Neiva Railway
- Coffee Railway and the Coffee Transversal
- Green-Cali Corridor
- Railway Interconnection Cartago Airport - Saragossa
- Bioceánico Train of the Cauca-Buenaventura - Cali - Medellín - Cartagena - Barranquilla
- Railway Initiative - A scheme for Antioquia and the Colombian Northwest
- Reactivation of rail transport from and to the maritime terminal of Santa Marta
- Western Bogotá Commuter Train

\*Source: PM TI 2015-2035

- Southern Bogotá Commuter Train
- Coffee Bimodal Corridor
- Quibdóo-Virginia-La Dorada train (complement to the Nuquí-Quibdó train)
- Nuquí - Quibdó Railway Connection
- Bogotá - Carare - Medellín Railway Line



PACIFIC TRAIN

The reactivation of this is similarly key for foreign trade. It is a strategic road that runs through the departments of Caldas, Quindío, Risaralda and Valle. In order to have a more competitive and efficient branch. The National Infrastructure Agency, ANI, has allocated more than 20 billion dollars (17.764 billion euros) to structure the new rail corridor for the Pacific. Amongst other points, the deviation of the El Cerrito-Yumbo route is considered. Furthermore, the ANI is currently preparing a new agreement with the Tren de Occidente company to recover the connectivity between the Saragossa Free Trade Zone and Pereira. The project will cost 120 billion dollars (106.586 billion euros) and involve a construction period of 24 months.

The works will be carried out in a section of 30.22 kilometres and will include the recovery of 10.6 kilometres of railways already in existence, the construction of the Caimalito variant along 3.3 kilometres and the Carthage variant with 16.3 kilometres.



The new rail corridor will also prevent the passage of cargo through the municipalities between the north of Valle del Cauca and Risaralda.



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## Urban transport: metropolitan and light rail projects, on the rise

COLOMBIA IS COMMITTED TO RAIL FOR URBAN MOBILITY. A SUSTAINABLE MEDIUM THAT ARTICULATES THE DEVELOPMENT OF LARGE NUCLEI SUCH AS BOGOTÁ OR MEDELLÍN.

The railroad forges its path into the large urban centres in Colombia. The advantages of this medium, due to its accessibility, high transport capacity and its low emissions, mean it is the most suitable medium for mobility challenges faced in the main cities of the country. Within this context of commitment to sustain-

nable and efficient alternatives with which to reduce rolling traffic and congestion, the Government has designed a national policy (National Urban Transport Policy) through which key initiatives have been structured such as the Integrated System of Mass Transportation (SITM) and the Strategic Public Transport Systems (SETP).

In the railway sphere, one of the lines of action focuses on Bogotá, where the network is composed of an interaction between the different systems.

This mesh is the largest in the country and in 2017 registered about 12.2 million trips per day. 42% of these trips were made in the Integrated Pu-

blic Transportation System of the city, 26% in TransMilenio (bus and cable car), while 22% was in private cars. Given the need to provide more means to respond to population growth and improve services, in July 2016, the City Council of Bogotá gave the green light to the Mayor's Office to expand to 5 billion dollars

(4.422 billion euros) financing of mobility infrastructure. Of these funds, 2.1 billion Colombian pesos (594.1 million euros) are allocated to the construction and improvement of the structure of the system, in addition to the road work of of the motorway named Carrera 7.

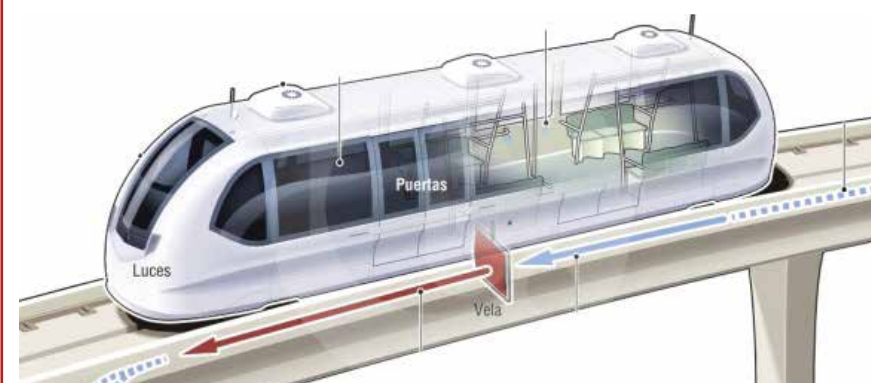


## FIRST LINE OF THE BOGOTA METROPOLITAN RAILWAY

The capital will have a metro system. It is an infrastructure project that will change mobility in the coming years. The first line will have 23.96 kilometres of track layout and 16 stations - ten of them will have direct and integrated connection with the TransMilenio system. The route will begin in the depot yard of Bosa until it reaches the junction of 72nd Street and Caracas. The route will run southeast to northeast and will pass through Avenida Villavicencio, Primero de Mayo-where it will connect with the NQS and Calle Octava-and then with Avenida Primera until it reaches its final destination. This line will have an estimated cost of 4.347 billion dollars (3.851 billion euros). It should be noted that it has the backing of the European Investment Bank (EIB), which will finance 480 million dollars (425 million euros).



## OVERHEAD LIGHT RAIL SYSTEM IN RIONEGRO



Rionegro, in Antioquia, is set to become the first city in the country to boast an

automatic elevated system or APM (Automatic People Mover). The project will

have, according to the design, 17.8 kilometres over viaducts, with a single track of 13.06 kilometres and a double track of 4.50 kilometres. Along the route, there will be 14 stations until the line reaches José María Córdova airport. It is estimated that the system will transport around 500,000 passengers per day. With regard to rolling stock, it is planned to acquire a fleet of 28 cars that will be operated without a driver, at an average speed of 38 kilometres per hour. Currently, the technical, legal and financial structuring to put it on track is ready.

## WESTERN REGIONAL TRAMWAY



This entails a project that seeks to implement a light rail system that connects the municipalities surrounding Bogotá. It will have a length of 41 kilometres, feature 18 stations and will transport more than 126,000 passengers on a daily basis. It will take 48 minutes on average from the municipality of Facatativá to the heart of the capital, reducing by 60% the travel time between Bogotá and the Sabana de Occidente. The estimated investment will be 1.7 billion dollars (1.506 billion euros). In November 2018, the tender for technical and operational studies was awarded.

As recently explained by the Governor of Cundinamarca, Jorge Emilio Rey Ángel, from last April to October 2019, works were underway to have the final bidding documents to carry out the tender awarding process and in the same period the construction and operation contracts will be awarded. According to the forecast schedule of actions, the construction phase will begin in 2021 with the aim of starting commercial operations two years later, in 2023. Regiotram aims to improve mobility in the western corridor of the centre of the country.

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TRANSMICABLE

The march of sustainable transport continues in Colombia with the start-up of new systems. Amongst them, TransMiCable, a cable car that has 163 cabins, which began operating in Ciudad Bolívar (location number 19 of the Capital District of Bogotá) on December 29, 2018. It has already recorded in its first operational quarter, an average demand of 21,000 passengers on business days.

There are four stations along its route: Tunal Station, Juan Pablo II, Manitas and Mirador del Paraíso. This network directly benefits about 80,000 inhabitants in the area of influence of the System and has managed to significantly reduce the transfer times between the neighbourhoods Mirador and Paraíso, in the upper part of Ciudad Bolívar, and the Tunal Portal to one hour.



MIO CALI CABLE

MIO Cali Cable is a suspended aerial cable transport system that connects the Cañavalejo Terminal with the Siloé area, located in the southwest of the city, in the hillside area of the Western Mountain Range on its way through Cali. This system shifts between 6,000 and 7,000 people from Monday to Friday. Since the beginning of operations four years ago, MIO Cable has become a tourist attraction, especially in the upper part of its route.



MEDELLÍN METROPOLITAN RAILWAY



The second largest city in Colombia, with two million inhabitants, it is located in the Aburrá Valley. Since its inauguration in November 1995, it has become a key means of transport for urban mobility. The metropolitan railway is part of the Integrated Mass Transportation System of the Aburra Valley (SITVA).

There are two lines: the A line that connects the city from Niquía, in the north to La Estrella, in the south in a 26-kilometre route with 21 stations. The second, Line B, begins in San Javier, in the east and ends in San Antonio, the station located in the centre of Medellín. The Metro system also includes the connection with 5 Metrocable lines, 1 tram line (Ayacucho tram), 2 Metroplus lines and several integrated bus routes.

Master Plan 2006-2030

At present, the "Metro Master Plan 2006-2030" is underway, which includes the "Master Plan for Expansion". It contemplates 16 new lines that will be added to existing ones. Two will be trains, five of cables, two more for buses, plus a further tram line. The Cable Picacho branch is already under construction, with an advance rate of 45%, and the Southern Rings of Metroplús. Another of the works included is the modernisation of railway signalling, with which it

is intended that frequencies in trains improve from 3 to 2:30 minutes by the year 2021. The corridor of the Multipurpose Railway System (Antioquia railway) is also making swift progress, which is in the stage of study and design to appraise its viability. A phase that has a budget of 7.3 billion pesos.

In the Antioquia development plan "Think Big 2016-2019", the reactivation of this project is included. For this, the "Promotora Ferrocarril de Antioquia SAS" firm has been created. The purpose is the rehabilitation of the 306-kilometre railway section. The layout proposed in the studies runs for 305 kilometres. The route is divided into three sections: La Pintada-Caldas (99.7 kilometres); Caldas-Botero (80.9 kilometres)

and Botero-Puerto Berrío (124.4 kilometres). There will be acquired 27 electric train units of three cars each, which will meet the demand during the first five to eight years of service. The capacity is 300 passengers per coach.

With the construction of the Antioquia Railroad, in addition, four subregions of the department (Southwest, Valle de Aburrá, Northeast, Magdalena Medio), which have a population of more than 4.2 million inhabitants, will benefit.

If the schedule goes according to plan, construction of section 2 of the Antioquia Railroad, between Caldas and Botero, beginning in 2020 and its operation starting in 2023, is expected to begin.





SOME MAFEX MEMBERS WITHPROJECTS IN COLOMBIA



ARCELORMITTAL

ArcelorMittal has supplied rails for Metro Medellin; the first mass transit system in Colombia and currently the only metro system in the country. We have supplied rails for the Ferrocarriles del Norte de Co-

lombia (FENOCO), Empresa de Transporte Masivo del Valle de Aburra, as well as other projects of railway renovation and maintenance all along the country, have been also supplied by ArcelorMittal. ArcelorMittal has developed state-of-the-

art manufacturing and control systems to develop and produce rails that comply with the strictest requirements: geometric precision, strict flatness, the highest quality of the market and increased reliability

ARDANUY INGENIERÍA

Ardanuy Ingenieria has taken part in over 20 projects in Colombia. In 2019 the Consulting Company was selected along with the FGC to carry out the Technical and Integral Supervision for the Railway Signalling and Traffic Management (SGT) Systems of Line A and the Bello Station Switchyard belonging to the Metro de Medellín Network. Awarding of this contract solidifies the numerous works carried out by the Company in a country in which it already has an important presence thanks to its subsidiary, Ardanuy Colombia SAS. The following are only some of the works which have been completed by the Company: Studies and Assessment for the reactivation of the Antioquia Railway, Intermodal Strategic Plan for Colombia, Atlantic Railway Network, Light Rail Proposal for the



city of Cali, as well as the feasibility study for the change to standard width track

of the passenger and freight network, amongst others.



CAF

CAF is one of the main railway rolling stock supplier in Colombia. The Company has manufactured the new metro fleet operating in Metro Medellin system. Furthermore, in 2018 CAF was selected for the refurbishment of 42 three-car units manufactured in the mid-90s and currently operating in the Colombian city's metro network. The scope of the work covers the modernisation and upgrading of the units in their structure and interior and exterior decoration, as well as the replacement and retrofit of some of the vehicles' main equipment and systems, such as the traction systems, auxiliary equipment, brakes and lighting.



IDOM

IDOM, an association of independent professionals working in the fields of Consulting, Engineering and Architecture, has been established in Colombia since 2009. 140 professionals are permanently based at the IDOM offices in Bogota and Medellin. Specifically, in rail, IDOM has developed several projects, such as the design of

the Ayacucho y Av. 80 tramway in Medellin, the advanced basic design of the first line of the Metro of Bogota, the feasibility project of the Regio Tram, or studies on improving the signalling and control systems of the Cerrejón railway. At present, IDOM is developing the design of the new depot and maintenance

facility of the Medellin Metro, including a complete audit of equipment to reactivate operations on the two corridors of the central rail system, a key element of intermodal transport in the country: the Dorada-Chiriguaná section (521 km) and the Bogotá-Belencito section (318 km).



## SOME MAFEX MEMBERS WITH PROJECTS IN COLOMBIA



### SIEMENS

Siemens Mobility will install its advanced rail signaling technology on line A of Metro de Medellín, 25.8 km long and 21 stations, and the Patio de Bello that serves the metro network. The scope of the contract covers the design, supply, implementation, assembly, testing, optimization, safety certification and commissioning of a

ground signaling system, keeping the existing on-board equipment in trains and taking into account their interfaces. Westrace MKII state-of-the-art interlockings will be developed and installed, the existing LZB system will be modernized, railway signals will be replaced by LED technology and communications and energy facilities will be adapted.

The contract, of 42 million euros and 3 years of execution time, is of great importance for Siemens Mobility as it reinforces its presence in the main rail transportation system in Colombia and one of the most innovative and cutting-edge tubes in Latin America. The project is expected to enter service in 2021.

### TELTRONIC

Teltronic was awarded by FENOCO (Ferreocarriles del Norte de Colombia S.A.) to provide a TETRA network supplied by Teltronic, supporting simultaneous voice and data transmission on the Chiriquaná-Santa Marta line. Used principally for the transportation of coal.

Later, Teltronic's U.S. subsidiary PowerTrunk was responsible for testing and validating a data-centric TETRA solution intended to support rail signalling, according to directives issued by the Colombian government to ensure the highest safety standards for railways. This project means a proof of TETRA technical viability to offer safe and efficient communications in railway signalling environment, in an experience that may be applicable to other transportation environments with signalling systems based on different existing protocols such as ETCS, CBTC or PTC.



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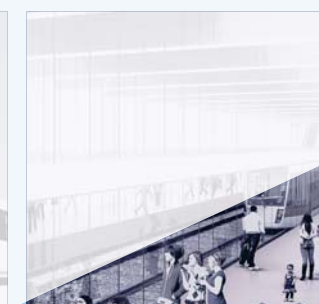
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# Rail de-regulation in the **2020** horizon

THE OPENING UP TO THE PRIVATE COMPETITION OF THE TRANSPORTATION OF PASSENGERS BY RAIL APPROACHES THE 2020 HORIZON FOR THE MEMBER STATES OF THE EUROPEAN UNION, IN GENERAL, AND FOR SPAIN IN PARTICULAR.

**T**here are 20 months left of preparation and adjustments by the public sector, ADIF as administrator of rail infrastructure, and Renfe, as their operator, to comply with the directive marked by the so-called Fourth Railway Package of the European Union. The Spanish Government approved on 21 De-

cember, in its penultimate Council of Ministers of 2018, a Royal Decree Law, which gives the green light, definitively to the possibility of new railway companies entering to operate in the national territory in high-speed and long-distance services. The Royal Decree contemplates the date of December of 2020 as the

start of the entry of competitors alongside Renfe Operadora. Within 18 months, any company that has the appropriate license for the transport of passengers by rail, as well as having the safety certificate granted by the State Railway Safety Agency, may provide their services after having requested the corresponding

The existence of a market open to the Competition will foster the easing of services.



use of rail track to the body managing the railway infrastructures, namely ADIF.

### **The EU promotes competition**

The so-called Fourth Railway Package, on which the whole development of the forthcoming de-regulation of passenger transport, at a commercial level, in the Member States, agreed by the European Parliament and the Council of Ministers of the European Union - is based, has marked the calendar, of mandatory fulfilment, that has as date of beginning of the entrance of different operators in the national railway networks in the year 2020, although it is intended that the liberalisation agreement is already incorporated by all the countries of the Union during the present exercise, and that it is in the next year when they can thus begin to operate with all nor-

Users will have at their disposal more alternatives to travel between which to choose from.

mality those companies that meet the demanded requirements.

The decision of the EU has been justified in the need for European railways to be much more attractive and competitive as a means of transport, as well as making the industry more innovative.

According to the Community authorities, the agreement reached will allow, in particular, to improve the provision of rail services.

### **Fourth Railway Package: What does it entail?**

This is a set of Directives and Regulations approved in these laws involve

modifications with respect to two groups of standards.

On the one hand, those named "technical pillars", which regulate safety, interoperability and the Railway Agency of the European Union. On the other, those of the organisation of the market for passenger transport services.

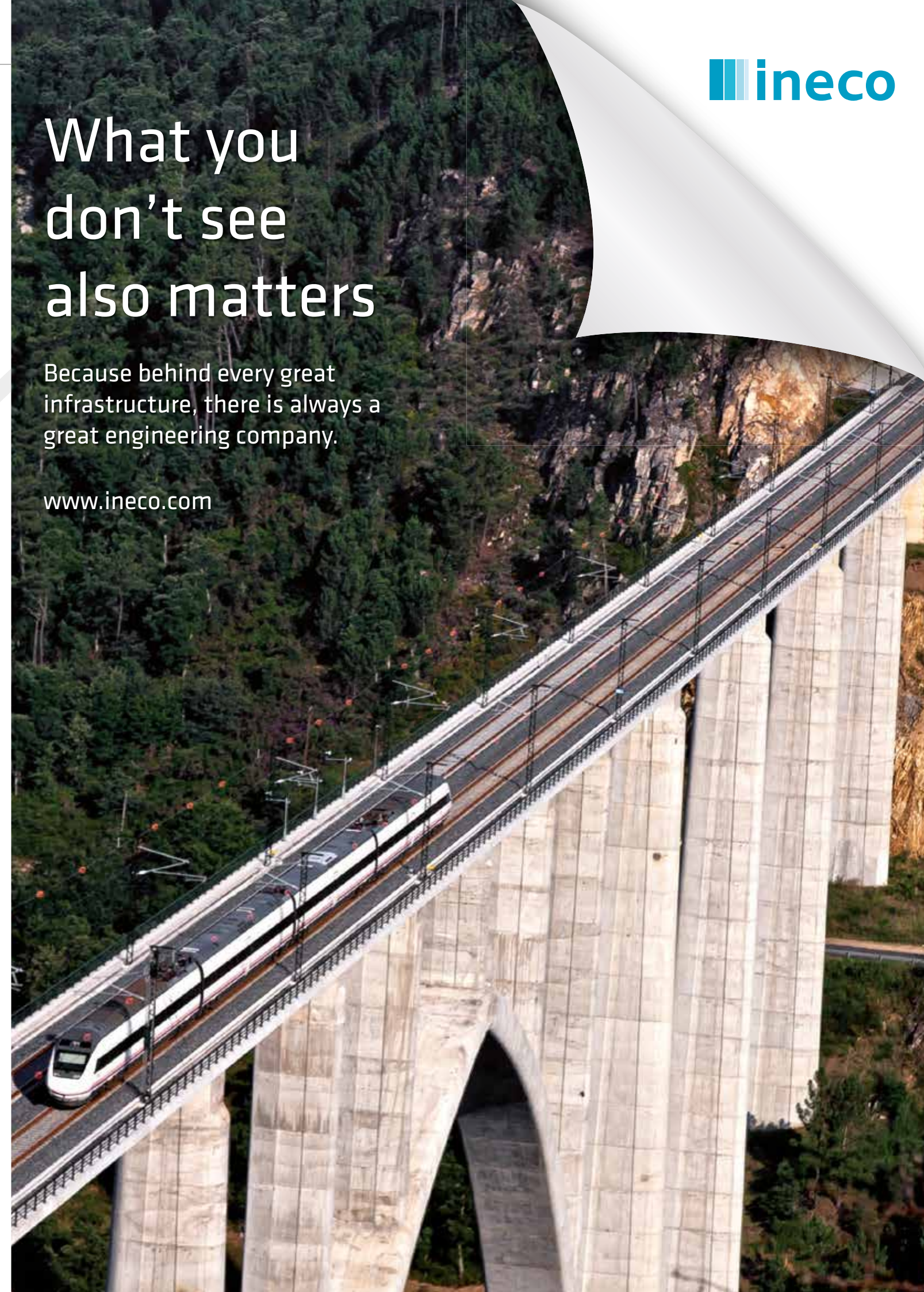
Specifically, this Fourth Railway Package is composed of six legislative proposals that were presented by the Commission in January 2013, but that have had to undergo different procedures. Amongst them, the acceptance of the different indications of the member states, until reaching



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the definitive agreement that is now contemplated. According to the European transport commissioner, Violeta Bulc, "a new chapter for European railways opens up", since it has been proven that in recent years the market share of the use of this transport compared to the other existing ones has been constantly decreasing. The Commissioner believes that a gradual opening of the market will improve the performance of rail services and will favour the creation of new investment opportunities, jobs in the sector, maintaining thus developments in the process of decarbonisation, etc.

#### Better responses to demands

From the EU it is defended that the entrance in 2020 of this new norm opening competition to the national railway markets, will suppose a better answer to the demand of the market, and, mainly, of the consumers, since new business models are set to appear that will offer a greater number of possibilities to passengers. It is similarly deemed important, as a final aim of this process, that there is no single operator in each country, that the monopoly be broken, and that historical companies adapt to the new formulae. This will improve the service for passengers, with high-

The Fourth Railway Package marks a calendar, of mandatory compliance, where 2020 will be key.



Passengers will have at their disposal more options to choose from when travelling.

her quality, better performance in terms of punctuality and frequencies, etc., and also lead to cheaper prices.

#### Trans-European transport network

This set of measures is part of the European Union project known as the Trans-European Transport Network,

and the Connect Europe programme, which seeks to improve European communications through airports, roads, ports, but, above all, all railways, which are considered the most sustainable transport method, and for which the construction of 15,000 kilometres of high-speed tracks and the railway connection with 94 large

ports are planned; along with 38 airports with the highest traffic density and the improvement of 35 cross-border crossings.

To this end, nine fundamental corridors were drawn up and an investment of some 700 billion euros is forecast up to 2030. Noteworthy amongst them, for Spain, the 4<sup>th</sup> and

the 6<sup>th</sup>, which are the Mediterranean and Atlantic corridors.

#### New opportunities

From Europe it is indicated that the de-regulation of the sector will generate new opportunities for private companies. The existence of a market open to competition will foster

According to the European Commission "a new chapter opens up for European railways".

the easing of services, and will result in greater efficiency in the allocation of resources. In addition, users will benefit, since they will have at their disposal more commercial alternatives to travel and choose the option that best fits their needs.

However, at present there is also a current in the sector that believes that de-regulating the operation of passengers can be counterproductive and costly.

#### Regulations

The regulations approved by the Government indicate that this liberalisation does not affect the services considered Public Service Obligation (PSO), since the European Union approved two years ago that Commuter Rail, Medium-Distance and Avant services were not included in this mandatory opening in 2020 until the year 2023, although, being a means of transport considered essential for the internal communication of the countries, this period could be extended.

However, the Government has signed an PSO service contract with Renfe with a minimum term of ten years and a possible extension of another five, for an amount of 9.693 billion euros, which Renfe's operations are safeguarded in this regard, by making it impossible for competitors to enter.

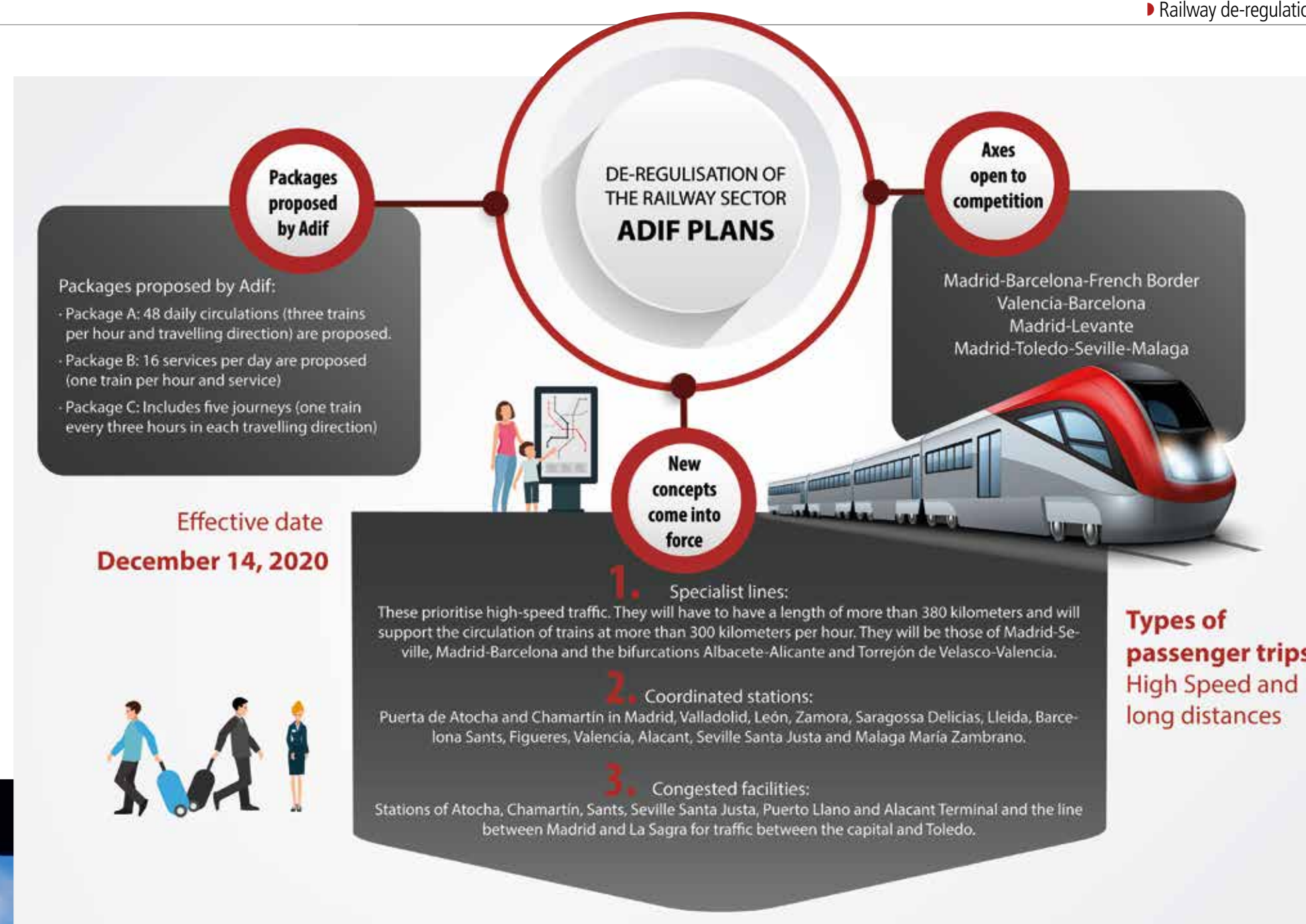
Another aspect to be highlighted in the Decree approved by the Government is that, finally, the current



regulatory framework is completed and clarified, in such a way that the legal rules are established on which the entrance of those companies wishing to compete with Renfe Operadora. Amongst these clarifications are the reinforcement of the requirements of independence and transparency on the part of infrastructure managers before the companies that operate on the Spanish network. In this regard, it should be noted that there is a different opinion between Adif, and the current public operator, Renfe Operadora. Whilst who will charge for the tracks the new companies will use is interested in having a good number of companies requesting them and paying the appropriate rates of use of the roads, which will mean increased levels of income; the public

operator, on the other hand, fears that the arrival of these competitors will diminish the ability of passenger movement. Yet Renfe has also been prepared to compete in this new scenario and has already announced the entry into operation of a new type of high-speed train, EVA, which will be 40% cheaper than the current version. With a layout of five seats per row, it will not feature first-class seating and cafeteria, and will carry vending machines for food and beverages. This train can start running next year, possibly at Easter, and will link Madrid with El Prat (Barcelona). However, at present there is also a current in the sector that believes that de-regulating the operation of passengers can be counterproductive and costly.

The de-regulation of international traffic is already approved.



#### ADIF's Plans

The administrator of Railway Infrastructures has already sent the Ministry of Development, the CNMC and future Renfe competitors in passenger transport, the draft of the "Modification of the Network Declaration for 2019". This document contains the aspects that will govern the de-regulation of commercial passenger services in the General Interest Rail Network (RFIG) and details the supply of capacity in both the Spanish high-speed network (AVE) and on long-distance routes. In this process of opening up to competition, the ten-year agreement made by Adif is to make available to those interested 60% of extra

capacity that currently exists.

Thus, its forecast is to shift from 119 to 189 circulations per travelling direction per day so that at least three different operators can compete from December 14, 2020 onwards.

This increase in infrastructure falls within the framework allowed through EU Regulation 2016/545. Furthermore, Adif reserves the capacity to finalise specific agreements regarding operations year on year.

#### Consultation process

Presently, the consultation process on the Adif document is open and has already received a response from some operators interested in

the Spanish market, such as the case of the French railways (SNCF). Due to its experience, capacity and fleet available, Renfe has an advantage over the other bidders.

The next step is to have available on July 1, 2019, the final document that includes the system of allocation of capacity that makes effective the entry of competitors into the market within 20 months. In addition, by October 31, the aim is to have resolved the requests of potential rail operators.

#### Three axes and service options

This document indicates that the axes that will be opened to competition





## At the starting line, there are sizeable number of stakeholders interested in commencing operations on the Spanish market.

in 2020 will be: Madrid - Barcelona French border; Valencia- Barcelona; Madrid - Levante and Madrid - Toledo - Seville - Malaga. Once the works are finished, the high-speed lines to Galicia and the Basque Country will be incorporated into them. In addition, it is explained that operators can access three types of packages (A, B and C), which depend on the number of circulations planned per day. This proposal aims to ensure that at least three railway companies can operate optimally. With these alternatives, of different sizes, we also seek to include the different business

strategies and adapt to the commercial plans of the stakeholders, such as the offers of trips in the so-called "low cost" bracket. In the first place, for Package A, 48 daily circulations are proposed (three trains per hour and direction); while that of group B comprises 16 services per day (one train per hour and direction), and the C five trips (one train every three hours in each direction). Itemised per corridor, the proposals similarly differ. For Madrid-French border passenger connections, an increase of 60% is estimated. Thus, it would go from the current average

of daily traffic that is in 43 to a total of 69.

Regarding the second axis, the Levante corridor, Adif also proposes to expand circulation by 40%, from the current 37 services to 52.

In this case, for package A there are 32 routes per day (two trains per hour in each direction), 16 for package B (one train per hour and direction), and four operations in each direction for package C. third, Madrid-Toledo-Seville-Malaga, its commercial use will be increased by 70%. These routes include 48 circulations in mode A (three trains per hour and direction), another 16 in package B (1 train per hour and direction), and in C (four journeys per day and in each direction).

Adif indicates that the awarding criteria to the potential operators will be the bid maximising greater use of the capacity offered. Stakeholders

have the right to choose to bid on one, two or all three corridors.

These plans, which are specified in ten-year framework agreements, could be abandoned in those cases in which the operators' requests do not exceed 65% of the capacity offered. Should this percentage not be reached, a new proposal will be launched by Adif.

### New classifications

The opening to competition of passenger services also brings with it three new concepts: specialist lines, coordinated stations and congested facilities.

The latter are the ones that will be de-regulated at the present time.

### Private operators await the starter's gun in Spain

Before the possible companies that are willing to present their candidacy

## The "Declaration on the Network" document will specify the characteristics of Adif's capacity allocation process.

to obtain one or several connections, it should be noted that there have already been those who have done this, and have achieved it. This is the de-regularisation of international traffic that is already approved, as well as that of merchandise, although the latter is not providing the results that were expected, and in fact in the years 2017 and 2018 it has stagnated.

### International traffic

Turning once again to international passenger traffic by rail, last September the National Markets and Competition Commission (CNMC) ruled in favour of the company Intermodalidad del Levante (ILSA) controlled by the company Air Nostrum, with the participation of Acciona, who had submitted the connection project between Madrid and Montpellier, thus giving this the green light.

It has been ILSA, then, who has taken the first real step, yet the issue is the lack of units with which to operate, in fact there is no fixed term for the launch of this connection, which would have two daily frequencies with stops in Saragossa, Barcelona, Perpignan and Narbonne.

### Interested operators

However, poised to act is another good number of interested stakeholders, amongst which are several interested companies, namely the French state-owned company Société Nationale de Chemins de Fer (SNCF) who already announced their wish to enter the Spanish market in 2014, following the announcement of the then Minister of Development.


Along with this company, the German operator Deutsche Bahn (DB) has also announced its desire to enter the Spanish railways, which

has displayed its volition to launch a route between Coruña and Porto, connecting several other cities. This action would be carried out with its subsidiary Arriva Trains.

These two companies have enough in-house rolling stock to bring them to Spain and would not depend on manufacturers to supply (it takes an average of two years to deliver new units) or rent compositions from Renfe.

Precisely, the ability to have trains to break the monopoly is one of the current topics of debate. The request that new competitors have sufficient resources to provide commercial operation is also included in this point. It is for this reason that the companies that want to start operating will have to boast robust solvency to face an investment of purchase of rolling stock or explore other business formats.

Likewise, there are other foreign companies analysing the situation and may make their decision in the coming months, such as the British Virgin Trains or the Dutch Nederlads Spoorwegen. Regarding interest on a national level, the list is also broad, although there has been a reduction among the first stakeholders back in 2014.

Already having been granted the appropriate permits are: Aisa Tren; Avanza Train; Veloi Rail; Alsa Railroad; Continental Rail; Ecorail; Ferrovial Railway and Interbus, amongst others. However, the experts consider that it is an excessive number, and in fact the possibility is assessed that in the end there will only be three or four competitors alongside Renfe, and that there will also be a series of joint ventures for the running of the system. 





**Mafex Magazine: The Shift2Rail (S2R) initiative provides a boost to R&D in new technologies to progress in the implementation of single railway area. On what five fields are the innovation programmes focused?**

**Carlo Borghini:** The Shift2Rail Joint Undertaking (S2R JU), the newest JU, was established under Horizon 2020's transport research and innovation proposal to provide a platform for coordinating long-term research and innovation in the rail sector. Shift2Rail JU's purpose is to fulfil the main priorities in Horizon 2020 by making rail transport more sustainable, seamless, competitive and research-responsive.

Given this whole-system approach, the S2R Master Plan established an

R&I Programme structured around the following five integrated Innovation Programmes (IPs): (IP1) Cost-efficient and reliable trains, (IP2) Advanced traffic management and control systems, (IP3) Cost efficient and reliable high capacity infrastructure, (IP4) IT Solutions for attractive railway services, (IP5) Technologies for sustainable and attractive European rail freight.

Transversally, five cross-cutting themes and activities (CCA) are analysed independently from the specific IP.

**Mafex Magazine: What main challenges are set out in each one of them?**

**Carlo Borghini:** Each of the IPs has different challenges, but at the same

time a single overall objective: ensure an unprecedented system transformation driven by the sector working together.

These are the challenges we are working on:

Rolling stock development of concepts towards the next generation of traction systems able to master technologies breakthrough developments like Silicon carbide (SiC) semiconductors applied to different railway traction applications to achieve optimal traction and braking effort in the future. New concepts and architectures for train control and monitoring, with specific applications in train-to-ground communications and high safety electronic control of brakes.

Rail signalling technological advancement synchronizing the development of different aspects of required technological solutions, e.g. on-board automation systems, high-capacity radio communications systems, safe train separation systems, cyber security systems, innovative testing processes, etc. and by offering improved functionalities and standardized interfaces, based on common operational concepts, facilitating the migration from legacy systems, decreasing overall costs, adapting it to the needs of the different railway segments. IP2 is the core of the system of systems approach.

A whole system-approach progress on infrastructure, enhancing existing switches and crossings (S&C) and track systems in order to ensure optimal line usage and capacity. Investigating novel ways of extending the life of bridges and tunnel assets through new approaches to maintaining, repairing and upgrading these structures. Managing assets in a more holistic, intelligent and consistent way, using lean operational practices and smart technologies that can contribute to improving the reliability and responsiveness of customer service and the whole economics of rail transportation. In addition, ambitious research for a step, yet radical, change in the design and the technology of the track system, in particular the S&C sub-system.

Passenger centric IT solution enriching the suite of support facilities for the 'one-stop shop' sale and use of transport products and ancillary services across multiple transport modes as well as travel companion and travel tracking to enable the delivery of next generation traveller experience, including support in case of disruptions across multiple modes. This work is key in enabling better accessibility and seamless connectivity of the rail system with other modes and embedded in a local, regional and cross-border context including towards a Mobility-as-a-Service (MaaS) vision. Therefore,

Each of the IPs has a single overall objective: ensure an unprecedented system transformation driven by the sector working together.

conditions for a market uptake of a multimodal market place supported by a semantic web of transportation will also be researched, setting-up the ground for future "interoperability framework" developments.

Research activities targeting increased freight attractiveness through automation of the chain of processes including equipment, nodes, lines, leading to testing of autonomous freight train prototypes. With particular attention to noise and Life Cycle Cost (LCC), new developments on freight locomotive are planned with improvements for last mile freight distribution concepts and research to enable longer freight trains or Driver Advisory Systems (DAS). Disruptive concepts for intelligent freight wagons with predictive maintenance will be investigated to increase attractiveness and competitiveness of rail freight transportation, especially for perishable, dangerous or expensive goods, by providing traceability of the cargo with a low cost system.

Cross-cutting activities starting with the definition of socio-economic factors that can contribute to an attractive railway system and looking at how in particular in relation to the innovations that will be achieved in the S2R Programme. An analysis of the dynamics of new preferences, behaviours and lifestyles, and the main factors that influence them, will help to build up an aggregated knowledge of mega-trends, scenarios and disruptions and all possible customer requirements related to railway to accelerate the development of the rail market, its competitiveness and the work within S2R. The development of tools and approaches to enable the impact evaluation of

the implementation of new technologies planned in the S2R MAAP. The detailed definition of System Platform Demonstrators to allow the S2R activities to be compared with the system level targets of the Master Plan. Transversal evaluation and methodologies around energy, noise and vibration to ensure that all potential improvement brought by the S2R technical innovations are well identified/able when applied together into rail products and system solutions. An integrated approach to deal with the safety and security of the railway system and an integrated planning that takes into account interdependencies in the railway system. This will deliver precise railway network simulation to support railway operational planning and best decision-making concerning global safety aspects.

**Mafex Magazine: How many projects are there underway at the present time and which are the main subject matters that these deal with?**

**Carlo Borghini:** At this precise moment, the S2R JU manages around 70 projects structured around the 5 IPs and CCA. These projects have the objective to deliver the different Technological Demonstrators included in the Innovation Programmes, and they are progressing towards higher level of Technological Readiness, with the target to perform demonstration activities in the next years, in principle by 2022. Every year the S2R JU launches a Call for Proposals. These projects are implemented by the S2R Members, whose activities are complemented by Open Calls or procurement activities.

Through a system approach, the Programme progress is monitored





through a set of KPIs which are updated on a yearly basis taking into account the results achieved.

**Mafex Magazine: Shift2Rail (S2R) has been allocated a budget of around one billion euros up to 2024. How is progress moving in terms of global development up to the present date and its financing?**

**Carlo Borghini:** 2018 saw the progress of the R&I activities launched in the previous years. They are now well on track and largely proceeding at cruise speed. A new wave of R&I activities (Call 2018) started at year end. In total, it is estimated that the Total Project Cost of the activities performed in the year 2018 amounts to EUR 83.4 million.

Each year, around April, the S2R JU assesses its R&I activities through a Control Gate approach. This exercise takes into account the deliverables and reports submitted in the context of the Annual Review of the ongoing projects and it is complemented by further reviews during the full year. This Programme assessment confirms that the overall progress of the activities has been in line with the

expectations and planning. Only a few TDs show delays compared to the initial scheduling, mostly due to external factors. In such cases, the JU requests the concerned Project Teams to put in place the necessary mitigating measures. In addition, the Members and additional stakeholders have been able to integrate and adapt their activities to new challenges and refocus research and innovation towards key priority areas. For a Programme of such magnitude, the results achieved so far demonstrate the capacity of the sector to move ahead, embracing new ideas, solutions, technologies and operational models.

**Mafex Magazine: One of the cornerstones of Shift2Rail (S2R) is the public-private sector collaboration. Firms and bodies are deeply involved in Shift2Rail. Was a joint project necessary to accelerate the concept of the future train?**

**Carlo Borghini:** A joint project was essential to accelerate the con-

cept of "the railway of the future", well beyond the future train. The first success story of S2R is having brought the sector to work together, involving operators, infrastructure managers, manufacturers, academia and research centres, with a shared objective to offer a different service to clients, passengers and shippers.

In the past years, many standalone research and innovation projects have been performed, but their results did not always reach the final market, the users. Through a system approach introduced by the Joint Undertaking model, the sector works together with the objective to tackle the aspects that do not allow rail to harvest its key benefits. The sector working together means that there is a system of systems approach which ensures that new technologies, innovative solutions and in the future operating models, are considered with an integrated, market driven and forward-looking vision.

At this precise moment, the S2R JU manages around 70 projects.



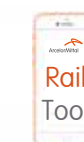
## At the forefront of Rails Solutions

ArcelorMittal Rails & Special Sections has rail production facilities in Poland, Luxembourg, Spain and the United States that offer a wide portfolio of products, covering rails for subways, trams, trains, light rails, crane rails, crossings and rail accessories. The company is a specialist in rails for high-speed rail networks, with over one million tonnes produced and is present in infrastructure projects in over 30 countries. Its high technologic quality allows ArcelorMittal to participate in the more demanding tenders all over the world.

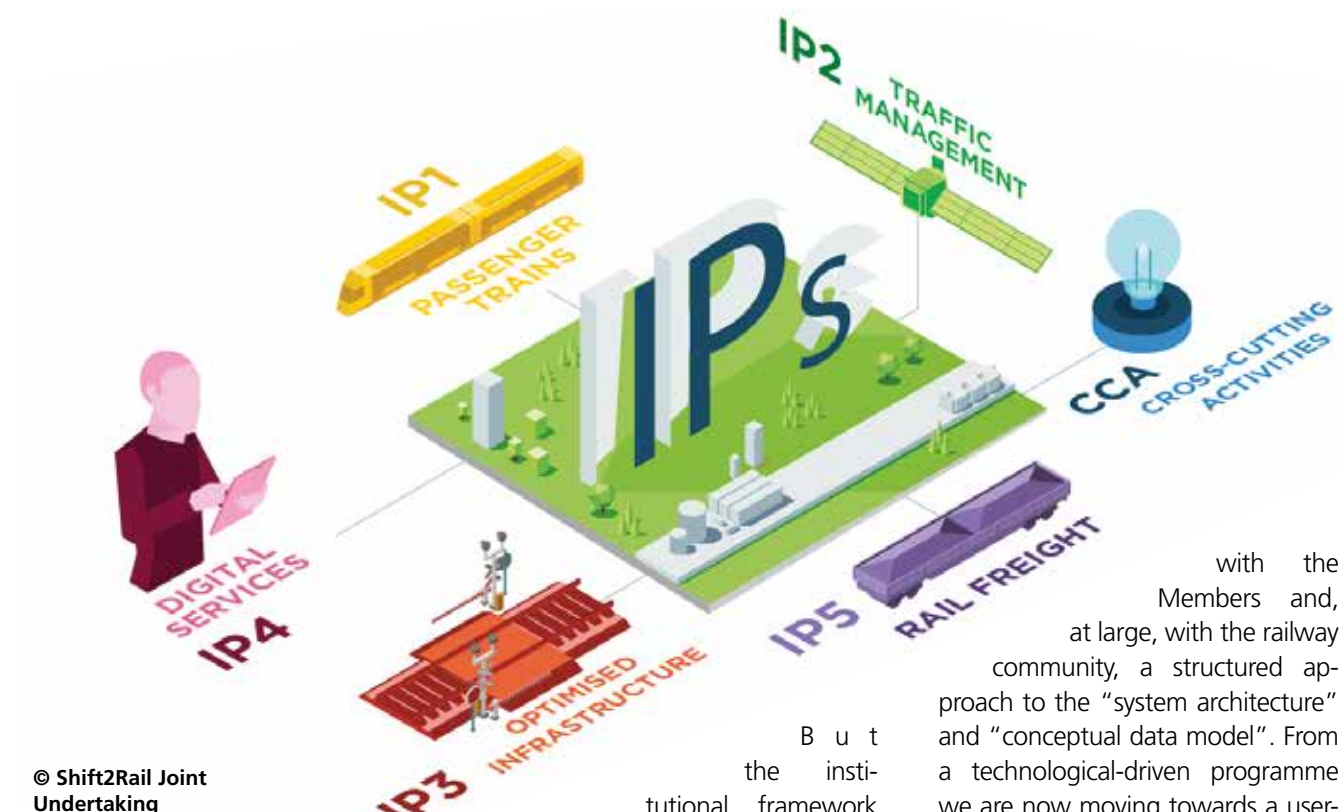
ArcelorMittal's main trending topics for railway:

- **Corporate Social Responsibility:** ArcelorMittal has received the Ecovadis Gold rating.
- **R&D:** ArcelorMittal operates a dedicated rail research and development unit which includes pilot plants and prototyping facilities. Its Rail Excellence Centre also includes a dedicated welding centre which can provide advice and support for current and future grades for its customers.
- **Digitalisation:** ArcelorMittal Rails & Special Sections is extending its 4.0 transformation with the launch of several digital tools.
- **Increasing the length of rails:** in order to provide further track safety, welding, track laying and maintenance cost savings.
- **Increasing the service life of rails:** with the most appropriate solution related to different applications; LCV (Low Carbon Vanadium) for tramway or new hardness grades for heavy haul applications.

New ArcelorMittal rails calculation tool  
Available now for download  
in your app store







© Shift2Rail Joint Undertaking

The Joint Undertaking also brings another key element: it contributes to sharing the financial risk of Research and Innovation, encouraging the sector not to look at short-term solutions but towards results to achieve socio-economic impact in line with European Union policies.

**Mafex Magazine: Why do you believe the response has been so positive on the part of all the stakeholders in the sector?**

**Carlo Borghini:** The positive response of the sector's stakeholders starts with the concept of the Joint Undertaking, an independent trusted body which provides transparency on the purpose of its activities, funding to federate research and innovation, and a long-term mandate aiming at clear objectives, including towards the deployment of innovative solutions through proposals for standards and regulation – when needed – in strict collaboration with the European Union Agency for Railways (ERA) under the policy umbrella of the Commission.

Without such an institutional environment, driven by a result-oriented team, it would not have been possible to achieve the progress we can proudly report today.

But the institutional framework would not have been sufficient, without the passion and commitment of the S2R Members, including in Spain – CAF, Talgo, Indra, but also Aernova, Amadeus, CEIT, Cemo-sa and many other stakeholders. On the one hand, success derives from the long-term commitment at company level of forward-looking senior management, capable of anticipating the challenges of the future and, on the other hand, the passion of the staff working at different levels in the R&I activities. Not to be forgotten as well – the staff involved in the demos at all levels of the value chain. This is an unstoppable success story.

**Mafex Magazine: The 2019 tender season is open with calls for proposals until the month of June, eighteen items to which financing standing at 150.3 million euros will be allocated. Can you give us some details of the areas you aim to boost?**

**Carlo Borghini:** The Call 2019 has two main features: the first one is to progress R&I activities in the different IPs towards the achievement of technological demonstrations in the following 3 years. This will be further integrated by the last Call of the JU that is expected in 2020. The second, we have added after having discussed

with the Members and, at large, with the railway community, a structured approach to the “system architecture” and “conceptual data model”. From a technological-driven programme we are now moving towards a user-driven integrated railway model, enabled by digitalization, automation and new technologies. It is the start of the transition towards the system transformation that will tackle underpinning business models and most probably will drive the next programme for rail research and innovation from 2021.

**Mafex Magazine: Spanish participation is noteworthy in many of the advancements developed within the programme. What opinion does its contribution to this industry warrant?**

**Carlo Borghini:** No doubt the Spanish participation to the S2R Programme is noteworthy. One of the key aspects of this contribution is bringing together entities with diversified experience in rail but also in other sectors, such as aviation and/or defence. In addition, Spain has the most extensive high speed network in Europe as well as in terms of ERTMS deployment. In addition, the Spanish industry has also a strong positioning globally, which motivates the different stakeholders to look for innovative solutions that would allow for the maintenance if not the improvement of such a positioning.

As I said, those features of passion and commitment I mentioned before, are strongly present in the work and results from the Spanish entities working in the Programme together with their counterparts across the rest of Europe. But it is really the European approach which is Shift2Rail's glue!

**Mafex Magazine: How might the railway panorama in Europe shift once the Shift2Rail programme comes to an end?**

**Carlo Borghini:** If in any manner S2R would come to an end, Europe will suffer from a missed opportunity, going back to piecemeal collabo-

## The 2019 tender season is open with calls for proposals until the month of June.

rative research. Railway is a system and to move railway forward and to harvest the benefits of new technologies, a system approach is needed.

As you can imagine, I strongly believe that research and innovation is an essential element of socio-economic growth, which translates into European industry competitiveness, jobs, progress for regions, people, workers, now and in the future. An integrated programme, with long-term commitment is not the sum of those working together – it is a unique force with a multiplier effect on transformation of integrated systems, where from cooperation the sector moves to compete leveraging an extensive and unique know-how.

There is an unquantifiable value of the sector working together under strict rules of equal treatment and transparency, and this value is intrinsic to the nature of an institutional partnership. But we need to be clear: this is not to subsidize ad mortem; any investment in research and innovation shall have as a final objective a return on investment. The

current investment in S2R JU should translate in clear measurable benefits in terms of performance and cost-efficiency in the rail system; it also means that if we fail, we need to fail fast and take the opportunity to explore new ideas.

**Mafex Magazine: Upon its completion, will Europe be placed at the forefront in matters of railway innovation? Can all this technological knowledge be transferred to other parts of the world?**

**Carlo Borghini:** Europe is already today at the forefront of railway research and innovation, because S2R R&I initial results start being embedded in new products and solutions, more than we are aware of.

But the question touches the competitiveness of railway in comparison to other transport modes, usually recognized to be more innovative. As I have already mentioned, the journey that needs to be undertaken by the rail sector is an unprecedented transformation that will bring many benefits.



© Shift2Rail Joint Undertaking





## Sustainability: A challenge to respond through new technological advances

THE RAILROAD HAS BECOME THE CORNERSTONE IN SUSTAINABLE TRANSPORTATION. TO RESPOND TO NEW ENVIRONMENTAL CHALLENGES, THE RAILWAY INDUSTRY WORKS IN THE DEVELOPMENT OF TECHNOLOGICAL ADVANCES WITH WHICH TO CONTRIBUTE TO REDUCED ENVIRONMENTAL IMPACT.

Currently, transport represents about 23% of CO<sub>2</sub> emissions worldwide. As well as causing atmospheric, acoustic and landscape pollution Aware of the need to implement means to ensure a more sustainable future, from the administrations and the industry we work on new models in the big urban centres or more ecological alternatives in the movement of goods or passengers over medium and long distances. In this joint effort, the railway plays a decisive role; since it accounts for solely 0.7% of total CO<sub>2</sub> emissions. The modal shift in favour of this type

of transport would also allow for a reduction of a series of pollutant gases (NO<sub>x</sub> and particles) and environmental aspects (noise, luminescence, etc.). Likewise, it has a series of additional advantages such as reduced energy expenditure, high capacity and the flexibility of its rolling stock that makes it adaptable to the forecast demand peaks in each case. Travelling by train significantly saves on CO<sub>2</sub> emissions. Per unit transported, in the case of the road, it produces between 3 and 5 times less than road journeys, while in the case of the plane it is between 7 and 10 times lower.

This mode of transport will be essential in the coming years in the face of cities' trend towards growth. It is estimated that by 2050, 85% of the world population will reside in urban centres, especially in regions such as Europe and America. This structural change involves the development of new concepts such as Smart Cities; a change where sustainability will be pivotal. In order to respond in a planned manner to the increase in journeys, the implementation of integrated public transport networks is backed as a solution. Therein, the presence of urban and interurban rail systems stands out, due to its numerous advantages: comfort, speed, reliability, high capacity, etc. The importance of the environment in mobility in Spain is reflected in lines of action such as the "Innovation Plan for Transport and Infrastructures 2018-2020" issued by the Ministry of Public Works. Within this programme, the fourth axis is dedicated to "Energy Efficiency and Sustainability" with proposals that aim

to achieve an energy efficient and environmentally friendly transport system.

The "2014-2020 Energy Savings and Efficiency Master Plan" drafted by the Railway Infrastructure Administrator (ADIF) operates along similar lines. Amongst the main initiatives, the use of systems for the generation of renewable sources or the use of surplus energy for self-consumption or reinvestment into the network is promoted. The Spanish railway industry is committed to R&D to contribute to a reduced environmental footprint.

### At the fore in terms of R&D

Furthermore, to respond to the environmental challenges associated with all of the foregoing changes, the Spanish railway industry, in collaboration with administrations, universities and technology centres, is working on the development of new advances with which to contribute to reduced environmental impact. A stance that provides added

value and contributes to its position of leadership in the world, both in terms of manufacturing, as well as in operation and maintenance, compared to new competitors that boast an increased presence in the global market.

The constant work in innovation is rendered in the implementation of pioneering solutions that provide greater energy efficiency in the operation of different networks (high speed, medium distances, commuter, urban transport or goods, etc.) and a way to travel or transport goods with the lowest carbon footprint.

Spanish companies have designed cutting-edge systems to achieve more efficient consumption.

In infrastructure and superstructure, its contribution has made it possible to have one of the most modern and efficient networks, with 3,240 kilometres of high speed track, the second most extensive in the world only after China. Furthermore, it is at the forefront in the implementation of the most modern signalling system, the ERTMS (European Traffic Management System), with more than 2,000 kilometres equipped with this system.

In this field, ADIF also has a presence as a technology tractor for "efficient

The Spanish railway industry is committed to R&D to contribute to a reduced environmental footprint.





infrastructures of great capacity", with actions to achieve a "Smart Electrical Network", equipment more resistant to adverse weather conditions, noise reduction and maintenance costs. With regard to rolling stock, we work on making available to the market new trains with lighter equipment, with an aerodynamic design and equipped with state-of-the-art technology. The advances incorporated by companies such as Renfe Operadora, for example, already save 30% of the network's energy, minimising thus environmental ramifications.

## Bolstering innovation

The manufacturers located in Spain, in addition, have reinforced the R&D area in recent years to introduce innovative concepts such as state-of-the-art high-speed platforms; trams without catenary, tram-trains or electric battery trains. In addition, new advances have been created such as inductive battery chargers that do not require any direct electrical contact, such as catenaries, cables or plugs. They have also con-

tributed to the efficiency of the new train fleets, the research in relation to the useful life of the materials used and their maintenance. The development of a new electric traction system, by means of a converter designed from silicon carbide semiconductors (SiC), will allow for us to reduce the size of current devices by 30%.

Additionally, in the field of goods, we work on new platforms with high traction power, with an economic and ecological functioning, which have systems capable of reducing total energy consumption by 5%. Another step in this segment is the work being carried out around the "coach of the future", which, through the introduction of new propulsion concepts, will offer more attractive rail freight services by maximising flexibility and efficiency and reducing operating costs and maintenance.

The operation of autonomous trains (ATO) is another development that will increase the competitiveness of passenger and freight transport by rail, improve operational efficiency

and thus optimise the use of resources. Advances in sustainability are also being developed in other multiple segments such as traffic management systems, including Da Vinci, which has been implemented in many countries around the world, given its major capacity to adapt to other types of traffic.

## Energy optimisation

In matters of resource optimisation, several pioneering initiatives around the world are worthy of special mention. On the one hand, the reversible substations in a conventional network of 3000 V DC. The energy produced in the regenerative braking of a train, if not used by other nearby trains, is returned and re-injected into the supply network, leading to savings. The results of this project, named Inverfer by Adif, are already operational on the Má-

laga-Fuengirola commuter rail line.

The Spanish industry also brings major advances in this field as the system of energy recovery from the regenerative braking of rail traction vehicles. An improvement that allows us to use this energy for the internal consumption of the installations, returning the surplus to the electric company's network.

In terms of network management and operation, Spanish innovations are also notable, such as advanced, non-contact ticketing systems (Smart Tickets).

## Renewable energy supplies

On this path towards sustainability, the use of renewable energies is increasingly common. At present, the consumption of electric power allows Renfe to use massively clean energies unlike other modes of transport dependent on oil such as aviation, maritime transport or the roadways. For its part, Adif has

several innovative initiatives such as the so-called "Ferrolinera". This involves a system for recharging the batteries of electric vehicles in stations and car parks. The system consists of taking advantage of the electricity coming from the substations that feed the catenary, storing the clean energy generated by the application of regenerative braking of the trains, and adding it to the photovoltaic energy collected in the canopies of the parking lots of certain stations, equipped with photovoltaic panels.

Other systems, such as the Madrid Metropolitan Railway, provide 100% of heating and cooling to platforms and underground offices in certain stations, such as that of Pacific, through the installation of geothermal heat pumps.

## Shift2Rail: new technologies

In terms of transport, Europe has made a contribution to sustainable mobility through the promotion of the railway. In this context, the

In terms of transport, Europe has made a contribution to sustainable mobility through the fostering of the railway.

Shift2Rail R&D initiative came into being, whereby the work of Spanish companies is highly noteworthy. The main aim is to develop a new concept of trains, more comfortable, silent, ecological, etc. operate more reliably in a more innovative rail infrastructure network.

Among the numerous projects in which the Spanish railway sector participates are: Mat4Rail, Etalon, Optrail, INESS, Merlin, C4R, GRAIL2, RIVAS, SUSTRail, AEROTRAIN and Roll2Rail. The themes on which they work within these initiatives are also diverse: Materials and smart interior design, digitisation and automation of freight transport, electric traction system, smart maintenance, reduction of energy consumption, new generation of sturdy wireless communications for control and monitoring applications, etc. The Spanish contributions stress the importance that R&D has for the industry and the major resources it devotes to the same in order to contribute to achieving more sustainable transport. 







## Premier pilot project in Sagunto to test the hyperloop **high-speed system**

**H**yperloop idea is more than 200 years old, when British inventor George Medhurst proposed to introduce vehicles inside vacuum tubes to reduce aerodynamic drag. 100 years later, in Russia, professor Boris Weinberg researched how to levitate magnetically vehicles to reduce wheel-track ground friction.

Since then, in the XXth century the tube is left apart due to technical complexities but the magnetic levitation gains traction giving birth to the first "maglev" trains in China and Japan, which present high infrastructure costs in part due to the need of coils all along the track. In 2012, with advances in vacuum and automation, businessman Elon Musk popularizes hyperloop on TV, and a year later, he proposes a theoretical concept using air-bearings for levitation, and not magnets such as Japanese and Chinese maglevs. In parallel, he organizes a student competition in which Hyperloop UPV, a Spanish project, is awarded as Best Design and Top Propulsion system in USA. Its founders decide to bring their concept to reality and they found the company: Zeleros.

ZELEROS IS COMPRISED OF MORE THAN 30 PROFESSIONAL AND IS CURRENTLY ABOUT TO EMBARK UPON THE DEVELOPMENT OF THE PREMIER PILOT PROJECT IN SAGUNTO, A TRACK OF 2 KMS IN LENGTH ON WHICH THE HYPERLOOP HIGH-SPEED SYSTEM WILL BE TESTED WITH THE SUPPORT OF INSTITUTIONS AND COMPANIES FROM THE SECTOR.

larizes hyperloop on TV, and a year later, he proposes a theoretical concept using air-bearings for levitation, and not magnets such as Japanese and Chinese maglevs. In parallel, he organizes a student competition in which Hyperloop UPV, a Spanish project, is awarded as Best Design and Top Propulsion system in USA. Its founders decide to bring their concept to reality and they found the company: Zeleros.

Currently, Zeleros is composed of more than 30 professionals and is on the way to build the first pilot project in Sagunto (Spain) a 2-km track where they will demonstrate their hyperloop system at high speed with the support of institutions and companies from railway, aeronautical, energy and infrastructure fields, becoming one of the pioneering initiatives at a global level.

# RAILLIVE! 2020

## TECHNOLOGY, INNOVATION & STRATEGY FOR THE ENTIRE RAIL SUPPLY CHAIN

The Most Exciting Rail Event of The Year

**Madrid**

Tuesday 31st March - Thursday 2nd April 2020: Conference

Wednesday 1st April - Thursday 2nd April 2020: Exhibition

### Trending Topics at RAIL LIVE!





# The Sharework project will create new technology for human-robot collaboration in the industry

A Istom in Spain is taking part in the European Sharework project that will bring a new smart system to the market integrated by different software modules, with the aim of driving collaborative work between operators and robots without need for physical protection barriers, thereby boosting process productivity and improving the ergonomics of those workstations where it is implemented. Specifically, Sharework, which stands for "Safe and effective Human-Robot cooperation towards a better competitiveness on current automation lack manufacturing processes", will establish a modular system designed to adjust collaborative robotics to each industrial process and to the workers themselves, and will also make it possible to adapt the robots currently installed in each plant to ensure more effective cooperation with humans. Although collaborative robots account for only 5,000 units currently, their reduction in price and the boom of Industry 4.0 has driven

investment in automation and spurred companies' interest in investing in cobots, whose market value is expected to reach €3.7 billion in 2023, given the high rate of return on investment. In this collaborative robotics growth scenario, Sharework will begin by applying human-robot collaboration in four types of real industrial scenarios in the automotive, railway, metal and capital goods manufacturing industries.

To this end, it will develop modular software based on human-robot collaboration capable of flexibly and efficiently adapting to the required work, thanks to the robot's perception of the environment through multiple sensors, smart data processing, augmented reality and gesture and speech recognition technology. It will also continuously evaluate work ergonomics and make suggestions for improving the worker's posture.



# Simulation Tool to Evaluate Power Consumption on Electrified Railway Lines

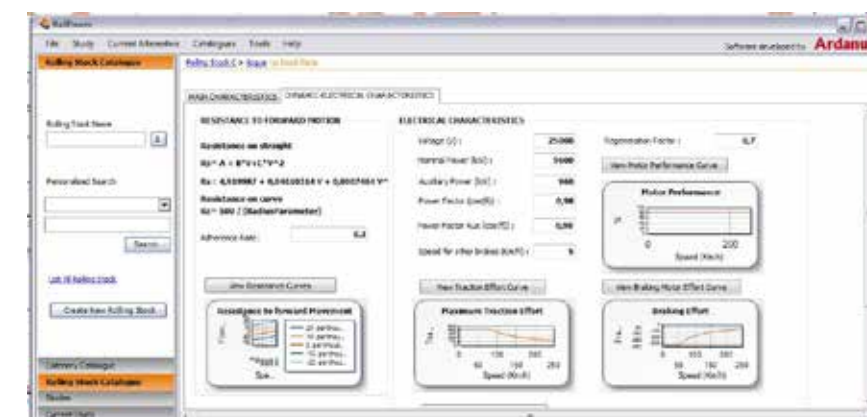
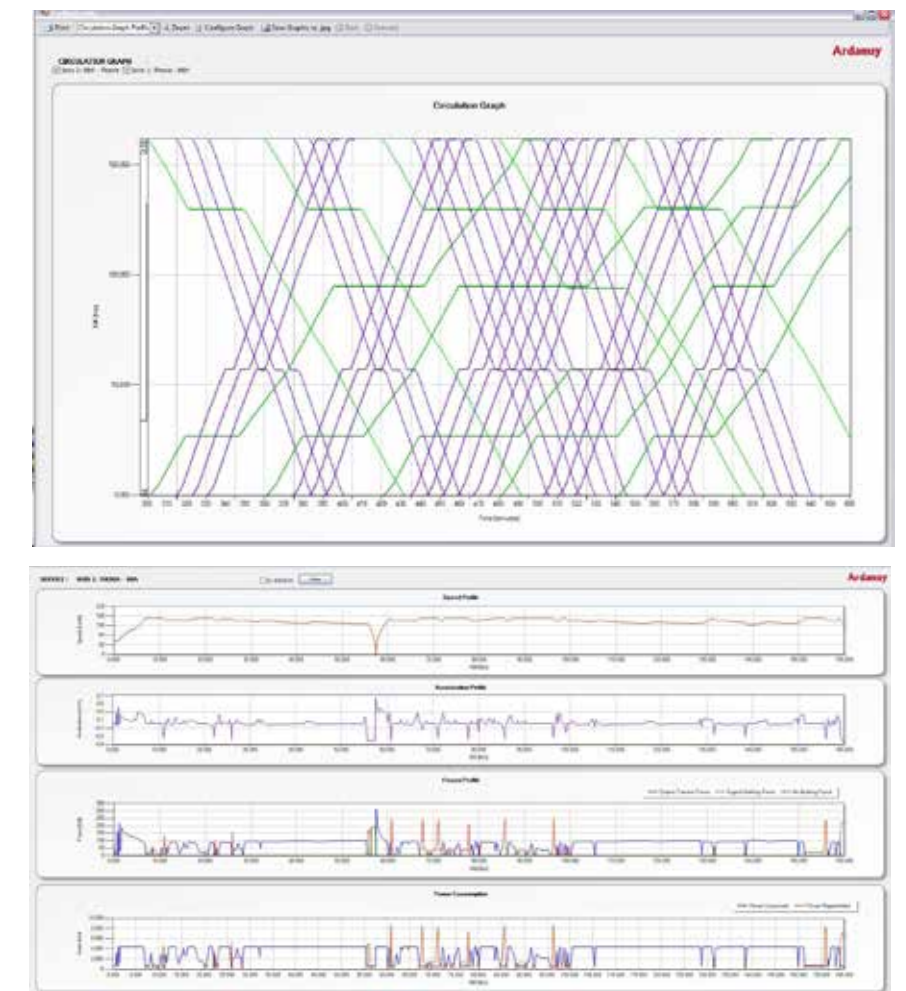
R ailPower is a comprehensive tool which permits electrical dimensioning studies to be carried out on railway lines based on real operational conditions. The results obtained help facilitate decisions in order to correctly electrify the line which thus contributes to cost optimization, determining operational limits and anticipating any critical situations which may arise.

The field of application for which RailPower can be used is extensive. It is designed to be applied to all kinds of railway transportation systems by carrying out simulations of electrification systems implementing both alternating (1x25 kV and 2x25 kV) as well as direct current (750 V, 1,500 V and 3,000 V). For each study, two modules are tested.

The first module simulates train circulation by forcing it to comply at all moments with the necessary signalling requirements and consequently obtains the dynamic train results (speed, acceleration and power).

The second module tests the equivalent electrical circuit and results are obtained for the pantograph voltage, current for each train, output and the power for each substation feeder as

ARDANUY INGENIERIA HAS DEVELOPED ITS OWN SIMULATION TOOL DENOMINATED "RAIL POWER" WHICH PERMITS POWER CONSUMPTION ON ELECTRIFIED LINES TO BE EVALUATED.



well as for the contact cable and return rail current.

Results of all associated calculations related to dynamic, electrical and graphical train circulation aspects can be observed on the screen (or can be printed) in table or graphic form for their subsequent interpretation and analysis. The software program provides instantaneous and average values as well as the RMS for all calculated terms.





## The new locomotives are arriving in Poland

The innovative BOMBARDIER TRAXX DC3 locomotive has been presented in Poland together with the rolling stock leasing company Akiem. These locomotives, which operate under direct current, are the most modern and efficient in the country.

Akiem ordered 20 locomotives in November 2018 and delivery is scheduled between 2019 and 2021.

The traction and auxiliary converters for these locomotives are manufactured in the Bombardier site in Trápaga and that is where the management of the operative project is also carried out, which covers from the selection of suppliers and stock-piles to the final tests and shipment of the converters, passing through

THE INNOVATIVE BOMBARDIER TRAXX DC3 LOCOMOTIVE HAS BEEN PRESENTED IN POLAND TOGETHER WITH THE ROLLING STOCK LEASING COMPANY AKIEM. THESE LOCOMOTIVES, WHICH OPERATE UNDER DIRECT CURRENT, ARE THE MOST MODERN AND EFFICIENT IN THE COUNTRY.

the intermediate phases of supplies, manufacturing, testing and final inspections.

Among the Spanish converters, the new AC3 families stand out, with 1 and 2 systems for alternating current, the DC3 for DC power supply and the new MS3, the latest generation of multi-system locomotives. The TRAXX 3 is the most modern locomotive platform in Europe, with more than 2,300 units sold to date and 18 years of experience. Its three models also offer the Last Mile

functionality, a support diesel engine which bridges non-electrified sections.

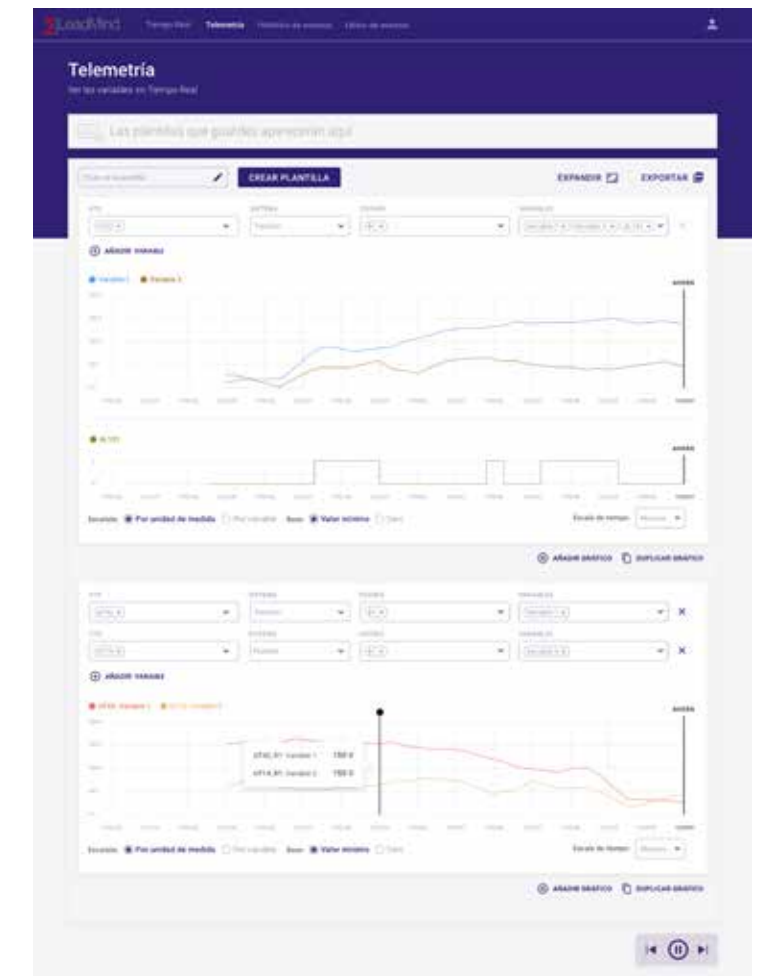
Among the advantages of the platform stand out its economic and ecological performance, having the Ecomode system able to reduce the total energy consumption by 5% to be able to turn off the traction motors individually. The locomotives are also designed with a modular maintenance that allows to reduce the downtime making the mechanical service faster and easier.

## SPA - An innovative tool for predictive maintenance -

CAF LeadMind is a multi-platform solution resulting from a close collaboration among different departments and business units in the CAF group. It provides an open, customizable and client-oriented solution that respond to the needs of the different agents involved in the railway chain. Four well-differentiated technological areas (connected digital train, big data, cybersecurity and analytics) are interconnected to create a unique ecosystem that collect and analyze data from our trains with a simple objective, to reduce the life-cycle-cost and to increase competitiveness.

Condition Based Maintenance (CBM) is one of LeadMind's core competences, favouring optimal decision-making through health condition monitoring of machinery in real time.

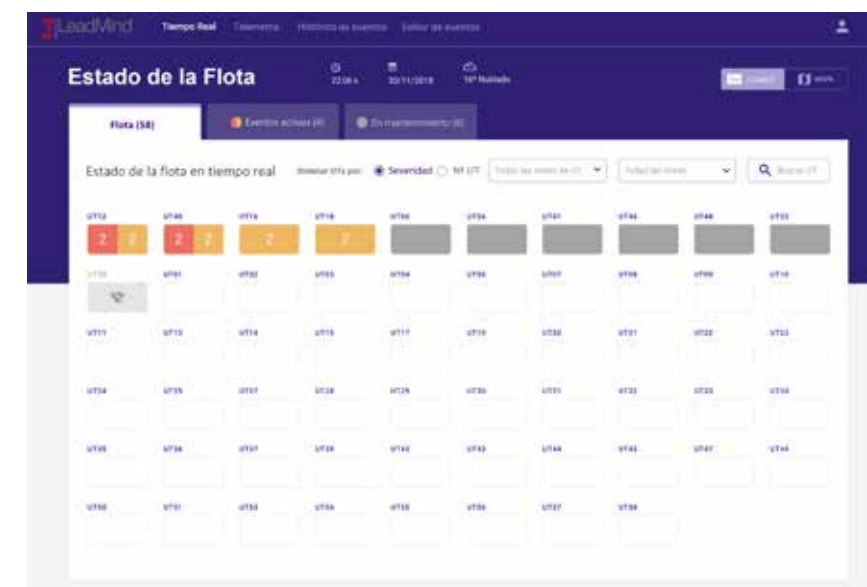
Current capabilities of collecting sensor and real condition data from our machines allows LeadMind to focus attention in the subset of assets needing real intervention, hence being able of reducing unnecessary maintenance operations and improving reliability.



Advanced analytics is used for Prognosis and Health Management (PHM) within the CBM program,

with the aims at predicting the Remaining Useful Life (RUL) of the different components using historical records (telemetry and maintenance activities) and degradation trends observed from condition monitoring data.

Use cases, such as the use of CBM indicators for predicting failures in batteries and compressors in Euskotren with 85% accuracy, support our confidence in a continuous improvement. PHM uses stored data to build health/CBM indicators, define control limits or failure thresholds, and finally predict the RUL of the assets.





# BIM in rail infrastructure: MetroLink

IDOM is working in BIM for the MetroLink project (first metro line in Dublin), under BIM Level 2 standards applied strictly, being a real hands-on example for the application of this project working methodology.

IDOM's scope for MetroLink project does not only include the delivery of the preliminary design in BIM. IDOM has also created numerous standards and manuals which will be used by Transport Infrastructure Ireland (TII) for BIM implementation within their organization. Since TII has no previous experience working within the BIM environment, the above-mentioned standards will be introduced and applied to all the organization and they will also be used to carry out any future project promoted by TII as well as for the management of

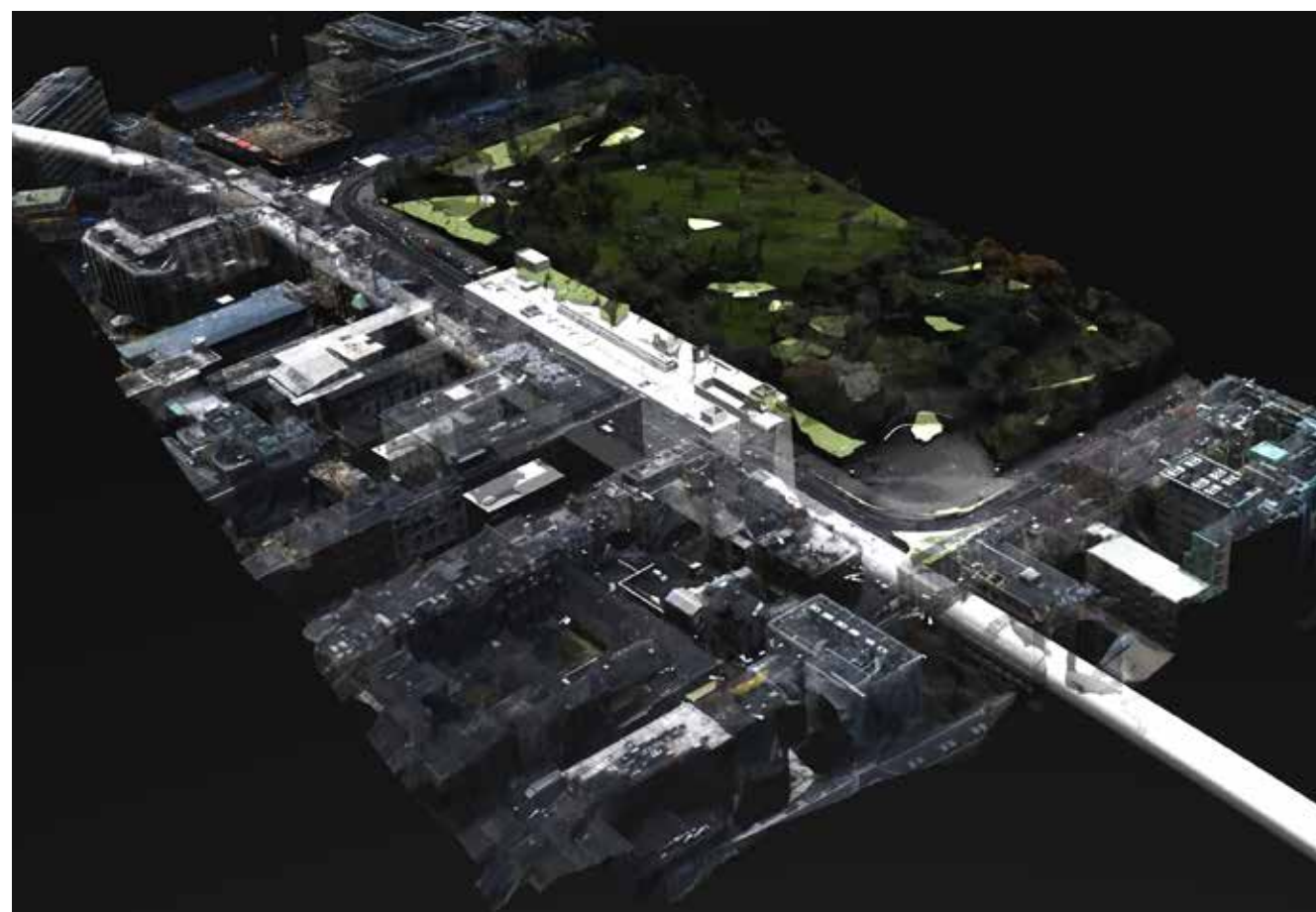
IDOM IS WORKING IN BIM FOR THE METROLINK PROJECT (FIRST METRO LINE IN DUBLIN), UNDER BIM LEVEL 2 STANDARDS APPLIED STRICTLY, BEING A REAL HANDS-ON EXAMPLE FOR THE APPLICATION OF THIS PROJECT WORKING METHODOLOGY.

any asset generated along the life-cycle of the infrastructure regardless of their stage.

Although the .ifc format is very often considered as the ideal format to export and import BIM models, this is very often a bit further from the reality. Just as an example, IDOM decided to implement and use imodels for the creation of the federated model which included both metro stations and the rest of the metro infrastructure.

For that reason, it was necessary to create a smart system to guarantee that the model developed from the preliminary stages could be used as the base for a model that could be used during all and every phase of the project: Design, construction and, finally, operation & maintenance.

At the same time, this system will allow, in the future, to create a digital twin.



# Digitalization will help achieve more personalized, safer and more sustainable mobility

This is clear from the Trends Report of the Transport Sector, prepared by Indra, which analyzes the geopolitical, regulatory, social, organizational and technological environment of the sector, as well as the main challenges and objectives that the various agents of this transformation are pursuing in terms of mobility (<https://www.indracompany.com/en/ittreport2018>).

Digital technologies enable developments such as mobility as a service, inter-modality, autonomous driving and predictive maintenance, which are considered key factors for the mobility of the future, and they will mean important advantages for users, managers, operators and public bodies and authorities: lower costs, the possibility of resizing routes, safer car driving and less severe environmental impacts, among many other aspects.

According to Indra's Report, the transport operators will carry out a more intelligent, inter-modal and optimized management of their services. Operators of buses, subways and trains will soon have a centralized integrated route management system connected to traffic and traveler information, which machine learning and big data will use to resize routes in real time and generate customized routes for users of other means of transport.

Transport infrastructure maintenance will be increasingly predictive, starting from the very design of the infrastructure in the BIM (Building Information Model), up to the collection of rele-

## Beneficios



## ITT Report 2018 Informe de tendencias del sector Transportes

### Entorno



### Tecnologías



### Tendencias de movilidad inteligente



vant data through Big Data to establish indicators and patterns that, supported by artificial intelligence, will help with decision making. Inspections through the use of unmanned vehicles (UAVs) and the use of augmented reality for operator training and remote assistance for sensitive repairs will also transform these services.





## LANDER Checksim, or how to continue to offer confidence

CHECKSIM SETS OUT TO CHECK AND DETECT CERTAIN ASPECTS THAT COULD CAUSE A SERIOUS BREAKDOWN IN THE DRIVING SIMULATOR.

Confidence is one of the main pillars LANDER works on when creating driving simulators alongside the customers. It is a word that rolls glibly off the tongue, but taking the sensation to the 5 continents from their small operation in San Sebastián is no easy task. Different languages, cultural diversity or long distances, among others, are setbacks that have to be solved at the outset in personal relations. And this is just the beginning of

innumerable details which have a direct impact on customer-LANDER relations. There are some of these aspects that are rarely mentioned, but in fact they are extremely important to produce that extra portion of trust. One such detail is LANDER's Checksim tool. This is an in-house predictive maintenance software system to be applied to simulation equipment. Checksim sets out to check and detect certain aspects that could

cause a serious breakdown in the driving simulator, such as malpractice or overheating in the unit. The software automates a number of basic checks on the functioning of the simulator's computerised unit, so that in the event of any threats it can warn the user with an emerging message to correct something that is not being carried out properly. This allows users to react in time and prevent any further complications. In this way LANDER wishes to avoid any routine checks by those operating the equipment, in a bid to free them up to concentrate on training, and also ensure that the equipment is fully operational at all times, with no unexpected downtime to disrupt day-to-day training activities.

## From data to profit

Nowadays a number of 'trendy' buzzwords are used such as Internet of Things, Big Data, Digitalization, Predictive Maintenance,... which are on everyone's table but just a few are fully understood and implemented, all together, in an effective and efficient way. A successful Digital Transformation process focused on Predictive Maintenance implementation will reduce, as an average, a 20-25% of railway maintenance costs and there is an opportunity of 9-12 billion EUR per year in operational savings (McKinsey Annual Report). This transformation process will ensure that a railway business has the required Digital

WHY UNDERTAKING THE PATH TO TURN DATA INTO PROFITS IS NEITHER STRAIGHTFORWARD OR A CHOICE? HOW CAN TECHNICAL AND FINANCIAL RISKS OF AN INVESTMENT IN DIGITAL RAILWAYS BE MINIMIZED? WHAT TECHNOLOGIES AND SERVICES CAN BE USED FOR THIS PURPOSE? WHAT QUALITATIVE AND QUANTITATIVE BENEFITS OF APPLYING THE DIGITAL MAINTENANCE CONCEPT TO ROLLING STOCK ASSETS CAN BE DEMONSTRATED IN PRACTICE?

capabilities (technologies, business model and operational excellence) to sustain a Digital Culture focused on a new Digital customer who demands a new top-bottom strategy, people commitment and new skills and roles. NEM Solutions combines more than 12 years of experience transforming

digitally, railway businesses worldwide. Through domain expertise and data analytics excellence it is the way to transform data into profits. The Predictive Technology, A.U.R.A., is designed as one stop platform which controls independently of the OEM, more than 67k assets from more than 250 fleets.





# Siemens Mobility develops **PTC signaling** technology applied to the mobile maintenance

The PTC is a system specifically designed for monitoring and controlling train movements in order to stop a train before an accident can take place. In that sense, the specification is quite open and is part of the manufacturer companies to warranty the avoidance of the following points:

- Train collisions
- Derailments provoked by excessive speeds
- Movements of trains over wrong aligned switches
- No authorized entries in working areas

One of the main technical characteristics of the technology is that the localization system is based in the absolute positioning coming from GPS (Global Positioning System), reducing considerably the equipment installed on the track. This makes the PTC an ideal signaling techno-

SIEMENS MOBILITY SPAIN IS ONE OF THE GLOBAL CENTERS OF EXCELLENCE INSIDE SIEMENS IN CHARGE OF DEVELOPING PTC TECHNOLOGY AROUND THE PLANET.

logy for infrastructures with a big number of track kilometers and with difficult track installation access. In that sense, it is one of the preferred systems to equip railway freight infrastructures in countries where the ERTMS technology does not exist. Siemens Mobility Spain is one of the global centers of excellence inside Siemens in charge of developing PTC technology around the planet. Siemens Mobility Spain is leading PTC projects all around the world including such remote places as Panama, Mozambique or Australia. Inside the R&D innovation plan, it has been developed a tablet portable solution able to localize the maintenance workers and inter-

connect them with the PTC system. The Tablet Trainguard Sentinel, as it is known, uses an internal GPS chip integrated, able to solve the localization necessities. It also supports different Ethernet interfaces allowing the communication with the trains and the control center. This solution allows to increase the productivity of the maintenance workers distributed along the track as well as their safety. It is possible to block areas of the track and to apply temporary speed restrictions to the running trains as well as communicating in real-time with the railway operators. Moreover, all the information is online registered, allowing to track the field operations.



## The **EURODUAL** locomotive receives two innovation awards

STADLER HAS BEEN RECENTLY AWARDED WITH TWO INNOVATION PRIZES, ONE IN GERMANY AND ANOTHER IN SPAIN DUE TO THE EURODUAL LOCOMOTIVE.

Actualidad Económica selects annually the best products and services launched to the Spanish market. In the 41st edition of the awards the Stadler's EURODUAL locomotive has been selected as one of the "Best Ideas of the Year" in the category of "Industrial innovation".

The EURODUAL has also been awarded the InnovationsPreis in the category of vehicles by the specialized German publication Privatbahn Magazine. This prize is awarded every two years since 2008 in recognition of innovations in the railway industry capable of marking trends.

VERSATILITY, profitability and environment, EURODUAL is the technological response of Stadler to the challenges posed by cross-border rail freight transport. This new generation of ultra-versatile bimodal locomotives, electric with a diesel engine, are able to circulate on all types of lines, electrified or non-electrified, offering two solutions in one and combining the advantages of both types of traction. It offers the operational flexibility of diesel locomotives and the environmental benefits of electric locomotives along with a very high hauling capability. The powerful locomotives can

be used for freight and passenger transport services, at speeds of up to 160 km/h.

In its design, the minimization of its environmental impact has been taken into account, both during the production phase and during its useful life with a notable reduction in emissions and external noise. Drivers are the key for safe and efficient operations. The driver's cab has been designed in accordance with ergonomics criteria guaranteeing the safety and comfort of the drivers. They are fully isolated, both acoustic and thermal, and feature an optimized HVAC system and driver assistance systems.

With its avant-garde technology, it covers every need in an efficient and reliable way offering rail operators numerous economic and ecological benefits.





# BIM at the heart of HS2 Design

In 2016, the UK Government launched a Construction Strategy in order to reduce the cost of building and infrastructure projects throughout their entire life cycle, with a focus on the operation phase (Opex). The HS2 high-speed line that will connect 8 of the 10 largest cities in the UK at a speed of 400km/h is part of this Strategy, and from its conception it was established that it should be developed in a collaborative manner, based on information models with a Level 2 BIM Maturity. TYP SA is part of the Design Joint Venture (Design House) with Arup and Strabag in the two southern contracts (S1 and S2) for the Construction Joint Venture SCS, composed of Skanska, Costain and Strabag.

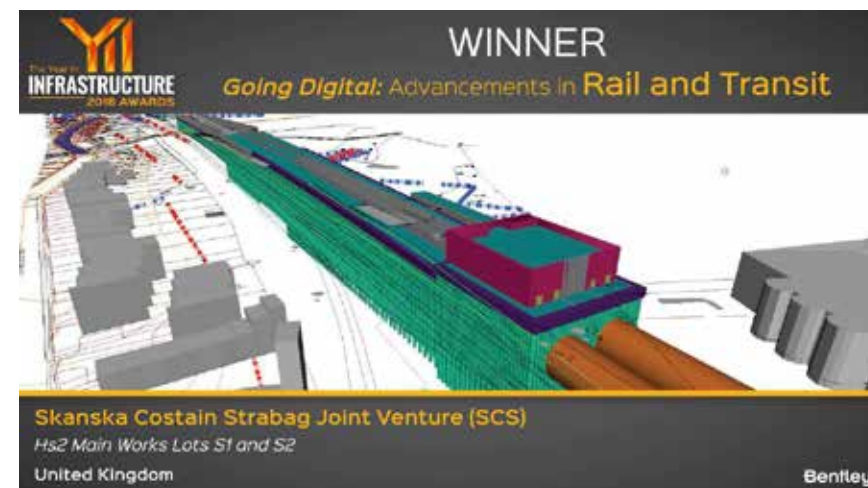
The BIM Team of the Design House is led by TYP SA and includes experts from the 3 design companies. It works collaboratively with the BIM Team of the SCS Contractor, defining and implementing the BIM methodology to give joint responses to the HS2 requirements.

The work developed by the BIM Team meets HS2's determination of using BIM to the highest standard in order to increase productivity, reduce the use of material and carbon footprint and become a new stan-

THE BIM TEAM OF THE DESIGN HOUSE IS LED BY TYP SA AND INCLUDES EXPERTS FROM THE 3 DESIGN COMPANIES. IT WORKS COLLABORATIVELY WITH THE BIM TEAM OF THE SCS CONTRACTOR, DEFINING AND IMPLEMENTING THE BIM METHODOLOGY.

dard for the industry. The methodology has achieved a significant number of tangible benefits: having a single source of information that allows you to produce the information once, but use it many times, and calculate the impact of any design change quickly and accurately. The digital approach of the project

and the innovative BIM development has received the Year In Infrastructure 2018 award in the category of 'Innovation in Rail and Transit' awarded by Bentley. To build on this experience, we are collaborating with the National College for High Speed Rail teaching BIM in a rail industry in continuous evolution.



The BIM Team of the Design House is led by TYP SA and includes experts from the 3 design companies.





GUÍA DE SOCIOS

ENGINEERING, CONSULTANCY AND CERTIFICATION

Projects and infrastructure technical assistances, superstructure, signalling, communications and ticketing

- ▶ Albatros, S.A.U.
- ▶ Ardanuy Ingeniería, S.A.
- ▶ Caf Signalling, S.L.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Calmell, S.A.
- ▶ Citef (Fundación para el fomento de la innovación industrial)
- ▶ Dsaf-Dinamicas De Seguridad, S.L.
- ▶ Duro Felguera Rail, S.A.U.
- ▶ Eurogestión
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Ikusi SLU
- ▶ Indra Sistemas, S.A.
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Inserail
- ▶ Luznor Desarrollos Electrónicos, S.L.
- ▶ Segula Technologies España, S.A.U.
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Sigma Rail
- ▶ Teknorail - Grupo Eurofinsa
- ▶ Tecnivial S.A
- ▶ Tectronic
- ▶ Thales España Grp, S.A.U.
- ▶ TPF Getinsa Euroestudios, S.L.
- ▶ Trigo Group
- ▶ Typsa - Técnica Y Proyectos, S.A.
- ▶ Vicomtech

Systems, environmental, financial management and IT consulting

- ▶ Aquafrisch, S.L.
- ▶ Ardanuy Ingeniería, S.A.
- ▶ Citef (Fundación para el fomento de la innovación industrial)
- ▶ Eurogestión
- ▶ Fundación Gaiker
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Ik4 Research Alliance
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Segula Technologies España, S.A.U.
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Teknorail - Grupo Eurofinsa
- ▶ TPF Getinsa Euroestudios, S.L
- ▶ Vicomtech

Technical Specifications Drafting and supervision of rolling stock manufacturing

- ▶ Albatros, S.A.U.
- ▶ Ardanuy Ingeniería, S.A.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Eurogestión

- ▶ Hispacold S.A.
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Polar
- ▶ Segula Technologies España, S.A.U.
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Teknorail - Grupo Eurofinsa
- ▶ Trigo Group

Work supervision

- ▶ Ardanuy Ingeniería, S.A.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Indra Sistemas, S.A.
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Inserail, S.L.
- ▶ Segula Technologies España, S.A.U.
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Sice Tecnología y Sistemas
- ▶ Tpf Getinsa Euroestudios, S.L
- ▶ Typsa - Técnica y Proyectos, S.A.

Product and process certifications

- ▶ Ardanuy Ingeniería, S.A.
- ▶ Cetest, S.L.
- ▶ Citef (Fundación para el fomento de la innovación industrial)
- ▶ Dsaf-Dinamicas De Seguridad, S.L.
- ▶ Eurogestión
- ▶ Fundación Gaiker
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Polar
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Trigo Group
- ▶ Teknorail Group

Drafting of operation and maintenance (O&M) plans and transport and demand studies

- ▶ Ardanuy Ingeniería, S.A.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Citef (Fundación para el fomento de la innovación industrial)
- ▶ Duro Felguera Rail, S.A.U.
- ▶ Eurogestión
- ▶ Gantrex Spain
- ▶ Idom-Engineering, Consulting, Artchitecture
- ▶ Ineco-Ingeniería y Economía del Transporte, S.A.
- ▶ Segula Technologies España, S.A.U.
- ▶ Teknorail Group
- ▶ Tpf Getinsa Euroestudios, S.L
- ▶ Typsa - Técnica y Proyectos, S.A.

Training and simulations tools

- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Ik4 Research Alliance
- ▶ Segula Technologies España, S.A.U.
- ▶ Lander

INFRASTRUCTURE AND SUPERSTRUCTURE

Civil works (platforms,stations, depots)

- ▶ Azvi S.A
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporacion
- ▶ Funor, S.A.
- ▶ Inserail, S.L.
- ▶ Luznor Desarrollos Electrónicos, S.L.
- ▶ Parrós Obras, S.L.
- ▶ Sener Ingeniería y Sistemas, S.A.

Electrification

- ▶ Alstom Transporte, S.A.
- ▶ Azvi S.A
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporacion
- ▶ Cunext
- ▶ Ingeteam Power Technology, S.A.
- ▶ Inserail, S.L.
- ▶ La Farga Yourcoppersolutions, S.A.
- ▶ Semi- Sociedad Española de Montajes Industriales, S.A.
- ▶ Telice, S.A.
- ▶ Tria Ingeniería, S.A.
- ▶ Valdepinto, S.L.

Infrastructure and superstructure equipment and components

- ▶ Alstom Transporte, S.A.
- ▶ Amurrio Ferrocarril y Equipos, S.A.
- ▶ Arcelormittal España, S.A.
- ▶ Artech (Electrotécnica Artech Smart Grid, S.L.)
- ▶ Azvi S.A.
- ▶ Cables de Comunicaciones Zaragoza, S.L.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporacion
- ▶ Cunext
- ▶ Dsaf-Dinamicas De Seguridad, S.L.
- ▶ Duro Felguera Rail S.A.U.
- ▶ Flexix, S.A.
- ▶ Funor, S.A.
- ▶ Hicasa-Hierros y Carbones, S.A.
- ▶ Ik4 Research Alliance
- ▶ Ikusi SLU
- ▶ Inserail, S.L.
- ▶ Jez Sistemas Ferroviarios, S.L.
- ▶ Ladicim
- ▶ Mb Sistemas, S.Coop.
- ▶ Next Generation Technologies
- ▶ Precon - Prefabricaciones y Contratas, S.A.U.
- ▶ Pretensados del Norte, S.L.
- ▶ Semi -Sociedad Española de Montajes Industriales, S.A.
- ▶ Talleres Alegría, S.A.
- ▶ Talleres Zitrón
- ▶ Tecnivial S.A
- ▶ Telice, S.A.

Track assembly

- ▶ Alstom Transporte, S.A.
- ▶ Amurrio Ferrocarril y Equipos, S.A.
- ▶ Azvi S.A.

- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporacion
- ▶ Gantrex Spain, S.A.
- ▶ Inserail, S.L.
- ▶ Pretensados del Norte, S.L.
- ▶ Talleres Alegría, S.A.
- ▶ Tria Ingeniería, S.A.

TRAFFIC CONTROL AND SIGNALLING SYSTEMS, COMMUNICATION, PASSENGER INFORMATION AND TICKETING

Traffic control and signalling (safety)

- ▶ Albatros, S.A.U.
- ▶ Alstom Transporte, S.A.
- ▶ Bombardier España
- ▶ Cables de Comunicaciones Zaragoza, S.L.
- ▶ Caf Signalling, S.L.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Ik4 Research Alliance
- ▶ Ikusi SLU
- ▶ Implaser 99, S.L.L.
- ▶ Indra Sistemas, S.A.
- ▶ Inserail, S.L.
- ▶ Jez Sistemas Ferroviarios, S.L.
- ▶ Luznor Desarrollos Electrónicos, S.L.
- ▶ Revenga Ingenieros S.A:
- ▶ Segula Technologies España, S.A.U.
- ▶ Semi- Sociedad Española de Montajes Industriales, S.A.
- ▶ Sice Tecnología y Sistemas
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Teknorail - Grupo Eurofinsa
- ▶ Tecnivial S.A
- ▶ Tectronic, S.A.
- ▶ Telice, S.A.
- ▶ Thales España Grp, S.A.U.

Protection (security) and infrastructure monitoring

- ▶ Albatros, S.A.U.
- ▶ Alstom Transporte, S.A.
- ▶ Azvi S.A
- ▶ Bombardier European Holdings, S.L.U.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporacion
- ▶ Dsaf-Dinamicas De Seguridad, S.L.
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Ik4 Research Alliance
- ▶ Indra Sistemas, S.A.
- ▶ Inserail, S.L.
- ▶ Segula Technologies España, S.A.U.
- ▶ Semi- Sociedad Española de Montajes Industriales, S.A.
- ▶ Siemens Rail Automation, S.A.U.

- ▶ Telice, S.A.
- ▶ Thales España Grp, S.A.U.
- ▶ Vicomtech

Systems and equipment for collection, ticketing and access control

- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Calmell, S.A.
- ▶ Comsa Corporacion
- ▶ Ecocomputer S.L.
- ▶ Gmv Sistemas, S.A.U.
- ▶ Ikusi SLU
- ▶ Indra Sistemas, S.A.
- ▶ Inserail, S.L.
- ▶ Revenga Ingenieros S.A:
- ▶ Semi- Sociedad Española de Montajes Industriales, S.A.
- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Sice Tecnología y Sistemas
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Telice, S.A.
- ▶ Vicomtech

Communications

- ▶ Albatros, S.A.U.
- ▶ Azvi S.A.
- ▶ Cables de Comunicaciones Zaragoza, S.L.
- ▶ Caf Turnkey & Engineering, S.L.
- ▶ Comsa Corporación
- ▶ Eurogestión
- ▶ Gmv Sistemas, S.A.U.
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Ik4 Research Alliance
- ▶ Ikusi SLU
- ▶ Indra Sistemas, S.A.
- ▶ Inserail, S.L.
- ▶ Revenga Ingenieros S.A:
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- ▶ Sener Ingeniería y Sistemas, S.A.
- ▶ Sice Tecnología y Sistemas
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Tectronic, S.A.U.
- ▶ Telice, S.A.
- ▶ Thales España Grp, S.A.U.
- ▶ Vicomtech

Passenger information and on-board entertainment systems

- ▶ Albatros, S.A.U.
- ▶ Alstom Transporte, S.A.
- ▶ Bombardier España
- ▶ Turnkey & Engineering, S.L.
- ▶ Gmv Sistemas, S.A.U.
- ▶ Grupo Eurogestión Ingeniería de Telecomunicaciones, S.L.
- ▶ Icon Multimedia, S.L.
- ▶ Indra Sistemas, S.A.
- ▶ Inserail, S.L.

- ▶ Revenga Ingenieros S.A.
- ▶ Sice Tecnología y Sistemas, S.A.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Tecnivial S.A.
- ▶ Telice, S.A.
- ▶ Vicomtech

ROLLING STOCK MANUFACTURERS

High Speed trains (over than 250km/H)

- ▶ Alstom Transporte, S.A.
- ▶ Bombardier España
- ▶ Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- ▶ Patentes Talgo, S.L.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Zeleros

Long distance and regional passengers trains (up to 250km/H)

- ▶ Alstom Transporte, S.A.
- ▶ Bombardier European Holdings, S.L.U.
- ▶ Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- ▶ Patentes Talgo, S.L.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Stadler Rail Valencia, S.A.U.

Urban and suburban trains

- ▶ Alstom Transporte, S.A.
- ▶ Bombardier European Holdings, S.L.U.
- ▶ Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- ▶ Patentes Talgo, S.L.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Stadler Rail Valencia S.A.U.

Freight wagons and Locomotives

- ▶ Alstom Transporte, S.A.
- ▶ Bombardier España
- ▶ Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- ▶ Patentes Talgo, S.L.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Stadler Rail Valencia, S.A.U.
- ▶ Talleres Alegría, S.A.
- ▶ Zeleros

Vehicles for infrastructure maintenance

- ▶ Alstom Transporte, S.A.
- ▶ Bombardier España
- ▶ Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- ▶ Patentes Talgo, S.L.
- ▶ Siemens Rail Automation, S.A.U.
- ▶ Talleres Alegría, S.A.

MANUFACTURERS OF VEHICLE COMPONENTS, AUXILIARY EQUIPMENT AND SYSTEMS

Traction and propulsion components

- ▶ Alstom Transporte, S.A.
- ▶ Artech (Electrotécnica Artech Smart Grid, S.L.)
- ▶ Bombardier España
- ▶ Caf Power & Automation, S.L.U.
- ▶ Flexix, S.A.



# GUÍA DE SOCIOS

- Ik4 Research Alliance
- Ingeteam Power Technology, S.A.
- Mgn Transformaciones del Caucho, S.A.
- Siemens Rail Automation, S.A.U.
- Zeleros

## Control, auxiliary and diagnostic systems

- Albatros, S.A.U.
- Alstom Transporte, S.A.
- Artech (Electrotécnica Artech Smart Grid, S.L.)
- Bombardier España
- Caf Power & Automation, S.L.U.
- Gmv Sistemas, S.A.U.
- Hispacold S.A.
- Ik4 Research Alliance
- Indra Sistemas, S.A.
- Ingeteam Power Technology, S.A.
- Kimua Group
- Nem Solutions
- Sigma Rail
- Stadler Rail Valencia, S.A.U.
- Zeleros

## Assembly equipment

- Artech (Electrotécnica Artech Smart Grid, S.L.)
- Danobat, S. COOP.
- Funor, S.A.

## Mechanical components

- Alstom Transporte, S.A.
- Bombardier España
- Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- Flexix, S.A.
- Funor, S.A.
- Gamarra, S.A.
- Hispacold S.A.
- Ik4 Research Alliance
- Metalocauchos, S.L.
- Mgn Transformaciones del Caucho, S.A.
- Polar
- Stadler Rail Valencia, S.A.U.
- Talleres Alegría, S.A.
- Zeleros

## Interiors

- Bombardier España
- Colway Ferroviaria, S.L. (Nexus Management)
- Flexix, S.A.
- Fundación Gaiker
- Polar
- Satys Interiors Railway Spain, S.A.

## Safety

- Albatros, S.A.U.
- Alstom Transporte, S.A.
- Artech (Electrotécnica Artech Smart Grid, S.L.)

- Bombardier España
- Dsaf - Dinamicas de Seguridad, S.L.
- Fundación Gaiker
- Indra Sistemas, S.A.
- Luznor Desarrollos Electrónicos, S.L.
- Sigma Rail

## MAINTENANCE: EQUIPMENT, MAINTENANCE SERVICES AND REFURBISHMENT

### Infrastructure and superstructure maintenance

- Alstom Transporte, S.A.
- Amurrio Ferrocarril y Equipos, S.A.
- Azvi S.A.
- Caf Turnkey & Engineering, S.L.
- Comsa Corporacion
- Duro Felguera Rail, S.A.U.
- Gantrex Spain
- Inserail, S.L.
- Ladicim
- Semi- Sociedad Española de Montajes Industriales, S.A.
- Sigma Rail
- Tria Ingeniería, S.A.

### Rolling Stock maintenance

- Alstom Transporte, S.A.
- Artech (Electrotécnica Artech Smart Grid, S.L.)
- Azvi S.A.
- Bombardier España
- Caf - Construcciones y Auxiliar de Ferrocarriles, S.A.
- Caf Turnkey & Engineering, S.L.
- Comsa Corporacion
- Goratu Lathes
- Grupo Trigo
- Hispacold S.A.
- Nem Solutions
- Next Generation Technologies
- Patentes Talgo, S.L.
- Siemens Rail Automation, S.A.U.
- Stadler Rail Valencia, S.A.U.
- Talleres Alegría, S.A.
- Talleres Zitón

### Maintenance of traffic control and signalling, communications, passenger information and ticketing systems

- Albatros, S.A.U.
- Alstom Transporte, S.A.
- Artech (Electrotécnica Artech Smart Grid, S.L.)
- Azvi S.A.
- Bombardier España
- Caf Signalling, S.L.

- Caf Turnkey & Engineering, S.L.
- Dsaf-Dinamicas de Seguridad, S.L.
- Gmv Sistemas, S.A.U.
- Ikusi SLU
- Indra Sistemas, S.A.
- Inserail, S.L.
- Jez Sistemas Ferroviarios, S.L.
- Luznor Desarrollos Electrónicos, S.L.
- Next Generation Technologies
- Patentes Talgo, S.L.
- Semi- Sociedad Española de Montajes Industriales, S.A.
- Sice Tecnología y Sistemas, S.A.
- Siemens Rail Automation, S.A.U.
- Sigma Rail
- Telice S.A.

### Maintenance of systems, equipment and vehicles components

- Albatros, S.A.U.
- Alstom Transporte, S.A.
- Artech (Electrotécnica Artech Smart Grid, S.L.)
- Bombardier España
- Caf-Construcciones y Auxiliar de Ferrocarriles, S.A.
- Caf Power & Automation, S.L.U.
- Caf Turnkey & Engineering, S.L.
- Gmv Sistemas, S.A.U.
- Goratu Lathes
- Grupo Trigo
- Hispacold S.A.
- Indra Sistemas, S.A.
- Ingeteam Power Technology, S.A.
- Kimua Group
- Mgn Transformaciones del Caucho, S.A.
- Nem Solutions
- Patentes Talgo, S.L.
- Satys Interiors Railway Spain SA
- Sice Tecnología y Sistemas
- Stadler Rail Valencia, S.A.U.

### Supply of maintenance equipment

- Albatros, S.A.U.
- Alstom Transporte, S.A.
- Aquafrisch, S.L.
- Bombardier España
- Danobat, S. COOP.
- Kimua Group
- Nem Solutions
- Newtek Solidos S.L.
- Next Generation Technologies
- Patentes Talgo, S.L.
- Polar
- Tecnival S.A.
- Sigma Rail



## ALBATROS, S.L.U.

Technology company specialized in the design and manufacture equipment for trains, metros and trams. Divisions: Power Electronics (static power converters and battery chargers) and On-Board Systems (PACIS, control systems and other embedded systems). Leader in providing auxiliary components for trains and is among the leading world companies in such competitive markets like Europe, USA and Latin America. Headquarters located in Spain and factories in USA and Brazil. SEPSA products stand for high quality, high reliability and a long design life. The QM system is certified in accordance with IRIS, ISO 9001, CMMI3 and its eco-management system in accordance with ISO 14001.

- Albatros, 7 Pol.Ind. Pinto Estación 28320 Pinto (MADRID)
- +34 91 495 70 00
- sepsacomercial@sepsa.es
- www.sepsa.es



## AQUAFRISCH, S.L.

Aquafrisch is a family business founded in 1996 that started as a company manufacturing and distributing water treatment and purification equipment. Shortly after, she entered the field of maintenance of railway depots and began to manufacture washing machines for trains and various equipment for rail and metro. Twenty years later, Aquafrisch is consolidated as a manufacturer of machinery for railway depots and water treatment, industrial and potabilization equipment. During these years, Aquafrisch spread throughout the national territory and is also very present in international markets.

- Ignacio Zuloaga, 10 28522 Rivas Vaciamadrid (MADRID)
- +34 91 380 03 33
- jmartin@aquafirsch.com
- www.aquafirsch.com



## ALSTOM ESPAÑA

As a promoter of sustainable mobility, Alstom offers a complete range of solutions (from high-speed trains to metros, tramways and e-buses), passenger solutions, customized services (maintenance, modernization), infrastructure, signalling and digital mobility solutions. The company recorded sales of €7,3 billion in the 2017/18 fiscal year. Alstom is present in over 60 countries and employs 34,500 people. In Spain Alstom employs around 2,000 people on 18 sites, including a rolling stock manufacturing site and 4 innovation centres where it runs R&D programmes for rolling stock and railway signalling, safety, security, digital mobility and services.

- Martinez Villergas, 49 - Edificio V - 28027 (MADRID)
- +34 91 334 58 00
- +34 91 334 58 01
- www.alstom.com



## AMURRIO FERROCARRIL Y EQUIPOS, S.A.

Design, production, installation of turnouts, track devices, crossings. For all type of purpose. Metro, tram, regional, conventional, high speed, heavy haul, ports and industrial.

- Maskuribai, 10 01470 Amurrio (ÁLAVA)
- +34 945 891 600
- +34 945 892 480
- comercial@amufer.es
- www.amufer.es



## ARCELORMITTAL

ArcelorMittal, as the steel industry leader in product and process innovation, is fully geared to meet the future requirements of the rail industry. With rail production facilities in Spain, Poland, Luxembourg and USA offers a wide portfolio of rails for subways, trains, trams, light rails, crane rails, crossings and rail accessories. We area specialist in rail for high-speed net, with over 1 million tons produced, and presence in infrastructure of over 30 countries, the high technologic quality allows participating in the more demanding tenders all over the world. ArcelorMittal has its own R&D Rail Excellence Centre for developing new products and processes.

- ArcelorMittal Asturias. Edif. de Energías, 2 pl. 33691 Gijón (ASTURIAS)
- +34 985 187 750
- rails.specialsections@arcelormittal.com
- https://rails.arcelormittal.com/



## ARDANUY INGENIERÍA, S.A.

Ardanuy Ingeniería, S.A. is an engineering consulting firm specialized in studies, projects, works management, safety engineering (ISA), operation / maintenance studies; and technical guidance for railways (high-speed, conventional, freights, metros, trams, cable cars), electrical engineering (sub-stations and high-voltage lines), roads (highways, freeways, BRT's, streets, etc.), buildings (architecture and facilities) and telecommunications. The company was established in 1992 and is comprised of a permanent team of more than 200 professionals. Ardanuy Ingeniería develops activities worldwide, in more than 60 countries in all 5 continents.

- Avda. Europa, 34 28023 (MADRID)
- +34 91 799 45 00
- +34 91 799 45 01
- madrid@ardanuy.com
- www.ardanuy.com





### ARTECHE

The Arteche Group is focused on offering equipment and solutions for the electricity and railway business worldwide. The expertise of more than 70 years manufacturing instrument transformers and electromechanical relays gives the client the assurance of a technological leader. With projects over more than 40 countries, our dedicated range of railway relays are designed to meet the highest standard requirements of the sector and its reliability and durability allow them to be used not only as general purpose relays, but also in all kind of safety functions, both for on-board and signalling applications making them suitable to be used in circuits requiring up to SIL-4 safety integrity level.

Derio Bidea, 28 48100 Mungia (VIZCAYA)  
+34 946 011 200  
+34 946 155 628  
marketing@artech.com  
www.artech.com



### ASOCIACIÓN IK4 RESEARCH ALLIANCE

IK4 is a private and independent alliance of R&D centres, a benchmark in the European R&D context. It comprises 6 organisations in the Basque Country: AZTERLAN, CEIT, IDEKO, IKERLAN, LORTEK and TEKNIKER.

The IK4 Research Alliance sets out to generate, capture and transfer scientific and technological knowledge in order to contribute towards improving the competitiveness of companies and the progress of society.

Polígono Azitain 3k, 2G 20600 Eibar (GUIPÚZCOA)  
+34 943 820 350  
jmerdozain@ik4.es  
www.ik4.es



### AZVI

Azvi is the company which undertakes construction within Grupo Azvi. For over 100 years, Azvi has carried out a significant number of large scale civil engineering and building projects. Azvi has extended its activity to all construction areas in Europe, America and the Middle East, without losing sight of its origins and railway background. By applying principles of responsibility to the whole business sphere, seeking the creation of value, maintaining a strong commitment to all its stakeholders in all countries where it is present and investing in R&D Azvi continues constructing a company capable of facing the new challenges of an increasingly globalised market.

Almendralejo, 5. 41019 (SEVILLA) / Maudes, 51, 2º. 28003 (MADRID)  
+34 954 999 320 / +34 91 553 28 00  
+34 926 88 47 06  
azvicentro@azvi.es  
www.azvi.es



### CAF POWER & AUTOMATION

CAF Power & Automation designs and develops electric traction systems, energy storage systems and control & communication, which guarantee adaptable reliable and committed solutions with transport. Our systems are modular and flexible and can be integrated both in new vehicles and in those in service or that need refurbishment. Traction systems; Energy Storage (GREENTECH) and Control & Communication (COSMOS). Railway systems modernisation and refurbishment: Equipment and components, system integration, installation, maintenance and guarantee. Railway system maintenance: Technical support, spare parts, training courses, test benches.

Mikeletegi, 58 - 2, Parque Tecnológico de San Sebastián (GUIPÚZCOA)  
+34 943 309 251  
info@cafpower.com  
www.cafpower.com



### CAF SIGNALLING, S.L

CAF Signalling, the technological subsidiary of the CAF Group, designs and provides Integral Signalling Solutions, both in Spain and abroad. The company has its own advanced technology products, both for onboard and wayside applications that make up the core of its integral solutions. As a result of a significant and growing effort in R&D&I, particularly in the area of critical safety systems, CAF Signalling promotes continuous innovation and customer focus. CAF Signalling, boasts the Company's own in house engineering and expertise to take on "turn-key" railway signalling projects.

Avda. de la Industria, 51 28108 Alcobendas (MADRID)  
+34 91 789 27 50  
+34 91 661 37 51  
cafsignalling@cafsignalling.com  
www.cafsignalling.com



### CAF TURNEY & ENGINEERING

CAF Turnkey & Engineering was created in 2007 with its head office in the Technological and Scientific Park of Biscay (Zamudio). It began its business in Integrated Engineering of Transport Services and in 2015, after merging with the company CMFS (Mexico), it increased its portfolio of services with the inclusion of EPC projects for both civil works and subsystems. Following solid and constant growth, the company currently has a workforce of 200 with offices in Zamudio, Madrid and Mexico, providing service to both companies within the CAF Group and national and international private and public customers.

Parque Científico y Tecnológico de Bizkaia, Laida Bidea, Ed. 205. 48170 Zamudio (VIZCAYA)  
+34 946 819 550  
+34 94 623 29 29  
comercial@cafte.com  
www.cafte.com

## BOMBARDIER

### BOMBARDIER TRANSPORTATION

Bombardier is today a key company of the Spanish railway industry, with around 1,000 employees between direct and indirect job positions, in its offices, workshops and factories located in Trápaga (Centre of excellence in propulsion equipment), San Sebastián de los Reyes (Centre of excellence in signaling systems), Alcobendas and Pinto (fleet maintenance). The company's activity ranges from the design, manufacture and sale of railway vehicles, propulsion and traction control systems (diesel and electric) and signaling systems, to the delivery of railway maintenance services for fleets, repair and modernization of railway material.

Miniparc 3 – Edificio K C/Caléndula, 93 28109 Alcobendas (MADRID)  
+34 91 658 55 00  
+34 91 650 75 18  
javier.hinojal@rail.bombardier.com  
www.bombardier.com/en/worldwide-presence/country.spain.html



### CABLES DE COMUNICACIONES ZARAGOZA, S.L.

Cables de Comunicaciones is one of the main European companies dedicated to the design, manufacturing and commercialisation of telecommunication, signalling and optic fibre cables. Ever since its foundation in 1971, it has contributed to the development and extent of the telecommunications infrastructures. Railway companies from the main European countries entrust us with the manufacture of their cables. Among them, they stand out: ADIF, SNCF, NetworkRail, Infrabel etc. Cablescom undertakes its activity in Zaragoza, in the Malpica industrial park, over a surface of 77,000 m2, which includes a production plant, offices and warehouses.

Polígono de Malpica, C/D, 83 50016 (ZARAGOZA)  
+34 976 729 900  
j.alzorric@cablescom.com  
www.cablescom.com



### CAF - CONSTRUCCIONES Y AUXILIAR DE FERROCARRILES, S.A.

CAF is one of the world leaders in the design and implementation of comprehensive transit systems. CAF provides comprehensive project and engineering management throughout all stages of the project including feasibility analysis and investigations, system design, civil work, signalling, electrification and other electromechanical systems, rolling stock supply and system operation and maintenance. In terms of rolling stock, CAF supplies and maintains high speed trains, regional and commuter trains, locomotives, metro units, trams and buses.

J.M. Iturrioz, 26 20200 Beasain (GUIPÚZCOA)  
+34 943 880 100  
+34 943 881 420  
caf@caf.net  
www.caf.net



### CALMELL, S.A.

The Calmell Group is the leader in access control and identification, through its companies Calmell S.A., Affix S.L., Idoneum S.A., which are respectively engaged in producing the supports (tickets, cards...), developing specific software and hardware, personalization and security. In the public transport sector it works for integrators and operators supplying any kind of support for ticketing and reader/writer systems. With a strong international presence through its network of representatives and distributors, the Calmell Group is able to satisfy your needs on a global level.

Pol. Ind. Pla d'en Coll C/ Fresser, 12 C 08110 Montcada i Reixac (BARCELONA)  
+34 93 564 14 00  
dsala@calmell.net  
www.calmell.net



### CETEST, S.L. Centro de Ensayos y Análisis

Fully accredited ISO17025, CETEST is an experienced laboratory in railway vehicles and components testing. Its offering covers a wide variety of component test benches at their facilities as well as portable ones. CETEST provides a global on-track measurement deployment capacity. From validation and verification test in the development phase to product homologation and failure detection / root cause analysis in the after-sales operation, CETEST can assist you during the full lifecycle of your product. Their customers include passenger, freight and special track maintenance vehicle manufacturers, component suppliers, as well as Notified Bodies, engineering firms and authorities.

Lazkaibar, s/n Edif. CETEST 20200 Beasain (GUIPÚZCOA)  
+34 943 028 690  
emartinez@cetestgroup.com  
www.cetestgroup.com



### CITEF

CITEF (Railway Technology Research Centre) was created in 1997 as part of F212 (the Foundation for the Development of Industrial Innovation) for research, innovation, experimentation, study and teaching purposes within the railway knowledge area. It is a non-profit organisation pursuing aims of general interest within any rail transport technology sector.

José Gutierrez Abascal, 2, 28006 (MADRID)  
+34 91 336 32 12  
citef@etsii.upm.es  
www.citef.es





### COLWAY FERROVIARIA, S.L.

COLWAY FERROVIARIA S.L., a company belonging to the COLWAY Group, is specialized in the design, engineering, manufacture, installation and commissioning of turnkey railway interiors and toilet modules projects. Revamping of seats and floors for a significant improvement of the coaches, with a controlled investment, is included among its capabilities. Through the integrated management of modular supplies & systems, based on experience, research and innovation, satisfaction and expectations of railway constructors and Public Administrations are achieved. Its work is based on the application of strong values: commitment, professionalism, ethics and agility.

🚩 Botánica, 149-151, 08908, Hospitalet de Llobregat (BARCELONA)  
 ☎ +34 93 414 65 12  
 ☎ +34 93 639 86 10  
 ✉ jlperalta@colway-08.com  
 🌐 http://colway-08.com/site/es



### COMSA

COMSA is the company of COMSA Corporación specialised in railway infrastructures. Founded in 1891, the company provides a comprehensive service in the field of construction, maintenance, electrification and control and communication systems for high-speed and conventional lines, metros and tramways. In this business activity, it is leader in Spain, where has been involved in the carrying out of all high-speed lines, and has permanent operations in Argentina, Brazil, Croatia, Denmark, Mexico, Poland, Portugal and Uruguay. It has also taken part in a large number of projects in other markets such as Italy, the Philippines, Taiwan, Malaysia, India, etc.

🚩 Julián Camarillo, 6A 2ª planta 28037 (MADRID)  
 ☎ +34 91 353 21 20  
 ☎ +34 91 350 49 54  
 ✉ jalvarez@comsa.com  
 🌐 www.comsa.com



### CUNEXT COPPER INDUSTRIES

Cunext in the way to continuous development has created the entire cable product range for overhead line electrification adapting at any speed from local transport to high speed line. Our modern technology together with a wide experience at cable and alloy manufacturing makes us the best partner for railway companies offering best product quality and service. Cunext Group locate production plants at strategic places such as Cordoba for copper products, Vitoria and Brescia for aluminium products.

🚩 Av. de la Fábrica, s/n 14005 (CÓRDOBA)  
 ☎ +34 957 499 300  
 ✉ josep\_anfruns@cunext.com  
 🌐 www.cunext.com



### EUROGESTIÓN

Consulting company focused on the transport market and renewable energies. With a high degree of specialisation in the railway sector, they develop tailor-made applications that allow the automation of data processing to build an information system that provides value to its customers. They also have a set of computer support tools that help them carry out their management.

🚩 Valle del Roncal, 12 28232 Las Rozas de Madrid (MADRID)  
 ☎ +34 91 639 84 7  
 ✉ jmmartinez@eurogestion.eu  
 🌐 www.eurogestion.eu



### FLEXIX, S.A.

FLEXIX, develops, manufactures worldwide since 1950 INJECTION and EXTRUSION RUBBER PARTS, rubber-metal, rubber-plastic, special elastomers and assemblies. We are part of the KÄCHELE-FLEXIX Group, with 2 plants in Germany, 1 in Spain and a warehouse in USA. For the RAILWAY SECTOR we produce mainly for infrastructures, absorption of vibrations under track, tie pads for sleepers, different range of stiffness (14-152 kN/mm). We provide development in geometries (FEM), materials, (conductivity, non-harmful gases...). TYPE OF PARTS: Pads, Ducts, bellows, tubes, silent-blocks, joints, bumpers, axles, links, valves, bearings. MIXTURES: NR, SBR, EPDM, CR, H/NBR, ECO, AEM, ACM, Silicone, FPM.

🚩 Pol. Ind. Pinoa 1-D 48170 Arteaga-San Martín Zamudio (VIZCAYA)  
 ☎ +34 944 977 180  
 ☎ +34 944 977 190  
 ✉ flexix@flexix.com  
 🌐 www.flexix.com



### FOREST TRAFIC S.L.

Manufacturer of panels for floors / ceilings / doors / sectorial / furniture. We assist our customers throughout each project: from the material consultancy to the development of the pre-equipped kits and its delivery in JIS process all over the world. We develop panels with different cores: fire proof plywood (HL3 for UNE EN 45545), composites, technical foams, honeycombs, cork-rubber compounds, etc. We can as well increase the physio-mechanical features with aluminum, inox, HPL or polyester coatings. We guarantee ALL of our panels against delamination using individual ultrasonic testings in the whole area of the panel.

🚩 P.E. Boroa. Parcela 2B-9 48340. Amorebieta (VIZCAYA)  
 ☎ +34 94 475 74 02  
 ☎ +34 94 475 74 03  
 ✉ ffiglesias@forest-traffic.com  
 🌐 www.forest-traffic.com



### DANOBAT S.COOP.

Specialised Machine Tools and production systems for railway industry offering technologically advanced solutions and services, including among others engineering, consultancy, which are fully adapted to clients' needs. DANOBAT focuses its activity in the supply of turnkey solutions for the manufacturing and maintenance of railways rolling stock, incorporating own leading technology products, together with those manufactured by specialised companies.

🚩 Arriaga Kalea, 21 20870 Elgoibar (GUIPÚZCOA)  
 ☎ +34 943 748 044  
 ☎ +34 943 743 138  
 ✉ danobat@danobat.com  
 🌐 www.railways.danobatgroup.com



### DINÁMICAS DE SEGURIDAD, S.L.

DSAF is a entrepreneurial society focused on the safety of the movement of people at risk. Committed to the new technologies applied to the design of signaling systems, prevention and emergency in safety, DSAF promotes the development of products that guarantee the highest grade of security according to the standards of type approval current in generalized risk societies such as global ones. The activity of DSAF focuses on these two major sectors: road / rail tunnels and wind towers.

🚩 San Blas, 13 Pol. Ind. Goiaín 01170 Legutiano (ÁLAVA)  
 ☎ +34 945 466 314  
 ☎ +34 945 466 314  
 ✉ info@dsaf.es  
 🌐 www.dsaf.es



### DURO FELGUERA RAIL, S.A.

DF Rail is a company specialized in the design and manufacture of turnout systems for metro, conventional, heavy haul and even high speed lines up to 350 kph.. DF Rail has its own designs and patents thanks to an intense effort in research and development, and its technologically advanced facilities, with more than 56,000 m² for the design, manufacturing and assembling of turnout systems as well as machining and flash-butt welding of Mn steel crossings, machining of switches and stock rails. Besides, it designs and manufactures locking systems, fastening systems, wear devices, insulated glued joints and transition rails. Our products are installed in more than 21 countries.

🚩 Pol. Ind. Fábrica de Mieres 33600 Mieres (ASTURIAS)  
 ☎ +34 985 456 331  
 ☎ +34 985 456 164  
 ✉ dfrail@dfrail.com  
 🌐 www.dfrail.com



### FUNORSA

Funorsa is a Steel casting foundry with more than 20 years in the railway sector. We are specialized in pieces of high responsibility as couplers, Pivots, connection rods and different parts of the bogies. We are able to cast low alloy, alloy and inox castings up to 1.300 kg with a capacity of 2.000 Tons per year.

🚩 Condado de Treviño, 41 Pol. Villalonguejar, 09001 (BURGOS)  
 ☎ +34 650 665 302  
 ✉ comercial@funorsa.es  
 🌐 www.funorsa.es



### GAIKER CENTRO TECNOLÓGICOS

GAIKER Technology Centre, located in the Technological Park of Bizkaia, is devoted to the development of new technologies to be transferred to the industry. Since 1985, the Centre has carried more than 2,000 R&D Projects in the areas of Plastics and Composites, Environment and Recycling and Biotechnology. Besides, GAIKER offers to its customers Advanced Technological Services, Analysis and Tests and Technological Dissemination Services. GAIKER counts on 87 employees and was awarded in 2008 by the European Foundation for Quality Management (EFQM) with the "Prize Winner" for the best European organisation in "Management for Process and Facts".

🚩 Parq. Tecnológico Edif., 202 48170 Zamudio (VIZCAYA)  
 ☎ +34 946 002 323  
 ☎ +34 946 002 324  
 ✉ alonso@gaiker.es  
 🌐 www.gaiker.es



### GAMARRA, S.A.

GAMARRA S.A. is one of the foremost producers of Low Alloy Carbon Steel Castings in Europe. We produce Steel castings for most Railway Carriage and Locomotive Manufacturers throughout Europe and beyond. We also produce a wide range of castings for Commercial Vehicles, Off-Road Construction Machinery, Public Works, Ministry of Defence, Lifting and Farming Machinery and General Industrial requirements. Our products can be supplied in rough cast, machined or assembled with other accessories. We produce more than 7,000 tonnes of castings per year in the range of 10 kg to 300 kg and dimensions up to 1,100 x 1,100 mm.

🚩 Portal de Vergara, 6 01013 Vitoria-Gasteiz (ÁLAVA)  
 ☎ +34 945 251 677  
 ☎ +34 945 274 948  
 ✉ comercial@gamarras.es  
 🌐 www.gamarras.es





### GANTREX SPAIN, S.A.

Gantrex is the global market leader in production, distribution installation and maintenance of high quality crane rail solutions. Gantrex products are used in many different applications and end-markets including ports, shipyards, steel mills, aluminium smelters, railway depots and heavy industries.

Pol. Ind. Izarza, 4N 48150 Sondika (VIZCAYA)  
+34 944 535 084  
info.bilbao@gantrex.com  
www.gantrex.com



### GEMINIS LATHES, S.A.

Leaders in the development of horizontal and multiprocess lathes, and specialized in railway sector, where we are proud to support the manufacturers of trains and maintenance lines, among other agents in the value chain. We offer customized solutions with highly reliable machines for the maintenance of rolling stock. Our lathes are specialized in the machining of axles, axle-wheel set and wheels.

Lerun, 1 - 20870 Elgoibar - GUIPÚZCOA  
+34 943 748 060  
+34 943 744 182  
sales@geminislathes.com  
geminislathes.com



### GLOBAL QUALITY ENGINEERING SER. UNA COMPAÑÍA DE TRIGO GROUP

TRIGO Spain is a supplier of quality services and support in the supply chain in industrial sectors. Founded in 2001, it offers quality assurance services in products, maintenance, industrial means management and metrology with more than 600 quality professionals in Spain. TRIGO GROUP is present in 25 countries with a team of more than 10,000 professionals. TRIGO Spain exports to the railway sector good practices of high added value developed in sectors such as aerospace and automotive.

Papiro, 8-9 Parq. Ind. La Negrilla 41016 (SEVILLA)  
+34 954 526 195  
antonio.peco@trigo-group.com  
www.trigo-group.com



### IDOM CONSULTING, ENGINEERING AND ARCHITECTURE S.A.U

IDOM is one of the leading companies in the field of professional services in Engineering, Architecture and Consultancy. An independent company established in 1957 and it has participated in over 30,000 projects in five continents. In 25 countries with 42 offices. More than 3,500 staff possesses the expertise and experience to cover all the phases of a railway project (high speed, conventional, freight, metro, light rail, tramway, depot and workshops). From conception to commissioning and beyond and facing the challenges of an innovative, efficient and resilience Transport System. IDOM accompany the client by providing the correct technical assistance required for the decision making process.

Zarandoa, 23 48015 Bilbao (VIZCAYA)  
+34 944 797 600  
+34 944 761 804  
cortega@idom.com  
www.idom.com



### IKUSI, S.L.

At Ikusi, we provide complex turnkey integration project design, engineering and development services both for rolling stock and for infrastructure, with the agility and flexibility required by the rail industry. We are oriented towards improving our clients' competitiveness and innovation capacities, thanks to our deep business knowledge developed during these years. Our business focus is the design and supply of innovative technological solutions to help vehicle builders, transport operators and authorities optimize and transform their business while guaranteeing quality of service and enhancing passenger experience in terms of security, information, comfort and accessibility.

Paseo Miramón, 170 20014 San Sebastián (GUIPÚZCOA)  
+34 943 448 800  
+34 943 448 816  
prevencia.comercial@ikusi.com  
www.ikusi.com



### IMPLASER 99 SLL

IMPLASER is a Spanish manufacturer of security signaling products specialized in railway projects. Innovation and quality are our greatest exponents; our design, manufacturing and service procedures have been certified according to ISO 9001:2000 since 2001. Furthermore, we are the first SME being certified in R+D+i in Spain. Our wide range of products is certified by AENOR with photoluminescent values of 150, 300, 580 and 720 mcd/sqm. We are also specialized in the manufacturing of security, informative and accessibility decals for installation inside and outside the railway coaches.

Pol. Ind. Borao Nave 5 50172 Alfajarín (ZARAGOZA)  
+34 976 455 088  
+34 976 455 088  
chuerta@implaser.com  
www.implaser.com



### GMV SISTEMAS S.A.U.

GMV is a leading firm in the design, development, implementation and rollout of Intelligent Transportation Systems (ITS) guaranteeing compliance with the railway sector standards. Main products and services: On board units for location and communications, Fleet Management Systems, Fare Collection Systems, Passenger information systems, CCTV systems, PA & Intercom system, Systems for security reinforcement, Eco-driving systems, Software for planning and scheduling of services. Conceived for all railway modes (tram, metro, commuter train, long distance, high speed trains...)

Juan de Herrera, 17 PTB 47151 Boecillo (VALLADOLID)  
+34 983 546 554  
+34 983 546 553  
jagg@gmv.com  
www.gmv.com



### HIERROS Y CARBONES, S.A.

Since 1997 Hicasa is specialised in transformation, tailored cut, storage and distribution of railway tracks materials, all kinds of rails and railways accessories with a permanent stock of more than 3,500 MT. In 2006 we have incorporated to our Group of companies a factory specialised in manufacturing light rails from 7 kg/m to 48 kg/m, manufacture according European and American Standard, Australian or South African together with other types of Standard (AREMA). Our own experience allows us the optimal management of the supply chain, exporting to more than 30 countries all over the world.

Pol. de Asipo Parcelna, 48 33428 Cayes Llanera (ASTURIAS)  
34 985 260 473  
+34 985 260 905  
paco@hicasa.com  
www.hicasa.com



### ICON MULTIMEDIA, S.L.

With over 25 years of experience, we have a extensive experience in the Digital Signage sector. Our DENEVA Digital Signage platform is specially designed for high availability environments such as Smart Cities or as a powerful and comprehensive marketing tool for 'Smart Stations', guaranteeing a reliable and safe travelers and users experience.

Av. Santiago Amón, 3. bajo. 34005. (PALENCIA)  
+34 979 702 906  
+34 979 702 021  
comercial@iconmm.com  
www.iconmm.com



### INDRA

Indra is one of the leading global technology and consulting companies and the technological partner for core business operations of its customers world-wide. It is a world-leader in providing proprietary solutions in specific segments in Transport and Defense markets, and a leading firm in Digital Transformation Consultancy and Information Technologies in Spain and Latin America through its affiliate Minsait. Its business model is based on a comprehensive range of proprietary products, with a high-value focus and with a high innovation component. In the 2018 financial year, Indra achieved revenue of €3.104 billion, with 43,000 employees, a local presence in 46 countries and business operations in over 140 countries.

Avda. de Bruselas, 35 28108 Alcobendas (MADRID)  
+34 91 480 50 00  
+34 91 480 50 80  
enavarro@indra.es  
www.indracompany.com



### INECO

Global leader in transport engineering and consultancy, it has contributed to the development of transport infrastructures for over 50 years in more than 50 countries. Its high level technical specialisation allows its activity to diversify into new markets and reinforce its presence in those where it is already established. Its participation in the whole railway system in Spain has led the company to develop important international projects like the Makkah-Madinah high speed in Saudi Arabia, the HS2 project in the United Kingdom or the deployment of ERTMS in Europe.

Paseo de la Habana, 138 - 28036 (MADRID)  
+34 91 452 12 00  
internacional@ineco.com  
www.ineco.com



### INGENIERIA Y TECNICAS DEL TRANSPORTE TRIA, S.A.

In 2005 Tria Group was set and has been closely linked to railway infrastructure sector being from then on the most profitable division within the group. Tria has an extensive technological know-how that allows us to cover a wide range of activities in the sector and has a highly experienced and qualified team of professionals in every department: track superstructure, catenary, substations, facilities, consultancy and R&D. In 2010 Tria started his way to internationalization setting branches around Europe, South America and Australia without stopping using innovation as a key to success.

Calle de la Romería, 6 28600 Navalcarnero (MADRID)  
+34 91 140 78 17  
amantecon@triaingenieria.com  
www.triaingenieria.com



## Ingeteam

### INGETEAM POWER TECHNOLOGY, S.A.

Ingeteam is an international group specializing in power and control electronics (inverters, frequency converters, controllers and protections) and electrical engineering and automation projects. The company operates in 22 countries, with 3,900 employees. R&D is at the backbone of its business activities.

In railways, the traction converters INGETRAC are based on an smart integration of proved Modules, comprising all necessary elements to be fully operational, on each required application.

Pol. Parque Tecnológico, 110 48170 Zamudio (VIZCAYA)  
+34 944 039 600  
+34 944 039 837  
traction@ingeteam.com  
www.ingeteam.com



### INSE RAIL S.L.

Inse Rail is an engineering firm that is highly specialized in the railway industry and specifically its installations and systems.

Founded in 1994, it is dedicated to engineering, consulting and project management in the railway, industrial, energy and building construction industries, carrying out its activities in the different stages of planning, design, construction and operation of investments.

Inse Rail participates in the international development of the High Speed Rail and metropolitan transportation, with a strong specialization in electrification, signaling, security and communication systems, and other railway transport installations.

Avda. de Burgos, 12 28036 (MADRID)  
+34 91 302 95 40  
cggarci@inserail.es  
www.inserail.es



### INTERNACIONAL HISPACOLD, S. A.

Hispacold, a World leader Company for climate systems with more than 40 years' experience is specialized in passengers comfort.

Hispacold designs and manufactures HVAC solutions for all rail vehicles: trams, metros, EMUs, DMUs, LRVs... with proven and reliable technology solutions.

Hispacold is certified in the most recognized International quality management, environment and safety standards: ISO 9001, ISO 14001, OSHAS 18001, EN 15805-2 and the prestigious IRIS ISO/TS 22163.

Avda. Hacienda San Antonio, 1 - 41016 (SEVILLA)  
+34 954 677 480  
+34 954 999 728  
hispacold@hispacold.es  
www.hispacold.es



### LADICIM - UNIVERSIDAD DE CANTABRIA

LADICIM participates in R&D projects focused on the innovation of the railway superstructure, carrying out studies on the development of its elements, acc to national (Adif), European (EN) and American (AREMA) reference standards. The results are reflected in more than 500 reports, 25 research papers with a high impact index and 7 Doctoral Theses. The projects include collaborations in countries such as the USA, Canada, Saudi Arabia, Turkey, Germany, Senegal, Tanzania, Morocco or Ethiopia. LADICIM has implemented a quality system according to the UNE-EN ISO/IEC 17025 standard, being accredited by ENAC (Spanish Accreditation Board) for the testing of fastenings, sleepers and rail welds.

E.T.S. Ing de Caminos, Canales y Puertos  
Avda. de los Castros 44, 39005 (SANTANDER)  
+34 620 12 30 24 / +34 942 20 18 28  
+34 942 20 18 18  
jose.casado@unican.es  
https://ladicim.es/



### LANDER SIMULATION & TRAINING SOLUTIONS

Lander Simulation & Training Solutions, S.A. specializes in designing, developing and implementing cutting-edge commercial simulation devices for training purposes.

On the basic premise of preventing accidents and loss of human life, LANDER works with each customer to build training simulators which meet the specific needs of each operation.

Lander was incorporated in 2002, and now operates in more than 20 countries across all 5 continents. Its solutions cover the entire range of railway operations - suburban trains, long-distance units, high-speed trains, freight, monorail systems, metros or light rail.

Portuete 23A, local B3 20018 San Sebastián (GUIPÚZCOA)  
+34 943 217 491  
lander@landersimulation.com  
www.landersimulation.com



### LUZ NOR DESARROLLOS ELECTRONICOS, S.L.

LUZ NOR is a company specialized in the design and manufacture of professional torches, emergency lighting and other electronic security devices. LUZ NOR puts at your disposal highly qualified technicians, a high quality standard, efficient development, manufacturing and control systems and, above all, a philosophy of commitment to clients that allows LUZ NOR to offer innovative products with advanced technology and recognised prestige.

Paduleta 47 - Pol. Ind. Jundiz Vitoria (ÁLAVA)  
+34 945 200 961  
+34 945 200 971  
iarbeloa@luznor.com  
www.luznor.com



### JEZ SISTEMAS FERROVIARIOS, S.L.

JEZ has been a supplier of switches and crossings in Colombia since the 1980s. JEZ currently supplies switches and crossings for the depot expansion project for the Medellin Metro. This expansion includes turnouts on the main line and the turnouts to the yard, for a total of 38 units with different geometries. Since the creation of the Medellin Metro, JEZ has been its main supplier of switches and crossing and their replacement parts. JEZ supplies assembled switches and crossings on both wooden and concrete sleepers for Ferrocarril del Norte de Colombia (FENOCO), adapted to the high axle loads required for this mining system.

Arantzar s/n Llodio 01400 (ÁLAVA)  
+34 946 721 200  
+34 946 720 092  
egarcia@jez.es  
www.jez.es



### KIMUA ENGINEERING, S.L.

Kimua designs and produces different types of auxiliary tools for lifting, transporting, assembling and doing maintenance of rolling stock and its components during any stage of the Railway value chain. Additionally, Kimua has added 2 new business units to its portfolio; one for providing renting services of standard solutions and a second one for providing its clients with specific training courses in areas like handling and lashing of big and large loads.

Pol. Irurzubi 7, 20490 Lizartza (GUIPÚZCOA)  
+34 943 691 396  
lucas@kimuagroup.com  
www.kimuagroup.com



### LA FARGA YOUR-COPPERSOLUTIONS, S.A.

La Farga is able to produce all the range of railway products in an integrated process. Our railway range includes all alloys used, the different measures of grooved contact wire and all supporting and electricity supply elements, feeders, hangers and cables. Furthermore, we offer technical visits and assessment to our clients and we constantly develop new railway products with the aim of introducing the best copper solutions into the market.

La Farga is a family-run metallurgical company, with more than 210 years of history. We produce semi-finished copper products and their alloys for several technological sectors.

Colònia Lacambra, s/n, 08508, Les Masies de Voltregà (BARCELONA)  
+34 93 850 41 00  
+34 93 859 04 01  
gustau.castellana@lafarga.es  
www.lafarga.es



### MB SISTEMAS S.COOP.

Automated Solutions for the Train Carbody Manufacturing.

With an extensive experience in joining technologies, we implement automated solutions in the train carbody manufacturing industry. We are a benchmark in this field and our solutions certainly result in cost and time savings, whilst also offering an extremely high appearance and dimensions quality level.

From the simultaneous engineering to the implementation of the solution, our terms are particularly appealing in a world where the limit date for obtaining the first cars is crucial.

P.I. Igeltzera - Igeltzera 8 48610 Urduliz (VIZCAYA)  
+34 944 030 626  
+34 944 030 627  
amacias@mbsistemas.es  
www.mbsistemas.es



### METALOCAUCHO, S.L. (MTC)

MTC, being part of Wabtec Corporation, designs and manufacture rubber-metal components for suspension and vibration control systems used on railway, automotive and industrial applications. With headquarters in Spain, MTC has 4 production facilities in 1) Spain, 2) China, 3) India and 4) USA, which offers to customers the possibility to localize production in any of these countries.

Thanks to a wide commercial presence in any country of the world, MTC gives local support to develop projects for both OE and Aftermarket business.

Our main products are related to Primary Suspensions, Secondary Air Springs, Bushings, Buffers, Layer Springs, Subassemblies, Elastic Wheels, etc.

Poligono Erratzu 253, 20130 Urnieta (GUIPÚZCOA)  
+34 943 333 755  
+34 943 333 751  
info@mtc.com  
www.wabtec.com/business-units/metalocauch-mtc



### 3M ESPAÑA, S.L.

3M is a global innovation company based on science, dedicated to the development of products that improve the daily lives of people. 3M Science is present in homes, offices, hospitals, dentists' offices, telephones, computers, vehicles. You will find it on roads, trains and airplanes; It also helps you transport energy and stay connected.

In the case of the rail segment, 3M technologies can help maximize the efficiency of manufacturing and maintenance of rolling stock and infrastructure, while reducing costs and improving performance and sustainability. All this, also guaranteeing the safety of the workers.

Juan Ignacio Luca de Tena, 19-25. 28027 - Madrid  
+34 91 321 6072  
mlomban@mmm.com  
www.3m.com/es





### MGN TRANSFORMACIONES DEL CAUCHO, S.A.

MGN was established in 1957 and since then it has been developing its activity both designing and manufacturing rubber-metal components, mainly for the railway industry. MGN invests in research and innovation as a basis for the development of elements to be adapted in the new understanding of passenger and freight trains, taking the latest technological advances of the rubber world, vibration control and damping systems. - Primary and secondary suspensions. - Conical springs - Bushes and spherical bearings - Rods, Bogie subsystems - Pivot Bushes - Elastic Supports - Compression buffer and Draw Gear springs - Bellows, Gangway protections - Profiles, o-rings and seals.

🚩 Candelaria, 9 28864  
Ajalvir (MADRID)  
☎ +34 91 887 40 35  
✉ enp@mgncaucho.com  
🌐 www.mgncaucho.com



### NEM SOLUTIONS | NUEVAS ESTRATEGIAS DE MANTENIMIENTO, S.L.

NEM Solutions offers digital solutions to maximize productivity of train fleets; to lengthen life-cycle and to optimize maintenance and operational strategy. The principal purpose is to attain maximum profit, which facilitates the decision-making process and management. Through A.U.R.A. technology NEM Solutions provides real time predictive analytics. The operator gets total data control and enables the decision-making process and the follow-up of set objectives, in real time, with a global vision of the fleet situation. NEM Solutions look after the safety and efficiency of 250 train fleets, which means looking after 4,4M train passengers managing more than 67.000 assets in 25 countries.

🚩 Parque Tec. de Miramón Pº Mikeletegi. 54  
1ª pl. 20009 San Sebastián (GUIPÚZCOA)  
☎ +34 943 309 328  
✉ +34 943 309 326  
✉ azevallos@nemsolutions.com  
🌐 www.nemsolutions.com



### NEWTEK SOLIDOS, S.L.

NEWTEK is mainly active in the manufacture of systems for filling sand in trams, trains and locomotives. NEWTEK supplies installations composed of storage silos, fixed sand feeders, sand feeding mobile units, aspiration systems and dust collection devices. The company also designs, manufactures and maintains custom installations according to the needs of each client.

🚩 Pol. J Mª Korta, Parcela A1 - 20750  
Zumaia (GUIPÚZCOA)  
☎ +34 943 835 942  
✉ anajera@newteksolidos.com  
🌐 www.newteksolidos.com



### POLAR DEVELOPMENTS

POLAR experience in structural design with composites based on carbon fibre and epoxy resin. POLAR extracts technologies from specialized sectors and transfers them to sectors that can benefit from its advantages. Aeronautics, Space, Shipbuilding. POLAR is currently developing various R & D projects with public and private funding in order to test new materials and typologies. POLAR verifies the results obtained through the construction of prototypes and specific test campaigns.

🚩 Av Gregorio Peces Barba, 1 Parque Científico UC3M – Leganés Tecnológico  
28919 Leganés (MADRID)  
☎ +34 692 424 561  
✉ rafael.moreno@polardv.es  
🌐 www.polardv.es



### PREFABRICACIONES Y CONTRATAS, S.A.U. (PRECON)

PRECON is the Spanish leader in design and supply of precast concrete products for railway tracks, either ballast and ballastless tracks. It has supplied monoblock, twinblock, block slabs and sleeper for switches and crossings, Either for high speed, conventional lines, haul, subways and tramways.

🚩 Espronceda, 38 (Local 3) 28003  
(MADRID)  
☎ +34 91 343 03 48  
✉ +34 91 359 12 46  
✉ fsanchez@precon.cemolins.es  
🌐 www.preconsa.es



### PRETENSADOS DEL NORTE, S.L.

PRETENSADOS DEL NORTE, is one of the most important producers of pre-stresses steel in the word. Our products are recognised for having the best quality on the market. Our high standards of quality mean that we are talking about the best pre-stresses steel you can find. Our company has more than 30years' experience in manufacturing and investment that have led to what we are today: PRETENORTE. Technologically, we have equipped our company in Vitoria-Gasteiz with the best state-of-the-art machinery. We continue to incorporate the latest novelties for your complete satisfaction. Pretenorte is highly specialised in pre-stressed steel and its many applications.

🚩 Miravalles, 4 Zona Indus. de Betoño  
01013 (VITORIA)  
☎ +34 945 258 431  
✉ +34 945 261 400  
✉ pretenorte@pretenorte.com  
🌐 www.pretenorte.com



### NEXT GENERATION RAIL TECHNOLOGIES, S.L. (NGRT)

NGRT S.L. is a company focusing on railway safety, working with railway regulators and helping infrastructure managers and train operators secure their infrastructure and operations. NGRT's products are designed to detect any anomalies that occur in the railway infrastructure.

The NGRT applications will detect rolling stock, independent of speed, direction and track conditions at any location, in all weather conditions, as well as anomalies impacting on the railway infrastructure.

🚩 Severo Ochoa, 9 29590 Campanillas  
(Málaga)  
☎ +34 650 100 801  
✉ info@ngrt.org  
🌐 www.ngrt.org



### PARRÓS OBRAS, S.L.

Family business with over 25 years experience in civil construction and iron and steel industry for the railway sector. Parros Group which is specialized in pile driving and catenary foundations, has implemented the 80% of the foundations of the entire Spanish High Speed Network. Whether conventional railway network or Highspeed Railway (AVE), PARROS GROUP is distinguished by the versatility of our machines adapted "Ad hoc" for auxiliary civil works from the railway, with automatic switching to the three Spanish gauges. Also innovative is our implementing system of noise barriers from the railway track and its foundations. Generic activities of building and general construction.

🚩 Ctra. Virgen del Monte, 1 13260  
Bolaños de Calatrava (CIUDAD REAL)  
☎ +34 926 88 47 05  
✉ +34 926 88 47 06  
✉ rocio@parros.es  
🌐 www.parros.es



### PATENTES TALGO, S.L.U.

Talgo is a Spanish company with more than 70 years of experience, specialized in designing and manufacturing trains, maintenance equipment as well as providing maintenance services to railway operators worldwide. Today, Talgo is the leading global reference for Spanish High Speed Technology and the number one player in Spain's railway market. Due to Talgo's successful expansion strategy and its globally acclaimed products, the company has become truly international. Its key success factors are innovation, unique technology, sustainability, safety, competitiveness and tailor-made projects with clear focus on customer. Talgo trains are internationally recognized as the best in their category.

🚩 Pº del tren Talgo, 2 28209 Las Matas  
(MADRID)  
☎ +34 91 631 38 00  
✉ marketing@talgo.com  
🌐 talgo.com



### REVENGA SMART SOLUTIONS

Revenge Smart Solutions offers comprehensive solutions for the transport sector: railways and metros, roads, ports & airports. In railways & metros we focus on passenger experience solutions, ranging from intercomms, public address and information panels, to systems related with revenue/cost issues, like ticketing, tolling and access control, and also with operator oriented solutions like railway telephony, signalling (level crossings, point heaters and inspection systems) and station control. More than 45 years of experience. Projects deployed in 24 countries.

🚩 Fragua, 6  
28760 Tres Cantos (MADRID)  
☎ +34 91 806 18 10  
✉ +34 91 804 19 55  
✉ marketing@revenga.com  
🌐 www.revenga.com



### SATYS INTERIORS RAILWAY SPAIN

Satys is a Spanish company specializing in the design and manufacture of galley systems for railway rolling stock.

A galley system is broken down into 3 main families of equipment:

- Refrigerated cabinets
- Functional systems. Cooling, electricity, water, lighting, etc.
- Interiors. Countertops, lining, etc.

Satys offers a wide range of products specifically for each one. Thanks to the unique and highly efficient Satys technology, our products are internationally recognized as the best in their class in terms of quality, safety, availability, reliability, accessibility and environmental friendliness.

🚩 Isla de Jamaica, 8 28034 (MADRID)  
☎ +34 91 334 15 90  
✉ +34 91 358 05 64  
✉ mvega@satys.com  
🌐 www.satys.com



### SEGULA TECHNOLOGIES

SEGULA Technologies is an engineering group with a global presence, helping boost competitiveness within all of the major industrial sectors: automotive, aerospace, energy, rail, naval and defense, pharmaceutical and oil & gas. Present in 30 countries and with 140 offices worldwide, the Group fosters a close relationship with its customers thanks to the expertise of its 12,000 employees. A leading engineering specialist placing innovation at the heart of its strategy, Segula Technologies conducts large-scale projects, ranging from studies to industrialisation and production.

🚩 Av. Bruselas 8 Oficina 8 01003 Vitoria-Gasteiz (ÁLAVA)  
☎ +34 678 771 259  
✉ jmartin@segula.es  
🌐 www.segula.es





### SOCIEDAD ESPAÑOLA DE MONTAJES INDUSTRIALES, S.A.

Activities in 2018/2019: \*Execution of Works and maintenance SS/EE traction and autotransformer centers associated with, for the section: Plasencia-Badajoz in the High Speed railway Madrid-Extremadura. \*Electrification, safety installations and telecommunications of Medina del Campo – Salamanca – Fuentes de Oñoro Line, in section Salamanca – Fuentes de Oñoro.  
\*New SS/EE traction in Parets del Vallés at the p.k. 20/285 of Barcelona-French border line.  
Innovations in 2018: Design and development of a new overhead contact line C-200, powered to 25 kV and versatile in their different sections.

🚩 Av. de Manoteras, 6 2ª Pl.  
28050 (MADRID)  
☎ +34 91 308 93 35  
☎ +34 91 701 77 71  
✉ ferrocarril@semi.es  
🌐 www.gruposemi.com



### SENER INGENIERÍA Y SISTEMAS, S.A.

SENER is one of the leading engineering and technology groups in Europe with over one billion euros of annual turnover, more than 2,000 professionals and a continuously growing international presence with offices in over 15 countries. In the field of railway engineering, Sener counts on an extensive experience in metros, light rail trains systems and tramways, conventional railway line, freight transport and High Speed Lines. SENER's activities range from preliminary, conceptual and feasibility studies, basic and detailed engineering to project management services, supervision of works, value engineering and ICE services.

🚩 Av. de Zugazarte, 56 48930 Getxo  
Las Arenas (VIZCAYA)  
☎ +34 944 817 500 / +34 91 807 70 68  
☎ +34 944 817 501 / +34 91 807 87 32  
✉ uen\_infraestructurasytransporte@sener.es  
🌐 www.ingenieriaconstruccion.sener



### SICE TECNOLOGÍA Y SISTEMAS, S.A. (SICE TYS)

SICE Tecnología y Sistemas, (SICE TYS) is a group of companies that provides solutions and systems for Transport and Traffic, Environment and Energy efficiency, Smartcities and Telecommunications. SICE TYS, as systems integrator, offers technological solutions adapted to the railways sector, conceiving a centralized management with functionalities oriented to the operation of public and private transport, integrating: - Security Systems - Telecommunications Systems - Signaling (Interlockings, Level Crossings, CTC) (ENYSE) - Automatic Fare Collection - Traffic Prioritization of Public Transport - Engineering (OFITECO): railway lines; Tunnel monitoring; Load test (railways bridges).

🚩 Sepúlveda, 6 -Pol. Ind. Alcobendas  
28108 Alcobendas (MADRID)  
☎ +34 91 623 22 00  
☎ +34 91 623 22 01  
✉ sice@sice.com  
🌐 www.sice.com



Talleres Alegría, s.a.

### TALLERES ALEGRÍA, S.A.

Talleres Alegría, s.a. is a family owned company devoted since 1900 to design, manufacturing and after sales assistance of all kind of fixed track material, its accessories and spare parts. Developing of Designing and Commissioning Integral projects of turnouts to be installed at Depots and Industrial Ports and Factories. Design, manufacturing, repair and maintenance of self propelled vehicles to carry out works at the infrastructure. Design, manufacturing, retrofitting, repair and maintenance of freight wagons.

🚩 Peña Santa, 7 - Pol. Ind. Silvota  
33192, Llanera (ASTURIAS)  
☎ +34 985 263 295  
☎ +34 985 266 011  
✉ talegría@talegría.com  
🌐 www.talegría.com



### TECNIVIAL, S.A.

In TECNIVIAL we specialize in all types of fixed signalling for track ( Marker Boards), conventional lines and High Speed lines. We are one of the companies approved by the Spanish Railway Infrastructure Administrator (ADIF) and the others. The last product boosted to the market have been the NANOTEC SIGNS ( R+D). The incorporation of cutting-edge materials (carbon nanoparticles) to the signs manufacturing , allows the improvement of its behavior and mechanical features: light, corrosion-free, low residual value and maintenance, eco-friendly, resistant to loads ( snow/wind). Besides, we develop Corporate Image projects according to the needs of the customer; design & installation.

🚩 Livorno, 19004 (GUADALAJARA)  
☎ +34 639 101 699  
☎ +34 949 252 080  
✉ export@tecnivial.es  
🌐 www.tecnivial.es



### TEKNORAIL SYSTEMS, S.A.

Teknorail Systems, S.A. is a company belonging to the EUROFINSA Group, whose activity focuses on the development of railway interior projects, aimed both for the refurbishment of existing vehicles and also for new rolling stock, with a scope of supply that ranges from the design and engineering to the industrialization and material supply, including the technical assistance to the car commissioning.  
Teknorail's main goal is to provide its customers with high-quality solutions for railway interiors by means of innovation, global project management, modular supply and flexible solutions.

🚩 Paseo de la Castellana, 91  
28046 Madrid (MADRID)  
☎ T: + 34 91 515 60 00  
☎ F: + 34 91 564 72 86  
✉ info@teknorail.com  
🌐 www.teknorail.com



### SIEMENS MOBILITY, SLU

Siemens Mobility is a separately managed company of Siemens AG. As a leader in transport solutions for more than 160 years, Siemens Mobility is constantly innovating its portfolio in its core areas of rolling stock, rail automation and electrification, turnkey systems, intelligent traffic systems as well as related services. With digitalization, Siemens Mobility is enabling mobility operators worldwide to make infrastructure intelligent, increase value sustainably over the entire lifecycle, enhance passenger experience and guarantee availability.

🚩 Ronda de Europa, 5  
28760 Tres Cantos (MADRID)  
☎ +34 91 514 88 87  
☎  
✉  
🌐 www.siemens.es/siemens-mobility



### SIGMA-RAIL, S.L.

SigmaRail is an innovative company offering new cognitive computer vision solutions for the rail industry. Applying state-of-the art deep learning techniques SigmaRail offers a wide range of services from infrastructure inspection, ETCS geographical data, BIM modelling, rolling stock yard sorting or predictive infrastructure maintenance. We address the requirement of modelling a given environment and automate its data processing. This way we can help infrastructure managers, rail operations, suppliers, installers and maintainers of most rail projects around the world to be more efficient. SigmaRail has completed projects in Spain, UK, Morocco, Saudi Arabia, Mexico, Singapore and Australia.

🚩 Av. Gregorio Peces-Barba 1, 28919  
Leganes (MADRID)  
☎ +34 620 84 98 37 / +34 680 14 58 66 /  
+34 620 43 60 51  
✉ acoello@sigma-rail.com, info@sigma-rail.com  
🌐 www.sigma-rail.com



### STADLER RAIL VALENCIA, S.A.U.

International rail vehicle construction company, Stadler, is headquartered in Bussnang in Eastern Switzerland. Founded in 1942, it has a workforce of over 8,500 based in various production and over 40 service locations. Stadler provides a comprehensive range of products in the heavy and urban transport segments: High-speed trains, intercity trains, regional and commuter heavy rail trains, underground trains, tram trains and trams. Stadler also manufactures main-line locomotives, shunting locomotives and passenger carriages, including the most powerful diesel-electric locomotive in Europe. It is the world's leading manufacturer in the rack-and-pinion rail vehicle industry.

🚩 Pol. Ind. del Mediterráneo Mitjera, 6  
46550 Albuixech (VALENCIA)  
☎ + 34 961 415 000  
☎ +34 961 415 002  
✉ stadler.valencia@stadlerrail.com  
🌐 www.stadlerrail.com



### TELICE, S.A

Telice is an international company, with more than 45 years of experience in different markets related to cutting-edge technology and standing out in the railway market. Its activity covers the design, installation and maintenance of railway electrification systems, safety and railway signalling, electrical substations, civil engineering projects, industrial electricity, fibre optic installation, industrial automation and safety systems in tunnels, underground and mining projects. Due to its wide expertise, Telice has become preference collaborator for the main railway administrations. Telice has international presence in Norway, United Kingdom, Portugal, Peru, Chile and Brazil.

🚩 Anabel Segura 11, Edif. A, 3ª Pl. Oficina  
B 28108 Alcobendas (MADRID)  
☎ +34 91 084 17 07  
☎ +34 987 264 407  
✉ telice@telice.es  
🌐 www.telice.es



### TELTRONIC

Backed by over 40 years of experience in the design, manufacturing, and deployment of Professional mobile radio projects on a turnkey basis, Teltronic presents a broad portfolio of critical communication solutions for transport sector, providing complete solutions: network infrastructure, control centre, and end-user equipment, including specialized onboard systems specifically designed for train, metro, tram and LTR. Besides voice and data transmission solutions, the company offers integration services with other subsystems: PA and intercom, applications to manage and control fleets and for operating aid, real time CCTV or communications support for signalling systems ETCS, CBTC, PTC...

🚩 Pol. Malpica, C/F Oeste 50016  
(ZARAGOZA)  
☎ +34 976 465 656  
☎ +34 976 465 720  
✉ fsanjuan@teltronic.es  
🌐 www.teltronic.es



### THALES ESPAÑA GRP S.A.U.

Thales is a World leader in Mission Critical Solutions for Land Transportation. Thales Spain, with more than 60 years of experience, has been pioneer and leader in the technological development of the Spanish railways, being one of the main suppliers of safety and telecommunication systems for the Spanish Railways Administrations and present in countries as Turkey, Mexico, Algeria, Malaysia and Morocco. Its activity goes from the development, manufacturing installation, commissioning to the maintenance of equipments and systems for railway signalling, train control, Telecommunication, Supervision ticketing and critical infrastructures security.

🚩 Serrano Galvache, 56 Edif Álamo  
28033 (MADRID)  
☎ +34 91 273 7200  
☎  
✉ jose.villalpando@thalgroup.com  
🌐 www.thalgroup.com





### TPF GETINSA EUROESTUDIOS, S.L.

Passion for excellence  
Our priority : developing solutions that meet our client needs. This approach is based on three pillars: expertise, efficiency and continuous innovation.  
Today, TPF is ranked among the most important multidisciplinary companies active in the following sectors: building, transport infrastructure, water and energy.  
Over the years, the group successively expanded in Europe, Asia, Africa and America through a series of acquisitions and became a key player, internationally recognized in its field.

🚩 **Ramón de Aguinaga, 8 28028 (MADRID)**  
☎ **+34 91 418 21 10**  
☎ **+34 91 418 21 12**  
✉ **internacional@tpfingenieria.com**  
🌐 **www.tpfingenieria.com**



### TYPESA

Founded in 1966, TYPESA is a leading consulting engineering group in the fields of transport, buildings, water, environment, energy and rural development. We have a long-standing relationship with public, private and institutional clients in the Americas, Europe, Africa, Asia and the Middle East, assisting them in the development of infrastructure, energy and city projects from concept to completion. In addition to providing world-class engineering services, TYPESA has extensive experience in building the capacity of local firms and in strengthening institutions to guarantee the sustainability of the infrastructure.

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☎ **+34 943 309 230**  
☎ **+34 943 309 393**  
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### ZELEROS

Zeleros is the Spanish company developing a hyperloop transport system, already considered as "the fifth means of transport". Its focus on the vehicle optimization allows to reduce infrastructure costs and to operate at safer pressures for the passengers. Zeleros has already raised substantial private and public support, and collaborates with companies such as Renfe (Trenlab) and Altran, research centers (Universitat Politècnica de València, CIEMAT, UPM) and is supported by investors such as Plug and Play, Angels or ClimateKIC. Currently Zeleros is preparing the construction of its own 2-kilometer test-track in Sagunto to demonstrate the system at high speed.

🚩 **Muelle de la Aduana s/n, Edificio Lanzadera 46024 (VALENCIA)**  
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