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## Roll2Rail: new dependable rolling stock for a more sustainable, intelligent and comfortable rail transport in Europe

Eulalia Peris <sup>a,\*</sup>, Javier Goikoetxea <sup>b</sup>

<sup>a</sup>UNIFE (The European Rail Industry), Avenue Louise 221, Brussels 1050, Belgium

<sup>b</sup>CAF (Construcciones y Auxiliar de Ferrocarriles, S. A.), J. M. Iturrioz 26, Beasain 20200, Spain

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### Abstract

A modal shift to rail is crucial to achieving a reduction in greenhouse gas emissions, relieving urban congestion and providing increased mobility. In order to successfully meet this growing demand for efficient and green mobility, the railway sector needs to progress in terms of quality of service, energy and life cycle costs, interoperability, capacity, noise reduction and must also further develop its carbon emission advantages.

Roll2Rail is a research project which aims to develop key technologies that will overcome hurdles to innovation in rolling stock development and forms part of a longer term strategy towards revolutionising the rolling stock of today. The results will contribute to the increase of operational reliability and to the reduction of the life cycle costs. This project started in May 2015 and it is supported by the Horizon2020 programme of the European Commission ([www.roll2rail.eu](http://www.roll2rail.eu)). Roll2Rail is one of the so called “lighthouse projects” of the Shift2Rail Joint Undertaking and will contribute to Innovation Programme 1. At the end of the project the outcomes will be incorporated into real vehicles or relevant environments within the Technical Demonstrators of Shift2Rail.

In particular, Roll2Rail focuses on technological innovations in different subsystems of the vehicles which, individually, each and all together, contribute to achieve the desired impact at vehicle and whole railway system level on capacity, reliability, efficiency, comfort and life cycle costs. The project expects innovations in 8 different areas such as traction and power electronics, train communications, car bodyshell, running gear technologies, brakes, train interiors, noise and vibration and energy performance. Moreover, this project will deliver a set of technical recommendations and proposals of standardisation. Details on the concept, activities to be performed and first results are presented in this paper.

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\* Corresponding author.

E-mail address: [eulalia.peris@unife.org](mailto:eulalia.peris@unife.org)

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## 1. Introduction

The European Union has committed to supporting the railway sector by investing in research that endeavours to revolutionise current railway technologies in order to boost the use of rail transport and drive the competitiveness of the rail sector versus other means of transport (ERRAC, 2002; COM, 2011). To this end, in 2014, the EU officially launched the Shift2Rail public private partnership which focuses on building the railway system of tomorrow (EC 2014). Shift2Rail is the first European initiative to deliver focussed, market-driven research by accelerating the integration of new advanced technologies into innovative rail products, meeting the key objectives of the EU 2020 Strategy and the EU Transport policy.

While the start of Shift2Rail research activities in 2016 is moving ever closer, Roll2Rail is setting the foundations for many of the technologies that will be continued within Shift2Rail's Innovation Programme 1: "Cost-efficient and Reliable Trains, including high capacity trains and high speed trains". It is planned that Roll2Rail will transition into Shift2Rail when the joint undertaking is fully operational next year. The start of this preliminary work on the future core research activities of Shift2Rail is a major milestone for the European rail industry, which is currently facing strong competition from outside Europe.

Roll2Rail, or, to give its full title, "New Dependable Rolling Stock for a more Sustainable, Intelligent and Comfortable Rail Transport in Europe", aims to develop key technologies that will overcome hurdles to innovation in rolling stock development and forms part of a longer term strategy towards revolutionising the rolling stock of today. In keeping with the long term goals of Shift2Rail, this project envisions paving the way towards a 15% increase in the capacity of the railway system, a 50% increase in the operational reliability and punctuality of the vehicles, a 30% improvement in energy efficiency of the system, and a 40% reduction in vehicle and track life cycle costs, while at the same time also improving passenger comfort.

Roll2Rail was officially launched in May 2015 after being selected by the European Commission following the first "Mobility for Growth" call of the Horizon 2020 Programme. With a budget of €16 million, the project involves 31 partners covering a wide range of expertise in different areas. Together, UNIFE, and the technical leader, the Spanish train manufacturer CAF, are coordinating a consortium comprised of train manufacturers, infrastructure managers, railway operators as well as research centres and universities based in different EU countries. This variety of key stakeholders is essential in order to ensure the successful adoption of results leading to the step change required in the rail industry.

### 1.1. Roll2Rail Objectives

The main concept behind Roll2Rail is to depart from the traditional incremental approach to vehicle development to a whole new way of thinking on product development. The actions to be undertaken within the scope of Roll2Rail are related to the following more specific objectives:

- To develop the basis of a new traction technology based on emerging electronic components and motor-wheel high-speed equipment.
- To open the way for new functionality which will allow more flexible and reliable coupling between vehicles by using wireless technology applied to train control functionalities.
- To reduce vehicle weight so as to increase space available for passengers using carbody solutions based on lightweight composite materials.
- To un-block innovation in the field of running gear by developing a clear way of quantifying the life-cycle cost impact of existing and new technological solutions.

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