Shift2Rail Joint Undertaking - ciele, možnosti a aktivity
Shift2Rail Joint Undertaking - Objectives, Opportunities and Activities

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Abstrakt

Neustále rastúce požiadavky na dopravu, narastajúce zápchy na cestných komunikáciach, bezpečnosť energeticých zdrojov a zmeny klimiatických podmienok patria medzi hlavné výzvy, ktorým čelí nielen Európska Únia, ale celé ľudstvo. Jednou z možností, ako týmto výzvam čeliť, je posilnenie železničnej dopravy, ktorá bude musieť v budúcich dekádach prevziať väčší podiel dopravnej prevádzky.
Európska komisia pracuje na vytvorení Jednotnej európskej železničnej oblasti (Single European Railway Area - SERA) a na propagácií modálnej zmeny z cestnej na železničnú dopravu s cieľom zabezpečiť kompetitívny a z pohľadu zdrojov účinný európsky dopravný systém. Európska veda a výskum musia pomôcť a podporiť železnice a železničnú dopravu pri získavaní a budovaní novej, oveľa výraznejšej úlohy v rámci globálneho dopravného trhu, a to jednak prostredníctvom riešenia krátkodobých problémov, ktoré súvisia s bežnou prevádzkou, ako aj prostredníctvom podpory tohto sektora pri získavaní silnejšej pozície na trhu.
Príspevok predstavuje ciele, možnosti a aktivity Shift2Rail Joint Undertaking, prvej európskej spoločnej iniciatívy v oblasti železničnej dopravy, ktorá má za cieľ podporovať výskum a inovácie v tejto oblasti, ako aj riešenia orientované na trh, a to prostredníctvom urýchlenej integrácie nových a pokročilých technológií s inovatívnymi produktami a riešeniami železničnej dopravy.

Abstract

Rising traffic demand, congestion, security of energy supply, and climate change are some of the major issues that the European Union and the wider world are facing. Tackling these challenges will call for the railway sector to take on a larger share of transport demand in the next few decades.

The European Commission is working towards the creation of a Single European Railway Area (SERA), and has promoted a modal shift from road to rail in order to achieve a more competitive and resource-efficient European transport system. However, rail's share in the European freight and passenger transport markets is still not satisfactory. EU research and innovation (R&I) must therefore help rail play a new, broader role in global transport markets, both by addressing pressing short-term problems that drain rail business operations, and by helping the sector to gain a stronger market position.
In this contribution, objectives, opportunities and activities of Shift2Rail Joint Undertaking, the first common European rail initiative focusing on research and innovation (R&I) and market-driven solutions by accelerating the integration of new and advanced technologies into innovative rail product, are presented.

1. Introduction

Following more than a decade of fruitful cooperation with the EU in rail research and development, the Shift2Rail journey started in 2009, when key European rail sector players, under the coordination of the Association of the European Rail Industry (UNIFE), began investigating a policy instrument that could facilitate a step change for the European rail system. The results were then presented to the European Commission.

Capitalising on the rail sector's success in EU-funded collaborative research projects since the mid 1990s, Shift2Rail constituted a natural evolution from EU industrial research cooperation in Horizon 2020. It was also clear that realising the ambitious EU transport policy and climate change goals required a massive coordinated investment in rail research.

The paper starts with a global policy context and a vision for European railway transport, which is followed by a decription of Shift2Rail Research and Innovation

(R&I) activities and funding opportunities. A couple of projects are briefly introduced to highlight practical implementations within the Shift2Rail Joint Undertaking.

2. Policy context

The European Commission is committed to a Europe 2020 strategy based on smart, sustainable and inclusive growth. This includes achieving a more competitive and resource-efficient European transport system with a view to addressing major societal issues such as rising traffic demand, congestion, security of energy supply and climate change.

To achieve this, the Commission's 2011 Transport White Paper ("Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system") [1] sets out a number of key goals to strengthen the role of rail in the transport system, given rail's inherent advantages in terms of environmental performance, land use, energy consumption and safety. A number of these goals relate specifically to rail passenger and rail freight transport, while others relate more generally to urban mobility, with an indirect impact on rail.

The 2011 White Paper points out that the creation of a Single European Railway Area (SERA) will be crucial to achieving a modal shift from road towards more sustainable modes of transport such as rail, as this could serve to dramatically cut the costs of running passenger and freight trains by providing a common framework of rules and regulations for rail operators in all EU countries.

Since the adoption of the 2011 White Paper, a lot of progress has been made towards the goal of creating a Single European Railway Area. The agreement on the rail recast[1] will considerably change the way the rail market works, stimulating investment, improving market access conditions and strengthening the role of national rail regulators. The recast also paved the way for the various major proposals that together form the Fourth Railway Package[2], without which the European single market cannot be complete. The proposals were adopted by the Commission in January 2013 and aim to remove remaining administrative, technical and regulatory obstacles that are holding back the rail sector in terms of market opening and interoperability.

The measures contained in the Fourth Railway Package will be crucial to realising the Single European Railway Area and promoting a modal shift. However, they will not be sufficient. The emergence of innovative approaches in business models, services and products throughout the whole rail value chain and a substantial increase in research are an inevitable part of all the efforts provided so far. In line with a key objective of H2020 to improve the efficiency of EU funding and better address societal challenges by pooling together existing R&I efforts and expertise, namely through Public-Private Partnerships (PPPs) in the form of Joint Undertakings, the Shift2Rail Joint Undertaking (S2R JU) was established by Council Regulation (EU) No 642/2014 of 16 June 2014. The S2R JU is a public-private partnership, providing a platform for the actors of the European rail system to work together with a view to driving innovation in the years to come by implementing a comprehensive and co-ordinated research and innovation strategy.

The Connecting Europe Facility (CEF) is the EU's new programme for investing in EU infrastructure priorities in transport, energy and telecommunications (digital networks) with a view to completing the European single market and boosting Europe's competitiveness. Under CEF, €26.25 billion is made available from the EU's 2014 - 2020 budget to co-fund TEN-T projects in the EU Member States. Thanks to many topics relevant to the railway transport, the CEF also

[1] Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a Single European Railway Area (recast)

2 The Fourth Railway Package – Completing the single European railway area to foster European competitiveness and growth, COM (2013) 25 final

has the potential to bring an important contribution to the development of the single European railway market and the deployment of innovative rail solutions. Shift2Rail seeks to develop synergies with this facility to ensure that tested and validated solutions emanating from the activities of the S2R JU can be taken up for funding under the CEF.

3. Shift2Rail objectives

Rail research conducted within the S2R JU must contribute to addressing the challenges faced by the rail sector, through a comprehensive and coordinated approach to research and innovation and focusing on the needs of the rail system providers and users.

In particular, the Shift2Rail activities should prioritise the following general objectives [2]:

- Achieve *the Single European Railway Area* through the removal of remaining technical obstacles holding back the rail sector in terms of interoperability and through the transition to a more integrated, efficient and safe EU railway market, guaranteeing the proper interoperability of technical solutions.
- Radically enhance *the attractiveness and competitiveness of the European railway system* to ensure a modal shift towards rail through a faster and less costly transition to a more attractive, user-friendly (including for persons with reduced mobility), efficient, reliable, re-designable and sustainable European rail system.
- Help the *European rail industry to retain and consolidate its leadership* on the global market for rail products and services by ensuring that R&I activities and results can provide a competitive global advantage to EU industries vis-à-vis foreign competition and by stimulating and accelerating the market uptake of innovative technologies.

In order to meet these overarching objectives, the rail sector must be able to deliver increased quality of services at affordable costs and ensure proper interoperability of technical solutions. The expected outcomes of the Joint Undertaking are structured around the four following specific objectives:

- *Improved services and customer quality* to improve the attractiveness of rail services through innovative solutions and adapt them to the constantly and rapidly evolving quality expectations of users, while ensuring consistently excellent delivery. Three different elements have to be taken into account:
    - The operational reliability of rail has to be substantially improved to make rail transport a more punctual, safe and secure travel and shipment option that is resilitent to extreme conditions and climate change. In the long term (by 2030), a 50% increase in the reliability and punctuality of rail services should be achieved.
    - The capacity of rail has to be enhanced, in particular through improved capacity management, to meet increased demand for passenger and freight railway services. In the long term (by 2030), a 100% increase in the capacity of the railway transport system should be achieved.
    - Rail has to offer an improved customer experience, for both passengers (including persons with reduced mobility) and freight, enhancing accessibility, offering more transport and travel options in a more flexible manner, with more speed, more comfort, more reliability and availability of additional services such as personalised information and integrated ticketing solutions for a seamless combination of transport modes for both passengers and goods.

- *Reduced system costs*. The long-term objective (by 2030) should be to achieve a 50% reduction of the life-cycle cost of the railway transport (i.e. the costs of

developing, building, maintaining, operating, renewing and dismantling infrastructure and rolling stock), while also reducing negative externalities. In particular, three different elements have to be taken into account and balanced out to lead to an optimal reduction of system costs:

  - Where feasible, the investment costs of new rolling stock, infrastructure or technical solutions (including renewal and/or upgrade of existing assets) should be significantly reduced to facilitate the uptake of more modern and efficient technologies.
  - Second, expenditures linked to the operation of services, including long-term maintenance and energy consumption should be reduced.
  - Third, indirect costs of externalities such as noise, vibrations, emissions and other environmental impacts, should be addressed to make rail an even more sustainable transport solution.

- *Enhanced interoperability*. The aim is to remove remaining technical obstacles holding back the rail sector in terms of market opening for supply of rail products, connectivity and efficiency, and thereby enabling economies of scale while maintaining and improving the safety standards.
- *Simplified business processes*. The aim is to reduce the development and productions costs of innovative technologies. Improvements can be achieved mainly through three elements: harmonisation of specifications, improvement of the requirement process and the simplification of the authorisation procedures, leading to reduced development and production costs.

It shoud be noted that measures contributing to these four specific objectives are all inter-connected and contribute to achieving the general objectives of the S2R JU.

4. Shift2Rail Innovation Programmes

The performance of the railway system will only be improved if it is understood and managed as a whole system shared between many actors, with particular attention to the interfaces between the parts of the system managed by the different actors. Furthermore, rail transport must be fully integrated in the overall transport system with close links to other modal networks: airports, ports, metro and bus stations, and all type of individual transport means in order to provide attractive and seamless transport services for freight and passengers. A cross-sector, whole-system approach to design, maintenance, delivery and safe operation should be adopted.

Given this systems approach, the work conducted within the Shift2Rail framework is structured around five asset-specific Innovation Programmes (IPs), covering all the different structural (technical) and functional (process) sub-systems of the rail system [3]:

- IP1: Cost-efficient and Reliable Trains, including high capacity trains and high speed trains;
- IP2: Advanced Traffic Management & Control Systems;
- IP3: Cost-efficient, Sustainable and Reliable High Capacity Infrastructure;
- IP4: IT Solutions for Attractive Railway Services;
- IP5: Technologies for Sustainable & Attractive European Freight.

These five Innovation Programmes form a whole assembly of the railway system, with a number of common cross-cutting themes and the R&I activities. For this reason, in addition to the five Innovation Programmes, the work of Shift2Rail is also structured around five cross-cutting themes that are of relevance to each of the projects and takes into account the interactions between Innovation Programmes and the different subsystems:

- Long-term needs and socio-economic research

- Smart materials and processes
- System integration, safety and interoperability
- Energy and sustainability
- Human capital

In addition, cross-cutting activities also include research on long-term economic and societal trends, such as customer needs, human capital and skills, which are necessary to be taken into account by the different Innovation Programmes.

Shift2Rail looks for collaboration across the railway sector, promoting collaboration and knowledge transfer processes between industry, academia and research institutions. Shift2Rail also facilitates cross-fertilisation from other sectors by involving key players from other transport sectors, but also from other industrial sectors, such as IT, telecommunications and energy sectors.

A sustainable growth of the rail sector requires a dedicated and balanced approach addressing specific common research and innovation challenges, while integrating and demonstrating cooperation between stakeholders across the whole rail value chain. Responding to these challenges requires different types of activities, including:

- Demonstration activities - are considered as being the last non-commercial step to demonstrate the operational performance and reliability of all deliverables from the technology demonstrators (TDs)so that the first commercial units can be designed, with guaranteed performance based on the outcome of the demonstration activities.
- Research and technological development activities - can be of three types:
    - Dedicated research projects on the development of specific technologies and concepts to fill the gaps in innovative technologies, and in business, organisational and logistic solutions;
    - Strategic studies, such as for instance deriving the future demand for rail services from long-term trends;
    - Projects addressing cross-cutting activities supporting the successful take-up of technology innovations.
- Other supporting activities – such as pooling, reviewing and commenting user requirements and proposing interoperability standards, conducting activities to communicate and disseminate research results and to prepare for their take-up and use, etc.

On top of these three types of activities that are funded and conducted directly by the S2R JU, the Members of the are required to conduct additional activities with a view to leveraging the effect of the R&I activities undertaken within Shift2Rail. These activities are not eligible for financial support by the S2R Joint Undertaking but must contribute directly to the broader objectives set out in the Shift2Rail Master Plan.

On 10 January 2017, the Shift2Rail JU Call for proposals 2017 has been opened. The deadline for all topics of this call is on 30 March 2017 [4].

4. Shift2Rail projects – some examples

In this section, a couple of Shift2Rail running projects are introduced.

SMART - Smart Automation of Rail Transport [5] is three years project on IP5, which aims at increasing the quality of rail freight, as well as its effectiveness and capacity, through the contribution to automation of railway cargo haul at European railways. The project will deliver three main results:

- complete, safe and reliable prototype solution for obstacle detection and initiation of long distance forward-looking braking,

- short distance wagon recognition for shunting onto buffers which can be integrated into planned Autonomous Train Operation (ATO) module,
- a real-time marshalling yard management system integrated into IT platform available at the market.

The SMART prototype solution for obstacle detection will provide prototype hardware and software algorithms for obstacle detection, as well as standardised interfaces for integration into ATO module. The system will combine two night vision technologies - thermal camera and image intensifier with multi-stereo vision system and laser scanner in order to create fusion system for short (up to 20 m) and long range (up to 1000 m) obstacle detection during day and night operation, as well as operation during impaired visibility. By this planned fusion of sensors, the system will be capable, beside reliable detection of obstacle up to 1000 m, to provide short range (< 200 m) wagon recognition for shunting operations with a +/- 5 cm distance estimation tolerance.

The real-time marshalling yard management system will provide optimization of available resources and planning of marshalling operations in order to decrease overall transport time and costs associated with cargo handling. The yard management system will provide real time data about resources available over open and TAF/TSI (Telematic Application for Freight and Passengers / Technical Specifications for Interoperability) standard data formats for connection to external network systems and shared usage of marshalling yards between different service providers.

MISTRAL [6] – is two years project on IP 2, which will elaborate the Technical Specification of the future communication system for all railways in light of the migration from the current obsolete GSM-R. The new radio system will leverage the broadband capacity of IP-based wireless communication to enhance signaling but also to make possible innovative services for both users and train automation/control. To achieve the objective, MISTRAL will generate firstly a portfolio of foreseeable future communication scenarios. Then, a Techno-Economic Proposition consistent with future scenarios will be defined, including a portfolio of innovative services ushered-in by new technologies and compliant with new users requirements as well as with safety, security and Quality of Service (QoS) requirements. Such Techno-Economic proposition will be subject to a Business Viability Analysis - meant to gauge and optimize the total-cost-of-ownership of the new communication system - and to a Technical Viability Analysis that will investigate the compliance with the new requirements. Subsequently, the results of such Business and Technical Viability Analysis will be used as basis to refine and finalize the Validated Techno-Economic proposition, which will thus rely on an optimized life-cycle cost and on a sound portfolio of innovative services.

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[5] http://shift2rail.org/smart/

[6] http://shift2rail.org/mistral/

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