

European Rail Traffic Management System (ERTMS)

An EU industrial programme to raise railway competitiveness

SUMMARY

In recent decades, the European Union has been promoting rail as one of the main pillars of its transport decarbonisation policy. This is likely to be even more the case with the European Green Deal and the ambitious emission reduction targets proposed recently by the new President of the European Commission, Ursula von der Leyen. However, in order to contribute effectively to the decarbonisation of transport, railways must offer a harmonious, efficient, fast and safe service.

Whereas over time the EU Member States had each developed their own railway signalling systems, the EU launched an industrial project to develop and deploy a single control, command and signalling system, known as the European rail traffic management system (ERTMS). The aim was to improve rail technical compatibility, efficiency and competitiveness. Since the late 1990s, the EU has been working on a regulatory framework, technical standards and ERTMS deployment plans. Given the scale of investment required, the EU has also allocated funding to the project through the Connecting Europe Facility and the EU structural and investments funds.

ERTMS deployment is also supported by the active involvement of EU rail operators, infrastructure managers and the supply industry and the first commercial lines using ERTMS were opened in 2005. Although it offers benefits to both the rail sector and passengers, ERTMS still faces challenges, the greatest being low and patchy development, insufficient funding and coordination between Member States and slow migration from national legacy systems to ERTMS.

Recent announcements of ERTMS full-scale deployment plans and commitments in Europe could be read as a sign that ERTMS is increasingly perceived as a top priority.



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Background

To be able to run trains safely and efficiently on a rail network, signalling systems are necessary to keep trains constantly clear of each other. Over time, EU Member States have developed their own signalling systems with specific standards. There are currently roughly [30 national signalling systems](#), hampering the technical and operational compatibility of railways across the EU, and resulting in additional costs for the sector, including for maintenance. In the late 1980s, representatives of the EU rail industry started developing a single control, command, signalling and communication system, known as the **European rail traffic management system (ERTMS)**, to improve rail interoperability. The European Commission supported the project with a view to providing a common standard and increasing rail competitiveness.

ERTMS is composed of [two elements](#). The first is the **European train control system (ETCS)**, which consists of an on-board unit to supervise train movements and of a balise, deployed trackside, which stores data on rail infrastructure. The second element is the **global system for mobile communications on railways (GSM-R)**: it is a radio system providing voice and data communication between track devices, the train, and traffic control centres. The trackside system and the interface installed on board exchange data and provide the driver with all the information to operate and control the maximum speed allowed. ERTMS currently has several versions ([baselines](#)) comprising different functionalities, and [three levels](#) differing from each other by trackside equipment and information transmission modes. [Baseline 3](#) is the latest complete [adopted version](#) and is compatible with Baseline 2.

Non EU countries such as [Norway](#) and [Switzerland](#) participate in the ERTMS programme. ERTMS is also becoming a global standard outside the EU and has been adopted by a number of countries in particular in Asia and in the Middle East. These countries [invest](#) in this technology for benefits other than interoperability, namely higher rail capacity, speed, safety and lower maintenance costs.

The EU framework

The ERTMS concept stems from efforts to enhance rail interoperability. The first steps in this endeavour were taken in 1996 and 2001 with two directives on interoperability: the first applied to the trans-European [high-speed rail system](#) and the second to the trans-European [conventional rail system](#). In 2005, the European Commission appointed an ERTMS coordinator, Karel Vinck. According to its initial [2009 deployment plan](#), ERTMS was to be rolled out by 2020 on [six corridors](#) with high freight traffic and in a number of EU ports, marshalling yards and freight terminals. In 2013, the adoption of the reviewed trans-European transport network ([TEN-T](#)) guidelines marked another key milestone for ERTMS. They established a dual-layer transport structure consisting of a Europe-wide comprehensive network, including a core network organised in [nine corridors](#) to facilitate the development of infrastructure. The nine corridors were aligned with the 2009 ERTMS deployment plan and with the [European rail network for competitive freight](#). The TEN-T guidelines made ERTMS deployment a horizontal priority and strengthened the role of the European coordinator.

In April 2016, the EU adopted the technical pillar of the [fourth railway package](#), which enhanced the role of the European Union Agency for Railways ([ERA](#)) as the ERTMS system authority. The agency is now responsible for delivering rolling stock authorisations and issuing ERTMS [trackside approvals](#). The 2016 [Directive on Interoperability](#) specified the Agency's responsibility for implementing ERTMS in a harmonised way and checking compliance with the relevant technical specifications for interoperability (TSIs). EU Member States, meanwhile, have to develop [national plans](#) to implement ERTMS. While gradually establishing a regulatory framework, the Commission, ERA and European rail associations have stepped up their cooperation. By 2016 they had signed four memoranda of understanding to define a [deployment strategy](#) for ERTMS and to strengthen cooperation on [deployment](#) and [management](#). The [2016 Memorandum of Understanding](#) aimed to maintain technical compatibility so as to avoid barriers to accessing infrastructure in the event of subsequent modifications, and to speed up ERTMS deployment.

The deadlines for ERTMS deployment proved too optimistic, prompting the Commission to put forward a [new deployment plan](#), adopted in January 2017. It set a new, more realistic timetable for deploying ERTMS, according to which roughly **40 %** of the [nine core network corridors](#) should be equipped by 2023 and the remaining sections by 2030. The new plan also insisted on the need to coordinate solutions for cross-border infrastructure deployment, which are particularly important for rail operators' businesses. In 2023, the plan will be reviewed to establish updated deployment dates for the corridors to be equipped beyond 2023. In November 2017, the Commission adopted an [action plan](#) to deliver ERTMS, with clear responsibilities and deadlines. The Commission appointed Matthias Ruete as the new [European ERTMS coordinator](#) as from January 2019.

European Parliament

In its 26 March 2019 [decision on discharge](#) on the implementation of the European Union Agency for Railways budget for 2017, Parliament stressed how key ERTMS was to achieving the single European railway area and the need to optimise coordination of ERTMS deployment and management. In its 31 May 2018 [resolution](#) on the transport pillar of the CEF after 2020, Parliament called on the Commission and the Member States to remain committed to CEF's main objectives, including the completion of ERTMS by 2030 on the TEN-T core network. It also asked the Commission to consider establishing dedicated transnational initiatives to speed up the implementation of horizontal priorities such as ERTMS.

The EU supports ERTMS **financially** for both trackside and on-board investments. Over the 2007-2013 period, the EU [allocated](#) roughly €1.2 billion, and for the 2014-2020 period approximately €2.7 billion. The main sources of EU funding are the [Connecting Europe Facility \(CEF\)](#) and the European structural and investment funds ([ESIF](#)), i.e. the European Regional Development Fund (ERDF) and the Cohesion Fund. According to data transmitted by the Commission Directorate-General for Mobility and Transport, there are currently 48 ongoing ERTMS grant agreements concerning roughly 6 000 km of track and 2 500 on-board units, for a total CEF contribution of €900 million. For the [new post-2020 CEF](#), the Commission has proposed a budget of [€42.3 billion](#) in current prices, of which €30.6 million would be devoted to transport. The proposal highlights the added value of ERTMS in the [context](#) of the completion of the TEN-T network and the deployment of new systems for traffic management and safety. In March 2019, the Commission and the [European Investment Bank](#) launched a [new CEF transport blending facility](#) with an initial budget of €200 million. It is aimed, in part, at supporting ERTMS roll-out and leveraging funds from promotional banks and the private sector. ERTMS can also benefit from funding provided by the [Shift2Rail](#) programme.

State of play

According to information provided by the Commission, as of October 2019, ERTMS had been rolled out in Europe on approximately 5 700 km of the 15 600 km of track that should be equipped by 2023. ERTMS deployment [is uneven](#) across Europe, with countries such as Belgium and Spain each having more than 7 000 km contracted, while Croatia and Finland, for instance, have 188 km and 100 km respectively. Data gathered by [UNISIG](#), a European industrial consortium involved in ERA's activities in the field of ERTMS TSIs, show that contracts have been signed for a total of 13 795 ERTMS on-board units, of which 3 880 are complete and/or in service. The remainder are to be delivered by 2028.

As regards the number of contracts signed for vehicles with ERTMS, there are large disparities too, with more than 2 159 vehicles in Germany, 810 in Spain, 369 in France and 7 in Romania. In 2018, the Norwegian rail infrastructure agency awarded a €800 million contract to install ERTMS across its entire network by 2034. Similarly, [the Netherlands](#) has committed to deploying ERTMS by 2024 throughout its network, and Denmark has allocated €2.6 billion to full-scale ERTMS deployment by 2022. Germany has committed to installing ERTMS on 2 100 km of line by 2023. [Worldwide](#), as of September 2019, contracts had been signed for ERTMS deployment on more than 105 000 km of track, compared to roughly 41 000 km in 2010. Trackside contracts break down as follows: 51 % for Europe, 32 % for Asia, 12 % for Africa and the Middle East, 4 % for Oceania and 1 % for South America.

Views

In 2017, the **European Court of Auditors** (ECA) published a [report](#) with the results of an audit assessing ERTMS management and deployment. The ECA visited Denmark, Germany, Italy, Spain, the Netherlands and Poland, covering in part the nine core network corridors. In addition to enhanced interoperability, the report underlined other long-term benefits, such as increased rail capacity, commercial speed, safety and lower maintenance costs for infrastructure managers. The ECA found that ERTMS had been launched as a strategic choice without an overall cost estimate or planning and considered that deployment levels were low and patchy. This was owing to the high costs involved and the absence of any immediate benefit or business case for many rail operators and infrastructure managers. The ECA made recommendations, such as inviting the European Commission and Member States to assess the overall cost of ERTMS deployment and agree on binding targets for decommissioning national signalling systems. It asked ERA and the Commission to ensure compatibility between previous and future ERTMS versions. It also called on Member States to align their national development plans with that of the European Union. Lastly, the ECA advocated for better adaptation of CEF funding procedures to the ERTMS project lifecycle and for allocations of EU funding to focus on trackside equipment for cross-border sections and core networks, and on-board systems for rail operators involved in international traffic.

In 2018, **UNIFE**, the association representing the EU rail supply industry, advocated for maintaining ERTMS deployment as a [CEF funding](#) priority in the post-2020 multiannual financial framework (MFF), and underlined its key role in achieving an attractive rail system. In a similar spirit, the **European Association of Rail Infrastructure Managers** (EIM) and the **Community of European Railways and Infrastructure Managers** (CER) in their 2018 [position paper](#) on next MFF, asked for a minimum allocation of €15 billion to deploy ERTMS, given its performance and productivity gains.

Following the European Court of Auditor's call for an economic analysis of ERTMS, the Commission outsourced a **study** on the [ERTMS business case on the nine core network corridors](#), and published it in June 2019. By adding up all ERTMS-related costs and benefits for the 2015-2050 period, it provided an impact assessment of ERTMS for those corridors and compared different deployment strategies. The study concluded that ERTMS brought benefits for many stakeholders: infrastructure managers, rail operators, industry and passengers. It also showed that there is a positive business case for the nine core corridors, and argued that ERTMS will improve safety, reliability and, in some cases, capacity. The study called for continued EU support for ERTMS, focusing on infrastructure deployment for important parts of the network (typically cross-border sections) and on retrofitting on-board units for international and freight operators. Finally, the study underlined the need for robust coordination between stakeholders across and within Member States.

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