

# ERTMS Deployment RFC RALP

November 2020



## ***Rail Freight Corridor Rhine – Alpine***

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## ERTMS Deployment planning

### Introduction

In order to keep up with the substantial technical progress in the frame of digitalisation as well as to prepare for the growing traffic demand and to offer the best quality for competitive rail freight services, the establishment of interoperability through a common European train control system is a paramount prerequisite. Subsequently, the implementation of ERTMS is part of the European policy.

The following document describes the ERTMS Deployment plan of RFC Rhine-Alpine, according to Art. 11, 1(b) of the Regulation (EU) 913/2010. Legally the deployment by the Member States along RFC Rhine-Alpine is based on the currently applicable European Deployment Plan ([link to EDP](#)) for the European Rail Traffic Management System which is included in the Commission Implementing Regulation (EU) 2017/6 of 5 January 2017. This Regulation lays down the timetable for the deployment of ERTMS on the Core Network Corridors (CNC) as set out in its Annex I schemes. In this context it has to be mentioned that the railway networks associated to CNCs and RFCs are not fully aligned.

Member States are also obliged to fulfil / implement the Technical Specifications for Interoperability (TSI). Referring to section 7.4.4 of the Annex to the Commission Regulation (EU) 2016/919 on the “Control-Command and Signalling” subsystems (TSI CCS), the Member States were asked to notify their National Implementation Plans (NIPs) to the Commission until 5 July 2017, to update the NIPs at least every five years and to include next generation radio system deployment in the future updates. The collection of the NIPs is published under the following address of the Commission ([link to NIPs](#)).

In addition to the EDP, on 14 November 2017 the EU Commission published a working document on actions and associated objectives to achieve interoperability and drive ERTMS deployment (Delivering an effective and interoperable European Rail Traffic Management System (ERTMS – the way ahead)) also known as [ERTMS Deployment Action Plan](#). Therein it is specified that both, the CNC and RFC, which have as their constituent members certain of the addressed stakeholder groups (Ministries, NSAs and Infrastructure Managers), should also be used effectively to support ERTMS deployment.

With the aim to develop rail freight on its lines, the RFCs defined their role during the consultation phase in a joint statement in September 2017 as follows:

- Be a dialog platform for all stakeholders
- Act as an alert maker & moderator for the issues raised by its stakeholders
- Act as a forum to address technical issues with impact on operations tackled by its stakeholders.

In addition, in May 2020, Matthias Ruete, the ERTMS coordinator of DG Move since January 2019, published a new ERTMS work plan ([link](#)). It gives a serious look on the implementation of ERTMS so far, setting the focus for the future on a more continuous and non-disruptive development. It emphasizes several goals to be achieved:

- Reinforcement of the pace of implementation
- Orientation towards a more European approach
- The need for industrialisation of the ERTMS implementation
- Priority of a consistent and coherent strategy for the vehicle equipment
- Coordination of the decommissioning of the Class-B system
- Inclusion of ERTMS in the national recovery programmes
- Looking on ERTMS also as a traffic management system, not just as a train command system

Matthias Ruete considers the RFC Rhine-Alpine as a key project on European level and regularly participates in the meetings of the ERTMS task force of RFC Rhine-Alpine.

### **Details of the corridor roll-out planning**

This chapter contains details of the ERTMS deployment planning on RFC Rhine- Alpine. The information is indicative and can differ from the NIPs due to different update procedures, deadlines and dates for publication.

RFC Rhine-Alpine is based on the ERTMS Corridor A according to the TSI CCS 2012/88/EU, Chapter 7 (previous EDP), on which the Member States involved had to implement ERTMS on the assigned lines until the end of 2015 (or 2020 as defined in the TSI CCS). Belgium was not part of the ERTMS Corridor A, hence also not the connection from the German-Belgian border to the railway lines in the Rhine valley. This changed with the establishment of the RFC Rhine-Alpine in November 2013.

Joint coordination of trackside deployment on the ERTMS Corridor A started in 2006. In the following years progress developed very differently. Today the ERTMS Corridor A has been merged with the RFC Rhine-Alpine and a new EDP has come into force covering the CNC, but the status of ERTMS deployment in each country along the RFC is still quite different due to the following context.

In **the Netherlands**, the deployment started on the Betuweroute between Kijfhoek and Zevenaar which was inaugurated in 2007 as a dedicated freight line only equipped with ETCS B2, SRS 2.3.0d. Between 2007 and 2015 the connection to the Port of Rotterdam (Havenspoorlijn with ETCS L1) and from Zevenaar Oost to the German border (ETCS L2) have been converted to ERTMS. In the Netherlands no Class B systems are available on the lines equipped with ETCS, which makes ERTMS equipment on the vehicles indispensable. In 2020, the challenge is that the vehicles using the Betuweroute must be upgraded to Baseline 3 SRS 3.6.0, as this is the planned standard for the future ETCS equipment on the Dutch railway network.

ERTMS deployment on the main RFC Rhine-Alpine lines has been decided in 2019. The Dutch strategy includes the immediate removal of the Class B-system on lines equipped with ERTMS. The current national ERTMS roll out plan includes early OBU transition to ERTMS B3 enabling ERTMS only roll out on the infrastructure. Therefore, ERTMS OBU roll out is prepared in a separate programme. ERTMS on the Rotterdam - Venlo route by 2029-2031 is under consideration in the Dutch national roll-out plan and will enable ERTMS only operations from

that date. In addition, on the Betuweroute an upgrade from B2 SRS 2.3.0d to B3 SRS 3.6.0 is in discussion. A schedule is currently not yet available.

In **Belgium**, the outlined ERTMS implementation of the Corridor lines is part of a country-wide migration program by 2025 in order to improve the safety level on the whole network. All vehicles in Belgium have to be operable with ERTMS in the near future, whereby ETCS L1 and L2 FS B2 tracks shall be equipped with System Version 1.x to allow B2 and B3 locos. On the other hand, ETCS L1 LS B3 tracks shall be equipped with System Version 2.x in order to allow the operation in Limited Supervision. Consequently, in order to permit B2 vehicles to still run on those lines, the TBL1+ system will be kept until the majority of the RUs running on those lines will have migrated to B3 as well (certainly until end of 2025).

Since December 2016, the Class B system Memor/Crocodile is put out of service on the lines equipped with ETCS Level 1 FS version 2.3.0d, allowing only trains equipped with ETCS Level 1 (minimum Baseline 2) or under certain exceptions TBL1+ to run on these tracks.

Nevertheless, a Royal Decree published on 16 October 2018 provides the progressive decommissioning of the Memor/Crocodile Class B system on the main tracks equipped with any level of ETCS by 14.12.2025. On the same date, TBL1+ will be decommissioned on all main tracks and Belgium will become an ETCS only network.

In **Germany**, the release of SRS 3.4.0 was a major factor to start planning on the RFC lines as many interlockings still are not ready for a L2 installation and in SRS 3.4.0 the installation of Limited Supervision is possible. Due to the structure of the existing interlockings a mixed installation of L1 LS and L2 is planned. Nevertheless, corridor lines (more than 1000 km track length) cover only a small part of the whole network. Anyhow, the lines of RFC Rhine-Alpine are the most relevant for international rail freight.

After the commissioning of ETCS on the cross-border line in the Basel area in 2019, further awarding of ETCS implementation for the RFC Rhine-Alpine lines in Germany started in 2020. Putting into operation is expected stepwise from 2023 to 2028. The first full crossing with ERTMS between the border points Venlo/Kaldenkirchen and Basel is planned to be completed in 2025.

Unlike the Netherlands or Belgium, ERTMS on-board equipment of all vehicles is currently not foreseen or mandatory. The existing Class-B systems, especially PZB, are planned to be operational in parallel to an ERTMS installation for a transition period.

Decommissioning of Class-B systems is not yet decided. Nevertheless, the new tunnel in Rastatt and the connecting line to the existing route will not be equipped with Class-B systems (commissioning planned at the end of 2025).

In **Switzerland**, the operation of ERTMS in L2 has already been well proven since years on the HSL line from Rothrist to Mattstetten (2006), as well as on the Lötschberg base tunnel line (2007) and since 2016 the Gotthard Base Tunnel. In addition, miscellaneous conventional ETCS L2 lines have been taken into service, mainly on the Gotthard route and between Lausanne and Brig.

The existing Class B systems ZUB and Signum have been substituted by an economical migration concept based on the deployment of the ETCS mode L1 LS. This concept substitutes the Class B systems in Switzerland without limiting the operation of existing national vehicles and allowing the use of vehicles equipped with ERTMS at the same time (P 44). ERTMS only operation is already possible on the Swiss network (with subordinate exceptions).

Besides this, Switzerland has already completed major investments for equipping their fleet with ERTMS. Migration to B3 OBUs could also become a challenge due to the cost for retrofit of locos and the radio strategy for replacing GSM-R.

In **Italy**, the successful operation of ERTMS in L2 has already been well proven since years on the HSL network, connecting Torino - Milano - Bologna - Firenze and Roma - Napoli. For the conventional lines during the last years major investments had been made to upgrade the Class B system into SCMT, which is based on the use of balises thus presenting a good basis for the implementation of ERTMS. The corridor lines will be mixed level lines with ERTMS and the existing Class B system. The operational scenario and the relevant risk management for the implementation of ERTMS L1 and L2 (the choice depends on the existing signalling systems) have been defined. Go Live of ERTMS on the Italian RFC lines started on the border sections Iselle - Domo - Domo II and Pino-Tronzano - Luino in 2018 and 2019, equipment of the RFC Rhine-Alpine network is expected to be completed stepwise until 2027. Decommissioning of the Class-B system is planned stepwise from 2023, depending on the progress of the vehicle equipment.

### **RFC Rhine-Alpine ERTMS Deployment Planning state of play**

Graphical overviews and maps on the state of play of ERTMS deployment planning are provided in the Annex 1 to this document. The corridor sections are shown with their planned completion dates, ERTMS deployment type, the system version and an overview on the border crossings.

Selected information on ERTMS deployment is also available on the map in CIP in the area ETCS Deployment on the bottom of the left-hand side of the screen and in the information documents area ([link](#)). In the period until the next update of the ERTMS Deployment Overview the data base in CIP will regularly be updated.

### **Current challenges:**

- **Solutions on cross-border sections**

Today's existing ERTMS trackside installations in Europe are mostly implemented and managed by one infrastructure manager without crossing borders. On RFC Rhine-Alpine, ERTMS will be applied and operated internationally, including border crossings. However, the installation and authorisation of the trackside part is still in the hands of each Member State. The currently available ERTMS specifications, product developments as well as authorisation rules will be proven on RFC Rhine-Alpine in an international corridor environment. On the cross-border sections the interaction is much more complex due to different national technical requirements and different operational rules. An overview of the cross-border solutions can be found in the figures 8 - 27 of the Annex 1 to this document. These overviews illustrate the expected roll-out on the cross-border sections and the technical transitions to be managed in terms of the command control, voltage and radio systems. The change in operational rules must also be considered.

- **Development of an ERTMS network and terminal connections**

ERTMS is only beneficial for vehicle owners and railway undertakings when they can remove Class B equipment. This requires a seamless ERTMS network of lines between the major ports, terminals and industrial loading facilities. The extension of trackside equipment on RFC Rhine-Alpine lines will constantly increase from 2023. While Switzerland has already equipped the entire network and this is planned in Belgium by 2025, the process of equipping the networks will continue in the Netherlands, Germany and Italy after the completion of the corridor lines.

Operationally usable international sub-networks will, however, be available from 2022. The connection of terminals is taken into account up to the last transfer points equipped with an interlocking system.

- **Equipment of rolling stock with B3 on-board**

Vehicle equipment is not part of the infrastructure manager's ERTMS implementation strategy. Nevertheless, the success of ERTMS is heavily depending on the availability of vehicles with the necessary on-board equipment. In this respect, the ministries and infrastructure managers of RFC Rhine-Alpine support the vehicle owners by a regular monitoring of the ETCS deployment, by participation in selected sector working groups and other initiatives. In September 2020, DG Move published a study on the on-board equipment strategy ([link to Final Report](#), [link to Executive Summary](#)). Ministries and EU are discussing coordinated funding programmes. In the Netherlands a retrofitting project has already been started.

Different ETCS System Requirements Specifications (SRS versions) can be used on the vehicles and on the trackside. Therefore, it is important to understand their compatibility. Annex 2 to this document includes an overview of main definitions and schematic illustrations in this context.

Based on the NIPs, ERTMS-only operations on the whole corridor cannot be expected before 2030.

### **General issues of importance for the usage of ERTMS on RFC Rhine-Alpine**

The following topics - which are naturally not part of the ERTMS deployment monitoring of an RFC - are relevant to achieve a fully workable interoperable ERTMS system and proper preparation of B3 OBUs for ERTMS operations.

- 1. Vehicle authorisation process** (in the frame of the 4th Railway Package)

Under the following [link](#) the Implementing Regulation (EU) 2018/545 establishing practical arrangements for the railway vehicle authorisation and railway vehicle type authorisation process can be found.

The European Union Agency for Railways developed a guideline on practical arrangements for the vehicle authorisation process. This document and further explanations on the vehicle authorisation regime that applies as of 16 June 2019 are available on its [website](#).

For vehicle owners it is important to know that new vehicles must be equipped with B3 OBUs if an ETCS installation is foreseen. Derogations need to be requested beforehand.

- 2. Security of the on-board – trackside communication (Key management)**

ETCS L2 uses GSM-R for the exchange of data. GSM-R is an open communication carrier which needs to be protected. This is done by encrypted codes (keys). IMs organise Key Management Centres for the generation, distribution, storage and communication of the keys. Users shall take care of the procedures on a national level. In general RUs/vehicle owners have to choose a Home KMC which will get in contact with the IMs.

Key management can be done offline or online. Currently only offline key management is offered by the IMs, although the technical specifications for online key management have been released (SRS 3.6.0, subset 114, 137). This may change when keys with unlimited lifespan will no longer be released due to an increase of ETCS vehicles. Limited lifespan of keys will raise efforts for the involved parties. This will support migration to online key

management.

Preparations to develop an online key management have been started at DB Netz and Infrabel, but it may be available only in certain areas of the network as long as the radio system is not ready for online key management of the vehicles.

Infrastructure Manager	Also Home KMC for RUs/vehicle owners	Key Lifespan	Link or contact person
ProRail	No	Unlimited	kmc@prorail.nl
Infrabel	No	Limited	kmc@infrabel.be
DB Netz	Yes	Limited	<a href="#">link</a>
SBB / BLS	Yes	Unlimited	Erich.Imhof@sbb.ch
RFI	Yes	Unlimited	kmc@rfi.it

### 3. Driver Machine Interface (DMI) language

The DMI as part of the on-board equipment is an essential element of ERTMS operations. Regarding the text messages, the requested language can be different from country to country, and in addition different within a common language (German German, Austrian German, Swiss German (example: Rangieren vs. Verschub)). On RFC Rhine-Alpine the following national languages must be respected:

The Netherlands:	English
Belgium:	Dutch, French
Germany:	German
Switzerland:	German, French, Italian (change of language inside CH)
Italy:	Italian

The DMI language is part of the settings a driver must type in during the start-up procedure of his locomotive. The basic settings remain until the end of mission. Nevertheless, the DMI language can be changed manually if the vehicle owner requested the option from the supplier. Usage of a non-agreed DMI language can lead to misunderstandings between driver and operation centre and in so far to safety issues. To ensure the use of the correct DMI language, IMs may request a change of the DMI language at borders in their bilateral cross-border agreements which have to be respected by RUs.

Several NSAs started an initiative to harmonise the DMI language and intend to propose English as the system language in the next TSI OPE.

### 4. Operational Rules

When a train is operated under ERTMS, the respective national operational rules must be respected. On cross-border sections additional or deviating rules may apply for the use of ETCS. The relevant provisions can be found in the bilateral cross-border agreements which are available at the national infrastructure managers (part of the operational regulations relevant for network access).

International ERTMS users have to take into account that the level of integration and harmonisation of operational rules is much lower in L1 than in L2 (e.g. change of braking curves at borders is included in L2).

With ETCS B3, the braking curve depends on train data and the parameters (national values)

transmitted by the trackside. This is independent of ETCS L1 or L2. The main issue is how the brake percentage  $\lambda$  is determined and in which mode a train is braked (P or G).

## 5. Radio technology

### a) GSM-R

At present, radio frequency spectrum and migration from GSM-R to the Future Railway Mobile Communication System (FRMCS) is under discussion at national and European level. The new TSI including the specification for FRMCS is planned to be published at the end of 2022. Authorised products may not be available before 2025. In most countries, a nationwide roll-out cannot be expected before 2030. Therefore, the Netherlands, Belgium and Germany plan to migrate to FRMCS via GPRS as the capacity of the radio system is an important element in the development of a high-performance L2 network including the urban areas. A change in the radio technology will have an impact on the vehicle equipment.

### b) Transmission of information in L1 mode

In L1 mode, data can be transmitted to an OBU by balises, Euroloop or Radio Infill. Transmission by balises is the standard configuration. On RFC Rhine-Alpine, Switzerland and Italy have chosen additional options. Switzerland uses Euroloop and Italy Radio Infill. In Italy, rolling stock equipped with B2 that has an STM (SCMT) does not need the Radio Infill functionality until SCMT will be decommissioned. Rolling stock with ETCS Baseline 3 OBUs need the Radio Infill functionality independent from an equipment with NTC SCMT. Regarding "Radio Infill" a 'Notified National Technical Rule' (NNTR) has been opened at ERA.