ERTMS Deployment RFC RALP

December 2023

Rail Freight Corridor Rhine – Alpine

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ERTMS Deployment planning

1. Introduction

In order to keep up with the progress of digitalisation and, growing traffic demand, , 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.

In November 2023, the following chapter 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 still 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 is expected to be updated in 2024.

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.

ERTMS - the way
ahead 2017.pdf

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.

In addition, in July 2022, Matthias Ruete, the ERTMS coordinator of DG Move, published his second work plan (link). It gives a serious look on the further implementation of ERTMS, setting the focus for the future on a more continuous and non-disruptive development.

Matthias Ruete considers the RFC Rhine-Alpine as a key project on European level. Upcoming developments in the frame of revision of TEN-T and Rail Freight Regulation:

- Merger Corridor RALP with NSM
- Merger TEN-Corridor with RFC
- Assignment of national lines to TEN-T priorities (core, extended core and comprehensive)
- Governance structure for ERTMS (core element of the TEN-Regulation)
- Combination of ERTMS deployment with plans for the decommissioning of class-B

2. 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.

In **The Netherlands**, 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. The further national ERTMS deployment on the main RFC Rhine-Alpine lines has been decided in 2019. The plan 2019 includes ERTMS roll out also on Rotterdam - Venlo and Amsterdam - Betuweroute by 2030. A significant update of the national ERTMS deployment plan is foreseen in 2024. At this stage it is not possible to provide more information.

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 and B3 infrastructure will 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. Railway operators are strongly encouraged to equip their rolling stock with baseline 3 to accommodate as much as possible future upgrades of the infrastructure, such as the introduction of GPRS for GSM-R.
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 in 2018, with the latest revision on 6 December 2020 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. TBL 1+ is probably available on branch routes until 2028.
In a next step, from 2026 L1 will be replaced by L2.

In **Germany**, the roll-out planning on RFC RALP has changed over the past two years in the course of developing the DSD strategy for the German network. L1 LS is no longer planned, except on border sections to Switzerland. The sections formerly planned with L1 LS are now to be equipped with digital interlockings and L2 SRS 3.6.0 and SV 2.1.
Nevertheless, awarding of ETCS L2 SRS 3.4.0 SV 2.0 on RFC Rhine-Alpine lines in Germany has been tendered and contracted on dedicated lines since 2020. Putting into operation is expected stepwise and started in 2022. The first border crossing with ETCS will be completed in 2024 in the Basel area with L1 LS, border points in Aachen, Venlo/Kaldenkirchen and Emmerich/Kaldenkirchen are planned with L2 between 2028 and 2030. 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, will be operational in parallel to an ERTMS installation for a transition period. Decommissioning of Class-B systems is not yet decided.
The Federal Ministry of Transport, Building and Urban Affairs is currently planning to have a new "Overall ETCS Strategy" drawn up by the federal government for the economic, traffic-related and technical/operational introduction of ETCS. In September 2023, the Ministry publicly announced a call for tenders for the award of the contract. According to this, the "overall ETCS strategy" is to include the definition of a technical target image for ETCS/DSTW as well as supplementary measures from the "Digital Rail Germany" programme, the development of an upgrading and retrofitting concept for the infrastructure and vehicles as well as the development of measures to accelerate the equipping of vehicles with ETCS (e. g. funding instruments).

In **Switzerland**, the operation of ERTMS in L2 has already been well proven since years on the high-speed line from Rothrist to Mattstetten (2006), as well as on the Lötschberg base tunnel line (2007), since 2016 the Gotthard Base Tunnel and since 2020 the Ceneri 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 Class B systems ZUB and Signum have been replaced by ETCS L1 LS and EuroZUB/EuroSignum (Packet 44). This concept allows the operation of existing national vehicles and the use of vehicles equipped with ERTMS at the same time. ERTMS only operation with ETCS B3 vehicles is possible since 2017on the Swiss standard gauge network.

Besides this, Switzerland has already completed major investments for equipping the fleet with ERTMS. Studies for a further migration of vehicles are currently in progress.

In **Italy**, the successful operation of ERTMS in L2 has already been well proven since years on the high-speed line 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 as well as some subsequent sections of adjacent corridors are shown with their planned completion dates, ETCS deployment type, ETCS system version, the planned development of the radio systems, the expected availability of class B/A-systems 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 database in CIP will regularly be updated.

3. Current challenges:

3.1 Solutions on cross-border sections

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 15 – 41 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.

3.2 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 connection of terminals is taken into account up to the last transfer points of the national infrastructure manager, equipped with an interlocking system. Further ETCS equipment that may be required in the area of a third-party IM is not part of this overview.

3.3 Equipment of rolling stock with OBUs

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. Ministries and EU are discussing coordinated funding programmes. In the Netherlands a retrofitting project is ongoing.
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. An updated version is in preparation to also consider the impact of the TSI 2023.

4. 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 OBUs for ERTMS operations.

4.1 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 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 the ERA website.
In Switzerland, the BAV is issuing a separate authorisation (based on the ERA authorisation).
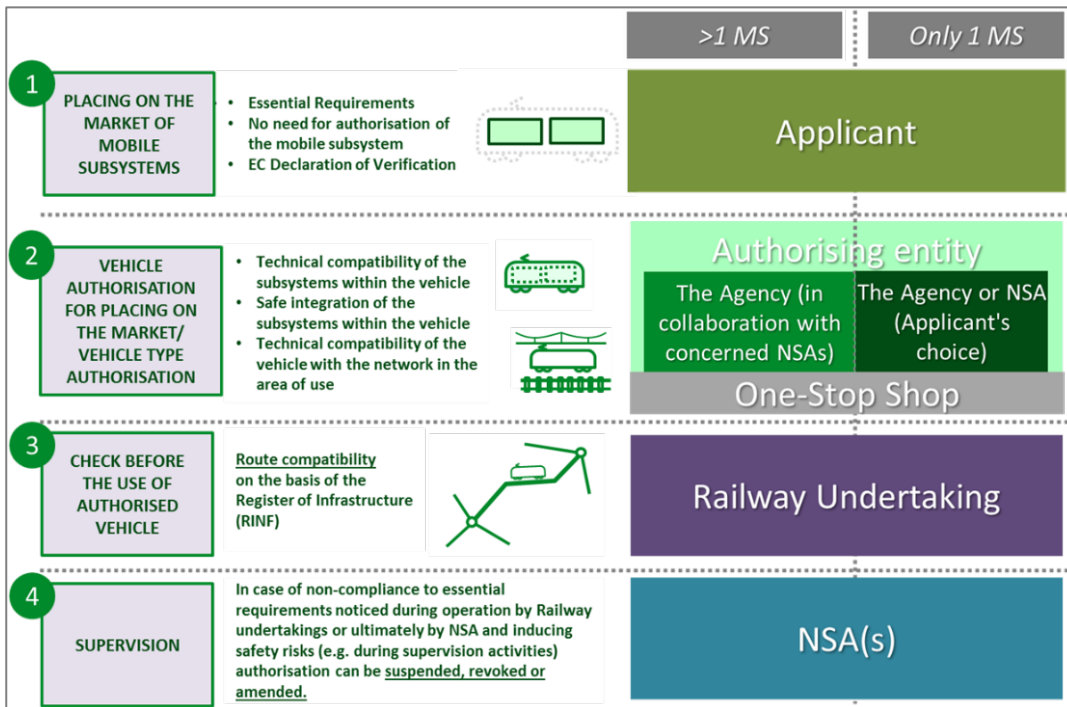
Overview on the technical pillar of the 4th Railway Package regarding vehicle authorisation (source: ERA)

ERA recommends conducting a "pre-engagement" for the preparation of an application before starting the official process via the ERA One Stop Shop.

One major element in the authorisation process are test cases for the ETCS and the Radio System Compatibility (ESC/RSC). The development of ESC/RSC test descriptions is in the responsibility of the IMs. Finally approved, ESC/RSC test will be published on the ERA website. Until then, they will be published in advance on the IM's website (as far as available).

For vehicle owners it is important to know that new vehicles can't be equipped with B2 OBUs anymore.

4.2 Security of the on-board − trackside communication (Key management)

ETCS L2 uses radio technology for the exchange of data. The protection of data transmission is done by encrypted codes (keys). IMs organise Key Management Centres (public KMC) 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 for their purposes 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 due to an increase of ETCS vehicles. Also limited lifespan of keys will raise efforts for the involved parties. This will support migration to online key management.

The development of an online key management has been started at DB Netz and Infrabel, but it may be available only in certain areas of the network (WiFi-hotspots or lines equipped with GPRS, see point 6.3.5.5). Usage of online key management requires rolling stock equipped with SRS 3.6.0 and a server based online Home KMC.

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	link
SBB / BLS	Yes	Unlimited	kmc-ch@sbb.ch
RFI	Yes	Unlimited	kmc@rfi.it

ERTMS key management contacts

Experts on EUG level developed a guideline on KMS (link) as a recommendation for common solutions and processes in the framework of European Rail Joint Undertaking (System Pillar). A security Domain (working group) has been established to deliver specifications of security requirements for the next TSI.

4.3 Driver Machine Interface (DMI) language

The DMI as part of the on-board equipment is an essential element of ETCS operations. Regarding the display of text information, the RU can order different language packages depending on the operational area of the rolling stock and drivers. 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 on demand, e. g. at border stations. Nevertheless, the DMI language can be changed manually on demand, e. g. at border stations. Nevertheless, regarding text messages transmitted by balises, the infrastructure managers can pre-set a language on their behalf. In the annex of the TSI CCS 2023/1695 the terms for the DMI are harmonised. On RFC Rhine-Alpine the following languages are used by the infrastructure managers for the transmission of text messages from balises to the DMI:

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

Train drivers shall be able to understand the content and communicate accordingly with the operational staff of the infrastructure manager when applicable. The RUs must take this into account in their SMS and instruct the drivers accordingly in their company regulations as misunderstandings between driver and operation centre can lead to safety issues.

4.4 Operational Rules

A train operated in ETCS, must respect the national operational rules. On cross-border sections additional or deviating rules may apply. 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 ETCS 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).

4.5 Radio technology

GSM-R is currently the standard communication technology for railway applications along RFC Rhine-Alpine lines. As ETCS Level 2 is a digital radio-based signal and train protection system, all trains automatically report their exact position and direction of travel to the RBC (Radio Block Centre) at regular intervals, through the GSM-R network. This functionality is supported by the SRS 3.4.0.

The support of GSM-R is limited, it is expected to become obsolete until 2035. Therefore, there is a need for a more powerful radio system. Basically, the replacement of GSM-R with a 5-generation radio technology is planned and in preparation (Future Railway Mobile Communication System - FRMCS). However, the completion of the technical specification and the product development of FRMCS is not completed. Planning of a network-wide implementation trackside and on-board is not yet possible. Authorised products may not be available before 2028. ProRail, DB Netz and RFI have therefore decided to upgrade their GSM-R network partially or completely with General Packet Radio System (GPRS) as a bridge technology and thus to install significantly higher transmission capacities. You will find overviews in Annex 1, figures 9-12.

A corresponding GPRS-compatible radio module is required on the vehicle if the RU or the vehicle owner want to benefit from the additional transmission capacities, e. g. for the usage of SRS 3.6.0 and online key management. It should be noted that vehicles with SRS 3.4.0 can continue to be used on lines equipped with GPRS. Nevertheless, from a capacity point of view the infrastructure managers are striving to ensure a high proportion of vehicles with SRS 3.6.0 from 2025 onwards until FRMCS is available.

4.6 Transmission of information in L1 with Euroloop and Radio Infill

In L1, data can be transmitted to an OBU by balises, Euroloop or Radio Infill. On RFC Rhine-Alpine, Switzerland and Italy have chosen to use Euroloop (CH and dedicated border lines to Italy) and Radio Infill (Italy). In Italy, rolling stock equipped with B2 and 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.