

ERTMS DEPLOYMENT PLAN

July 2025

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Mediterranean, approved by the Ministries of Transport

The information provided reflects the current planning status in July 2025 and is tentative and not legally binding. There may be deviations from other national publications.

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Abbreviations

Abbreviation	Description
ATB	Automatische treinbeïnvloeding (Automatic Train Control System)
B	Baseline
BAV	Bundesamt für Verkehr (Swiss Federal Office of Transport)
CCS	Control Command Signalling
DG Move	Directorate General for Mobility and Transport
DMI	Driver Machine Interface
EDP	ERTMS European Deployment Plan
ERA	European Union Agency for Railways
ERTMS	European Rail Traffic Management System
ESC	ETCS System Compatibility
ETCS	European Train Control System
EU	European Union
EUG	ERTMS Users Group
FRMCS	Future Railway Mobile Communication System
FS	Full Supervision
GSM-R	Global System for Mobile Communications – Railway
GPRS	General Packet Radio System
IM	Infrastructure Manager
KMC	Key Management Centre
KVB	Contrôle de vitesse par balises (Train Control System)
L	Level
LS	Limited Supervision
NIP	National Implementation Plan
NSRM	North Sea – Rhine – Mediterranean
OBU	On-Board-Unit
PKI	Public Key Infrastructure
PZB	Punktförmige Zugbeeinflussung (Intermittent Train Control System)
RBC	Radio Block Centre
RFC	Rail Freight Corridor
RSC	Radio System Compatibility
RU	Railway Undertaking
SMS	Safety Management System
SRS	System Requirements Specification
TBL 1+	Transmission balise (Beacon-to-Locomotive Transmission)
TEN-T	Trans-European Transport Network
TENtec	European Commission's Information System to coordinate and support TEN-T Policy
TSI	Technical Specifications for Interoperability
ZUB	Intermittent train control system used on the standard-gauge Swiss railway network

Cover Document

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.

The publication of Regulation (EU) 2024/1679 of the European Parliament and of the Council of 13 June 2024 on Union guidelines for the development of the trans-European transport network marks the establishing of the new Rail Freight Corridor North Sea – Rhine - Mediterranean (hereafter RFC NSRM), based on the RFC RALP and the RFC NSM. The following chapter describes the ERTMS Deployment plan of RFC NSRM. Main parameters for the development of ERTMS are:

- Priorities by the deployment on core (2030), extended core (2040) and comprehensive network (2050)
- Decommissioning of class-B systems (by 2040 on the core, 2045 on the extended core and 2050 on the comprehensive network)

Legally the ERTMS deployment by the Member States along RFC North Sea - Rhine - Mediterranean is still based on the currently applicable European Deployment Plan (EDP [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 at the end of 2025.

In addition to the EDP, the EU ERTMS Coordinator creates and publishes working documents on actions and associated objectives to achieve interoperability and drive ERTMS deployment.

The second work plan from 2022 ([link](#)) gives already a serious look on the implementation of ERTMS, setting the focus for the future on a more continuous and non-disruptive development. In 2024 Matthias Ruete has been conformed for a second term as EU ERTMS Coordinator. Currently, he is preparing a new work plan.

Matthias Ruete considers the RFC North Sea - Rhine - Mediterranean as a key project on European level.

2. Current Situation on RFC North Sea – Rhine – Mediterranean

This chapter contains details of the ERTMS deployment planning on RFC North Sea – Rhine – Mediterranean. The information is indicative and can differ from the National Implementation Plans (NIP) due to different update procedures, deadlines, and dates for publication.

2.1 The Netherlands

In The Netherlands, deployment started on the Betuweroute between Kijfhoek and Zevenaar which was inaugurated in 2007 as a dedicated freight line equipped with ETCS B2, SRS 2.3.0d only. 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 2010 the corridor between Amsterdam and Utrecht - but excluding the main stations Amsterdam and Utrecht - was equipped with ETCS B2, SRS 2.3.0d as dual signaling in parallel to the Dutch class B system ATB.

The further national ERTMS deployment on the main RFC North Sea - Rhine - Mediterranean lines has been decided in 2019. The plan 2019 included ERTMS roll out also on Kijfhoek - Venlo – German border and Utrecht - Betuweroute (main station Utrecht excluded) by 2030. It turned out the plan was too optimistic and roll out plans are temporary halted. Revised plan includes Port of Vlissingen – Roosendaal (2029 – 2030) and Kijfhoek – Roosendaal – Belgian border (2031). At this stage it is not possible to provide information about new realisation dates for other lines.

2.2 Belgium

In Belgium, the outlined ERTMS implementation of the Corridor lines is part of a country-wide migration program by the end of 2027*, although Infrabel is still aiming to equip the mainline network by the end of 2025, in order to improve the safety level of train operations on the mainline network. All vehicles in Belgium have to be operable with ERTMS by end of 2027 (*) 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 ETCS2 without lineside signalling implemented also with the system version 2.X and gradually deployed from end 2028.

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 28 November 2023 provides the progressive decommissioning of the Memor/Crocodile Class B system on the main tracks

*mid-May 2025 the Belgian federal Council of Ministers agreed to revise the “ETCS only” deadline for rolling stock and infrastructure from end 2025 to end 2027. Even though Infrabel is aiming to respect the original deadline of end 2025, the legal deadline is set at the end of 2027 for all for rolling stock and infrastructure.

equipped with any level of ETCS, as soon as ETCS is in service, at the latest by 12.12.2027. From 12.12.2027, 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 the next step, from 2026 L1 will be replaced by L2.

2.3 Germany

In Germany, the roll-out planning on RFC NSRM has changed over the past years in the course of the further development of the strategy for the German network. So L1LS was completely dismissed in 2022 except for the cross-border lines to Switzerland. The awarding of ETCS L2 (SV 2.0) is tendered and contracted on RFC NSRM since 2020. Putting into operation started in 2022. The operational use of ETCS on the lines of the RFC NSRM is currently not mandatory and therefore the vehicle equipment is not compulsory. The existing Class-B systems, especially PZB, will be kept operational in parallel to an ERTMS installation for a transition period. Decommissioning of Class-B systems is not yet decided.

In April 2024 DB InfraGO published an ERTMS migration strategy for the period until 2029 and a revised NIP was handed over to the DG Move by the MoT. Since then, the framework conditions have changed in political, financial, and strategic terms. The impact on the general ERTMS roll-out can only be assessed once budgets have been reallocated and projects have been reprioritized against the overall objective to establish reliable operations on the high-performance network. An update of the ERTMS migration strategy and the NIP will be reviewed and decided as soon as the evaluation process is completed.

Nevertheless, changes for the previously planned ERTMS roll-out on the former RFC Rhine-Alpine are currently estimated to be minor. Realization has already been stipulated between the federal government and DB InfraGO by means of financing agreements.

In 2025, the Federal Ministry of Transport published the study “Realignment of the overall strategy for the digitalization of railways” ([link](#)). The study confirms that the rollout of ETCS is economically viable if the rollout is implemented consistently. Furthermore, the study defines success factors for the digitalization like the establishment of stringent program control and decision-making authority, coordinated, Germany-wide vehicle conversion (Federal funding), long-term financing and procurement or standardization of planning, approval and commissioning processes. The derivation and definition of specific measures are currently still under review.

2.4 France

In France, the ETCS roll-out has begun in level 1 FS, system version 1.1, with two pilot sites located at the borders of Belgium and Luxembourg, hence allowing an actual ETCS transition between the three networks. These pilot sites have been in operation since 2016 and 2017.

The equipment of the route between these borders and the Swiss border near Basel is on-going (through Metz, Strasbourg and Mulhouse), with intermediate steps, the final achievement being scheduled end 2028, in L1FS, system version 1.1. There is still no date for the decommissioning of KVB on this route.

Following the updated SNCF Réseau strategy for its network, the rest of the corridor will be fitted with ETCS level 2, without lateral signalling, and without class B system which will be decommissioned along with the commissioning of ETCS. The NIP issued end 2024 provides for a phased roll-out along the Marseille-Metz route, via Dijon and Lyon, to be finalized around 2040. This NIP has been designed to, as much as possible, take into account four constraints:

- The need for digital interlockings, hence leading to a fusion of the ERTMS program with the Network Centralized Control (CCR) program
- The financial subsidies to be allocated by the State
- The European request to stick to the TEN-T Regulation
- The ability of Railway Undertakings to equip with ETCS all their rolling stock that will use the sections equipped with Level 2 only.

2.5 Luxembourg

In Luxembourg, deployment of ETCS started in 2004 and was completed for the whole network in 2017. Since December 2019, only vehicles equipped with ETCS are allowed on the Luxembourgish railway network and the Class B system MEMOR II+ has been decommissioned. Today ETCS is the only train protection system in service. The whole network is operated in ETCS L1 FS with system version 1.y. Luxembourg will continue to use and further develop L1 FS in the future and has no plans to switch to L2.

2.6 Switzerland

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 vehicles which support at least SV 2.0 is possible since 2017 on 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.

2.7 Italy

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 have 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 present configuration of the corridor lines during a migration phase until 2030 will be mixed level lines with ERTMS and the existing Class B system. Later, following the deployment of ERTMS according to the recovery plan since 2022 all the new awarded ETCS lines will be L2 stand alone. And according to the new NIP released end of 2024 in Italy L1 Radio Infill will no longer be implemented. Likewise, ETCS L1 will be migrated to L2.

The operational scenario and the relevant risk management for the implementation of the new plan L2 has 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 North Sea - Rhine - Mediterranean network is expected to be completed stepwise until 2032. Decommissioning of the Class-B system is planned stepwise from 2025, depending on the progress of the vehicle equipment.

2.8 RFC NSRM ERTMS Deployment Planning state of play

Graphical overviews and maps on the state of play of ERTMS deployment planning on RFC NSRM 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. The layout of the maps of the RFC NSRM in Annex 1 is based on the description of the assigned routes for freight transport in the TENtec web viewer of the EC ([link](#)). There may be minor deviations in connection with the allocation of routes to freight, passenger and mixed operation (e.g. Basel - Freiburg - Offenburg route) or meaningful completion (display of the Geneva border station).

Annex 2 gives an overview of the planned ERTMS equipment 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](#)). At the time of the editorial deadline for this document, the database for the RFC NSRM is in the conversion phase and will be finalised by the end of 2025. It will be updated regularly. There may therefore be deviations from the print document. In case of doubt, clarification can be provided via the feedback function on the CIP website or via the RFC NSRM office ([email](#)).

3. Current challenges on RFC NSRM

The following topics – which are not part of the original task for the RFC of ERTMS deployment monitoring – are nevertheless relevant to achieve a fully operational and interoperable ERTMS system including proper preparation of OBU equipment for ERTMS operations.

3.1 Cross-border sections

On RFC NSRM, ERTMS will be applied and operated internationally, including border-crossings. This means, that the currently available ERTMS specifications, engineering rules, products as well as authorisation rules will be proven in an international environment on the cross-border sections. Nevertheless, the responsibility for the installation and authorisation of the trackside part is in the hands of each Member State.

On the cross-border sections, interaction is much more complex due to different national technical requirements, operational rules, national regulations, and implementation schedules. An overview of the planned cross-border solutions on RFC NSRM can be found in Annex 2 to this document. These overviews illustrate the expected (stepwise) roll-out on the cross-border sections and the technical transitions to be managed in terms of the command control, voltage, and radio systems.

For the introduction of ERTMS on cross-border sections, the EDP sets out specific requirements regarding bi-lateral coordination and the involvement of the railway undertakings.

The infrastructure managers along the NSRM corridor are working together with the ministries on the implementation of harmonised processes to ensure the smooth introduction of ETCS at the borders. The involvement of RUs and vehicle owners takes place via up-to-date information on the status and further planning of the ERTMS roll-out, exchange on specific vehicle projects and regular workshops at corridor level.

3.2 Equipment of rolling stock with OBUs

Operators and vehicle owners are largely responsible for their own vehicle equipment strategy. Nevertheless, the success of ERTMS is heavily depending on the availability of vehicles with

adequate on-board equipment as different ETCS System Versions can be used on the vehicles and on the trackside. Therefore, it is important to understand their compatibility. Annex 3 to this document includes an overview of main definitions and schematic illustrations in this context.

In this respect, the ministries and infrastructure managers of RFC North Sea - Rhine - Mediterranean support the vehicle owners by their regular monitoring of the ETCS deployment, by participation in selected sector working groups and other initiatives.

Beyond the corridor level, there are several key tasks for rolling stock equipment that need to be addressed in order to establish ETCS as the sole command control system:

- Development of initiatives for the financial support of vehicle owners.
- Coordination and monitoring of rolling stock and trackside equipment, considering the migration of radio technology from 2G (GSM-R) to 5G (FRMCS) at national and European level.
- Stipulation and financing of a migration plan from GSM-R to FRMCS and monitoring of the realisation.
- Definition of a stable, future-proof equipment technology (with integration into the coordinate system of the ERTMS system versions).

3.3 TSI development

The updating of technical guidelines shows a continuing dynamic and takes place faster than the development and introduction of products can follow. Potentially limited or lacking backwards compatibility or the mandatory implementation of new requirements pose considerable investment risks, particularly for the vehicle side.

3.4 Trackside Approval

The objectives for trackside approval are laid down in EU directive 2016/797 and causes high additional expenses to obtain the necessary certificates, especially with regard to expert know-how. The benefits of the procedure are not yet comprehensible for the IMs, as critical points may only become known in a project phase that no longer allows for corrections. An ERA working group has been set up to achieve improvements. Positive results remain to be seen but are essential for an accelerated nationwide introduction of ETCS.

3.5 Parallel targets

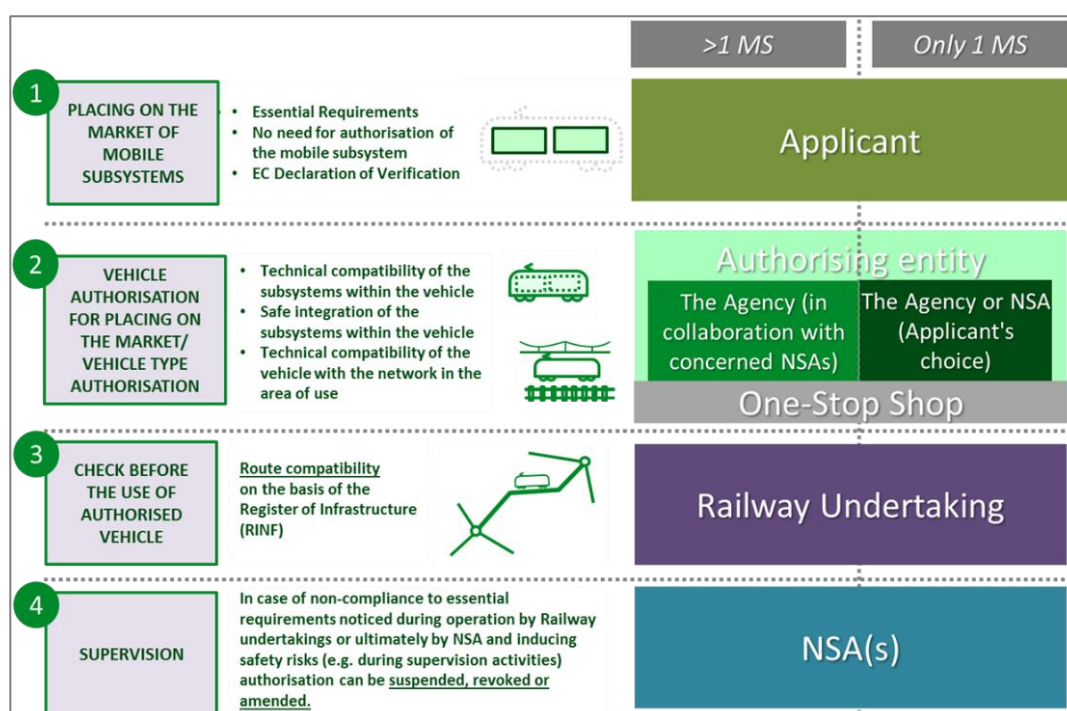
ERTMS consists of several components that must be developed and introduced in a coordinated manner on the trackside and on-board side. ETCS, FRMCS and online key management should be mentioned in particular. Objectives regarding the implementation currently only concern ETCS (TEN-T, EDP).

If L2 without lineside signals is a TEN-T target on the core network, this is only possible with a potent radio system. Therefore 5G (FRMCS) is necessary to achieve the goal. The migration from GSM-R to FRMCS is not yet planned and financed. However, it is currently expected that 5G compliant radio and OBU equipment will not be available in vehicles before 2032, and trackside even later. The complete migration may take 10 year or longer. As a result, decommissioning of the class B on the core network until 2040 is a very ambitious target. Summarizing, further ERTMS roll-out will need an efficient coordination on national and European level. Otherwise, in particular investments in the rolling stock can hardly be justified.

3.6 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 authorization and railway vehicle type authorization process can be found. The European Union Agency for Railways developed a guideline for the vehicle authorization process. This document and further explanations on the vehicle authorization regime that applies as of 16 June 2019 are available on the ERA [website](#).

In Switzerland, the BAV is issuing a separate authorization (based on the ERA authorization).



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 authorization 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.

3.7 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 Centers (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). The development of an online key management has been started by the IMs (apart from CFL due to their L1 FS network on which keys are not necessary). The usage of online key management requires rolling stock equipped with SV2.1 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 InfraGO	Yes	Limited	link
SBB / BLS	Yes	Unlimited	kmc-ch@sbb.ch
SNCF Réseau	Yes	Unlimited	guichetunique@reseau.sncf.fr
RFI	Yes	Unlimited	kmc@rfi.it
CFL	No	N/A	-

ERTMS key management contacts

At SNCF Réseau, RUs which need ETCS keys must contact its account manager (chargé de compte) in the Commercial Division, who will internally forward the request with the relevant information provided by the RU to the technical service involved. To get an account manager, new RUs can contact the general one stop shop: guichetunique@reseau.sncf.fr.

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.

The development of a complete system requires the establishment of a Public Key Infrastructure (PKI) in each country that fulfils defined security requirements. The national PKIs must ensure effective and secure communication with all participants and enable interoperable exchange. This is a challenging task and will take several years to be fully realised. Development and introduction of all relevant components is ongoing, including cyber security requirements.

3.8 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. 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 North Sea - Rhine - Mediterranean 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)
France:	French
Italy:	Italian
Luxembourg:	French, German

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.

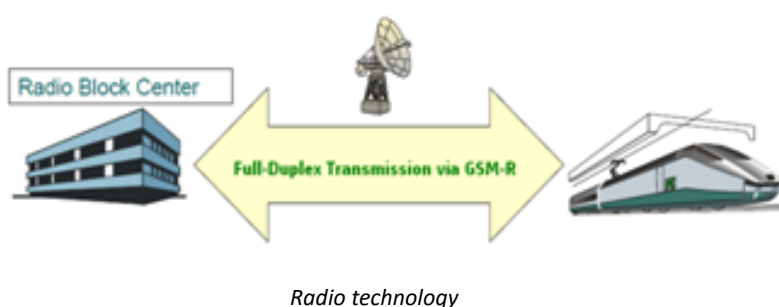
3.9 Operational Rules

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).

3.10 Radio technology

GSM-R is currently the standard communication technology for railway applications along RFC North Sea - Rhine - Mediterranean 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 maintenance support for 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 by a 5 G radio technology is planned and in preparation (Future Railway Mobile Communication System - FRMCS). 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 InfraGO and RFI still plan to use General Packet Radio System (GPRS) as a bridge technology and thus to install significantly higher transmission capacities (SV 2.1).

For SV 2.1 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 or for the usage of online key management. It should be noted that vehicles with SRS 3.4.0 can continue to be used on lines equipped with GPRS.

The migration from GSM-R to FRMCS should be expected to begin after 2028 and in so far within the life cycle of many of the existing rolling stock.

4. Transmission of information in L1

In L1, data can be transmitted to an OBU by balises, Euroloop or Radio Infill. On RFC North Sea - Rhine - Mediterranean, Switzerland and Italy have chosen to use Euroloop (CH and dedicated border lines to Italy) and Radio Infill (Italy). In Italy, on RFC NSRM L1 + Radio Infill is not in use anymore.

