

What will shape the cost of Europe´s railway communications migration?

FRMCS Deployment Cost Drivers and Calculation Tool

Webinar, 17 November 2026

Europe's Rail

EU-Rail FRMCS Deployment Group

KPMG sener

European FRMCS Deployment Group

Today's speakers:



Pascal Désaunay

EU-Rail / SNCF



Mario Sela

EU-Rail / DB



Álvaro Rodríguez

KPMG

WEBINAR

Agenda

FRMCS deployment cost drivers and Cost Model Tool

01 **Introduction**
EU-Rail & FRMCS Deployment Group

02 **Context & Approach**
Why now, evidence and method

03 **What Drives Cost**
On-board, trackside, handheld

04 **What Changes the Outcome**
Migration, risks and opportunities

05 **Recommendations**
Priority actions for deployment

06 **FRMCS Cost Model Tool**
Structure, console and live demo

07 **Conclusions**
Key insights and next steps

08 **Q&A**
Questions and discussion

CHAPTER

01

Introduction

EU-Rail & FRMCS Deployment Group

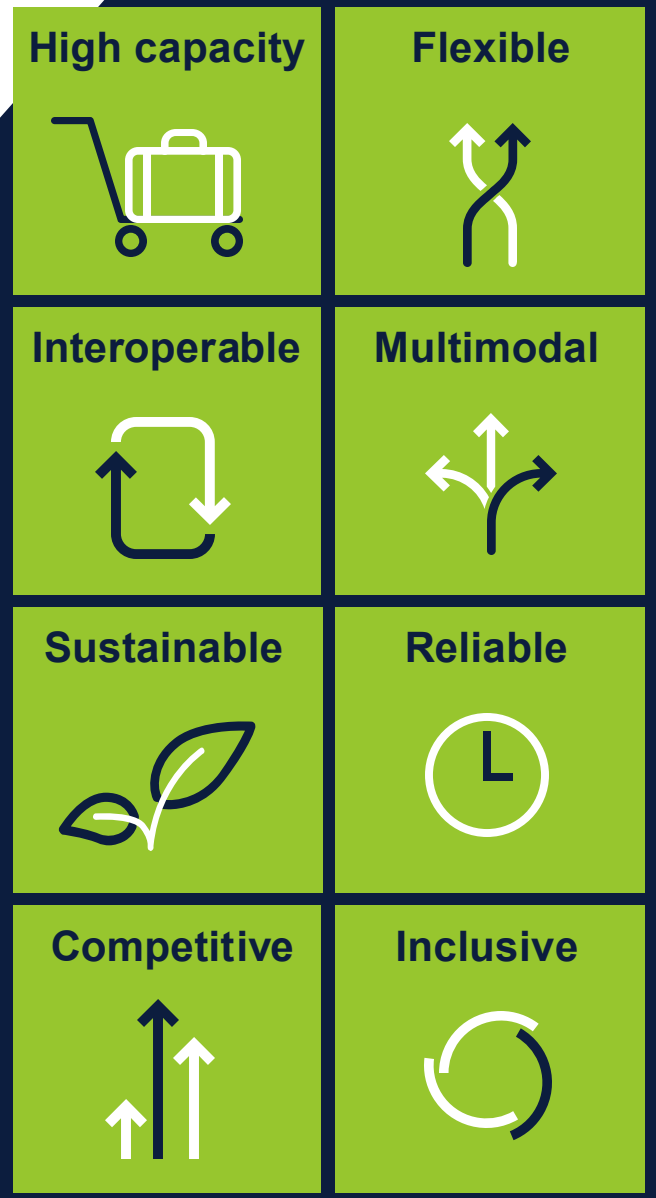
AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Vision

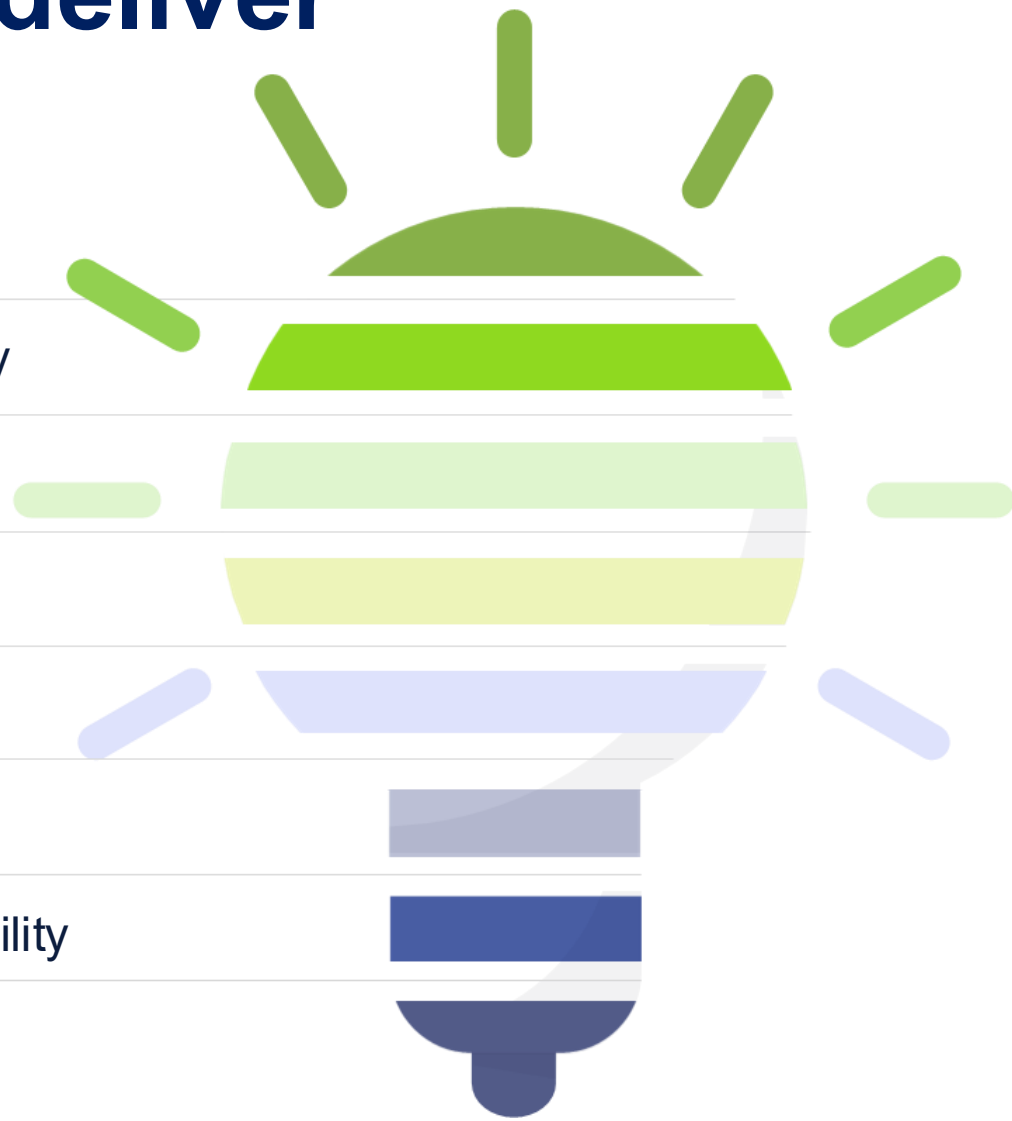
To deliver a **fully integrated European railway network for citizens and cargo.**

Rail Research and Innovation to Make Rail the Everyday Mobility



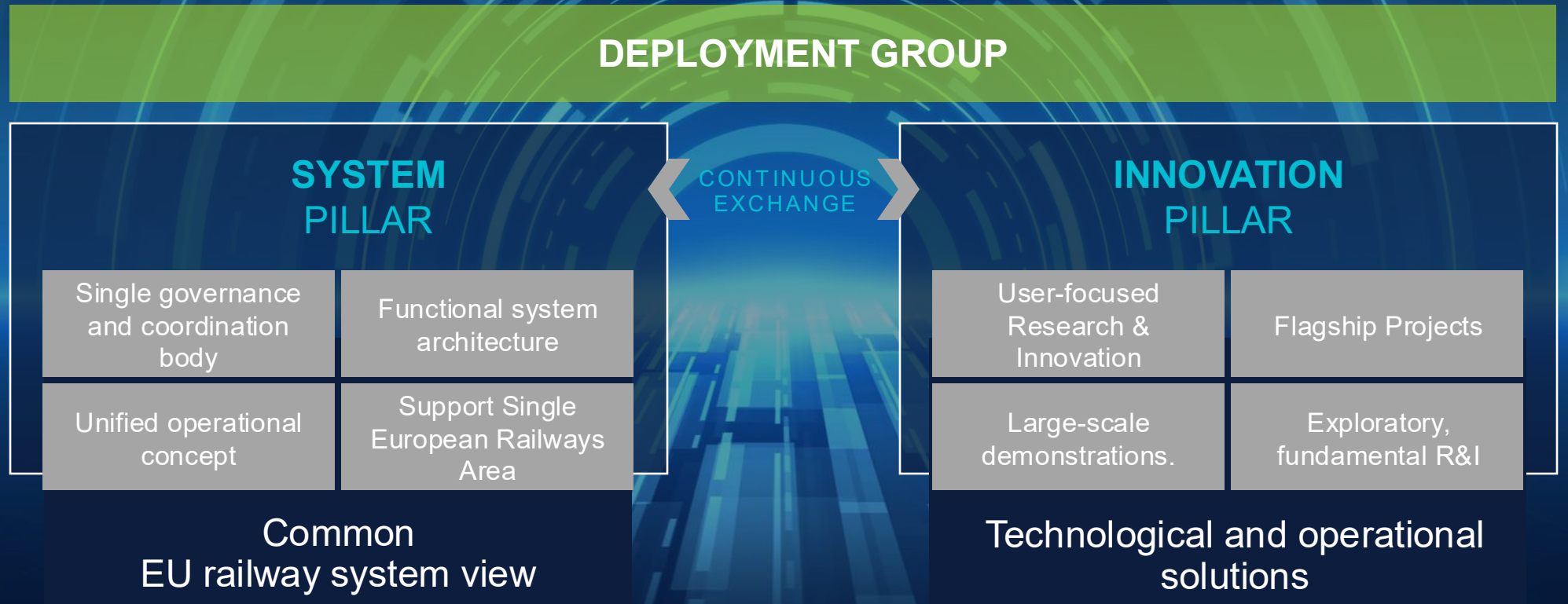
EU-Rail, a R&I integrated Programme and a cooperation to deliver

- Adapt to changing customer requirements
- More cost-efficient solutions and services compared to today
- Need for improved performance and capacity
- Addressing workforce shortage
- Climate change adaptation and environmental sustainability
- Increased competitiveness
- Interaction with other modes, make rail central to future mobility
- Addressing legacy systems and obsolesce



EU-Rail

Single R&I Programme based on a system view



EU-RAIL HL-Deployment Group

From Talking to Testing to implementing

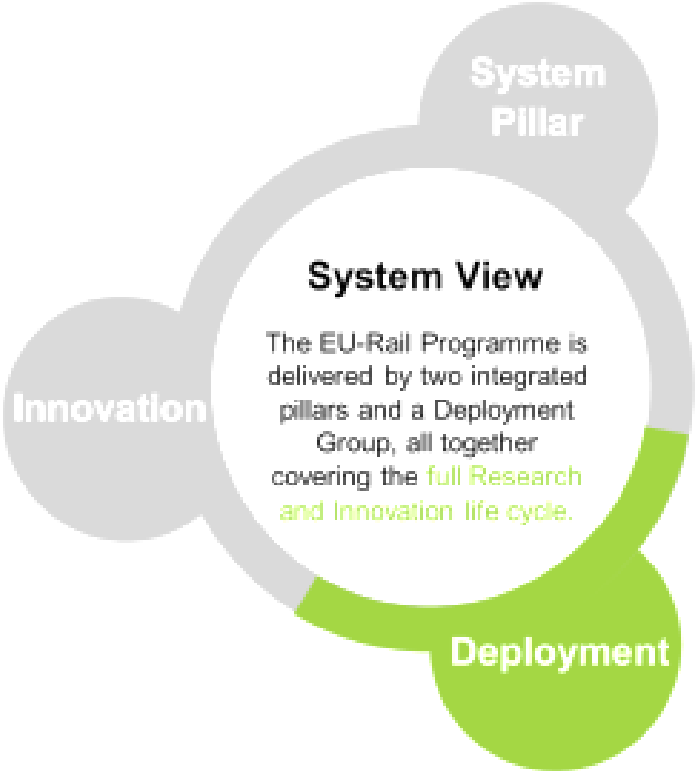
- Objective is to close gap between R&I activities and Deployment and Migration
- Support smooth, fast and cost-effective introduction of Innovations and new architecture
- Open group, contributing to whole railway sector and industry

Examines and provides recommendations on:

- Scenarios and analyses for the fast rollout of innovative solutions
- authorisation, cost-drivers, capacity and migration risks

Main sub programmes:

- European DAC Delivery Programme (EDDP)
- European FRMCS Deployment Group
- Coherence between transformation programmes



European FRMCS Deployment Group

FRMCS Deployment Group

Provide advice and recommendations to the High-Level Deployment Group and sector on the best way to deploy FRMCS (business driven: cost efficient, simple, fast)

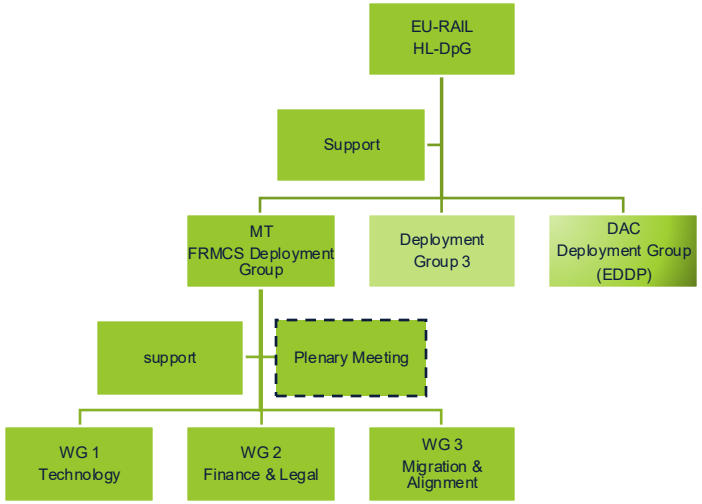
Deliverables

- Analyse (current) Infra, rolling stock, industry and workshop capacity for (fast, easy and cost effective) deployment. Estimate necessary capacities
- Support to accelerate and simplify authorisation,
- Perform cost analyses, model and risk assessments
- Develop toolbox with diverse migration scenario's (greenfield and brownfield situations)
- Provide dedicated cross-border (installation) alignment analyses and public-private mobile network interface analyses. Give recommendations
- Alignment with other major Rail programmes (ERTMS, DAC, …) and stakeholders

- Implementation programmes are and stay responsibility of RUs/IMs/lessors and Member States (inclusive financing).
- In alignment with: UIC development programme; MORANE2 test programme; ERA EECT process; ETSI standardisation, Stakeholder Alignment Meeting

Working areas

EU-Rail FRMCS Deployment Group



Working Group 1 (WG1) - Deployment Technology

Practical deployment guidelines on different topics, for example:

- Cross-Border Landscapes / National Investment Plans
- Template for a Service Level Agreement for MNO serving FRMCS
- Practical rooftop antenna coexistence and installation recommendations
- Non-ETCS FRMCS-using applications (survey and recommendations)

Working Group 2 (WG2) - Finance and legal

- Cost driver studies vehicles and rolling stock
- Recommendations to simplify Testing & Validation and Authorisation processes

Working Group (WG3) - Scenarios and alignment

- Report on FRMCS Deployment scenario's
- Questionnaire 2026 (Survey, now also including MNOs and NoBo's)
- Analyses coherence with other transition programmes (ETCS, ATO, DAC, …)

Management

- Risk management, stakeholder management, communication/dissemination

Members from 37 companies/associations

More information and all publications:
https://rail-research.europa.eu/about-deployment-group/

CHAPTER

02

Context & Approach

Why now, evidence and method

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Disclaimer

How to interpret the findings presented in this webinar

Findings, cost weights and assumptions are based on the limited available stakeholder input, benchmarking, market research and expert judgement. Given the evolving maturity of FRMCS, results are indicative and intended for analytical and planning purposes only. Assumptions should be validated and adapted to project-, organisation- and country-specific conditions.

INDICATIVE EVIDENCE | ANALYTICAL USE | LOCAL VALIDATION

Use the results as a structured basis for discussion, not as a definitive European cost benchmark.

Background – Why this analysis matters

FRMCS is essential for Railway transition. Its cost implications must be understood early.

A strategic transition

FRMCS is required to address GSM-R obsolescence and provides the communications foundation for future railway digitalisation.

Replacement need + digital enabler

A system-wide challenge

Deployment affects rolling stock and trackside infrastructure, while outcomes depend on migration sequencing, assurance, operational constraints and architecture choices.

Cost is contextual and interconnected

A structured response

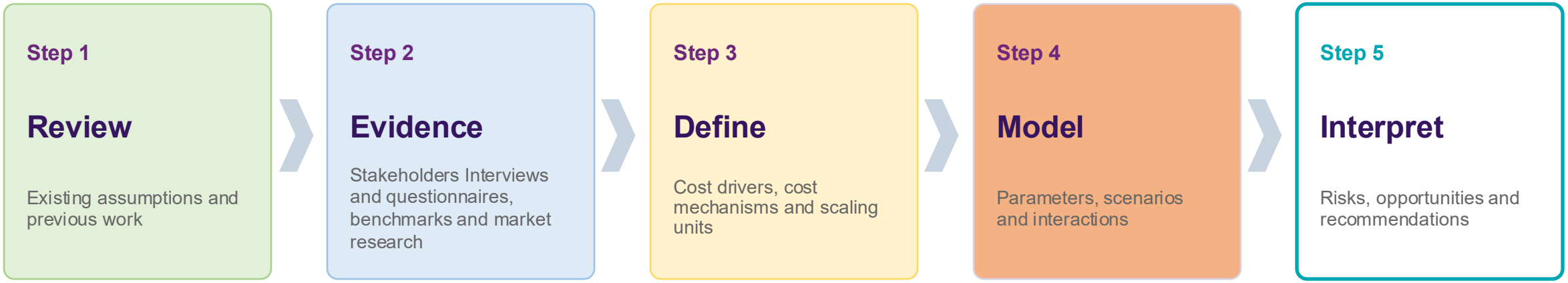
This creates a clear need to identify and assess the key cost drivers and provide a structured basis for evaluating deployment strategies, migration approaches and cost-reduction opportunities.

Understand what drives cost before making deployment decisions

The analysis covers both rolling stock and trackside infrastructure and supports informed discussion across technical, regulatory and policy choices.

Approach

The analysis progressively connected evidence to results



Stakeholder participation: IMs, RUs/lessors, suppliers (on-board and trackside), integrators, Certification and Assessment Bodies and Neutral Hosts/Tower Companies

Independent review of the previous work and iterative expert stakeholders feedback strengthened the analytical framework.

Disclaimer: *Findings, cost weights and assumptions are based on the limited available stakeholder input, benchmarking, market research and expert judgement. Given the evolving maturity of FRMCS, results are indicative and intended for analytical and planning purposes only. Assumptions should be validated and adapted to project-, organisation- and country-specific conditions.*

Before we show the findings…

What do you think?

Which factors have the greatest influence on the total cost of FRMCS deployment?

Keep your answer in mind…

- **A** Vehicle equipment prices
- **B** Sites and infrastructure
- **C** Vehicle certification and downtime
- **D** Migration timing and coexistence

CHAPTER

03

What Drives Cost

On-board, trackside, handheld

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Cost drivers overview

Main Focus on CAPEX!

Three cost domains, three different scaling logics

ON-BOARD

Scales by cab, vehicle, prototype and time

- Equipment & installation
- ESC/RSC compatibility testing
- Certification activities (NoBo/AsBo/DeBo)
- Authorisation activities (ERA/NSA) and administrative processing
- Prototype ratio
- CTT and APOM for series vehicles
- Vehicle immobilisation

TRACKSIDE

Scales by site, subproject, network and lifecycle

- RAN deployment and implementation
- Core and central systems
- Project support activities
- Authorisation and approval
- MNO share and service base access

HANDHELD

Scales mainly by device and transition strategy

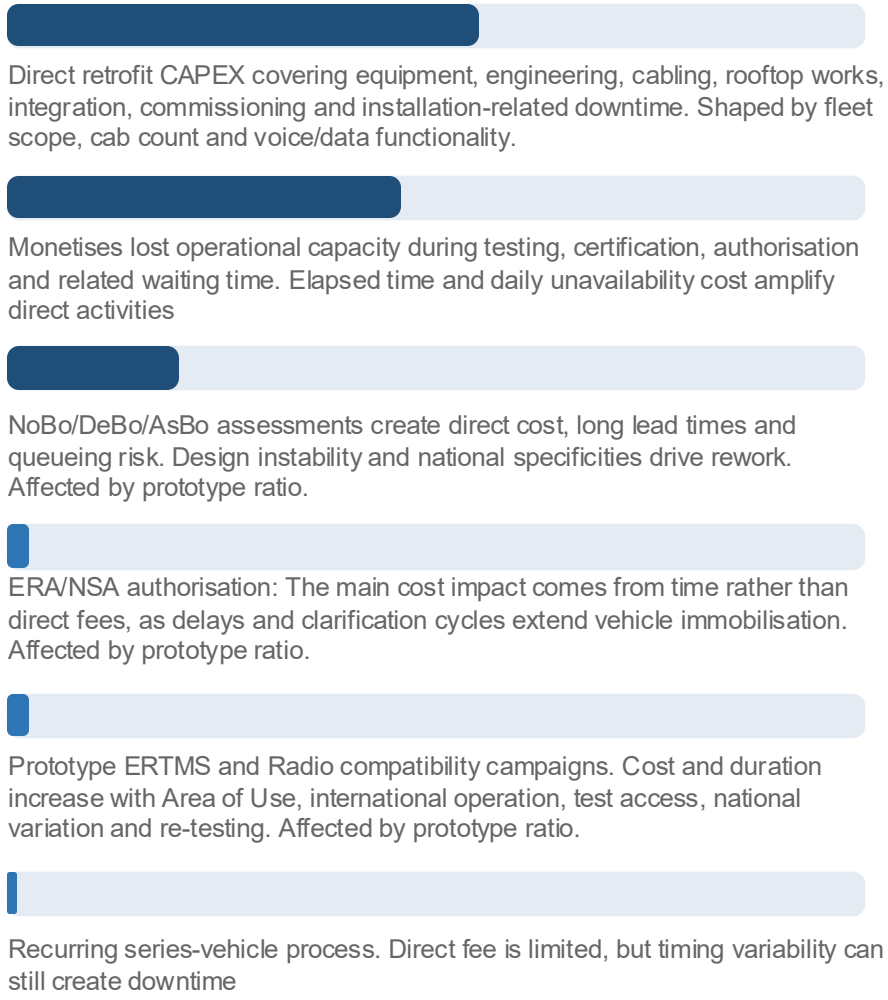
- Terminal replacement
- Fleet size and unit scope
- Device lifecycle
- Parallel GSM-R / FRMCS use
- Operational rollout timing

On-Board deep dive

Main Focus on CAPEX!

On-board cost is shaped by equipment, certification and time out of service

RELATIVE CAPEX WEIGHT



Equipment & installation

Direct retrofit CAPEX covering equipment, engineering, cabling, rooftop works, integration, commissioning and installation-related downtime. Shaped by fleet scope, cab count and voice/data functionality.

Vehicle immobilisation

Monetises lost operational capacity during testing, certification, authorisation and related waiting time. Elapsed time and daily unavailability cost amplify direct activities

Prototype certification

NoBo/DeBo/AsBo assessments create direct cost, long lead times and queueing risk. Design instability and national specificities drive rework. Affected by prototype ratio.

Prototype authorisation

ERA/NSA authorisation: The main cost impact comes from time rather than direct fees, as delays and clarification cycles extend vehicle immobilisation. Affected by prototype ratio.

ESC / RSC testing

Prototype ERTMS and Radio compatibility campaigns. Cost and duration increase with Area of Use, international operation, test access, national variation and re-testing. Affected by prototype ratio.

CTT / APOM series process

Recurring series-vehicle process. Direct fee is limited, but timing variability can still create downtime

Key message

Three main on-board cost drivers: equipment & installation, vehicle immobilisation and prototype certification.

Largest savings come from the combined reduction of prototypes, repeated testing activities and immobilisation days, supported by standardisation, reusable evidence, digital workflows and coordinated retrofit planning.

Other processes have a lower direct cost weight, but still affect immobilisation:
- *Prototype authorisation.*
- *ESC/RSC testing.*
- *CTT/APOM series*

Optimising and coordinating these processes reduces elapsed time and vehicle unavailability.

Trackside deep dive

Main Focus on CAPEX!

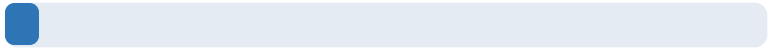
Trackside investment is driven by radio access deployment

RELATIVE CAPEX WEIGHT



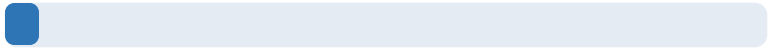
RAN deployment

RAN, sites, transmission, power, civil works, integration and commissioning. Number of sites × deployment scope, shaped by site density, spectrum, reuse of GSM-R infrastructure, energy supply, fiber availability and integration with MNOs



Additional project costs

Testing, training, documentation, safety and environmental measures and validation environments



Core & central systems

Network-level platform plus subproject integration. Uncertainty due to the ongoing evolution of FRMCS specifications and commercial solutions

Trackside approval

Best managed as a programme-level campaign. May affect commissioning timelines and indirectly influence other cost components, particularly the duration of GSM-R/FRMCS coexistence

MNO share modifies the cost structure. Hybrid models may reduce part of the dedicated infrastructure rollout but introduce additional costs related to integration, resilience, SLA management and service assurance.

Key message

Trackside cost optimisation is primarily about making the most efficient use of the radio access infrastructure.

The principal trackside cost drivers are related to radio access deployment, site density and infrastructure reuse. The greatest opportunities for cost optimisation arise from maximising the reuse of existing GSM-R assets, optimising deployment architecture and reducing site deployment requirements, while the potential impact of MNO-based approaches remains dependent on future market, operational and commercial developments.

CHAPTER

04

What Changes the Outcome

Migration, risks and opportunities

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

FRMCS Migration scenarios

Four deployment architectures with increasing MNO participation and service dependency

MIGRATION SCENARIOS			
1	**Dedicated IM network**	Fully dedicated infrastructure owned and operated by the Infrastructure Manager. The IM owns and operates the dedicated FRMCS radio access and core infrastructure.	No MNO
2	**Hybrid**	Public MNO services used selectively only in part of the network, typically for redundancy or specific coverage gaps.	Limited MNO use
3	**Shared with MNO**	MNO provides radio access across all lines while the core remains under Infrastructure Manager control.	Extensive hybrid
4	**MNO-operated**	Full delegation where both radio and core are provided and operated by the Mobile Network Operator.	Delegated

KEY MESSAGE Architecture choices shift costs between dedicated infrastructure, integration and recurring services, while changing control, resilience and dependency.

Source: WG3, Report on the FRMCS Migration Scenarios 2025

Impact of migration strategy in cost drivers

ARCHITECTURE	CAPEX EFFECT	OPEX / SERVICE EFFECT	CONTROL & RISK
Dedicated IM network	Higher infrastructure CAPEX	Greater operational control	Lower third-party dependency and service costs
Hybrid	Selective CAPEX avoidance	Integration + service costs	More interfaces to govern
FRMCS shared with MNO	Potentially lower dedicated rollout	Higher recurring service exposure	SLA, resilience and monitoring
MNO-operated	Shift away from owned assets	Service-based lifecycle cost	Commercial and operational dependency

MNO participation may shift costs from dedicated infrastructure towards integration and recurring services.

Further assessment requires project-specific technical, operational and commercial data.

Priority risks and mitigations

Key risks can amplify cost, but early programme action can reduce their impact

RESOURCE SATURATION

RISK

Concurrent European deployment may constrain workshops, assessors, laboratories, suppliers and trackside enabling resources.

MITIGATION

Start coordinated resource and procurement planning early; forecast demand, reserve capacity, develop alternatives and sequence deployment to avoid peaks.

OPERATIONAL READINESS

RISK

Late procedures, rulebooks, training and maintenance arrangements may delay entry into service after technical deployment.

MITIGATION

Treat change management as a core workstream and begin procedures, training, testing strategies and organisational preparation well before deployment.

OPEX UNCERTAINTY

RISK

Software, cybersecurity, connectivity, early-life defects and prolonged coexistence may increase lifecycle costs.

MITIGATION

Plan on a lifecycle-cost basis, validate OPEX assumptions progressively, optimise coexistence and use automation, OTA updates and improved maintenance practices.

FRMCS–ETCS ALIGNMENT

RISK

Misaligned voice, data and ETCS schedules may lead to double interventions, repeated assurance and longer transition periods.

MITIGATION

Coordinate IM and RU plans by Area of Use; bundle interventions where maturity allows and explicitly assess lifecycle impacts where sequential deployment is unavoidable.

Opportunities

The strongest opportunities lay in process optimization, anticipation of the deployment and use of hybrid infrastructure approaches

1 Optimise on-board authorisation and certification

Reduce prototype demand and repeated assessment through multi-type approaches, reusable evidence, greater harmonisation, proportionate authorisation and digitalised CTT/APOM processes.

Lower repeated assurance effort, process duration and vehicle immobilisation

2 Use FRMCS pre-fitment where appropriate

Install passive provisions during vehicle manufacture or scheduled maintenance, such as cable routes, brackets, reserved space, power interfaces and grounding.

Reduce future installation effort, downtime and peak workshop demand

Benefit depends on specification maturity and the risk of rework.

3 Assess MNO, TowerCo and Neutral Host models

Evaluate hybrid, service-based and shared-infrastructure approaches as potential ways to support deployment, allocate infrastructure responsibilities and accelerate selected migration stages.

Assess on total lifecycle cost, resilience and responsibility allocation

Current evidence is insufficient for representative quantitative conclusions.

CHAPTER

05

Recommendations

Priority actions for deployment

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Recommendations and areas for future development

Prioritise actions that shorten the programme and prevent repeated work

RECOMMENDATIONS

1 Integrate migration planning

Coordinate on-board, trackside and ETCS plans by Area of Use; bundle interventions where viable and prepare operational change early.

2 Streamline certification and authorisation

Reduce prototypes through standardisation, multi-type approaches and evidence reuse; automate CTT/APOM.

3 Shorten immobilization and deployment time

Manage the full elapsed process, reserve test capacity, prepare dossiers early and reduce waiting, re-testing and administrative buffers.

4 Maximise reuse before building new infrastructure

Assess sites, passive assets and fixed networks early and consistently.

5 Prepare early resource and infrastructure readiness

Secure workshops, specialist resources, suppliers, assessors, permits, power, fibre and transmission capacity two to three years ahead where possible.

6 Take selective pre-fitment into account

Use on-board pre-fitment and bundled maintenance interventions where maturity and net benefit justify them.

7 Decide on lifecycle-based architecture and OPEX

Assess coexistence, software, cybersecurity, connectivity, MNO and shared-infrastructure models on total lifecycle cost, resilience and responsibility.

AREAS FOR FUTURE DEVELOPMENT

Deployment evidence

Use pilots and early projects to validate implementation, certification, authorisation, CTT, ETCS sequencing and optimisation benefits.

Long-term OPEX validation

Refine software lifecycle, cybersecurity, monitoring, maintenance and coexistence assumptions using operational evidence.

MNO and shared-infrastructure economics

Develop representative CAPEX, OPEX, SLA, integration and responsibility assumptions for MNO, TowerCo and Neutral Host models.

CHAPTER

06

FRMCS Cost Model Tool

Structure, console and live demo

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

From Cost-Driver Analysis to a Practical Tool

WHAT HAS BEEN ANALYSED (INPUT)

Recommendations and areas for future development

Are more general outcomes and do not cover the individual situations of stakeholders

Individual application needed

Recommendations can be applied to individual FRMCS migration framesets of IMs, RUs, Lessors and other stakeholders



WHAT THE TOOL ENABLES (OUTPUT)

01 **Project-specific estimates**

Users build their own baseline with their own fleet, network and migration assumptions.

02 **Scenario & cost-lever analysis**

Alternative assumptions can be tested and compared against the baseline.

03 **Transparent, traceable results**

Every result can be traced back to explicit inputs and calculation logic.

From insight to action: cost drivers become structured, adjustable inputs, so each user can build its own cost picture.

FRMCS Cost Model Tool: Purpose, Scope & Disclaimer

> **The objective of this tool is to enable users to estimate deployment and migration costs, understand the main cost drivers and explore potential cost optimisation opportunities**

PURPOSE:

Translate the cost drivers identified and assessed within the **FRMCS Deployment Group** into a practical tool to support deployment planning and informed decision-making.

SCOPE:

Covers **On-Board, Trackside and Handheld** cost components, including deployment, migration and selected operating costs.

The initial version focuses on **Baseline Scenario:** parallel operation of GSM-R and a dedicated FRMCS network.

KEY FUNCTIONALITIES:

Generate **project-specific cost estimates** using user-defined inputs and indicative reference ranges.

Adjust key cost levers, compare alternative assumptions and assess their economic impact against a user-defined baseline.

DISCLAIMER & LIMITATIONS:

NOT A EUROPE-WIDE COST FORECAST: The model supports informed decision-making but does not replace project-specific technical, commercial or regulatory assessments.

RESULTS DEPEND ON INPUTS AND AVAILABLE EVIDENCE: Estimates rely on user-defined assumptions. Reference ranges are indicative and should be progressively replaced as more reliable evidence becomes available. Operating cost data remains limited, and MNO-based scenarios are not yet quantified.



FRMCS Cost Model Tool v1.0 and Beyond

Additional analytical capabilities are being developed, but are not yet included in the version to be published 2026.

PUBLISHED 2026

v1.0

FRMCS Cost Model Tool

- **Scenario 1 only**
  GSM-R and dedicated FRMCS in parallel, IM-owned radio and core
- **User-defined inputs**
  Guided by indicative reference ranges
- **Cost Levers**
  Impact assessed against the user's baseline
- **Full traceability**
  Model Analysis, Calculations and Outputs

DEVELOPED – NOT YET IN v1.0

MNO Participation & Alternative Scenarios

Framework to compare the five deployment scenarios with different levels of MNO participation, separating CAPEX and OPEX effects.

WHY NOT YET

FRMCS and MNO-based solutions are at an early stage: evidence is not yet robust enough for reliable comparisons.

Sensitivity Analysis

Identifies the parameters with the greatest influence on costs. Each assumption is varied individually (±20%), the swing is calculated and results are ranked in a Tornado Chart.

WHY NOT YET

Kept as complementary analysis to keep v1.0 focused on Scenario 1 cost estimation.

Life-Cycle Cost (LCC)

Extends the assessment to initial investment and recurring costs over the full analysis period.

WHY NOT YET

Requires further validated assumptions on cost evolution, maintenance and asset replacement.

This work is the foundation for future versions, as validated evidence becomes available.

A modular and traceable cost model structure

The model combines reference parameters, automated calculations and detailed cost outputs, with a dedicated Input Console serving as the main interface for users to configure their baseline and explore alternative assumptions.

Before starting: the Cell Style and Abbreviations tabs explain the colour code and terminology used throughout the model.

01 Inputs Console

USER-EDITABLE

Users describe their situation: global settings, key inputs (fleet, km, handhelds) and their own value for each cost item, guided by the report's reference ranges.

02 Model Analysis

READ ONLY

Lists every cost item used by the model, showing the user's values next to the reference values from the report.

03 Calculations

AUTOMATED

Processes the user's values automatically, for both the baseline and the cost-lever cases.

04 Outputs

READ ONLY

Total costs, On-Board, Trackside and Handheld breakdowns, and the cost items with the greatest weight.

05 Cost Levers

USER-EDITABLE

Back in the Inputs Console, users adjust On-Board, Trackside and Handheld levers and see the impact against their baseline.

Each change is recalculated automatically → updated outputs

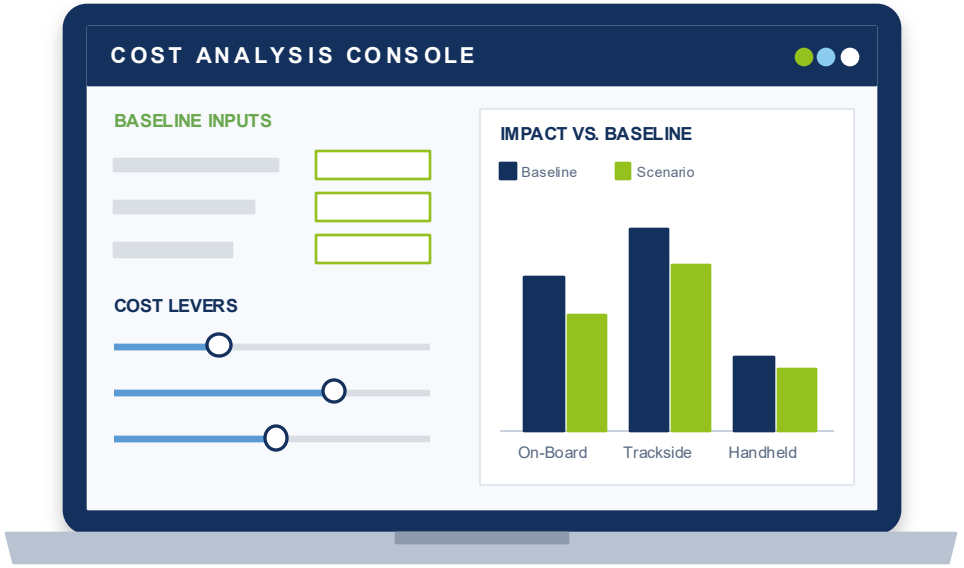
Only user values drive the results: every other tab can be consulted but not modified, keeping the calculation consistent and traceable.

From Assumptions to Cost Impact

LIVE DEMONSTRATION

FRMCS Cost Model Tool in Practice

Let's open the Excel tool and walk through a complete simulation using the Cost Analysis Console.



01 Define the baseline
Configure the scenario and enter project-specific inputs

02 Adjust cost levers
Test alternative assumptions

03 Assess the impact
Compare results against the baseline

FRMCS Cost Model: Key Takeaways & Next Steps

Turning cost-driver insights into practical deployment decisions and future model improvements.

KEY TAKEAWAYS

01 Understanding the main cost drivers

The model highlights the importance of radio infrastructure, on-board equipment, certification, authorisation and vehicle immobilisation in FRMCS migration costs.

02 Project-specific cost assessments

Users can establish their own cost baseline using project-specific assumptions, supported by indicative reference ranges.

03 Supporting cost optimisation

The Console enables users to test alternative assumptions, assess their economic impact and explore potential cost optimisation opportunities.

NEXT STEPS

01 Publication: Cost model, Manual and Report plus online Q&A Session early 2027

Release the cost driver report and the model alongside a comprehensive, step-by-step user manual as well as practical guidance online to facilitate its application.

02 Progressive model enhancement

Further refine reference parameters as new evidence becomes available, particularly for operating costs and improved MNO-based scenarios.

03 Continued engagement and user support

Consider follow-up webinars, additional guidance and potential support mechanisms to facilitate the adoption and use of the model.

A transparent and adaptable framework to better understand FRMCS deployment costs and support more informed migration decisions.

CHAPTER

07

Conclusions

Key insights and next steps

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Conclusions

INSIGHT	WHAT IT MEANS	IMPLICATION
01 Costs are context-specific	Fleet composition, network characteristics, technical architecture and migration strategy determine the cost profile. There is no single cost reference for every deployment.	→ Calibrate local inputs
02 A few components drive most expenditure	Radio access infrastructure, on-board equipment and installation, certification, authorisation and vehicle immobilisation are the main cost components.	→ Prioritise key cost blocks
03 Time is as important as direct expenditure	Long certification and authorisation processes, vehicle unavailability and prolonged GSM-R/FRMCS coexistence can significantly increase migration costs.	→ Reduce delays
04 Cost drivers are closely interconnected	On-board and trackside deployment, testing and approval, and migration schedules must be coordinated to avoid delays and unnecessary expenditure.	→ Coordinate deployment
05 Optimisation goes beyond equipment prices	Infrastructure reuse, standardisation, certification evidence reuse, streamlined processes and coordinated planning improve cost efficiency.	→ Test optimisation levers

Back to our opening question…

Which factors have the greatest influence on the total cost of FRMCS deployment?

WHY THE COST MODEL TOOL?

- **A** Vehicle equipment prices
- **B** Sites and infrastructure
- **C** Vehicle certification and downtime
- **D** Migration timing and coexistence

There is no single answer.

FRMCS deployment cost is shaped by a complex and interconnected combination of technical scope, infrastructure, authorisation, operational constraints and migration choices. Their relative weight changes by project, country and deployment strategy.

The answer is not one universal figure, but a project-specific cost range.

Why the Cost Model Tool?

The FRMCS Cost Model Tool helps each user combine project-specific inputs, test alternative assumptions and identify the individual cost range that best reflects their own FRMCS deployment scenario.

To turn a complex cost picture into a structured and project-specific assessment.

CHAPTER

08

Q&A

Questions and discussion

AGENDA

1. **Introduction**
   EU-Rail and the FRMCS Deployment Group
2. **Context & Approach**
   Why now, evidence and method
3. **What Drives Cost**
   On-board, trackside, handheld
4. **What Changes the Outcome**
   Migration, risks and opportunities
5. **Recommendations**
   Priority actions for deployment
6. **FRMCS Cost Model Tool**
   Structure, console and live demo
7. **Conclusions**
   Key insights and next steps
8. **Q&A**
   Questions and discussion

Q&A

Questions & Discussion

Thank you for your attention. We look forward to your questions and feedback.

LET'S DISCUSS

Cost drivers

On-board, trackside and handheld costs, risks and migration strategies

Using the Cost Model

Inputs, baseline configuration, cost levers and interpretation of results

Next steps

Model publication, user guidance and future enhancements

Use the chat to ask a question

Next Webinars

FRMCS Deployment Group

Webinars FRMCS Deployment 2027 (10:00 – 12:00)

- Q1 Wednesday 10/02/2027
- Q2 Wednesday 12/05/2027
- Q3 Wednesday 29/09/2027
- Q4 Wednesday 17/11/2027

Europe's Rail Members



acciona
adif
ALSTOM
MERMEC AN ANGEL COMPANY
AZD
CAF
ceit MEMBER OF BASQUE RESEARCH & TECHNOLOGY ALLIANCE
CD
DB
DLR
eSGR European Smart Green Rail
Faiveley Transport A Wabtec Company
FERROVIE DELLO STATO ITALIANE
FREQUENTIS FOR A SAFER WORLD
HITACHI Inspire the Next
indra
Talgo
Infraestruturas de Portugal
Jernbane-direktoratet
KNORR-BREMSE
kontron The Power of IoT
ÖBB
PKP
ProRail
SIEMENS
SNCF
Strukton Rail
TRAFIKVERKET
RAILWAY SYSTEMS by voestalpine
XLAB
Slovenske železnice
VIAS

Thank you