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ANNEX to GB decision n°09/2025

WORK PROGRAMME 2026

adopted by the EU-Rail Governing Board on 2 December 2025

In accordance with Council Regulation (EU) 2021/2085 and with Article 33 of the Europe's Rail Financial Rules from S2R GB Decision n° 11/2019 adopted by the GB decision n° 02/2021.

The Work Programme is made publicly available after its adoption by the Governing Board.

NOTICE RELATED TO S2R JU SUCCESSOR

On 30 November 2021, Council Regulation (EU) 2021/2085 of 19 November 2021, establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014, entered into force. In accordance with this Regulation, the Europe's Rail Joint Undertaking (EU-Rail) became the legal and universal successor in respect of all contracts, including employment contracts, procurement contracts and grant agreements, liabilities and acquired property of the Shift2Rail Joint Undertaking (S2R JU). Therefore, if reference is made to S2R JU's contracts/agreements/assets/liabilities in this Work Programme, they should be understood as those of EU-Rail's. In addition, in accordance with Article 174(12), at its first meeting on 21 December 2021, the Governing Board adopted Decision n° 2/2021 listing the decisions adopted by the Governing Board of the S2R JU that shall continue to apply for EU-Rail.

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LIST OF ACRONYMS AND ABBREVIATIONS

Acronym/ Abbreviation	Full Title
ABAC	Accrual Based Accounting
AI	Artificial Intelligence
ALM	Application Lifecycle Management
ATO	Automatic Train Operation
ATP	Automatic Train Protection
A&V	Auralisation and Visualisation
BEMU	Battery Electric Multiple Unit
BIM	Building Information Modelling
CA	Commitment Appropriation
CAAR	Consolidated Annual Activity Report
CAPEX	Capital Expenditure
CAS	Common Audit Service of DG RTD
CBA	Cost Benefit Analysis
CBM	Condition-Based Maintenance
CBO	Common Back Office
CCA	Cross Cutting Activities
CCRCC	Control Command and Railway Communication Conference
CDM	Conceptual Data Model
CEI	Call for Expression of Interest
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CERT	Computer Emergency Response Team
CFM	Call for Members
CMS	Capacity Management System
(C)COLA	(Common) Collaboration Agreement
CSA	Coordination and support action
CSIRT	Computer Security Incident Response Team
DAC	Digital Automatic Coupler
D&E-Net	Dissemination and Exploitation Network
DG RTD	Directorate-General of the European Commission for Research and Innovation

Acronym/ Abbreviation	Full Title
DMI	Driver Machine Interface
DOI	Digital Object Identifier
DRIMS	Dynamic Railway Information Management System
DSS	Decision Support System
EC	European Commission
ED	Executive Director
EN	European Norm
ERA	European Union Agency for Railways (formerly European Railway Agency)
ERRAC	European Rail Research Advisory Council
ERTMS	European Rail Traffic Management System
ETCS	European Train Controlling System
EU	European Union
EU-Rail	Europe's Rail Joint Undertaking
EUSPA	European Agency for the Space Programme
FACTs	Flexible AC Transmission Systems
FDFTO	Full Digital Freight Train Operations
FFFIS	Form Fit Functional Interface Specifications
FIS	Functional Interface Specifications
FRMCS	Future Railway Mobile Communication System
FWC	Framework Contract
GA	Grant Agreement
GB	Governing Board
GIS	Geographic Information System
GNSS	Global Navigation Satellite System
GoA	Grade of Automation
H2020	Horizon 2020, EU Framework Programme for Research and Innovation
HMU	Hydrogen Multiple Unit
HST	High Speed Train
HVAC	Heating, Ventilation and Air-Conditioning
IA	Innovation Action
IAMS	Intelligent Asset Management System
IAS	Internal Audit Service of the European Commission

Acronym/ Abbreviation	Full Title
IC	Innovation Capabilities
ICT	Information and Communications Technology
IEC	International Electrotechnical Commission
IKAA	In-kind contributions to additional activities
IM	Infrastructure Manager
IMU	Inertial Measurement Unit
IP	Innovation Programme
IPR	Intellectual Property Rights
ISO	International Standardisation Organisation
IT	Information Technology
ITD	Integrated Technology Demonstrator
JTI	Joint Technology Initiative
JU	Joint Undertaking
KPI	Key Performance Indicator
LCC	Life-Cycle Cost
LIDAR	Light Detection and Ranging
LTE	Long-Term Evolution (standard for wireless communication)
MAAP	Multi-Annual Action Plan
MaaS	Mobility as a Service
MAWP	Multi-Annual Work Programme
MB	Moving block
MBSE	Model-Based System Engineering
MFF	Multiannual Financial Framework
MoU	Memorandum of Understanding
MP	Master Plan
N&V	Noise and Vibration
NLOS	Non-line-of-sight
NTP	Network Time Protocol
OC	Open Call
OCORA	Open CCS On-board Reference Architecture
ODM	Operational Data Management
OPEX	Operational Expenditure

Acronym/ Abbreviation	Full Title
OTM	On Track Machine
PA	Payment Appropriation
PPP	Public-Private Partnership
PRM	Persons with Reduced Mobility
PTC	Positive Train Control
PTI	Platform Train Interface
PTO	Public Transport Operator
RAIM	Receiver Autonomous Integrity Monitoring
RAL	Unpaid amount
RAMS	Reliability and Maintainability System
RBC	Radio Block Centre
RCA	Reference Command Control and Signalling Architecture
R-CSIRT	Railway Computer Secutiry Incident Response Team
RFID	Radio Frequency Identification
R&D	Research and Development
R&I	Research and Innovation
RIA	Research and Innovation Action
RoI	Return of Investment
RU	Railway Undertaking
S2R (JU)	Shift2Rail (Joint Undertaking)
SaaS	Software as a Service
SBA	Single Basic Act (Council Regulation No 2021/2085 establishing the Joint Undertakings under Horizon Europe)
SC	Scientific Committee
SEMP	System Engineering Management Plan
SERA	Single European Railway Area
S&C	Switches and Crossings
SiC	Silicon Carbide
SIL	Software in the Loop
SIWG	System Implementation Working Group
SME	Small and Medium Enterprise
SNE	Seconded National Expert
SP	System Pillar

Acronym/ Abbreviation	Full Title
SPD	System Platform Demonstration
SPRA	System Pillar Reference Architecture
SPSG	System Pillar steering group
SRG	States Representatives Group
SRIA	Strategic Research and Innovation Agenda (for EU-Rail SRIA=MP)
SSG	Scientific Steering Group
SWL	Single Wagon Load
SteCo	Steering Committee
TAF	Telematic Application for Freight
TAP	Telematic Application for Passengers
TCMS	Train Control and Monitoring System
TC	Tender Call
TD	Technology Demonstrator
TL	Train Load
TMS	Traffic Management System
TRA	Transport Research Arena
TRL	Technology Readiness Level
TSI	Technical Specifications for Interoperability
TSN	Time Sensitive Networking
TSP	Travel Service Providers
UAV	Unmanned Aerial Vehicle
URID	User Requirements Working Group
V&V	Verification & Validation
WA	Work Area
WCRR	World Congress on Railway Research
WP	Work Programme

1 INTRODUCTION

The Work Programme 2026 (hereinafter “the Work Programme” or “the WP”) of the Europe’s Rail Joint Undertaking (hereinafter also “EU-Rail” or “the JU”) outlines the scope of the activities that will be performed in 2026 related to its integrated Research and Innovation (R&I) Programme. The main focus will be on :

- the Innovation Pillar:
  - the monitoring and performance analysis of the results, including the achievement of the planned milestones, of the EU-Rail funded Exploratory and Flagship Projects. In particular for the 2022 Flagship Projects to ensure a swift conclusion in 2026 and to gather lesson learnt,
  - the ramp-up, following the conclusion of the grant agreements in 2025, of the projects resulting from the Call 2025-1 and the Call 2025-2 that as part of the Integrated Programme build up on the first wave of Flagship Projects and complements those as well with additional Exploratory research activities,
  - the launch of the Call 2026-1 including the continuation of Flagship Area 6 activities on Rolling Stock and of Flagship Area 7 activities on innovation on automated multi-modal mobility-system and unconventional fast track-bound transport systems.
- the System Pillar:
  - delivering, building upon the third-year results of the System Pillar Tasks and Domains and the updated Standardisation and TSI Input plan to the European Commission,
  - launching the activities to be undertaken in the second half of 2026, as well as preparing the outline of the activities to be performed in 2027,
- the Deployment Group:
  - delivering, building upon the recommendations of the high-level and topical working group(s), in particular of the results of the FRMCS group towards cross-border, migration scenario, capacity, financial and legal analysis together with risk assessments. With this EU-Rail aims at closing the innovation gap towards deployment with addressing European migration and implementation plans,
  - supporting the activities of the European DAC Delivery Programme, in particular working with the European Commission on developing a comprehensive migration strategy to coordinate deployment, in accordance with the Commission communication on “Greening Freight Transport” COM(2023) 440,
- the future of rail research from EU-Rail:
  - contributing to the outlook of R&I beyond the present Programme, including pre-deployment possible activities, with a mission centring on simplifying the rail systems and operations, while enhancing its fundamental capabilities. It should aim at strengthening the Single Market and deliver a harmonized Single European Rail Area (SERA) with increased:
    - Agility: Accelerating innovation cycles with modular, interoperable systems and streamlined certifications.
    - Resilience: Ensure cybersecurity, climate adaptation, and military mobility.
    - Competitiveness: Reduce capital and lifecycle costs, improve system performance, and strengthening EU industrial leadership.

- analysing the current administrative processes, procedures and structures and proposing simplifications in line with the underpinning objectives which drove the establishment of the Joint Undertaking.

The EU-Rail Programme aims at contributing to the ambitious targets of the "Sustainable and Smart Mobility Strategy" of the European Commission[1], building upon the many results already achieved and those inherited from the S2R Programme. To highlight the most relevant of these targets, digitalization and automation of railway systems should be mentioned, being a key path towards sustainable (climate neutral, life cycle cost efficient, connected, integrated through a system approach) mobility for passengers and logistic for goods supply.

The WP also provides details on the corporate and supporting activities for the period to come, on the internal control system, and explains the governance structure of EU-Rail, including the tasks of individual bodies of the JU. Finally, the document presents information on the 2026 Budget.

This Work Programme must be read in conjunction with the EU-Rail's Master Plan (MP)[2] and Revised Multi-Annual Work Plan (MAWP)[3], adopted on 1 March 2022 and 24 June 2025 by the Governing Board (hereinafter also "the GB").

In the introductory part (Section 1), EU-Rail background, mission and the strategy for the implementation of the Programme are described.

Section 2 outlines the operational activities planned for 2026, the corporate and supporting activities, the EU-Rail governance, as well as it provides information on the organisational and internal management and control framework.

Section 3 details the EU-Rail's 2026 Budget.

Further information regarding IKAA, organisational chart, KPIs, demonstrators, EU-Rail's Founding Members, regarding the System Pillar deliverables and milestones, as well as the topics of the Call for proposals and its evaluation criteria is provided in Section 4.

1.1 The Europe's Rail Joint Undertaking (EU-Rail)

EU-Rail was established by the Council Regulation (EU) No 2021/2085 of 19 November 2021 establishing the Joint Undertakings under Horizon Europe and repealing Regulations (EC) No 219/2007, (EU) No 557/2014, (EU) No 558/2014, (EU) No 559/2014, (EU) No 560/2014, (EU) No 561/2014 and (EU) No 642/2014 (hereinafter "the Single Basic Act" or "the SBA")[4], which entered in force on 30 November 2021 and was amended by Council Regulation (EU) 2023/1782 of 25 July 2023.

In accordance with Article 174(6) of the SBA, EU-Rail is the legal and universal successor in respect of all contracts, including employment contracts and grant agreements, liabilities and acquired property of the S2R JU which it replaced and succeeded.

EU-Rail is a public-private partnership in the rail sector established under Article 187 of the Treaty on the Functioning of the European Union.

The objective of EU-Rail is to deliver a high-capacity integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure and services, aiming to achieve faster uptake and deployment of projects and innovations. That should exploit the huge potential for digitalisation and automation to reduce rail's costs, increase its capacity and enhance its flexibility and reliability, and should be based upon a solid reference functional system architecture shared by the sector, in coordination with the European Union Agency for Railways.

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1 COM(2020) 789 Final of 9 December 2020, https://eur-lex.europa.eu/resource.html?uri=cellar:5e601657-3b06-11eb-b27b-01aa75ed71a1.0001.02/DOC_1&format=PDF

2 Adopted by Governing Board Decision n° 01/2022 and available at https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/

3 Adopted by Governing Board Decision n° 03/2025 and available at https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/

4 OJ L 427, 30.11.2021, p. 17–119. Current consolidated version: 21/09/2023

Building on advances in automation and digitalization, EU-Rail aims at speeding up researching, developing and deploying operational and technological innovative solutions to achieve the radical transformation of the rail system and deliver on European Green Deal objectives. These objectives include,

- a shift of a substantial part of the 75% of inland freight carried by road towards transport by rail and inland waterways.
- scheduled collective travel under 500 km should be carbon-neutral by 2030 within the EU.
- traffic on high-speed rail will double by 2030 and triple by 2050.
- rail freight traffic will increase by 50% by 2030 and double by 2050.
- a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high-speed connectivity by 2050.
- improving the competitiveness of rail and supporting the European technological leadership in rail.

In addition to the General and Specific Objectives established in Chapter 1 of the SBA, EU-Rail is entrusted with the following:

General Objectives

(a) contribute towards the achievement of the Single European Railway Area;

(b) ensure a fast transition to more attractive, user-friendly, competitive, affordable, easy to maintain, efficient and sustainable European rail system, integrated into the wider mobility system;

(c) support the development of a strong and globally competitive European rail industry.

Specific objectives

(a) facilitate research and innovation activities to deliver an integrated European railway network by design, eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure also including integration with non-standard national gauges, such as 1520, 1000 or 1668 mm railway, and services, and providing the best answer to the needs of passengers and businesses, accelerating uptake of innovative solutions to support the Single European Railway Area, while increasing capacity and reliability and decreasing costs of railway transport;

(b) deliver a sustainable and resilient rail system: by developing a zero-emission, silent rail system and climate resilient infrastructure, applying circular economy to the rail sector, piloting the use of innovative processes, technologies, designs and materials in the full life-cycle of rail systems and developing other innovative solutions to guided surface transport;

(c) develop through its System Pillar a unified operational concept and a functional, safe and secure system architecture, with due consideration of cyber-security aspects, focused on the European railway network to which Directive 2016/797 applies, for integrated European rail traffic management, command, control and signalling systems, including automated train operation which will ensure that research and innovation is targeted on commonly agreed and shared customer requirements and operational needs, and is open to evolution;

(d) facilitate research and innovation activities related to rail freight and intermodal transport services to deliver a competitive green rail freight fully integrated into the logistic value chain, with automation and digitalisation of freight rail at the core;

(e) develop demonstration projects in interested member states;

(f) contribute to the development of a strong and globally competitive European rail industry;

(g) enable, promote and exploit synergies with other Union policies, programmes, initiatives, instruments or funds in order to maximise its impact and added value.

In carrying out its activities, the Europe's Rail Joint Undertaking shall seek a geographically balanced involvement of members and partners in its activities. It shall also establish the necessary international connections in relation to rail research and innovation, in line with the Commission priorities.

In addition to the tasks set out in SBA Article 5, EU-Rail together with the Commission had to prepare and, after consultation with the states' representative group, submit for adoption by the Governing Board the Master Plan, developed in consultation with all relevant stakeholders in the railway system and rail supply industry.

In accordance with article 87(1) of the SBA, the members of EU-Rail are the Union, represented by the Commission, and 25 Founding Members listed in Annex II of the SBA[5]. As stated in article 6 of the SBA, in order to become members of EU-Rail, the Founding Members signed a letter of commitment detailing the scope of the membership in terms of content, activities and its duration, as well as the Founding Members' contributions to the JU, including an indication of the envisaged additional activities.

EU-Rail, after having performed an in-depth review of the areas where such type of membership would bring added value to the R&I Programme, and after having launched a call for expression of interest in 2024, have incorporated five new members – the Associated Members - in accordance with Article 7 of the SBA.

1.2 Mission statement of EU-Rail

Taking into consideration the objectives to be achieved the following vision and mission are established.

The vision of EU-Rail is:

To deliver, via an integrated system approach, a high capacity, flexible, multi-modal, sustainable and reliable integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, for European citizens and cargo.

The Mission Statement of EU-Rail is:

Rail Research and Innovation to make rail the everyday mobility

1.3 Background and link with the Master Plan

As defined in the SBA, the "Strategic Research and Innovation Agenda" (SRIA) represents the document covering the duration of Horizon Europe that identifies the key priorities, and the essential technologies and innovations required to achieve the objectives of the JU.

In accordance with Article 86(5) SBA, the Master Plan shall constitute the EU-Rail Strategic Research and Innovation Agenda within the meaning of SBA Article 2(12).

The Master Plan (hereinafter also "the MP") was developed in consultation with railway stakeholders. The draft was open for feedback to the general public via the JU's website for 4 weeks and a webinar was organized on 19 November 2021. The Master Plan was sent in consultation to the Scientific Committee and the States Representatives Group, it has been presented to the Transport Working Party of the Council and the TRAN Committee of the European Parliament. Comments and suggestions received have been incorporated, when relevant, in the final version adopted by the EU-Rail Governing Board on 1 March 2022.

[5] Please see Annex VII of this Work Programme for full list of members other than the Union.

The EU-Rail's Master Plan builds also upon the "Rail Strategic Research and Innovation Agenda"[6] of the European Rail Research Advisory Council (ERRAC). ERRAC is a research platform composed of representatives from most of the major European railway research stakeholders: manufacturers, operators, infrastructure managers, the European Commission, EU Member States, academics and users' groups. Its mission is to deliver a vision of the railway's future enabled by Research and Innovation activities.

The Master Plan provides guidance for the Europe's Rail JU's more specific tasks, namely

- develop in its System Pillar a system view that reflects the needs of the rail manufacturing industry, the rail operating community, Member States and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector.

  The 'system view' shall encompass:

  - the development of the operational concept and system architecture, including the definition of the services, functional blocks, and interfaces which form the basis of rail system operations;
  - the development of associated specifications including interfaces, functional requirement specifications and system requirement specifications to feed into Technical Specifications for Interoperability (TSI) established pursuant to Directive (EU) 2016/797 or standardisation processes to lead to higher levels of digitalisation and automation;
  - ensuring the system is maintained, error-corrected and able to adapt over time and ensure migration considerations from current architectures;
  - ensuring that the necessary interfaces with other modes, as well as with metro and trams or light rail systems, are assessed and demonstrated, in particular for freight and passenger flows;
- facilitate the research and innovation activities necessary to achieve the objectives of EU-Rail, including low TRLs rail-focused research and innovation activities. In that respect, EU-Rail shall:
  - define and organise the research, innovation, demonstration, validation and study activities to be carried out under its authority, while avoiding fragmentation of such activities;
  - exploit standardisation and modularity opportunities, and facilitate the interfaces with other modes and systems;
  - develop demonstration projects;
  - develop close cooperation and ensure coordination with related European, national and international research and innovation activities in the rail sector and beyond as necessary, in particular under Horizon Europe, thereby enabling the Europe's Rail JU to play a major role in rail-related research and innovation while also benefiting from scientific and technological advances reached in other sectors;
  - ensure, through the cooperation referred here above, the translation of research into effective development effort and development of pioneering innovations and ultimately into market focused innovation through demonstration and deployment;
  - perform any tasks necessary to achieve the objectives set out in SBA Articles 4 and 85.

Five areas of priority for EU-Rail have been determined in its MP:

1) European rail traffic management and supporting rail's key role in a multimodal transport system

[6] https://rail-research.europa.eu/wp-content/uploads/2020/12/RAIL-Strategic-Research-and-Innovation-Agenda-2020-_FINAL_dec2020.pdf

2) Digital and automated train operations

3) Sustainable and digital assets

4) Competitive digital green rail freight

5) Smart solutions for low density traffic lines (cost-efficient regional lines)

These priorities are underpinned by a system view to ensure a harmonised approach to the evolution of the Single European Rail Area.

EU-Rail also works on forward-looking activities, tackling disruptive technologies and thinking, through performing exploratory research and other complementary activities.

The JU fosters a close cooperation and ensures coordination with related European, national and international research and innovation activities in the rail sector and beyond as necessary, in particular under Horizon Europe, Connecting Europe, and the Digital Agenda. The regional dimension is a priority to ensure that EU-Rail will deliver services to connect European regions in an integrated network approach.

EU-RAIL has put in place measures to maximise its impact using synergies with other European, national and regional programmes and activities beyond the involvement in the overall coordination of Horizon Europe.

This Work Programme results from extracting the priority research and innovation activities identified in the MP and detailed in the MAWP to be delivered by the end of 2026 for the running Flagship Projects and System Pillar activities, while preparing the work for launching new Exploratory Research and other activities, considering the available budgetary resources, including under the multi-annuality by instalment principle and the SBA conditions.

1.4 Strategy for the implementation of the programme

The overall Strategy of EU-Rail is anchored in its Master Plan and is further elaborated in its Multi-Annual Work Plan.

In order to deliver its objectives and strategy, EU-Rail will be set-up around one single Research and Innovation Programme based on a system view. The Programme will be delivered by two integrated pillars - the System Pillar and the Innovation Pillar - and complemented by a Deployment Group, all together covering the full life cycle of R&I from blue sky to pre-deployment and pre-industrialisation processes, TRL 8/9.

The System Pillar activities

The purpose of the System Pillar is to introduce common EU railway system view so that the evolution of the rail system is based on common operational visions and a layered functional architecture. The idea of the System Pillar is integrating new scientific knowledge and other industry best practices in order to accelerate and better organise its evolution. The System Pillar is the 'generic system integrator' for the EU-Rail and performs the role of architect of the future railway system. This means that the System Pillar prepares and proposes the concept of operations, the system architecture, the associated standards and specifications, and migration strategies.

The task is to develop the operational concept(s) and functional system architecture for a genuine integrated European system, supported by a model-based systems architecting and engineering approach, beyond the current specifications, with much greater standardisation and much less variation than at present. Its activities are organised in five Tasks, which are presented in Section 2.3.2.

The Innovation Pillar activities

The Innovation Pillar is set up to deliver user-focused research, innovation and large-scale demonstrations. It is tasked to deliver the operational and technological solutions which provide the necessary capabilities to make the European rail system more efficient, flexible and able to answer to

the customer needs, maintaining its safety and environment sustainability factors. Its activities are organised in seven Flagship Areas and the Transversal Topic, more details of which are presented in Section 2.3.3.

Continuous exchanges exist between the System Pillar and Innovation Pillar activities as part of the Integrated R&I Programme, with a bi-directional flow: both pillars should provide input and output to each other against a clearly defined series of priorities and objectives to be achieved.

The Deployment Group Activities

The Deployment Group shall deliver recommendations to the Governing Board of EU-Rail on the consideration and needs in relation to the deployment of solutions proposed by the JU. These recommendations may include:

- considerations on whether deployment should be mandatory or voluntary;
- technical and operational migration considerations;
- considerations on timing and need for synchronization at the European level;
- economic and business case analyses for the relevant stakeholders and for the European Union;
- purchasing strategies;
- industrial capacity;
- finance and funding plans.

The EU-Rail Deployment Group mainly consists in a High-Level Core Group which could be assisted on an ad-hoc basis by dedicated groups on specific topics requiring additional expertise. Such dedicated groups shall be selected upon recommendation of the High-Level Core Group and in agreement of the Governing Board.

2 WORK PROGRAMME 2026

2.1 Message from the Executive Director

Following the integration of new members in 2025, having also enlarged the geographical scope and impact of this Joint Undertaking with the full operationalisation of the Deployment Group, the Europe's Rail JU, its Programme office, and its Members will continue the implementation of the integrated Programme and disseminate its R&I results from the Innovation Pillar. It will continue to support the European Union and the rail sector contribute to the removal of the policy and market barriers, addressing the "innovation valley of death", respectively with the output of the System Pillar and Deployment group.

2026 will be characterised by the results of the first wave of Flagship Projects launched at the end of 2022, as well as the kick-start of the new waves of Flagship Projects building on those achievements and increasing the technological readiness level of cutting-edge innovation for rail.

Capitalising on those outputs and new actions, in 2026 EU-Rail will also focus on ensuring that the grounds are prepared to deliver upon the expectations of the European Commission in the Competitiveness Compass communication[7] to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, in particular to ensure that "*Europe must be the place where tomorrow's technologies, services, and clean products are invented, manufactured and marketed, as we stay the course to climate neutrality. A Europe that remains home to cutting-edge scientific and research innovation. That retains and attracts the world's best talents and provides quality jobs for all. Where upwards convergence between regions strengthens our global position and our unity."* For this, work in view of the preparation of rail research and innovation activities post-2027, under the new Multi-Annual Financial Framework Programme 2028 – 2034, and taking into account both the phasing out plan of EU-Rail and the High Level "A future policy based public private partnership for rail"[8] will be performed.

Additionally, in the Greening Freight Transport Communication[9] of the European Commission, the deployment of digital automatic couplings (DAC) technology, supported by the R&I of EU-Rail, is highlighted as a game-changer for European rail freight. The Commission is looking forward to developing a comprehensive migration strategy to coordinate deployment, with the help of EU-Rail.

In the same package, the Commission also published a proposal for a Regulation on the use of railway infrastructure capacity in the Single European Railway Area[10], where the rail Infrastructure Managers are called on ensuring alignment, in particular regarding digitalisation of capacity and traffic management, with the work of the Europe's Rail Joint Undertaking as well as they shall contribute to the EU-Rail works in this regard.

EU-Rail will have to work on those strategic items also in 2026, together with the Commission, its private Members and its Advisory Bodies, for a coordinated R&I implementation or pre-deployment activities.

The EU-Rail Research and Innovation activities are designed to deliver concrete solutions addressing the climate change crisis the world is facing, addressing climate mitigation and adaptation, as well as the to the European competitiveness in the broader transport and mobility landscape – the JU Programme Office and its Members are well aware of this urgency and the importance that the work of our integrated Programme, covering innovative solutions' lifecycle, from exploratory research to pre-implementation and deployment, has.

The target remains that by the end of this decade, Europe's Rail should *deliver a high-capacity integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure and services, aiming to achieve faster uptake and deployment of projects and innovations. That should exploit the huge potential for digitalisation and automation to reduce rail's costs, increase its capacity and enhance its flexibility and reliability, and should be based upon a solid reference functional system architecture shared by the sector, in coordination with the European Union Agency for Railways*.

[7] https://commission.europa.eu/document/download/10017eb1-4722-4333-add2-e0ed18105a34_en

[8] GB Decision 06/25 5June 2025): https://rail-research.europa.eu/wp-content/uploads/2025/06/GB-Decision_06-25_High-Level-Paper-on-future-rail_v1.pdf

[9] https://transport.ec.europa.eu/system/files/2023-07/COM_2023_440.pdf

[10] https://transport.ec.europa.eu/system/files/2023-07/COM_2023_443_0.pdf

The launch of the Research and Innovation activities of this Work Programme shapes the mission-oriented nature of the JU, building on openness and inclusiveness, answering the call of the Member States and Parliament to deliver impact and added value to European citizens. Synergies with other Union – as well as national and regional – programmes and partnerships provide opportunities to complement the series of actions expected from the rail sector, including interacting with ERRAC on complementary activities. Stakeholder relations and dissemination of results ensure the visibility of the progress achieved. Sound financial and risk management and compliance will underpin the implementation of the Programme along its lifecycle.

2.2 Executive Summary 2026

The European Green Deal[11] and the related Roadmap[12], published in December 2019, form an integral part of the European Commission's strategy to implement the United Nation's 2030 Agenda and associated Sustainable Development Goals[13]. EU-Rail, positioned within Horizon Europe under Cluster 5: Climate, energy and mobility, aims to address these particular Sustainable Development Goals:

The European Green Deal sets out a clear vision of how to achieve climate neutrality in Europe by 2050 and presents the EU's new growth strategy. To achieve climate neutrality, a 90% reduction in transport greenhouse gas emissions is needed by 2050. The transformation of the railway system will be pivotal to achieve the environmental and economic objectives by offering both decarbonised and time/cost-competitive transport solutions for passengers as well as for freight.

In December 2020, the "Sustainable and Smart Mobility Strategy – putting European transport on track for the future"[14] was adopted by the Commission. It fosters, besides other concepts, the idea of using the potential of digital technologies to revolutionise the way we move, making our mobility smarter, more efficient, and also greener. The Strategy identifies concrete milestones, and, in order to meet them, particular goals to be achieved by means of rail research and innovation are set as well (see chapter 1.1).

EU-Rail also aims, especially within the context of the European DAC Delivery Programme, to contribute in collaboration with the European Commission to the measures presented in July 2023 in the Communication titled "Greening Freight Transport"[15].

Further to the topic of "Digital Decade", the Commission indicated in its Communication of March 2021[16] how digital transformation can improve the ecosystems related to mobility and transport. Digitalisation can improve environmental and cost performance and simultaneously increase safety levels contributing to a higher quality of life. It will be achieved through more advanced levels of automation, faster and more reliable connectivity, and IT enabled profound transformation of the management of mobility services. The public could also benefit from fast internet connectivity for passengers on most stations and lines, user-oriented telematics and facilitated multi-modality.

In this context, EU-Rail and its Programme will strive for speeding up the development and deployment of innovative technologies in railway transport in order to contribute to achievement of the above-mentioned milestones. This will require a significant transformation of the railway sector, addressing

11 https://commission.europa.eu/publications/communication-european-green-deal_en
12 https://commission.europa.eu/publications/communication-european-green-deal_en
13 https://sdgs.un.org/goals
14 https://eur-lex.europa.eu/resource.html?uri=cellar:5e601657-3b06-11eb-b27b-01aa75ed71a1.0001.02/DOC_1&format=PDF
15 https://transport.ec.europa.eu/system/files/2023-07/COM_2023_440.pdf
16 https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021DC0118

long overdue changes in legacy operational processes, systems and governance models, as well as integrating with other transport and mobility solutions for passenger services and cargo logistics. The ongoing energy crises, which has major impacts also on rail, requires accelerating research and innovation towards deployment of innovative technological and operational solutions that would contribute to operational efficiencies and energy performance.

The strategic framework for EU-Rail's endeavours is provided in its Master Plan identifying the ambitions and the objectives of this partnership and defining a systemic, long-term and result-oriented delivery strategy for research & innovation in the railway sector.

More specifically, the JU's 2026 priorities in this respect will be on:

1. the R&I activities related to the EU-Rail integrated Research and Innovation (R&I) Programme:
    a. the Innovation Pillar:
        i. the monitoring and performance analysis of the results, including the achievement of the planned milestones, of the EU-Rail funded Exploratory and Flagship Projects. In particular for the 2022 Flagship Projects to ensure a swift conclusion in 2026 and to gather lesson learnt,
        ii. the ramp-up, following the conclusion of the grant agreements in 2025, of the projects resulting from the Call 2025-1 and the Call 2025-2 that as part of the Integrated Programme build up on the first wave of Flagship Projects and complements those as well with additional Exploratory research activities,
        iii. the launch of the Flagship Project Call 2026-1 including the continuation of Flagship Area 6 activities on Rolling Stock and of Flagship Area 7 activities on innovation on automated multi-modal mobility-system and unconventional fast track-bound transport systems.
    b. the System Pillar:
        i. delivering, building upon the third-year results of the System Pillar Tasks and Domains and the updated Standardisation and TSI Input plan to the European Commission,
        ii. launching the activities to be undertaken in the second half of 2026, as well as preparing the outline of the activities to be performed in 2027,
    c. the Deployment Group:
        i. delivering, building upon the recommendations of the high-level and topical working group(s), in particular of the results of the FRMCS group towards cross-border, migration scenario, capacity, financial and legal analysis together with risk assessments. With this EU-Rail aims at closing the innovation gap towards deployment with addressing European migration and implementation plans,
        ii. supporting the activities of the European DAC Delivery Programme, in particular working with the European Commission on developing a comprehensive migration strategy to coordinate deployment, in accordance with the Commission communication on "Greening Freight Transport" COM(2023) 440,
2. the future of rail research from EU-Rail:
        i. contributing to the outlook of R&I beyond the present Programme, including pre-deployment possible activities, with a mission centring on simplifying the rail systems and operations, while enhancing its fundamental capabilities. It should aim at strengthening the Single Market and deliver a harmonized Single European Rail Area (SERA) with increased:
            1. Agility: Accelerating innovation cycles with modular, interoperable systems and streamlined certifications.

2. Resilience: Ensure cybersecurity, climate adaptation, and military mobility.

3. Competitiveness: Reduce capital and lifecycle costs, improve system performance, and strengthening EU industrial leadership.

ii. analysing the current administrative processes, procedures and structures and proposing simplifications in line with the underpinning objectives which drove the establishment of the Joint Undertaking.

The Communication activities for 2026 will continue ensuring that the JU's mission, vision and objectives, including the Innovation and System Pillars, and the Deployment Group, are communicated and understood widely. It is expected that the first major results of the six first Flagship Projects will be made available in 2026. A large part of the communication and dissemination activities will focus on ensuring the results are communicated effectively to the relevant target audiences. To ensure the involvement of stakeholders from the entire rail value chain, including actors from outside of the traditional rail sector, EU-Rail will organise and participate to a number of events and conduct other communication and dissemination activities and campaigns.

During 2026 the JU will seek the continuation of the close collaboration established with:

- the European Railway Research Advisory Council (ERRAC),
- the European Union Agency for Railways (ERA),
- the European Union Agency for the Space Programme (EUSPA),
- the European Network of Infrastructure Managers (ENIM),
- national and regional research and innovation programmes as brought forward by the States' Representative Group,
- other programmes, partnerships and EU bodies, with the objective to establish synergies that will result in coordinated activities or joint R&I projects or administrative synergies, such as for example under the back-office arrangements with other JUs,
- different associations representing the key stakeholders of the rail sector and beyond,
- third countries programmes, in line with the policy priorities of the Commission and considering the key objective of the competitiveness of the European rail industry.

The main events, where EU-Rail will showcase its results in 2026, are Call Info Days, the Europe's Rail General Assembly (December 2026), Women in Rail Awards. Additionally, Europe's Rail will continue organising Regional Info Days. Participation of the JU will be ensured at the following external events: ITF Summit (May 2026), Transport Research Arena (2026), Connecting Europe Days (2026), InnoTrans (2026). Potential other events attendance relevant to the ongoing work of EU-RAIL. Potential other events relevant to the ongoing work of EU-RAIL will be attended.

Improvements in the JU's internal communication will continue in 2026, leveraging on the available IT tools, to boost the flow of information among the staff. Ad hoc campaigns, such as the informative brown Bag Lunches following the feedback from 2024 could continue, as well as team building activities in close collaboration with the Human Resources department.

At the corporate level, EU-Rail will strive for appropriate workload distribution, as well as for costing and staffing levels needed to ensure successful delivery of the Programme. In addition to supporting continuous learning and qualification raising of the staff, activities improving the well-being and team cohesion will be conducted throughout 2026. In the upcoming period, the JU's priorities in the HR area will also include developing a fit-to-purpose competency framework and a talent development plan.

The SBA Article 13 requires the Joint Undertakings to establish back-office arrangements between themselves in relation to a list of services. While such back-office arrangements were firstly put in place for accounting services and followed later by the procurement services, by ICT and HR or will follow in the upcoming period and will take form of Service Level Agreements (SLAs) concluded between the

respective JUs. The costs and benefits of such SLAs will be assessed during the future years while possibly new services will be considered for synergies.

In the area of internal control and assurance, EU-Rail intends in 2026 to perform additional reviews of lump sum grants the ex-post part of its Horizon Europe risk-based Control Strategy for grants. The ex-ante part of the above-mentioned Strategy will be continuously applied throughout the period 2026. Implementation of this Strategy represents a shift from quantitative (financial) checks towards the qualitative (technical) controls logically following from the exclusive application of the lump sum form of funding under Horizon Europe.

In the last years, the Joint Undertaking has demonstrated the progress achieved through the commitment of its members and stakeholders. The system transformation, to which the JU was expected to substantially contribute, did not end with S2R, as it will still require a major effort in the years to come, connecting fundamental research – applied research – large scale demonstrations/deployment. The system approach brought forward by an institutional partnership such as the Joint Undertaking has proved to be capable of delivering such major transformation, involving legislator, regulator, standardisation bodies and stakeholders.

2.3 Operational activities of EU-Rail in 2026

2.3.1 Objectives, indicators and risks

As mentioned in Section 1.4, the R&I activities of the EU-Rail Programme are based on two Pillars, the System Pillar, which is structured in five main tasks, and the Innovation Pillar that is organised in seven Flagship Areas (FA) and the Transversal Topic (TT). Their objectives and the main high-level risks associated to them are presented below.

The results of the JU will be measured via a series of key performance indicators (KPIs) addressing, on the one hand, the technological and operational outcomes and, on the other hand, the impact that they are expected to realise once deployed. The KPIs will cover the full lifecycle of R&I, from exploratory research to deployment coordination. The KPI model will be based on input delivered by each of the JU projects and reported on a yearly basis, through the Consolidated Annual Activity Report. Each project will be required to ensure that relevant quantitative and qualitative metrics are provided that contribute to the JU's overall KPIs. The current version of the KPIs at the level of the Flagship Areas and the Transversal Topic is provided in Annex III in Section 4 of this WP.

The System Pillar tasks will use the toolset provided by the JU in 2023. The Flagship Projects will have access to the System Pillar platform in order to facilitate information exchange. The process of exchange of information, of work on common tasks and of collaboration in general as one integrated programme will also continue to be analysed in 2026, based on the R&I outputs produced in previous years.

The System Pillar contributes defining the concept of Operations for Rail and a functional rail system architecture for the future, taking into account interfaces within different rail segments and other modes. These activities should ensure a common approach and efficient use of resources; EU-Rail is the platform to enable sector convergence on common solutions at European level and provides the needed coordination and resources. EU-Rail will therefore in particular coordinate and consolidate all relevant sector initiatives, noting the importance of unified requirements from the Railways.

The activities of the System Pillar focus is on key priorities but addressing the part of the rail system where relevant and cost-effective, standardisation or commonly agreed harmonised specifications needed to deliver them. This would allow setting the right conditions towards modular (standard interfaces) and scalable solutions in view of large-scale market introduction and their evolution.

The R&I activities that will provide technical solution to fit in the functional rail system architecture, addressing specific technical subsystems, are structured within the Innovation Pillar and established around the full lifecycle of research and innovation, from exploratory research, via applied research to large scale demonstrations.

R&I Large Scale Operational Demos will be one of the major game changers in the impact to be achieved by EU-Rail. It is not about coordinating the funding, it is about Integrated R&I Large Scale

Demonstration activities, i.e. moving from small-scale demonstrators[prototypes] in one specific network or lab, to European wide live, operational network-scale demonstration of solutions in a different environment, reaching TRL 8/9 level, and to show the benefits from the European deployment of new solutions. This will also be a key component for the inclusiveness of these areas of Europe, and consequently, Member States, under-represented in the current rail research and innovation activities. As they will be capable to contribute to demonstrate the benefits of the proposed partnership, or ongoing Programmes, solutions in their operational network and services offered to their customers.

This activity will also support the necessary steps for the regulatory changes or standards' changes needed to bring solutions to the market, closing the virtuous circle started in the definition of concepts within the System Pillar, before industrialisation and deployment.

The "Deployment Group", which became officialised in 2025, will tackle the transition from R&I to coordinated and consistent deployment at European level, to avoid creating new barriers or proposing ways to solve existing one and supporting the creation of the single European area. It will deliver, building upon the recommendations of the high-level and topical working group(s), in particular of the results of the FRMCS group towards cross-border, migration scenario, capacity, financial and legal analysis together with risk assessments. Additionally, with the European DAC Delivery Programme, EU-Rail will support the activities of the European DAC Delivery Programme, in particular working with the European Commission on developing a comprehensive migration strategy to coordinate deployment, in accordance with the Commission communication on "Greening Freight Transport" COM(2023) 440.

The tables below present a summary of the main activities for the year 2026:

Year 2026	**Type of call**	**Value of the actions (million EUR)**	**Maximum EU-Rail co-funding (million EUR)**	**Non-funded activities (million EUR)**	**Target contributions from Members in case of award (million EUR)**	**Indicative publication date**
Multi-annual Call for Proposals (*) (instalment)	Open *2026 values*		*22,9*			
Call for Proposals – Exploratory Research	Open	6,1	6,1	0,0	7,01	04/02/2026
Call for Tenders	Open	13,5	13,5	0,0	0,0	Q1 – Q4 2026 & implementation of new and ongoing contracts/framework contracts
Operational Experts	Open, including through REA,	0,4	0,4	0,0	0,0	Q1 – Q4 2026

Year 2026	Type of call	Value of the actions (million EUR)	Maximum EU-Rail co-funding (million EUR)	Non-funded activities (million EUR)	Target contributions from Members in case of award (million EUR)	Indicative publication date
	including the SSG					
Total		**13,9**	**36,8**	**0,0**	**7,01**	

(*) This call for proposals was launched in 2025 with budget commitments divided into annual instalments, meaning that the amount committed by the JU will be confirmed yearly based on the annual budget of the JU. This amount of Maximum EU-Rail co-funding corresponds to the 2025 instalment for the call 2025-2. For more information about the annual instalments, please refer to the "Table of Financial programming per year until 2027" in Section 3 "Budget 2026" of the present document.

In line with Regulation (EU) 2021/695 establishing Horizon Europe (referred also to as "Horizon Europe Regulation"), in particular with regard to Article 52 thereof as well as with Article 171(1) of the SBA, EU-Rail is bound to contribute to an interim Programme evaluation to feed into the decision-making process of the HE Programme, the next framework programme and other initiatives relevant to R&I. Such interim evaluation of the Programme shall be carried out with the assistance of independent experts selected on the basis of a transparent process once there is sufficient information available about the implementation of the Programme, but no later than four years after the start of that implementation. In 2024, the JU contributed to this activity steered by the European Commission, so that its intended purpose – namely the assessment of the Programme's effectiveness, efficiency, relevance, coherence, and Union added value – could have been effectively achieved.

Furthermore, EU-Rail will continue in 2026, as needed, to provide support and inputs to the EC for the purposes of reporting on the performance of partnerships under Horizon Europe, such as by means of the respective Biennial Monitoring Reports (BMR). The various editions of the BMR aim at providing a strong evidence base to guide the implementation of partnerships and to inform strategic discussions on the effectiveness of the new policy approach to European Partnerships and, where relevant, how it should evolve. The reports further aim to shed light on the progress of partnerships in achieving the EU objectives and targeted impacts both individually and collectively, at EU and national level.

Finally, in line with Article 19(4)(v) of the SBA, EU-Rail will, as necessary, continue working on its plan for phasing out from Horizon Europe funding, which was based on an assumption of non-renewal of the JUs after the 31 December 2031, also reflecting on the potential scenario of new activities to be performed after the current Europe's Rail integrated Programme and under suitable framework conditions. This includes contributing to the outlook of R&I beyond the present Programme, including pre-deployment possible activities, with a mission centring on simplifying the rail systems and operations, while enhancing its fundamental capabilities. It should aim at strengthening the Single Market and deliver a harmonized Single European Rail Area (SERA) with increased:

- Agility: Accelerating innovation cycles with modular, interoperable systems and streamlined certifications.
- Resilience: Ensure cybersecurity, climate adaptation, and military mobility.
- Competitiveness: Reduce capital and lifecycle costs, improve system performance, and strengthening EU industrial leadership.

EU-Rai will analyse as well the current administrative processes, procedures and structures and proposing simplifications in line with the underpinning objectives which drove the establishment of the Joint Undertaking.

2.3.2 The System Pillar

The System Pillar (SP) aims to define the concept of operations for Rail and a functional rail system architecture for the future, considering interfaces within different rail segments and other modes.

To achieve an architecture that offers the demanded functional improvements concerning production performance, reliability, quality, and cost as well as the needed architecture quality, the System Pillar (SP) follows the defined process, based on the principles of Model-Based System Engineering (MBSE).

The System Pillar is managed and led by the System Pillar Unit of EU-Rail, under the responsibility of the Executive Director, within the governance established by the Single Basic Act (Council Regulation (EU) No 2021/2085 of 19 November 2021).

The System Pillar has the responsibility to support a consistent and coordinated approach to the evolution of the rail system according to the EU policy goals. Article 86 5a of the Single Basic Act states:

> "develop in its System Pillar a system view that reflects the needs of the rail manufacturing industry, the rail operating community, Member States and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector. The 'system view' shall encompass:
>
> - the development of the operational concept and system architecture, including the definition of the services, functional blocks, and interfaces which form the basis of rail system operations;
> - the development of associated specifications including interfaces, functional requirement specifications and system requirement specifications to feed into Technical Specifications for Interoperability (TSI) established pursuant to Directive (EU) 2016/797 or standardisation processes to lead to higher levels of digitalisation and automation
> - ensuring the system is maintained, error-corrected and able to adapt over time and ensure migration considerations from current architectures
> - ensuring that the necessary interfaces with other modes, as well as with metro and trams or light rail systems, are assessed and demonstrated, in particular for freight and passenger flows;"

Based on the requirements in the Single Basic Act, the role of the System Pillar in providing inputs to the European Harmonisation channels is set out in the document "EU-Rail and Harmonisation".[17] In summary this means the development and proposal of mature inputs to existing European harmonisation channels, in particular European Standardisation and Technical Specifications for Interoperability (TSI).

In addition the System Pillar, through the development and maintenance of the Standardisation and TSI Input plan (STIP) collects all of the relevant harmonisation outputs of EU-RAIL into a single source document.

2.3.2.1 STANDARDISATION AND TSI INPUT PLAN (STIP)

The Standardisation and TSI Input Plan (STIP) is the main means to coordinate the transfer of EU-Rail results, relevant for harmonisation, into the ERA Change Control Management (CCM) process for TSI revision and the standardisation work of ESOs.

The inputs are then assessed by ERA and the ESOs for being considered as input to the ERA CCM process for TSI revision and the standardisation processes. In addition these outputs are aligned with the EC request to ERA on TSI revision and the EC request to standardisation bodies, ensuring a coherence between the work of EU-RAIL and the European harmonisation processes.

[17] https://rail-research.europa.eu/wp-content/uploads/2023/08/20230604-EURAIL-and-Harmonisation_Version_1.0.pdf

For the first version of the STIP, topics for harmonisation have been delivered by the members of EU-Rail via the Task and Domains of the System Pillar as well as the Flagship Projects of the Innovation Pillar. In total, over 200 topics were proposed, analysed by the System Pillar Core Group and EU-Rail and classified to allocate the topic to a manageable number of categories. The proposed categories are outlined in the table below.

Category for topic classification		
Category		**Description**
Main section		
C1	Operational harmonisation	Topics related to operational processes and rules
C2	Evolvability and maintainability	Topics aiming at enhanced compatibility between versions and easy maintainability
C3	TMS and CMS	Topics related to enhanced European TMS and CMS
C4	ATO GoA2	Topics related to ATO until GoA2
C5	ATO GoA3/4	Topics related to ATO until GoA3/4
C6	Remote supervision and control	RTO as application independent from ATO Goa3/4 (can come earlier) specific applications, e.g. shunting yards.
C7	ASTP	Topics related to enhanced odometry and localisation systems
C8	FDFTO	Topics related to enhanced freight traffic including DAC
C9	FRMCS	Topics related to new radio system
C10	Onboard	Topics related to CCS onboard systems
C11	Cybersecurity	Topics for cybersecurity in CCS systems
C12	Safety management	Topics related to safety in CCS
C13	PRAM	PRAM topics
C14	Trackside assets	Topics related to CCS trackside assets
C15	Traffic CS	Topics related to enhanced Traffic CS and interfaces to TMS/CMS
C16	Driving control, Adhesion management	Topics related to adhesion management and driving control
C17	Energy management and supply	Topics related to energy management and operational measures
C18	Bridge dynamics	Topics related to vehicle-bridge dynamical interaction
C19	Alternative propulsion, traction energy	Topics related to battery and hydrogen train
C20	TCMS	Topics related to TCMS
C21	Subsystem Components	Topics considering e.g. braking, environmental conditions etc.
C22	Reduction environmental impact	Topics considering noise, air quality and climate change
C23	Composite materials	Use of composite materials for lightweight design
C24	ETCS CR enhancement	ETCS CR enhancements from ERA assessed by the SP

Additional topics[18]		
C25	Digital asset management, data spaces and models	Topics related to data spaces, data models and asset engineering
C26	Digital Twin	Topics related to Digital twin modelling and digital register
C27	Virtual certification	Methods for virtual certification and implementation
C28	Zero-Onsite-Testing	Use of simulations and lab testing procedures
C29	Drones	Topics related to the use of drones in railway applications
C30	Field force applications	Topics related to field forces (maintenance staff and machines)
C31	Diagnosis, monitoring	Topics related to diagnosis, condition-based maintenance in railway applications

Table: Categories for Harmonisation.[19]

The first version of the STIP was published in summer 2024 after an extensive review and revision process. Comments from sector stakeholders including sector associations were assessed and resolved in a comment assessment table. At the same time the STIP was aligned with the European Commission requests for TSI revision and for standardisation, ensuring a consistent time planning and content of STIP inputs to the TSI revision and standardisation. Additionally, STIP introduces a new internal EU-Rail harmonisation mechanism—the System Pillar document—as an industrial standard. The final STIP V1.0 was adopted by the SP Steering Group.

The second version of the STIP has been discussed at Sector level, the new version aims to strengthen the integration of EU-Rail outcomes into harmonisation frameworks by establishing a structured and transparent mapping of expected results. The new version is aligned with appropriate harmonisation channels and updated timelines. It defines collaborative processes with the European Union Agency for Railways (ERA) and the European Standardisation Organisations to ensure timely delivery of harmonisation topics into the TSI revision and European standardisation processes.

Through the Standardisation and TSI Input Plan, the System Pillar has defined a clear and agreed plan for the evolution of the CCS/TMS system, the TSI enhancements, and standards, which will support interoperability, modular interchange ability, system integration ability, robustness, harmonisation and implementation of the Single European Railway Area (SERA), and the role of EU-Rail (both System Pillar and Innovation Pillar) in delivery. The STIP document is under revision and will be updated in 2026, in order maintain the critical role supporting the harmonised introduction of improvements into the European rail system, supporting competitiveness interoperability, and safety. **System Pillar engineering process**

The System Pillar specification work is based on a system engineering approach defining system levels as shown in figure below:

[18] The section "Additional Topics" includes topics with one or more of the following characteristics:

- Topics which do not yet have a defined time planning due to the early state and uncertainty in the development process.
- Topics which are very innovative and disruptive compared to established technical solutions. Acceptance and uptake by the sector might therefore require additional alignment and coordination.
- Topics for which the state of maturity does not allow a scheduled input to harmonisation channels in the short/medium term. Development and specification work is still ongoing, aiming at a higher maturity and the inclusion in one of the next STIP versions.

[19] Please consider that the list of topics may change/evolve as the project progress.

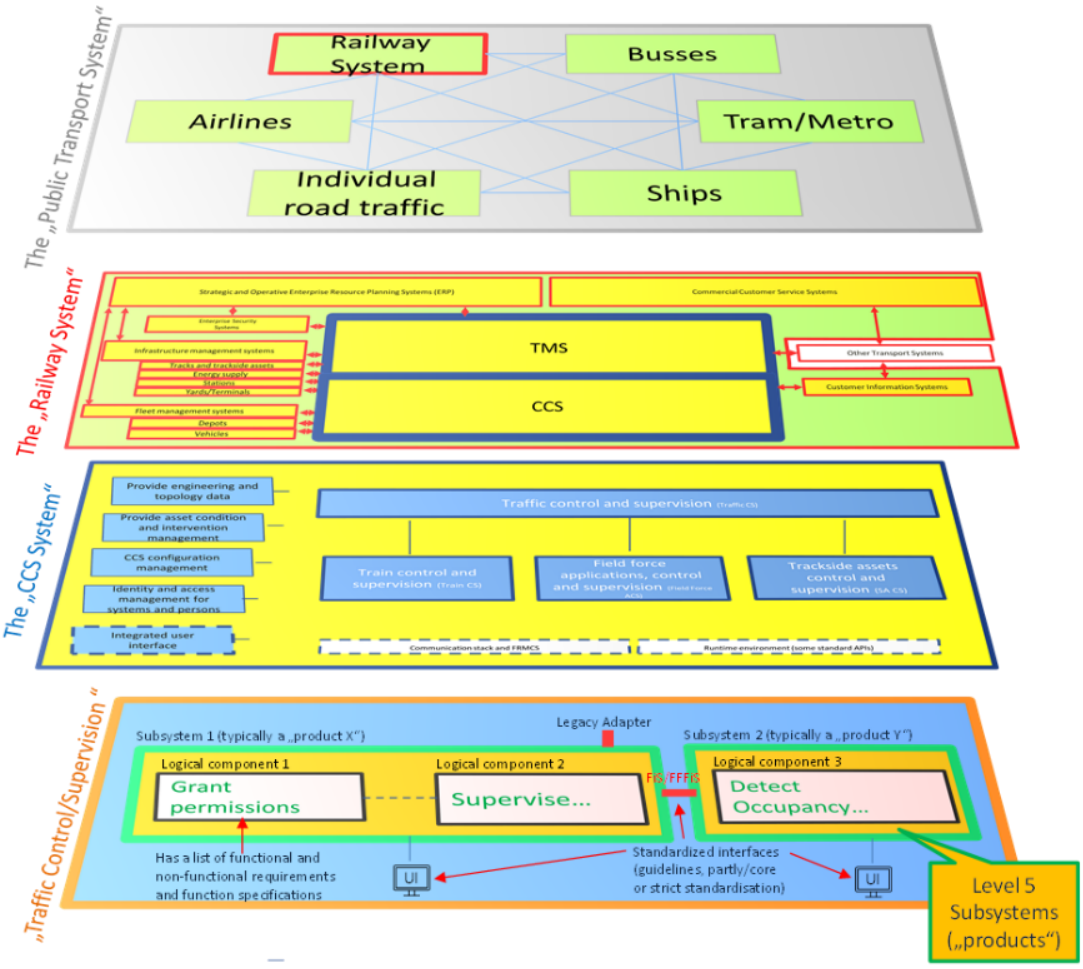

Figure: System Level 1-5 view, the content is based on indicative CCS/TMS

Figure below outlines the principles of the viewpoint-driven model-based system engineering approach that emphasises a clear separation of need analysis, requirement engineering and architecture building. Based on the operational needs, the system requirements are defined and used to specify the logical and physical architecture of the system.

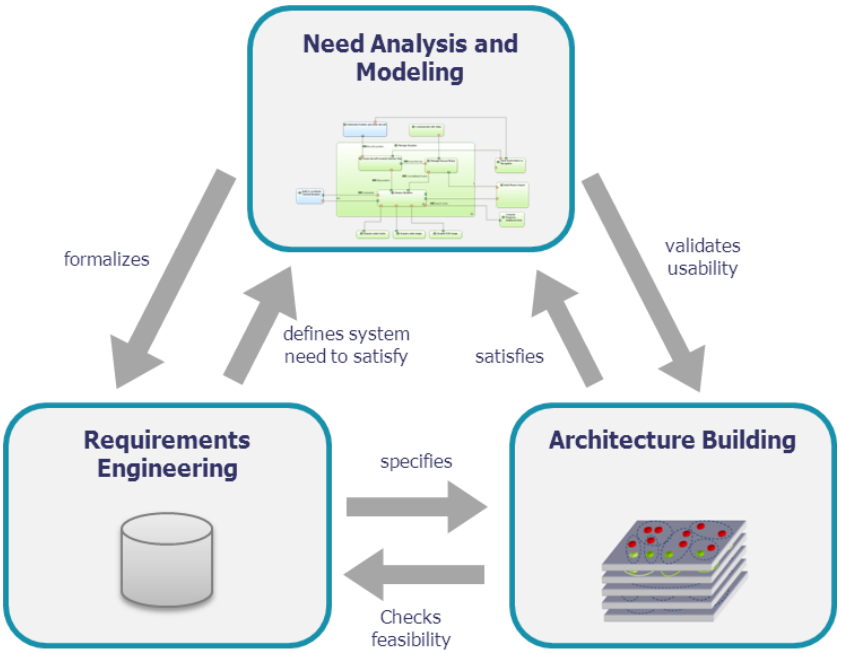

Figure: Viewpoint driven approach [Augmenting requirements with models to improve the articulation between system engineering levels and optimize V&V practices', INCOSE International Symposium, 29: 1018-1033]

During the first year of the System Pillar (Q4 2022-Q3 2023), the workflows supporting the described model-based system engineering approach for developing the railway system architecture have been launched. The performed work comprises both the top-down system engineering approach, starting from the CBOs and operation use cases, as well as the bottom-up integration of the existing outcomes of previous S2R works or other sector initiatives (as OCORA, EULYNX etc.) The work of these independent sector initiatives is critically assessed and integrated into the SP specification work where suitable. The process steps of the implemented model-based system engineering approach have been elaborated in the System Engineering Management Plan (SEMP) and applied to a first set of operational capabilities.

During the second year of the System Pillar (Q4 2023-Q3 2024), the above-described approach has been pursued. Additionally, the System Pillar is coordinating the harmonisation outputs and needs from the EU-RAIL programme in the Standardisation and TSI Input Plan (STIP) and supporting the interaction of the related activities of EU-RAIL with ERA and the standardisation bodies (incl. the Sector Forum Rail (SFR, now COG rail). The specific harmonisation topics for EU-Rail as a whole are being integrated and delivered in the Standardisation and TSI Input Plan. Additionally, the System Pillar published a paper on report on Energy Saving in Rail[20] outlining a comprehensive strategy for improving energy efficiency across the European rail system.

During the third year of the System Pillar (Q4 2024 – Q3 2025), the first inputs to Technical Specifications for Interoperability (TSI) and their associated documents (subsets, applications guides, etc.), EU Standards and other SP documents have been published. It is to be highlighted the publication of:

- the Cybersecurity specifications . With the aim to enable interoperability for cybersecurity interfaces across European rail automation systems and facilitate compliance with EU cybersecurity legislation and international standards. Four documents have been published: Secure Component Specification, Secure Communication Specification, Shared Cybersecurity Services Specification and Secure Program Requirements.

- Traffic CS Major Design Decisions . It outlines the strategic design decisions made by the Traffic Control and Supervision (Traffic CS) domain within the EU-Rail System Pillar. It supports the development of a harmonised, modular, and scalable European railway control system architecture.

- Traffic CS System Concept . It outlines the architecture, functionality, and migration strategy for the Traffic Control and Supervision (Traffic CS) domain within the EU-Rail System Pillar. It defines how Traffic CS supports the Single European Railway Area (SERA) through harmonized, modular, and scalable signalling systems to support interoperable, ETCS Level 2-based railway operations across Europe.

- Trackside Assets CS Specifications BL4R2 and BL4R3. It is a joint publication of 25 specification documents by EU-Rail and EULYNX, supporting the future European railway system architecture. Specifically, it provides Interface definitions, system requirements, and data models for signalling subsystems. Alignment with EU-Rail's System Pillar and the Control-Command and Signalling (CCS) target system.

- Transversal CCS-TMS Data model : It is a standardized framework aimed at enabling seamless data exchange across railway systems. Developed under the ERJU Transversal CCS domain, this model specifies data structures that are critical for various railway functions such as engineering, asset management, operational plan, train protection, and automated train operations.

- Task 5 Harmonised European railway Diagnostics : It outlines a strategy for harmonising diagnostic data across the European railway sector to support condition-based maintenance and improve operational efficiency.

During the next 3 years, the System Pillar (Q3 2025 – Q3 2028) is expected to consolidate and advance its harmonisation efforts across the European rail system, particularly in Control Command and

20 https://rail-research.europa.eu/wp-content/uploads/2024/07/ERSIPB-EDSIPB-B-S2R-219-01_-_20240314_Energy_saving_measures_in_rail_report_changes__2_.pdf

Signalling (CCS). Despite a reduced budget compared to the previous period, the SP aims to deliver a coordinated set of specifications for ETCS Level 2-only operations, including harmonised operational rules, trackside and onboard systems, and cybersecurity frameworks. Key deliverables include pilot-ready specifications for Traffic Control Systems, enhanced diagnostics, and modular onboard architectures. The SP will also support non-CCS domains such as Digital Automated Coupling (DAC), Capacity and Traffic Management Systems (CMS/TMS), and safety and RAMS methodologies. These efforts are designed to enable real-world pilots, reduce lifecycle costs, and ensure interoperability and scalability across Europe's rail infrastructure

2.3.2.2 .SP ORGANISATIONAL STRUCTURE OF THE ACTIVITIES

The figure below, includes the first and second level operational break down structure of the System Pilar, as of 2024. Additional specific projects and/or may be added in the upcoming years, as the development identifies new lines of work to fulfil the CBOs.

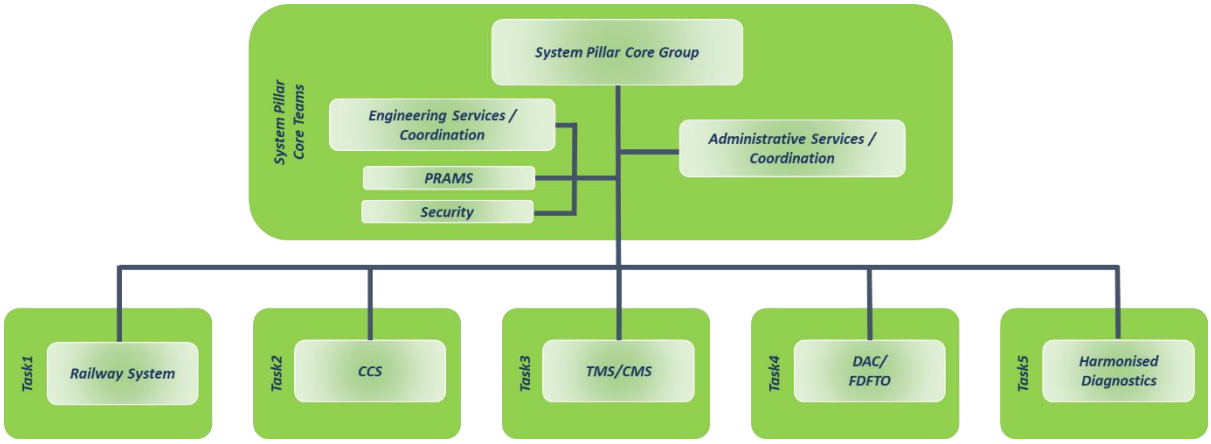

Figure: first level operational breakdown structure of the System

The roles and responsibilities of the following SP groups are depicted in the EU-Rail's Governance and Process Handbook[21]:

- SP Steering Group, Core Group, Engineering Services / Coordination (comprising Engineering Environment Team, Standardisation and TSI input planning, External Architectural support, PRAMMS Management and Assurance), Administrative Services (comprising Programme Office, Economic Analysis),
- Task 1: Railway System,
- Task 2: (Advanced) CCS system design,
    - The cross-cutting domain teams (comprising Operational Design, Architecture and release coordination and Migration and roadmap),
    - The CCS System Design Teams: comprising Traffic control and supervision, Train control and supervision, Trackside assets control & supervision, CONEMP (including now Transversal CCS component and Computing environment),
- Task 3: TMS/CMS system design,
- Task 4: DAC/FDFTO[22] System design,
- Task 5: Harmonised diagnostics.

System Pillar Core Teams

[21] https://rail-research.europa.eu/wp-content/uploads/2023/01/EU-Rail-Governance-and-Process-Handbook.pdf

[22] DAC = Digital Automatic Coupler / FDFTO = Full Digital Freight Train Operations (part of FA 5 project)

System Pillar Core Group

The System Pillar Core Group (SPCG) provides the competent leadership and expertise of the development of the functional layered railway system architecture, specification models and Operational Concepts that enable safe, secure and efficient delivery of the new systems. Moreover, the SPCG manages the common business objectives and deliverables from the different SP Tasks.

Engineering Environment Team

The Engineering Environment team includes methods definition (System Engineering Management Plan (SEMP)) [23] and tools provision and training (Polarion [24], Capella [25], SysML [26] specification environment) for the whole System Pillar. The Engineering Environment team monitors the formal quality of the work items, their correct allocation to the tasks and domains, and the consistency, traceability and integrity of the specification.

Performance, Reliability, Availability, Maintainability, and Safety (PRAMS) Team

The PRAMS team is in charge to define the strategy, policies, methods, and principles to be followed by the other Tasks and Domains during the design activities as well as to coach and support implementation. PRAMS team do not produce PRAMS Analysis, Hazard and Risk Analysis, for system components or system parts; these activities are delegated to the related Domain that have to include members with PRAMS skills. The PRAMS Functional team is in place to have a proper coordination and synchronization.

Security Team

Security requirements are coordinated centrally this includes top-level design and assurance of the security strategies and requirement implementation in the System Pillar Tasks and the specification of the subsystems for monitoring and the system control access.

System Pillar Task 1: EU Rail System

The System Pillar Task 1 will be focused on the European railway network to which Directive 2016/797 applies. The vision of the European railway system is:

- Support to the creation of the SERA (Single European Rail Area), i.e. no technical and operational barriers for trains, staff or customers, standardisation (economies of scale), safety (including learning from information sharing) and resilience.
- Performant and competitive.
- Synchronised deployment, and
- Full alignment with the future system.

The system architecture used by the System Pillar needs to be structurally and logically consistent, and reflect the structural reality that, currently, there is no single European railway system.

The high-level target architecture(s) will input to the considerations of the optimal level of technical and safety harmonisation building on cutting-edge technologies, making it possible to facilitate, improve and develop railway services within the Union, and with third countries, and to contribute to the completion of the SERA and the progressive achievement of the internal market.

The scope of Task 1 should not be time-bound and can consider several iterations of development i.e. it should be ambitious and flexible to consider the impact of new technologies and processes with regards to rail (e.g. from the innovation pillar) allowing for more performant, more efficient and less costly rail traffic. These innovations may require a substantial revision of, inter alia, safety concepts and the regulatory framework underpinning operations both with the clear goal to harmonise across Europe.

To achieve the overall evolution and target architectures defined in Task 1 will be a complex challenge. Best practice from other industries shows that successful integration of system architecture approaches, especially when moving from current engrained systems like in rail, is to take the

[23] SEMP: see https://rail-research.europa.eu/wp-content/uploads/2023/08/221206-SP-SEMP-V1-final.pdf
[24] Polarion: ALM Software used in SP, see https://polarion.plm.automation.siemens.com/
[25] MBSE tool used by the SP, see https://mbse-capella.org/
[26] sysML: Systems Modeling Language, see https://sysml.org/

opportunity when systems are in any case evolving to put in place the correct system architecture processes and principles.

System Pillar Task 2: CCS

The regulation and implementation of European rail control-command and signalling (CCS) is of central importance in the running of a safe, efficient, interoperable, robust cost-efficient and reliable rail service in Europe. CCS deals with all the on-board and trackside equipment required to ensure safety and to plan, command and control movements of trains authorised to travel on the network as well as the efficient integration of maintenance processes that occupy tracks.

Historically the automatic systems developed over time to monitor drivers' operation (continuous speed monitoring and avoidance of signals passed at red) have been developed to be different and they are still substantially different in each national railway network, and thus a major barrier to operate one European network.

A central focus at European level has been the implementation of ERTMS (European Railway Traffic Management System), a major industrial programme to harmonise the automatic train control and communication system and underpin interoperability throughout the rail system in Europe. Deployment of ERTMS provides the backbone for a digital, connected SERA.

The current harmonisation at European level, through the CCS TSI, addresses the safety and interoperability requirements, the on-board functions and the interfaces between trackside and on-board related to train protection, signalling the permission to move the train and radio communication. Hence, not the full CCS system.

For trackside CCS beyond that specified in the CCS TSI, there are currently network or deployment specific approaches of trackside engineering, operational concept, signalling rules and their interfaces.

The current typical CCS on-board configuration includes multiple proprietary TCMS (train control management systems) and Class B driven interfaces between the main train on-board building blocks, which are currently not harmonised.

As a result, even if ERTMS as it stands is implemented in full across the EU, national systems for significant parts of the CCS system would continue, along with national operational rules driving customisation, and a continued overall fragmented CCS market of signalling configurations and rail business models.

This situation significantly increases CCS complexity and reduces the opportunity for more open and competitive markets across Europe. It also creates a system that is not conducive to harmonised evolution and innovation and induces errors and incompatibilities in implementation of the TSI regulated interfaces. Finally, it undermines the performance of the rail system in favour of clients opting for other mobility and transport solutions.

Hence the CCS task is to develop a harmonised operational concept and functional system architecture for a genuine integrated European CCS system, supported by a model-based systems architecting & engineering approach, beyond the current specifications in the CCS TSI, with much greater standardisation and much less variation than at present. Differences in operation are one of the key root causes for complexity as well as product diversity and therefore are a major cost driver. The harmonization of operational principles where economically possible – in particular under cab signalling and radio-based ETCS is key to achieve generic CCS solutions, minimize national requirements, reduce life cycle cost and achieve operational interoperability. This integrated CCS system will on the one hand deliver unrestricted movement of trains, on the other hand, it will create a single market for rail components.

CCS – both on-board and trackside - will be based on a standardised modular system architecture using standardised interfaces. In order to preserve investment made, the System pillar should not only create adequate interface but care about migration feasibility (i.e. clear and affordable transition steps) and find paths for moving beyond the current system with proprietary interfaces and allowing modularity of components.

The need for the CCS task is because digitalisation technologies are ready for use in rail with huge potential to improve passenger and freight services. Digitalisation coupled with automation is one effective way to increase performance and capacity with less new infrastructure investments, e.g. thanks to the simplification of systems and the reduction of expensive trackside assets (light signals,

axle counters etc.). Without high quality architecture, adding such new technologies and maintaining compatibility will not be possible.

The purpose of the focus on CCS is therefore to take advantage that as networks and Member States migrate to CCS systems of ERTMS L2 or above – the opportunity is taken to do this in a harmonised manner following functional layered architecture principles: this will set a common basis that will allow to evolve systems at the technological evolution pace. It will be a major change from “black boxes” to “software solutions” computing environments.

Operational interoperability is an equally important goal of the Single European Rail Area. A further major opportunity is thus to create harmonized operational rules.

On this basis, a converging shared vision on future rail operations based on ERTMS-alone Level 2 and Level 3 networks will set up the baseline for the operational and technological solutions to ensure and continue evolutions of rail.

System Pillar Task 3: Capacity Management System (CMS) / Traffic Management System (TMS)

CM/TM means to create a long-term to short-term operational plan (production plan) that fulfils customer needs in an optimized way, to prepare and let execute the plan, and to predict and react on deviations and events with adapted planning or initiated interventions to solve production problems. The operational plan describes in very detail all types of track usage (train movements, stabling, construction sites, usage restriction areas, etc.).

Task 3 aim for Capacity and Traffic Management is to reach a high, smart and flexible automation and cooperation levels for its long- or short-term simulation, planning, forecasting and coordination processes (cross-company, cross-country) in a way that allows to work with an integrated and rolling high-quality plan in near-real-time, based on automated information exchange between all involved planning partners.

The harmonization of operational processes is a key driver towards a deep and seamless integration of the new services and capabilities, with a specific focus on national borders; this is fundamental for the evolution of the Capacity and Traffic Management System to get an effective SERA.

The basic vision will also include a highly digitalized tactical short-term planning with the relevant cost-efficient approach to address risks and opportunities.

This will allow task 3 of SP to achieve, though harmonised input of innovation into standardisation / TSI and processes, the following objectives:

- Support (with the application by stakeholders) the ability to sustain a given service quality, punctuality, and safe operation, by completeness of planning, adequate level of information, rapid responses to capacity requests and planning changes and reducing the impact of disturbances,
- Leverage on real-time interoperable data sharing to provide accurate status in order to provide to customer rapid alerts of capacity restrictions and traffic congestion and in general provide valuable information,
- Enabling of more efficient infrastructure usage and better predict capacity needs of infrastructure

System Pillar Task 4: Digital Automatic Coupler (DAC) / Full Digital Freight Train Operations (FDFTO)

Coupling is done manually by a worker who must climb between wagons to hook and un-hook them, requiring physically exhausting manual operation in a hazardous environment. A more efficient, sustainable and competitive rail freight system is essential to meet the needs of both climate protection and rising transport volumes. Digital automatic coupler is an enabler to create a modern and digital European railway freight transport. It will not only increase efficiency thanks to automation processes, but it will also ensure sufficient energy supply for telematics applications, as well as safe data communication throughout the entire train.

Through the work in task 4, mainly regarding the high-level specifications and providing the system view, System Pillar will be supporting the improvement of freight train composition, operation and capacity allocations of paths, stabling tracks (e.g. waiting for terminal slots) and shunting (yard) work.

System Pillar Task 5: Harmonised Diagnostics

The ambitious plans of the European Union and railway undertakings are targeting a significant increase in rail usage. This increase requests a higher availability of railway infrastructure and rolling stock but also shortens the time for maintenance for both infrastructure and rolling stock. Thus, fast, and accurate data sharing among different stakeholders is key for better maintenance.

Previous and on-going projects have already developed approaches and concepts for standardized data exchange. However, a harmonized European approach for exchanging maintenance data has not yet been established and data which is currently produced by different technologies (e.g. checkpoints) cannot be exchanged across Europe, which hinders development of the railway sector and blocks business cases.

The initial remit is to select a limited number of examples to demonstrate “proof of concept” European harmonization on the approach, based on the SP Data Model. The procedure methodology and proposed solution should be worked out using simple, non-critical and useful examples, keeping the complexity of the task within manageable limits. Therefore, existing and proven systems should be considered as far as possible, and feasibility demonstrated using a non-critical, useful applications and applying a system wide view.

2.3.2.3 SP DELIVERABLES, MILESTONES AND HARMONISATION PLANNING

The work of the System Pillar is structured along the different tasks described in previous section SP organisational structure of the activities. In the following section the deliverables and milestones are summarized per task and domain.

Task 1 Railway System

The main ambition for the Task 1 is to get a list of the needed and important improvements in the overall rail system (for a better “to be” architecture). A preliminary analysis should highlight differences in the selected interaction processes between countries represented in Task 1 to assess migration issues. For prioritized capabilities, full operational analysis and system analysis should be finalized using the SEMP.

The system view will allow a common understanding in the space of European railway systems the stakeholders’ needs, resources, and capability to deliver beyond the existing implementation of railway sub-system or products. It will support tackling harmonisation, enable innovation, and build the capability in the railway system.

These improved business and technical process solutions will, to the extent needed, describe the rationale behind the requirements of the to-be target Business Process Architecture and Operational Design. The design work for Task 1 is not intended to describe all process and improvement aspects of the full railway system in full detail, especially when no need for harmonisation inside of the System Pillar is identified.

The Task 1 will focus during 2025 and 2026 on developing a high-level system architecture on system level 2.

Task 2 CCS

The activity of task 2 on CCS represents the main focus of the System Pillar activities and is divided in several domains.

Task 2 CCS: Domain Architecture and Release Coordination

T2 ARC domain is responsible for the following “coordination areas” including the Change Request coordination, CCS harmonization coordination and the SP release management. Each coordination issue is not a design task per se, but fulfils a cross-domain, cross-task and SP-IP oriented roles and supports by this the management task of the Coregroup for a specific content area. Each coordination issue must be handled by one coordinator who is responsible for it.

During the period of the Work Programme T2 ARC domain is expected to deliver the High-level logical architecture overview on system level 3.

Task 2 CCS: Domain Operational Harmonisation

It is the task of the domain to integrate the stakeholder needs of RU and IM into the operational design in a way that allows to harmonize CCS procedures in the interoperable interactions and to harmonize CCS products according to the harmonization scope of the System Pillar. The target of the domain is to deliver until October 2025 harmonised rulebook chapters for the topic package 1 (Movement A to B, Revoke Movement Permission, Manage Usage restrictions, Movement A to B, Boarding and disembarking of passengers, Revoke Movement Permission, Preparation to train departure, Approaching Stop Location and Train arrival) for drivers, signallers, trackworkers and shunting workers.

During the period of the Work Programme, T2 OD domain is expected to deliver harmonised rulebook chapters for the topic package 2 (Change of train orientation, INIT trackside initialisation, Configuration update, Movement A to B, moving in SR, continue after trip, handling train after loss of communication and OS sweeping) for drivers, signallers, trackworkers and shunting workers.

Task 2 CCS: Domain Traffic Control and Supervision

The domain Traffic CS is a core element of the overall CCS functionality. Therefore, the progress with regards to the description of the functionality, the final alignment about interfaces and the interior architecture is key for the coming period until October 2025. The domain now goes into the phase of concrete specification of system and interfaces, which also increases the workload and need a tight collaboration with Task 2 OD.

Additionally, during the Work Programme period, Traffic CS is expected to work on the migration analysis and strategy.

Task 2 CCS: Domain Train Control & Supervision

The Train CS domain is responsible for the onboard CCS system. This includes beside the ETCS vehicle equipment also the additional components and functions like ATO (GoA 2 -4), RTO (Remote train operation), C-DAS and others from the on-board perspective. Close alignment with the communication domain (now Lot 3) required to define the interface between FRMCS and the Train CS system.

During the period of the Work Programme, work is expected to advance on the Common bus to connect ETCS with other components, Improved odometry, and Train Length and Train integrity determination.

Task 2 CCS: Domain Trackside Assets Control & Supervision

The Trackside CS domain is responsible for the specification of the sub systems controlling the trackside objects like points, track vacancy detection, level crossings and others. With this a unified interface between the Traffic CS system and the object controller should ensure the interchangeability between both components. After the successful release of the TACS specification (BL4R3) in July 2025, the work in this period should focus on the remaining topics for maintaining the specification for Trackside Assets CS.

Task 2 CCS: CONEMP

The CONEMP (Concept of employment, formerly Computing Environment and Transversal CCS domains) domain designs the operational processes of the future that are used to manage the CCS assets (installation, maintenance, change, incident management, decommissioning). The harmonization and optimization of those processes will have a direct positive impact to the lifecycle costs (Opex) of the Railway System in line with the stakeholder requirements.

Based on the operational processes the CONEMP domain derives the functionality for the relevant transversal services such as configuration and diagnosis in the systems, as well as the related requirements for systems implementing those services.

In the Work Programme period it is expected that CONEMP publishes the Standardisation of Computing Environment.

Task 3 CMS & TMS

CMS&TMS carry out the coordination and execution of the detailed design work for the lower System Levels 3, 4 and 5 for the Capacity/Traffic Management Systems and defines detailed operational processes and requirements, functional system analysis and technical architecture.

In the Work Programme period work will advance on specifications for the interface of the Operational Plan between Traffic CS and TMS enabling optimized traffic management of the harmonized trackside

system, and drafts for proposals for functional enhancements for the Telematics TSI according to the federated variant for Capacity and Traffic Management.

Task 4 DAC/FDFTO

Task 4 is responsible to manage all cross-cutting activities related to DAC/FDFTO (e.g., regarding operational procedures, architecture and interfaces embedding the onboard system, developed by FP51, into the overall railway system), manage the input to the Standardisation and TSI Input Plan (STIP) for DAC/FTDFTO and supports FP5 regarding authorisation strategy. This implies working in close alignment and cooperation with Innovation Pillar Flagship Project 5 (FP5) and EDDP, including participation in mediation of conflicts with other Innovation Flagship Areas and SP Tasks.

For the period of the Work Programme Task 4 is expected to deliver the first RuleBook of harmonised operational procedures.

Task 5: Harmonised Diagnostics

Harmonised European Railway Diagnostic (HERD) of the System Pillar will generate a set of proven technically and procedurally harmonised diagnostic data use cases and will provide a guideline for a harmonised diagnostic data exchange. The main benefit of HERD is the gain of harmonised condition information for integrated asset management.

The HERD team consists of representatives of the data user as well as of the data provider from supplier industry, infrastructure managers (IM), railway undertakings (RU), and vehicle keepers (VK). Strong alignment with the Innovation Pillar Flagship projects FP1, FP3 and FP5 as well as with the System Pillar Tasks 1, 2 and 4 is ensured by the team members.

For the period of the Work Programme Task 5 is expected to deliver the generic document/template for Harmonised Diagnostics Data Interface.

System Pillar Core Teams

Engineering Environment Team

The Engineering Environment team has a central and active role in guiding and supporting other teams. Modelling and specification (including integration of external input) is done in the Tasks and domains. The Engineering Environment team is not contributing to the specification or modelling work itself but is actively supporting where needed and taking care that the work of the Tasks and domain can be done in an efficient way and with the needed quality.

The deliverables for the period of the Work Programme are the SEMP v4. Additional deliverables will be determined in the second half of 2025 building on the outputs of 2025.

PRAMS

During the period of the Work Programme, PRAMS team will focus on maintenance of Safety related topics for the following documentation EU Hazard Data Base, Modular Safety Case structure, Modular Architecture, MTBSF criteria, Condition Base Monitoring requirements and PRAM requirements and guidelines. Specific deliverables for the period of the Work Programme will be determined in the second half of 2025 building on the outputs of 2025.

The Security team is in charge of centrally coordinating the Security requirements, including top-level design and assurance of the requirement implementation in the System Pillar Tasks and the specification of the subsystems for monitoring and the system control access. A focus for 2026 will be the input to future TSIs.

CCS TSI Maintenance Activities

The aim of the activities defined in the Lot 3 CCS TSI Maintenance Activities is:

- To resolve errors in the current TSI CCS in order to remove ambiguities in the specifications;
- To transfer results of Lot 2 and any other agreed enhancements into the ERA CCM process for the TSI CCS (with possible impact on TSI OPE);
- To facilitate the inclusion of completed versions of FRMCS specifications in future CCS TSIs;

- To help infrastructure managers and vehicle owners with the deployment of ERTMS by solving their (potential) technical problems and by putting into place appropriate processes for testing, validation and certification in view to facilitate the authorisation;
- To provide and maintain harmonised engineering guidelines.

2.3.2.4 SYSTEM PILLAR AND INNOVATION PILLAR INTERACTIONS

EU-Rail, through the System Pillar (SP) will aim to have a coherent approach to the evolution of the EU rail system through a system architecture approach.

The SP has a discrete work scope to set the system architecture of the rail system (Task 1), and in particular the CCS, CMS/TMS and DAC/FDFTO architecture (Task 2, 3 and 4), as well as coordinating the standardisation and TSI outputs of EU-RAIL. While the main focus will be on these Tasks, the System Pillar will have to integrate and duly consider other key elements, such as interfaces to urban mobility and energy systems.

EU-RAIL will develop the operational concept(s) and functional system architecture with much greater standardisation, a wider scope, aiming at no variation compared to present.

The Innovation Pillar (IP) will deliver, through research and innovation, advances in, inter alia, advanced traffic management, digital and automated train operations, and rail freight.

The description of the interaction is found in the EU-Rail Governance and Programme Handbook27.

The interaction between the IP projects and the SP is both-way. For the specification and development of the demonstrators for innovative technologies, the Flagship Projects of the IP will consider the specifications of the railway target architecture, developed by the System Pillar. Since the complete specification of all levels of the target architecture (including level 5, physical architecture) will not be available in the coming year, higher-level specifications and realistic assumptions will be used.

In return, the Flagship projects will inform the SP about the technical feasibility and efficiency of different system solutions evaluated in the demonstrators and therefore contribute to the guidance and realignment of the specification of the target railway architecture.

Therefore, the main objectives of the IP-SP interaction are:

- To identify the main technical standardisation areas of collaboration between SP and IP,
- To build in the projects the necessary details of the continuous process integration to reach together the EU-Rail outcomes that will achieve target system complying with the CBO,
- To include necessary provisions to achieve the Standardisation and TSI input plan together with all the necessary mature standards and regulation proposals,
- To assess that the inputs expected by the Flagship projects from the SP are foreseen to be achievable on time.

2.3.3 The Innovation Pillar

The Innovation Pillar is structured in 7 Flagship Areas leading to large scale demonstration as defined in the SBA, complemented by Transversal Topics.

2.3.3.1 FLAGSHIP AREA 1 (FA1): NETWORK MANAGEMENT PLANNING AND CONTROL & MOBILITY MANAGEMENT IN A MULTIMODAL ENVIRONMENT

The main objective of FA1 is to dramatically improve flexibility, efficiency, resilience and capacity adaptation of the European rail network – supporting the development and operation of a Single

[27] https://rail-research.europa.eu/wp-content/uploads/2023/01/EU-Rail-Governance-and-Process-Handbook.pdf

European Rail Area. The objective is to develop functional requirements, associated specifications, and operational and technological solutions to enable future European Traffic Management. This will include the requirements to make common train operations and ticketing possible and will enable the design of future network management, planning, and control.

To achieve the overall objective, several streams of improvement have been identified:

- Operators need to be able to adapt quickly to unforeseen deviations or disruptions and last minutes changes in demand.
- Increased flexibility paves the way for smarter and tailored door-to-door services and offers, where mobility solutions meet the expectations of passengers and logistics.
- Maintaining the reliability of rail traffic requires all subsystems that influence the traffic, or that are influenced by it, to be connected to the Traffic Management System, in order to collect information at the source and in real time.
- Enhanced integration of the rail networks should allow to extend capacity planning and operation at European level, enabling capacity optimization and automatic management of cross-border traffic by predicting and controlling routes of cross-border trains in European networks and corridors.

The operational outcomes to be achieved in FA1 will be:

- Improved strategic and tactical planning of the rail network
- Increased resilience of the connected, 'real time' rail network
- Integrated rail traffic within door-to-door mobility

The main risk preventing or delaying the delivery of the objectives in this Flagship Area remains the lack of coordination and interactions between the various actors, the organizational framework and not well defined or implemented deployment strategy, and potentially the lack of European regulations to enforce it.

The Grant Agreement of the first EU-Rail Flagship Project FP1-MOTIONAL implementing this Flagship Area was signed in December 2022 and activities have been ongoing ever since.

The activities of FP1-MOTIONAL have started in 2023 and preparation of the enablers continued in 2024 and 2025. It is expected notably to deliver the following **by 2026:**

Workstream 1: Network management planning and control & Mobility Management in a multimodal environment

deliver **by 2026** innovative solutions to be demonstrated with:

- **Improving strategic and tactical planning of the rail network**: to overcome the main pain points that the railways are facing and to ensure an enhanced, interoperable planning and management of European-wide railway timetables (**TRL6/7**);
- **Increasing the resilience of a connected 'real time' rail network**: improvement of real-time railway traffic management and operations with the goal to provide a more agile, optimized and automated response to unplanned situations, such as disturbances and dynamic demand especially in cross-border traffic situations(**TRL5-8**);
- **Integrated rail traffic within door-to-door mobility**: Demand-driven predictions to improve operations and service offers, considering information about events across modes. Effect of cross-regional, multimodal travels in combination with demand forecast and disruption handling on improvement of daily operations, benefit on customers (accessibility and attractiveness) (**TRL 5-8**).

In 2024, EU-RAIL has signed for the Grant Agreement for FP1-TRAVELWISE, the synergy topic launched together with SESAR JU, which will look at connecting rail traffic management and airports. The FP1-TRAVELWISE project has the following expected outcomes (TRL6) by 2026/2027:

- **Benchmark on existing solutions** of integrated rail and air traffic;

- **Integration of aviation and railway transport modes**:
    - Definition of single, common and collaboratively-agreed intermodal (airport / railway) operations plan.
    - Definition of the interface between the air traffic management systems (ATMS) (in particular regarding airport-rail connection) and the rail traffic management systems (TMS), both for planning purposes and operations, including disruptions;
    - Real-time information exchange services between aviation and railway.
- **ATM-airport-railway collaborative decision-making process:**
    - The evolution of ATM related concepts developed within ATM boundaries e.g. airport operations plan (AOP), airport operations centre (APOC), airport collaborative decision making (A-CDM), total airport management (TAM), network operations plan (NOP), etc.;
    - The integration of data from aviation and railway transport information systems;
    - The development of an integrated capacity management process to ensure modal shift from feeder flights to railway;
    - The development of visualisation and decision support tools.
- **An integrated aviation-railway transport network disruption and crisis management process.**

The Grant Agreement of the project implementing the second set of demonstrators for Flagship Area 1 (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 8, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area in the three main workstreams (capacity planning, traffic management and door to door mobility) with additional capabilities.

2.3.3.2 FLAGSHIP AREA 2 (FA2): DIGITAL & AUTOMATED UP TO AUTONOMOUS TRAIN OPERATIONS

The targeted objective of FA2 is to take the major opportunity offered by digitalization and automation of rail operation and to develop the respective systems. This includes next generation Automatic Train Control (ATC), including Automated Train Operation (ATO) Grade of Automation (GoA) 4, building upon radio-based European Rail Traffic Management System (ERTMS) or above, representing the next evolution of the system, incorporating the latest technological advances, and with functionalities enabling full optimisation of performance in line with the Traffic Management improvements developed in FA1. FA2 will aim at delivering scalable automation in train operations with fully unattended train operations including setting a train in motion, driving and stopping the train, opening and closing the doors, remote train control and recovery operations in the event of disruptions.

The expected outcomes of FA2 are:

- Reduce the cost of capacity, which is a major indirect catalyst for capacity optimisation.
- Allow precise traffic flow management, supporting punctuality, reliability, and productivity improvements.
- Allow the control of much higher train densities with a significantly reduced Life Cycle Cost (LCC) of CCS components compared to today.
- Deliver scalable solutions fitting for high- and low-density lines, supporting the generation of large-scale component markets and standardisable industrial asset management processes as well as to speed up the deployment and ensure long term evolvability of the system.

Potential restraints by the public to travel with automated trains, or the question of acceptance of automated cargo trains loaded with hazardous substances, might represent one of the risks associated with introducing Digital Automated Train Operations (DATO) under FA2.

Another risk is related to the migration to DATO soft- and hardware, where a clear functional separation between subsystems must be achieved. A clear interface with Traffic Management System (TMS) is crucial for implementation as well. The migration risk is also linked to the difficulty of the long lead time of European Train Control System (ETCS) deployment, which must be mitigated by reducing the cost and by agreeing on an effective EU deployment process, while research and innovation advances.

Furthermore, the risk of not having a 'fit-for-all' legal sector agreement that will allow for sharing and reallocating liabilities, risks, costs, and benefits across the stakeholder groups, might decelerate the implementation of digital and automated train operation technologies. The business risk might be an issue as well, since the benefits (e.g., capacity increase, mainly for governments) may not be reaped by the same players that will pay for the costs (Infrastructure Managers, Railway Undertakings, and industry), which might lead to postponements, or even avoidance of future investments. The role of the System Pillar to anticipate such risks and to deliver the necessary input to FA1 is important in this respect. Economical, legal, regulatory and organizational implications need to be assessed and jointly agreed upon in the rail sector, which goes beyond the technical scope of FA2.

The Grant Agreement of the first EU-Rail Flagship Project FP2-R2DATO implementing this Flagship Area was signed in December 2022.

Activities have started in 2023 and preparation of the enablers continued in 2024 and 2025. It is expected notably to deliver the following **by 2026**:

- Demonstrate technical and functional enablers such as ATO GoA3/4 over mixed radio based ETCS levels (**TRL5**), Hybrid Train Detection, moving block and train integrity (TIMS) (**TRL5/6)**, connectivity (**TRL6**), perception (**TRL5**), train positioning (**TRL5**), automated functions and digital register (**TRL5**);
- Demonstration of the remote driving and command in depots and yards, including perception systems (**TRL5**);
- A first demonstrator on next generation ATC, with modular onboard and trackside ATC architectures, at proof-of-concept stage, in close collaboration with the EU-Rail System Pillar;
- A proof-of-concepts and/or validation in laboratory and field (i.e., up to **TRL4/5 in Lab and TRL6 on site**) for the following new functions and technical enablers:
    - Virtual Coupling Train Set (**TRL4**)
    - Self-driving wagon (**TRL4**)
    - Autonomous route setting (**TRL4**)
    - Validation and certification (**TRL5**)

In 2024 and 2025, EU-Rail operationalised with concrete outputs its cooperation with EUSPA, ESA and ERA in a common project (delivered by FP2 within the EU-Rail programme) on the use of a dedicated Rail service of EGNOS (European Geostationary Navigation Overlay Service) for the rail demonstrations on the use of Satellite safe positioning in ERTMS. This cooperation is expected to provide its first results in the demonstrators of phase 1.

In 2024, EU-Rail has awarded a Grant Agreement for FP2-MORANE-2, a synergy Flagship project with SNS JU within the Flagship Area 2. The FP2-MORANE-2 project is focusing on European R&I testing and validation of the FRMCS specifications (Version2) which will support the pre-deployment of this major game changer for railway communication. The FP2-MORANE-2 project will develop test specifications on the basis of the Technical Opinion adopted by the European Union Agency for Railways in December 2024 (in addition to its addendum adopted in May 2025), develop prototypes which will be tested both in laboratory and in field, and so, for different applications (end to end, voice, ETCS, ATO, TCMS, etc…).

The FP2-MORANE-2 project has the following expected outcomes (TRL7) by 2026/2027:

- **Test design and planning:** Test specifications (performance, interfaces, cybersecurity aspects) and lab and field test plan and test methodology.
- **System component preparation and architectures**:

- Development of system components (TOBA, controller, dispatcher systems, RMR module with MNO capability, etc…).

- **Lab test preparations and execution:** Three laboratories will be used for this purpose.

- **Execution of 5 field tests:**

  - **Spain:** Conventional line + High speed line

  - **Sweden:** Conventional line (including testing of Multi Operator Core Network - MOCN - scenario with Swedish MNO)

  - **Germany:** Conventional line

  - **The Netherlands**: Conventional line (including MNO test with National operator).

The Grant Agreement of the project implementing the second set of demonstrators for Flagship Area 2 (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 7, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area for all the technical enablers, as foreseen in the EU-Rail MAWP with additional capabilities.

2.3.3.3 FLAGSHIP AREA 3 (FA3): INTELLIGENT & INTEGRATED ASSET MANAGEMENT

This Flagship Area has the objective to provide new innovative technical requirements, methods, solutions and services – including technical requirements and standards for future developments – based on the latest leading-edge technologies to minimise asset life-cycle costs or extend life cycles while meeting the safety and improving the reliability, availability and capacity of the railway system, addressing both infrastructure and rolling stock.

The expected result will be a common European asset management framework composed by a green, digital and safe set of solutions for the rail sector, focusing on three interrelated areas:

- Cost-effective asset management addressing short, mid and long-term interventions widely supported by digital (diagnosis) technologies and data analytics.

- Advanced and high-tech automated execution of construction and interventions supported by robotics and wearables changing the way of working improving health conditions for workers involved and increasing quality and consistency of the results.

- Environmentally friendly production of resilient assets, supported by new design principles, solutions and fabrication techniques.

The risks for FA3 may include extensive cost associated with the market uptake of final solutions due to missing business cases. Siloed proposals for technologies, not considering overall value chain demonstration cases and the integrated approach, might represent another issue.

A different type of risk for this Flagship Area can result from unfit or underdeveloped reference system architecture framework and Conceptual Data Model (CDM), preventing from correct integration of innovations.

Another example of potential risk may lie in the certification processes for new assets, systems, or processes, as well as in reluctance of human factor to accept human-machine interfaces (e.g. augmented reality) in the design and utilisation of innovation.

The Grant Agreement of the first EU-Rail Flagship Project FP3-IAM4RAIL implementing this Flagship Area was signed in December 2022.

Activities have started in 2023 and preparation of the enablers continued in 2024 and 2025. It is expected notably to deliver the following solutions that can be demonstrated by system approaches of the various developments targeting up to TRL 6 as European common integrated solutions, **by 2026**:

- **Asset Management & TMS.** The main aim of the demonstrator will be to show the integration between the Intelligent Asset Management System (IAMS) and the Traffic Management System (TMS) enabling the share of data and optimising decisions using common metrics – **TRL6**;

- **Asset Management & Rolling Stock.** The main objective of this demonstrator will be to present the monitoring of rolling stock (including on board and wayside technologies) leading to decisions and planning of interventions, and redirecting rolling stock to workshops to execute the (re)scheduled work both manually as well as by new technologies and solutions to conduct inspection tasks automatically – **TRL6**;

- **Long Term Asset Management.** Development of Life Cycle Cost (LCC) models for infrastructure and rolling stock. This demonstrator will include cross-border infrastructure remaining useful-life analysis and space-time cross-analysis and visualisation – **TRL6**;

- **Asset Management & Infrastructure.** The objective will be to integrate on field and on board systems with central platforms capable of managing Big Data to enable prescriptive interventions, minimising dangerous situations and service disruptions during operation – **TRL6**;

- **Asset Management & Digital Twins.** The focus will be on design, maintenance, upgrade and renewal interventions driven by Digital Twins for the optimisation of processes, maintenance planning and involved logistics. This will enforce the use of BIM to standardise system configuration and AI tools to execute simulations and predictions. The Digital Twin demonstrator will include visualisation, prediction and simulation – **TRL6**;

- **Design & Manufacturing.** This demonstrator will be the showcase of eco-friendly production of resilient assets supported by new fabrication techniques such as additive manufacturing (focused on infrastructure assets) – **TRL5/6**;

- **Robotics & Interventions.** The focus of this demonstrator will be the showcase of high-tech automated execution solutions for construction and interventions supported by robotics and wearables, among other devices, building a safer and more automated railway environment - **TRL5/6**.

The Grant Agreement of the project implementing higher TRL activities for Flagship Area 3 demonstrators (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 8/9, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area for all the technical enablers, as foreseen in the EU-Rail MAWP with additional capabilities.

2.3.3.4 FLAGSHIP AREA 4 (FA4): A SUSTAINABLE AND GREEN RAIL SYSTEM

FA4 pursues the objective of providing new innovative products and services based on leading edge technologies to minimize the overall energy consumption and environmental impact of the railway system, to make this transportation mode healthier, more attractive and to provide resiliency against climate change at a reduced total cost of ownership.

This Flagship Area should provide the following solutions:

- Developments oriented towards a more integrated and standardised Rail Power Smart Grid, integrating greener energies, cutting peak of energy consumption and allowing for a better control and management.

- Developments oriented towards a better energy management at station level (stations as energy hubs) providing more intelligent and integrated control systems and allowing for a larger energy flexibility and resilience of the Electrical Smart Grid.

- Technologies for a more sustainable and extreme hazard resilience design of railway infrastructures and rolling stocks, oriented towards the whole life cycle of the assets and supported by Digital Twin developments.

- Sector tools or platforms for the efficient implementation of circular economy solutions in the railway sector (infrastructure, rolling stock and buildings) and for sharing and communicating of accurate environmental data towards stakeholders.
- Guidelines for the design of modular stations according to size and uses.

One of the main risks associated with FA4 relates to the fact that the relevant technologies for achieving sustainable and green rail system (e.g. hydrogen solutions, batteries, sustainable construction technologies) are primarily developed by other industries and under partnerships other than EU-Rail. This might cause difficulties in transferring these innovations directly to railways for reasons such as the cost of technologies, incompatibilities of standards, or other technical constraints.

Some risks mentioned under FA3 are relevant for FA4 as well. This applies to the risk of having extensive cost associated with the market uptake of final solutions due to missing business cases. Siloed proposals for technologies, not considering overall value chain demonstration cases and the integrated approach, might represent another issue.

Finally, long and costly certification procedures for new assets, systems or technologies represents another risk to achieving the objectives under this Flagship Area.

The Grant Agreement of the first EU-Rail Flagship Project FP4-RAIL4EARTH implementing this Flagship Area was signed in December 2022. Activities have started in 2023 and preparation of the enablers continued in 2024 and 2025. It is expected notably to deliver the following **by 2026**:

- **Alternative energy solutions for the rolling stock at TRL4/7**, covering:
    - High performances Batteries Electric Multi-Unit (BEMU) train;
    - Hydrogen hybrid trains with test of heavy-duty inspection vehicle and loco for freight-passengers;
    - Sub-urban catenary trains with on board Energy Storage Systems (ESS);
    - Auto adaptive train energy consumption to various services situations.
- A **holistic approach to energy in rail infrastructure (design, production, use and intelligent management) at TRL5/7**, covering:
    - Rail Power Smart Grid in different systems as well as the integration of energy storage solutions;
    - Development of a universal hydrogen refuelling interface as well as digital algorithms to improve refuelling efficiency.
- **Sustainability and resilience of the rail system** in a holistic approach to asset management, delivering more value:
    - Development of solutions and models for the reduction of noise and vibrations from railway infrastructure and rolling stock and to predict the effect of degradation, of maintenance and of noise perception (**TRL5/6**).
- **Improvement of electro-mechanical components and sub-systems for the rolling stock, at TRL6/8**, covering:
    - Technological solutions for the migration to the airless train: Electro-mechanical braking system and novel electro-mechanical pantograph (TRL 6/8) and suspensions;
    - Optimised motors and gearboxes, high performance bogies, suspensions and new materials;
    - Eco-friendly HVAC system technologies;
    - Aerodynamic certification with experimental and numerical methods.
- **Healthier and safer rail system**, covering:
    - Simulation tools for improving the air quality in trains, stations and tunnels (reaching **TRL6/8**).

- **Attractiveness, at TRL4/6**, covering:
    - Modular rolling stock interiors providing easy access (incl. PRM) and new architectures for drivers' cabin.

The Grant Agreement of the project implementing higher TRL activities for Flagship Area 4 demonstrators (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 7/8/9, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area for all the technical enablers, as foreseen in the EU-Rail MAWP with additional capabilities.

2.3.3.5 FLAGSHIP AREA 5 (FA5): SUSTAINABLE COMPETITIVE DIGITAL GREEN RAIL FREIGHT SERVICES

The objective of FA5 is to make rail freight more attractive through increased capacity, e.g. with Digital Automatic Coupler (DAC), which is enabling more functionalities in freight to increase network capacity in a smart way for all types of rail freight transport, as well as significantly improved cross-border operations and multimodal customer services. Increased capacity is the key factor to enable a shift of transport volumes to rail, reducing substantially the related greenhouse gases emissions.

FA5 tackles the challenges by having two clusters which are interlinked but still distinct. The first one is "full digital rail freight operations". It is focused on increasing substantially the productivity, quality and capacity of rail freight by applying digitalization and automation to all possible operational functions and processes including innovative freight assets. The second cluster, "seamless rail freight", is focusing on important aspects to increase the efficiency of the immaterial (information/data) layer of transport and to gain time and save costs by ensuring a seamless environment (between different actors/countries/modes for planning/execution/management) in the long term, but also via short-/medium-term achievements and quick wins.

One of the major risks to the objectives of FA5 is that unclear and changing business cases as well as varying use-cases could lead to unwanted re-iterations in the development of innovations. Such iterations may result in failure to achieve authorisation/certification and could lead to higher investment costs.

In addition, the developments can be hindered by the lack of operational and technical information, or by the unavailability of data from legacy systems being the starting point for European and interoperable solutions. Another obstacle may take form of a delay in ERA's authorisation process or in the preparation of functional requirement specifications in order to meet TRL targets regarding technical enablers.

The number of different systems to be connected and the complexity of the systems can pose a risk to standardising and harmonising of processes, technologies and cross-border systems, which might delay achieving of the objective of European interoperability of systems. High degree of Integration with EU harmonized TMS real time data will be key for delivering expected outputs in rail freight corridors as expected in the "seamless rail freight" workstream.

Finally, the migration from a brownfield environment and underestimation of the complexity of adaptation may be a risk, especially if combined with missing operational rules and technical regulations/standards.

The Grant Agreement of the first EU-Rail Flagship Project FP5-TRANS4M-R implementing this Flagship Area was signed in November 2022 and the project started in July 2022. Activities have started in 2022 and preparation of the enablers continued in 2024 and 2025. It is expected notably to:

Workstream 1 Full digital Freight Train Operations with DAC as enabler for full digital freight train operation

deliver **by 2026** the following demonstrators:

- **European full digital freight train operations:** (**TRL 7**) Large-scale demonstrator showing full digital freight train operations based on DAC Type 4 (incl. energy supply & data/communication solution and Type 5 upgradability, DAC wagon retrofitting and DAC – Hybrid for locomotives)

in different regions with several train sets under real operational conditions including technical enablers described in scope section.

- **Demonstration of a fully digitalised and automated yard IV: (TRL 5/6 – some functionalities at lower TRL)** Demonstration of Yard automation equipment, wagon identity system allowing automated shunting, video gates and way side check points with visual recognition and AI tools for yard automation

Workstream 2 Seamless Freight: with easy access and reliable (intermodal) transport service offering digital solutions deliver **by 2026** at least the following:

- **Seamless freight corridor:** (**TRL 4-8**) The comprehensive innovations for planning and operation of cross-border freight trains should be demonstrated on (parts of) two European corridors. Freight specific pilot implementations of key enablers for intermodal predictions, improved cross-border timetable planning, management and path ordering systems taking into account also last mile service, as well as for real-time interaction between various TMS (including yards/terminals). Digital technologies for standardized European Railway checkpoints at borders or other operational stop points. Integrating and connecting the last mile (accession lines/shunting/yards/ terminals) slot planning directly or via interfaces.

- **Seamless multimodal freight:** (**TRL 4-8**) Seamless planning, management and booking of multimodal rail-based transport integrating multi-actors, should be demonstrated integrating rail in modern supply chains. Improved routing engines more responsive to changing demand, disruptions and customer requirements. This demonstrator will ease end customers to interface with rail.

In 2025, EU-Rail has awarded a Grant Agreement for FP5-DACtiVAte, a Flagship project within the Flagship Area 5, aiming to advance the full digitalization of freight train operations in Europe and to enable the pre-deployment of pilot trains with Digital Automatic Coupling (DAC) by executing required additional tests to the complementary FA5 project, thus establishing confidence before full implementation, while enabling DAC-authorization processes. The project tests the interchangeability of DAC components, expand the number of Wagon Onboard Units in line with FA5 project's system architecture, and enables thorough validation of the pre-deployment trains by additional locomotives able to integrate hybrid couplers. It is expected notably to deliver the following **by 2026**:

Workstream 1: DAC Interface A derailment and propelling safety tests, crash tests, climate chamber tests and initial tests to prove interchangeability of DAC coupler head/shank and draft gear across DAC solutions.

- **Derailment and propelling safety (TRL 6)**:
    - Providing the necessary test results of tests on running safety (safety against derailment) and tolerable longitudinal compressive forces with the DAC interface A (derailment tests);
    - Validating the limit value of compressive forces for DAC interface A of each coupler supplier, based on a specified reference wagon composition as well as for interoperable usage, with running safety validation assessment tool for propelled tests managed under the requirements of international standards and norms;
- **Crash tests considering (TRL 6/7):**
    - Validating figures for DAC interface A couplers according to the crash test requirements based on the requirements of EN 15227 and RID;
- **Climate Chamber Tests (TRL 6/7):**
    - Providing validation of DAC interface A couplers in harsh environment, esp. ice and snow based on T1 standard (-25°C / +40°C) fulfilling the requirements for authorisation.

Workstream 2: Mix and match tests - initial tests to prove interchangeability of DAC interface A coupler head/shank and draft gear across DAC suppliers:

- Managing tests to ensure the interchangeability across all project-involved DAC suppliers;
- Providing bench tests to measure the force transmission at different coupling angles and perform operational tests (TRL 7) on defined test cases.

The Grant Agreement of the project implementing higher TRL activities for Flagship Area 5 demonstrators (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 8, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area for all the technical enablers, as foreseen in the EU-Rail MAWP with additional capabilities.

The Flagship Areas 5 projects will also contribute to the DAC pre-deployment activities in Europe by supporting the Pioneer DAC Trains project that started in November 2025 (project co-funded by CINEA).

2.3.3.6 FLAGSHIP AREA 6 (FA6): REGIONAL RAIL SERVICES / INNOVATIVE RAIL SERVICES TO REVITALISE CAPILLARY LINES

The overall objective of FA6 is to ensure long term viability of regional railways by decreasing the total cost of ownership (TCO), in other words, cost per kilometre both in terms of operational expenditure and capital expenditure, while offering a high quality of service and operational safety. In addition, the aspired results aim to increase customer satisfaction and to become an attractive and preferred choice of transport mode.

These goals are expected to be achieved through a concept tailored to regional railways that includes digitalization, automation and utilization of mainstream and emerging technologies for signalling and trackside components, rolling stock and customer information. Cost drivers including infrastructure and energy components, e.g. trackside train detection (axle counters, etc.) and level crossing control systems, should be replaced by less costly wireless and energy self-sufficient components. The foreseen solutions include alignment with System Pillar CCS Reference Architecture, cost efficient infrastructure and energy components, a light, flexible and modular vehicle concept as well as safety and asset management. In addition, a passenger information system should be introduced, allowing to benefit from the solutions available for mainline services while integrating data from regional railways with other modes of transportation and local services, offering added value for customers.

Nevertheless, to enable suppliers to develop technologies at competitive costs and allow an effective implementation and usage by the operators, several risks have to be taken into account, such as the lack of standardization and harmonization, insufficient alignment with TSI-revision cycles, or difficulties with adjusting technologies to specific needs of regional rail, hindering the expected demonstrations and pilots.

In addition, the migration from a brownfield environment and underestimation of the complexity of adaptation may be a risk, especially if combined with missing common operational rules and technical regulations/standards.

The Grant Agreement of the first EU-Rail Flagship Project FP6-Future implementing this Flagship Area was signed in November 2022 and the project was launched in December 2022. Activities have started in 2023.In 2024 and 2025, the development of the technical requirements and use cases for the technical enablers for the next generation of railway regional lines continued. The preparation of the demonstration activities of the technical enablers started in June 2024 and continued in 2025. It is expected notably to deliver the following **by 2026**:

Regional Railway System (CCS & Operations) Demonstration:

- Demonstrate a single integrated Operations Control Center (OCC) covering interlocking, radio blocking and traffic management for regional lines that are not functionally/operationally connected with mainline (**TRL 4/5**);
- Demonstrate simple on-track radio network based on the findings in destination 2 related with cost effective communications, supporting all FRMCS applications, minimizing civil works and

energy consumption, to the achievement of cost effective Gigabit Train, the use of public network coverage and compatibility with main lines (**TRL4/5**);

- Demonstrate a specific application for Traffic Management Systems for regional lines improving resilience of a connected rail network, optimizing train operations including disturbing events taking into account high/low-demand situations (disturbance and distraction) (**TRL 4/5**).

Assets Demonstration:

- Demonstrate a systemic approach with the implementation of different railway assets in particular for cost-efficient wireless, energy self-sufficient wayside components in particular CCS track-side components (e.g. switches, level crossings) and if applicable for track vacancy detections and signalling will be evaluated and demonstrated (**TRL4/5**).

Suitable customer services:

- Demonstrate cost-efficient integration of on-board information of multimodal services integrating regional multimodal services (**TRL6**);
- Demonstrate passenger congestion rate monitoring, flow optimization application as well as a low-cost passenger information system for regional services developed within this action (**TRL5**).

The Grant Agreement of the project implementing higher TRL activities for Flagship Area 6 demonstrators (following the launch of the call for proposals in 2025) is expected to be signed in 2026. This is expected to cover activities reaching a higher TRL (up to 6/7, depending on the technical enabler) implementing and further demonstrating in 2027/2028 developments done in phase 1 of implementation of the Flagship Area for all the technical enablers, as foreseen in the EU-Rail MAWP with additional capabilities.

In 2026, EU-Rail is expecting to launch a topic in its call for proposals for the development of a regional modular lightweight small railway vehicle implementing the Flagship Area 6. This is expected to cover activities reaching up to TRL4, as foreseen in the EU-Rail MAWP. This topic will be combined with a topic of Flagship Area 7.

2.3.3.7 FLAGSHIP AREA 7 (FA7): INNOVATION ON NEW APPROACHES FOR GUIDED TRANSPORT MODES

The objective of FA7 is to explore non-traditional and emerging flexible and/or high-speed guided transport systems, as well as to create opportunities for innovators to bring forward ideas for shaping those future systems via a scientific approach into an existing rail system. This will provide socio-economically efficient and long-term sustainable transport for citizens and businesses throughout Europe. The main aspects for such systems are the reduction of energy consumption, noise and pollutant emissions and land consumption, the use of sustainable raw materials and energy sources and the sustainable use of existing infrastructures whilst ensuring utmost of accessibility and inclusiveness for all user groups.

The vision under FA7 is to develop the next generation of railway transport systems as well as guided transport systems based on a fully automated multi-modal mobility system for passengers and goods which is sustainable, interconnected, digital, on-demand, standardised, scalable and suitable for all transport modes. While FA7 is generally open to all innovation on new approaches for guided transport modes, the focus will be on solutions which allow higher flexibility through multi-modality such as a transition to intermodal-connected moving infrastructure by centrally coordinated, innovative purpose-built vehicles and on ultra-high-speed energy efficient and environmentally friendly rail systems. The innovation in this Flagship Area are expected to operate on an Open Platform, based on common standards and standardised interfaces, connecting all the transport modes, and be able to provide disruptive Operation and Business Models.

New approaches foreseen under FA7, like moving infrastructures, Pods, magnetic levitation, air levitation, and vacuum tube technique bring a lot of advantages and can be an important and possibly unavoidable component of the mobility of the future. However, several risks are associated with their deployment.

Firstly, a technological maturity is more difficult to be reached for such innovative systems compared to the evolution of existing systems. One of the particular challenges will be the conversion of the existing infrastructure of today's modes and railway mobility to above mentioned future solutions in a more sustainable and non-burdening way for the national economies.

Secondly, a lot of gaps exist related to introduction and consolidation of legislation, as well as standardisation, for FA7 innovative technologies and solutions. A delicate balance needs to be found between having the technologies mature enough to define standards and regulations and setting up a regulatory framework as soon as possible to ensure that the developments fit the required legislation in matter of safety and to obtain the maximum compatibility, interoperability and intermodality.

Finally, risks linked to the sustainable construction of intermodal transportation and/or robust domestic or cross-border transportation lines need to be considered. These include, for example, handling with many different legislative/administrative processes at national and European level, or coping with the emerging climate changes when introducing these new transportation modes.

The Pods4Rail project in this Flagship Area started in September 2023. It aims to investigate Pods4Rail to develop a concept for Pods and Pod-Carriers on railway and to identify relevant use cases and business cases. In 2024 and 2025, the multimodal mobility systems and related use cases were investigated from a social-economical perspective. Business cases were developed for the selected promising use cases.

The MaDe4Rail project was concluded in September 2024 and the results were disseminated during InnoTrans 2024. The MaDe4Rail project aimed to explore non-traditional and emerging maglev-derived systems (MDS) and to assess the technical feasibility and effectiveness to introduce MDS in Europe under safety aspects and technical-economic performance. In 2025, EU-Rail has awarded a Grant Agreement for MaDe4Rail 2, a project within the Flagship Area 7, aiming to advance the development of MDS and assess their feasibility for integration into the European railway network.

The Grant Agreement of the Hyper4Rail project in this Flagship Area was signed in November 2024 and started its activities in December 2024. Hyper4Rail aims to shape future mobility by converging European efforts towards a standardised hyperloop system.

In 2026, EU-Rail is expecting to launch:

- A topic in its call for proposals for automated multi-modal mobility-system with “moving infrastructures”. This is expected to cover activities reaching up to TRL5, as foreseen in the EU-Rail MAWP. This topic will be combined with a topic of Flagship Area 6.
- A topic in its call for proposals for the demonstration of safety components for hyperloop system. This is expected to cover activities reaching up to TRL4, as foreseen in the EU-Rail MAWP.

2.3.3.8 TRANSVERSAL TOPIC: DIGITAL ENABLERS

On the path of becoming fully digital and connected, the rail system will be characterized by a complex landscape comprising multiple heterogeneous enterprise-level mission-critical systems interacting with a very large number of networked stationary and mobile devices and sensors, generating requirements for new mechanisms to be embedded in the digital infrastructure.

Digitalisation is of major importance for all the Flagship Areas, hence it is organised as the Transversal Topic (TT) to have all elements of the system playing together in a coherent and interoperable way. The digital enablers from this work area – mainly the digital twins[28], innovative processes enabled by interoperable data sharing as including conceptual data model (CDM) will serve various demonstrations in the FAs.

The objective of the transversal topic on digital enablers will support the operational processes and activities of the FAs by three aspects: firstly, the Digital Twins support by composition of reusable, blackbox, compiled, digital interoperable model units of components, subsystems, executing in a federated simulation runtime environment the DT to provide suitable analysis tools (e.g. root-cause

[28] A digital twin is a virtual representation which is able to imitate the behaviour of a physical system during the span of its lifecycle.

analysis). Secondly, the TT will develop and provide a Digital Twins Design toolbox (design-time) to model development tools for design as well as for validation, verification and test; to model registry and discovery services and to model Interoperability validation tools. Thirdly, the TT will provide a Federated dataspace to feed digital twins in order to ensure a common Ontology, Identity and Trust management, Federation Services, Data Assets registry and discovery services, Data Distribution Services, Data stream management, cyber security etc.

There is a number of risks to the objective of enabling the fitting of individual digital twins in a joined environment, such as the potential lack of consensus, alignment, access to data or interoperability of systems. Thus, the risk exists that consolidation with other FAs will not be reached in time or in all needed areas to a sufficient extent.

Additionally, a lack of an agreed framework on rights and obligations as well as governance associated with use of a digital twin and federated data could hinder a proper usage of the developed digital environment.

Another risk associated with digital twin development is finding right complexity as well as granularity level. On one hand, creating a simple digital twin will mainly result in a digital model that cannot accurately represent the real system. On the other hand, creating a too complex digital twin will require substantial amount of work by orders of magnitude and can result in making it difficult to understand, maintain and debug.

Finally, transversality as such is a risk. Requirements and functionalities need to be collected from the FAs as well as the architecture developed in LinX4Rail (2019), and further development in the System Pillar needs to be considered. In addition, requirements from different stakeholders and FAs need to be accommodated and integrated. Besides the content-related challenges, this represents an issue for project management and governance.

Activities have officially started in 2023, following the signature of the Grant Agreement of FP1-MOTIONAL project in December 2022. Technical work continued in 2024 and 2025 and will lead to:

Flagship Project 1, Workstream 2 - Digital Enablers: to deliver **by 2026** the following:

- Connectors for Federated Data Spaces (**TRL6**);
- Common Domain Ontology, building upon S2R works on Conceptual Data Model (CDM) (**TRL6**);
- Digital Twin support, development and execution environment (**TRL5**).

The Grant Agreement of the project implementing the second set of demonstrators for Flagship Area 1 (following the launch of the call for proposals in 2025) is expected to be signed in 2026.

2.3.3.9 EXPLORATORY RESEARCH AND OTHER

Blue sky research, complementary research and other activities allow the integrated Programme to open up its activities to future breakthrough innovation and further R&I activities towards higher TRLs.

While the four first EU-Rail Exploratory Research projects (RAIL4CITIES, ESEP4FREIGHT, DACFIT and LEADER2030) are finalizing their activities in 2025, several projects will be supervised in 2026, notably:

- The Academics4Rail project aims to build a stable and durable community of railway scientific researchers and academia to share and exchange scientific knowledge with Europe's Rail, as well as to enable a network of 6 PhDs (with the academia teaming up with the industry). Additionally, the project provides the development of an overarching framework and methodology for the qualitative and quantitative assessment of Europe's Rail societal KPIs.
- The above project is complemented by PhDs EU-Rail project that reinforces fostering collaboration and innovation in the European railway sector by consolidating a scientific community and conducting research through 10 PhD positions.

- The InBridge4EU project addresses unresolved issues in current railway infrastructure standards, focusing on improving the dynamic interface between railway bridges and rolling stock.
- As a support action, DACcord projects coordinates efforts related to the European DAC Delivery programme.
- QuieterRail project aims to introduce a step change in predicting and mapping railway noise and vibration, in the acceptance testing of rolling stock, and in promoting cost-effective noise mitigation.
- Nexus project seeks to establish an innovation benchmark, addressing crucial challenges and guiding European metros toward transformative futures.
- SYMBIOSIS project is a pioneering interdisciplinary initiative in biodiversity. It will build a community of practice between transport infrastructure, energy distribution and production, and biodiversity, while addressing the role of strategic planning in climate change and building resilient rail transport infrastructure.
- XCROSS project will develop a suite of integrated disruptive technologies which combine to provide a technological process for the monitoring, inspection, and maintenance intervention of crossing surface profiles.

Additionally, EU-Rail is expecting to sign in 2026 the Grant Agreements associated to the 2025 call for proposals on Exploratory Research, following the input and advice from a large consultation process with ERRAC, the Scientific Steering Group, the States' Representatives Group, and also based on possible specific needs identified by the ongoing actions, sector stakeholders or ERA.

The JU have and still might also launch specific tenders to ensure effective Programme Management with sector expertise but also involve associations of stakeholders not represented in the JU Governance.

2.3.3.10 INNOVATION PILLAR SPECIFIC OBJECTIVES FOR 2026

In 2026, the main objective is to ensure to capitalise on the output of all the R&I activities, and in particular of the first wave of Flagship Projects (concluding in 2026) in view of the official kick-off of the second wave of Flagship Projects in 2026. During 2026 Research and innovation will have to continue at the same pace and, especially, any risk and opportunity will be duly managed to avoid jeopardizing the 2026 demos. Particular attention will be put on the full complementarity between the ongoing Flagship Projects 1, 2 and 5 and the projects FP1-TRAVELWISE, FP2-MORANE-2 and FP5-DACTIVATE to ensure the proper pace and synchronisation of outputs/deliverables. In 2026 any potential parallel running period from two Flagship Projects of the same Area should be minimised and closely monitored, but it will also be an opportunity to work for ensuring an appropriate transfer of knowledge.

The exercise conducted in 2025 with the maturity checkpoints will lead to possible project adjustments in 2026 leading to an analysis of the feasibility of the planned maturity foreseen and possible impact on the MAWP.

Additionally, as part of the Innovation Pillar activities and objectives, the JU will also continue to monitor the implementation of exploratory and other projects (comprising FA7 projects), gathering results that could provide either a direct input or provide the elements for disruptive technologies or basic research, possibly leading to future breakthrough innovation and further R&I activities towards higher TRLs.

The JU, based on the reporting to be provided by the actions, based on the maturity checkpoints outputs (for Flagship Projects) and on the continuous monitoring of the performance of the projects, will decide on their continuation on the basis of agreed performance indicators.

2.3.4 The Deployment Group

To facilitate the smooth deployment of new innovations and architectures, EU-RAIL has established a High-Level Deployment Group. Next to the Innovation Pillar and the System pillar this is the third main EU-RAIL department.

The Deployment Group is expected in 2026 to deliver recommendations to the Governing Board of EU-Rail on the consideration and needs in relation to the deployment of solutions proposed by the JU. These recommendations may include:

- considerations on whether deployment should be mandatory or voluntary;
- technical and operational migration considerations;
- considerations on timing and need for synchronization at the European level;
- economic and business case analyses for the relevant stakeholders and for the European Union;
- purchasing strategies;
- industrial capacity;
- finance and funding plans.

An important European Deployment activity is based on the work of the European DAC Delivery Programme (EDDP), established and enabled by Shift2Rail in September 2020. A deployment preparation activity for the transformation of rail (freight) towards an automated and digitised mode of transport is the continued management in 2026 and beyond . For a successful and effective implementation of the Digital Automatic Coupler for European rail freight (DAC), it is of crucial importance for EU-Rail to continue in the already implemented and active open platform through an efficient cooperation between railway undertakings, infrastructure managers and wagon keepers, as well as the rail supply industry, entities in charge of maintenance, concerned sector organisations, logistics operators, rail research centres and national and European political institutions. In 2026, the EDDP programme will focus on steer alignment activities between the Pioneer phase and the deliverables coming from FP5-TRANS4M-R and other DAC related projects (DACtiVate, DACfit, etc).

In 2024 the high-level Deployment Group set up a dedicated sub-deployment group for Deployment of FRMCS in the railways, which officially started in 2025. Now with the development of requirements for the new radio (FRMCS) system (from the sector) and first tests from EU-Rail are going to be executed in the FP2-MORANE2 project, there is a high need for clarity on European deployment activities. The current radio system will become obsolete, and Industry has indicated that support for maintaining will end in the 2030's.

In 2026 The Deployment Group will deliver migration scenarios, cost driver analyses, legal and capacity analyses together with risk assessment. In cooperation with sector and ERA the authorisation process will be analysed and if possible optimised for proposal by the European Commission to Member States.

In 2025 EU-RAIL undertook analyses for the need for European coordination of deployment of big transformation programmes such as ETCS, FRMCS, ATO, TMS, sustainable vehicles, etc. Considering the excessive costs and the big out of service consequences the development group will in 2026 continue these analyses and start coordinating deployment activities if necessary and asked for by the sector.

2.3.5 S2R R&I Programme

The former S2R Programme was administratively closed during 2024, which was preceded by finalization of all the S2R projects activities in 2023.

2.3.6 Other risks

The risks related to the different components of the EU-Rail Programme, some of which are mentioned in the previous Sections, will be subject to continuous reassessment, taking account of the practical experience with the Flagship Areas, individual projects and tasks. Risk assessment at the level of individual Flagship Projects is carried out within the workflows that are part of the grant management process standardized by the EC at the Research Family level, as well as in the context of EU-Rail's

additional specific control activities, such as e.g. the maturity checkpoints, which form part of the overall JU's HE Control Strategy for Grants. The assessment of various risks related to projects/beneficiaries will also be performed when selecting particular work packages for qualitative (technical) ex-post reviews to be performed in the respective year.

In addition, the table below presents other relevant risks related to the management of projects, as well as to the corporate management of the JU (such risks could also have indirect impact on operational activities), together with the corresponding risk-mitigation actions. These risks were identified as being relevant for 2026 in a risk assessment exercise which was performed in Q4 2025. Within this exercise, current internal and external factors and developments having influence on JU's business will duly considered. Such comprehensive risk assessment exercises complementing the ongoing ad hoc monitoring will be performed also for 2027, and their outcomes will be reflected in the updates to the below table, as necessary.

The table shows specifically those risks which require, due to their criticality, continuous attention and treatment of the Executive Director and, where relevant, of the Governing Board.

Risk identified	**Action plan**
Intrinsic to the EU-Rail Staff establishment plan and its actual fulfillment, efficiency of operations is impacted by extensive workload of JU's staff. In combination with the PM vacancies, and the timeferame of the recruitment process for these positions, resulting in high staff turnover, difficulties for the JU to attract new people, while vacant positions might be filled with delays resulting in shortage of resources becoming critical especially during peak periods.	- Continue in conducting recruitments for reaching the actual staffing according to the EU-Rail Staff establishment plan - once accomplished, the envisaged positive effects on workload allocation and back-ups should become visible. - Design/apply a replacement plan (back-ups) where possible. - Within the current budget constraints, a career plan for staff has been prepared and business continuity is ensured. - Enhancing of the overall planning of activities will allow for better personnel risk management. - Recruitment of short term resources (interim or trainees) has been extended. - Outsourcing of some activities, as applicable, making use of existing Framework contracts or by executing own procurements. - Implementation of back office arrangements among the JUs might decrease the EU-Rail's internal workload in some areas. - Introduction of a multi-annual learning and development policy will be considered. - Flexible arrangements within the bounds of the respective Commission Decision are in place with regard to hybrid working. - Initiatives aimed at ensuring good working environment and team spirit are implemented on a regular basis, such as social events and team building activities. - Provision of career opportunities.

Risk identified	Action plan
	- Further collaboration with other JUs under the BOAs agreement.
Given the interdependencies of complementary R&I projects, considering as well the complex and integrated new Programme (including inputs/outputs between System and Innovation Pillars), delays and misalignments in the completion of activities may lead to negative project cascading effects impacting Programme outputs.	- Ensure, through adequate Programme management strengthened monitoring and reporting of projects, including gate reviews to determine whether specific actions need to be taken with regard to a specific project (re-orientation, early closure, etc.). - During the GAP address any possible alignment issues between ongoing and future R&I activities. - The MAWP details the high-level interactions. - Application of maturity check points. - Reinforce the cooperation between the IP and SP teams in the JU (e.g. joint regular teams meeting, sharing of information) to anticipate any potential issue.
The ambitions of the System Pillar sector/EU are not matched by the outcomes of EU-Rail Programme due to the limitation in terms of available resources to cover the related activities. This might negatively affect the image of the JU.	- Analysis of feasibility of requirements expressed by the sector and appropriate management of expectations. - Application of shorter contractual periods. - Checking of contract deliverables by third parties, for example ERA, and third-party experts. - Implementation of systematised project management and reporting. - Constant communication on outputs, focusing on concrete results that can be implemented taking into account the legacy system, migraiton aspects, business cases, etc. - Request to the contractor for evidence allowing matching the foreseen outputs with resources allocation.
Vulnerabilities in IT infrastructure or human failures/omissions enabling unauthorized computer network access or cyber-attacks may lead to compromising of data with potential financial losses and/or reputational damage. Delays might also occur, e.g. if data relevant to day-to-day operations became unavailable e.g. due to a successful ransomware attack.	- Azure VPN connection encryption based on user certificates. - Azure VPN connection encryption based on user certificates. - Two factors authentication for M365 and EU login.

Risk identified	Action plan
	- VLANs used for LAN segmentation/ separation minimizing attack/connectivity footprint. - Secured guest Wifi, LAN-independent. - Corporate Wifi secured with user authentication. - Monthly security assessment of both Cooperation Tool and website. - Computers disk encryption in place. - Internet only for non-corporate devices on the wired network. - Lock, change user password remotely; inform the mobile telephony provider; implement intunes security policy for mobile phones. - Implementing the mitigation measures of the DPIA performed for Microsoft Office 365. - Continuous awareness-raising of JU's staff members with regard to cyber security and protection of IT tools and assets. Yearly mandatory cybersecurity sessions. - Sharing of information with the staff about detected actual phishing attempts (also from the EC or other EU bodies) and providing advice on the appropriate way of procedure in such cases. Yearly phishing exercise. - Recurring penetration test of the infrastructure. - Realtime monitoring of our infrastructure logs by CERT.EU to detect early signs of attacks. - Joint ICT strategic plan for all JUs is in place which foresees, i.e. the implementation of the EC authentication method for the JU infrastructure and the implementation of a new regulation for a close cooperation with all EU bodies in terms of cybersecurity and data protection.
Timely and qualitatively adequate execution of the daily Programme management activities may be jeopardized due to accumulation of tasks within the SyGMa/Compass workflows (GAP and project monitoring for the projects running under HE in combination with REPA). This could result, for example, in late payment or late delivery of approval of	- Increased frequency of meetings between ED, HoIP and HoSP and HoCS to monitor the current status of workflows and possible delays. - Increased intensity of the current status monitoring by the HoIP and HoCS to anticipate activities and prioritise. - Temporary partial reassignment of tasks of some of the existing staff members to support

Risk identified	Action plan
reports/deliverables, or even delaying the start of a grant.	the POs, FOs and LOs involved in the respective SyGMa/Compass workflows. - Potential deployment of temporary external resources allowing POs, FOs and LOs involved in the respective SyGMa/Compass workflows transferring some of their clerical/administrative tasks to such temporary external resources.

The performed and future risk assessments included/will include considerations with regard to risks of fraud. No qualitatively new potential fraud schemes were identified and the fraud risks described as a result of the thorough assessment carried out in 2022 both at the Research Family level and individually by EU-Rail still apply.

Further details on the JU's risk management are provided in Section 2.6.6.

2.3.7 Scientific priorities, challenges and expected impacts

The focus of EU-Rail's Programme as per particular Tasks, Flagship Areas and the Transversal Topic is presented in Sections 2.3.1, 2.3.2 and 2.3.3. Specific details on the scientific priorities are provided in EU-Rail's MAWP.

The most relevant challenges that the future rail system needs to address are defined in EU-Rail's MP.

They can be grouped in several topics as follows:

- **Changing customer requirements**

  Political, demographic, technological and market trends are changing the needs of passenger and freight rail customers. These shifts, along with disruptive events like the COVID-19 pandemic, require rail to be more flexible than in the past. A customer-centric rail system means offering reliable services that are reactive to demand, adaptable to customer requests, and accessible for all passengers alike.

- **Need for improved performance and capacity**

  In order to deliver an overall more sustainable transport system, rail must be able to accommodate increased demand. New infrastructure will be necessary in certain areas, but the vast bulk of future increased capacity must leverage existing infrastructure, through a systemic digitalization and automation of operations.

- **High cost**

  Rail is currently often more expensive compared to other transport modes, in some cases reflected on the intermediaries or passengers/users. To be more competitive and support future increased usage, rail must deliver more cost-efficient solutions and services when compared to the present day.

- **Climate change adaptation and environmental sustainability**

  Rail is the most sustainable form of motorised transport. Increased use of rail is necessary to fulfil the goal of introducing European climate-neutral mobility and transport. In addition, steps have to

be taken to further improve the climate and environmental footprint of rail itself (e.g. reduce the noise). Rail services and networks must also become more resilient against the impacts of climate change. In addition, attention will be focused, including re-prioritization, on areas of the Programme that deal with energy efficiency to answer the ongoing specific crisis risking affecting the overall performance of rail.

- **Legacy systems and obsolescence**

  Rail system assets have very long lifecycles and are based on global and European requirements; additionally, legacy national requirements still survive. The incompatibility of certain national requirements between EU Member States in conjunction with long life cycles results in market fragmentation, greater complexity in introducing new functions in a coordinated way, and in a significant increase in costs. Rail must move to common European network with stronger implementation of the objective of having an increasingly integrated Single European Rail Area, and be more flexible to introduce and scale up new technological and operational solutions to deliver new and improved client oriented services.

- **Interaction with other modes**

  Rail networks, and the services associated to them, to a certain extent link well with other transport modes. But such integration must be improved to better serve the needs of customers, and to make rail a more attractive mode overall so that it can become central to future mobility.

- **Increased competition**

  The European rail supply industry is world leading. However, it faces many challenges at global level. Innovative solutions, conceived, designed, and developed jointly creating new products to be deployed at European level are necessary to strengthen the competitiveness of the European rail supply industry, including its SMEs, providing major opportunities for system integrated solutions to be deployed at global level.

By making efforts in addressing the above-mentioned challenges of rail, and by delivering its set objectives, EU-Rail will strive for the following impacts:

- **More flexibility and punctuality for passengers / freight**

  EU-Rail will support the delivery of much more flexible approaches to planning and traffic management of rail services, allowing rail to better serve customer needs.

- **Improved performance and capacity**

  Through the development of cutting edge technologies designed to be implemented across the whole EU rail network, EU-Rail will help increase capacity and make best use of available assets.

- **Reduced costs**

  EU-Rail outputs are expected to help improve the efficiency of the rail system and reduce overall lifecycle costs, including on the less used lines.

- **More sustainable transport**

  EU-Rail will contribute to a more sustainable transport and mobility system by enabling an increase in the use of rail services, and improving the sustainability of the rail sector itself.

- **Harmonised approach to evolution and greater adaptability**

  EU-Rail will support the sector in coordinating on a common evolution of the system, and a greater harmonisation to support the delivery of the Single European Rail Area and improve the rate of deployment of new technologies.

- **Reinforced role for rail in European transport and mobility**

  EU-Rail work will support smart and cost-efficient rail connectivity, key to future sustainable mobility systems, to deliver better services for passengers and freight.

- **Improved EU rail supply industry competitiveness**

Increasing the R&I intensity of the European rail supply industry will enhance its capacity to retain its global leadership. By supporting the transformation of the current rail system into a central transport mode of tomorrow's European mobility, EU-Rail will build unique capabilities in the European rail industry, supporting its position in global markets.

2.3.8 Calls for proposals

The below tables summarize the anticipated values of the operational activities planned in 2026 (and annual instalment implementation of 2025) under EU-Rail/Horizon Europe, including the different calls

Year 2026	Type of call	Value of the actions (million EUR)	Maximum EU-Rail co-funding (million EUR)	Non-funded activities (million EUR)	Target contributions from Members in case of award (million EUR)	Indicative publication date
Multi-annual Call for Proposals (*) (instalment)	Open	0,0	0,0	0,0	0,0	04/02/2026
	2026 values	*0,0*	*22,9*	*0,0*	*0,0*	
Calls for Proposals – Exploratory Research (**)	Open 2026 *values*	6,1	6,1	0,0	7,01	

(*) This call for proposals is launched in 2025 with budget commitments divided into annual instalments, meaning that the amount committed by the JU will be confirmed yearly based on the annual budget of the JU. This amount of Maximum EU-Rail co-funding corresponds to the 2025 instalment for the call 2025-02. For more information about the annual instalments, please refer to the "Table of Financial programming per year until 2027" in Chapter 3 "Budget 2026" of the present document.

In accordance with the SBA and HE, EU-Rail makes use of calls for tenders to implement the R&I Programme, performing studies, seeking for professional support and expertise to the partnership, and any other relevant activities requested by the Governing Board to complement other R&I activities. For clarity, in line with the respective decisions of the Governing Board, these calls for tenders are not intended to replace functions entrusted to the Programme Office although from the pure accounting point of view, some costs are accounted in administrative lines of the general ledger.

(**) The call includes the hyperloop project (3M) funded through the Contribution Agreement signed with the European Commission (DG MOVE) in 2025 and included in the 2025 budget.

2.3.8.1 CONDITIONS OF THE CALLS AND CALLS MANAGEMENT RULES

The EU-Rail Calls will follow the rules of the European Union's Horizon Europe framework programme and in particular the Horizon Europe rules for participation,[29]as well as the General Annexes of the Horizon Europe Work Programme 2026-2027[30], which apply, unless specified otherwise, to EU-Rail calls for proposals.

Regarding admissibility conditions of applications and related requirements, part A of the Horizon Europe Work Programme 2026-2027 General Annexes applies with the following exception: the technical description Part B of the project proposal shall not be longer than 70 pages as described in the application form template for CSA, RIA; and no longer than 120 pages for IA topics.

Part B of the Horizon Europe Work Programme 2026-2027 General Annexes applies for general eligibility conditions.

Part C of the Horizon Europe Work Programme 2026-2027 General Annexes applies with regard to financial and operational capacity of applicants.

Part D of the Horizon Europe Work Programme 2026-2027 General Annexes applies regarding the award criteria, scores and weighting upon which the proposals will be evaluated, with the following additions:

- Under the criteria "Excellence", "quality of the proposed joint activities to achieve the deliverables".
- Under the criteria "Impact", "quality and credibility of the action to contribute achieving the EU-Rail Master Plan objectives and the expected impact of the EU-Rail Multi-Annual Work Programme".
- Under "quality and efficiency of the implementation", "Appropriateness of the project management structure and quality of the proposed coordination".

Part E of the Horizon Europe Work Programme 2026-2027 General Annexes applies with regard to the mandatory documents and annexes to be uploaded in the submission system.

Part F of the Horizon Europe Work Programme 2026-2027 General Annexes applies with regard to the type of the one-stage evaluation procedure and other aspects such as budget flexibility, joint/coordinated calls, indicative timetables for evaluation and signature of the grant agreement(s) and the evaluation review procedure if a complaint is submitted.

Part G of the Horizon Europe Work Programme 2026-2027 General Annexes applies regarding legal and financial set-up of the grant agreements, which includes aspects such as starting date, deliverables, form of grant, maximum grant amount and budget categories.

The standard funding rates of Horizon Europe will apply.

Where private Founding Members of the EU-Rail would be awarded any activities as a result of the EU-Rail calls for proposals, they must provide the necessary corresponding contributions in kind (IKOP and/or IKAA) in accordance with their individual letter of commitment.

Considering the lessons learned from the implementation of lump sum pilot since 2018, including evaluation and first reporting periods, EU-Rail calls for proposals will take the form of lump sums as defined in Commission Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme[31].

In order to facilitate the contribution to the achievement of EU-Rail objectives, the option regarding 'linked actions' of the Horizon Europe Model Grant Agreement and the provisions therein, will be enabled in the corresponding EU-Rail Grant Agreements. Complementarity between particular topics will be specified within their scope in Annex VI of the Work Programme.

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[29] Regulation (EU) 2021/695 establishing the Horizon Europe programme (https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32021R0695)

https://research-and-innovation.ec.europa.eu/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/horizon-europe-work-programmes_en

https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf

Considering the strategic interest of the expected outcomes of actions funded under EU-Rail calls for proposals, the JU reserves the right to object to transfers or licensing up to four years after the end of the action, in accordance with the conditions set in the Horizon Europe Model Grant Agreement, Annex 5 'Specific rules on IPR'— *Granting authority right to object to transfers or licensing (*Article 16)*,* and *Specific rules for carrying out the action (* Article 18).

The outcomes of actions funded under EU-Rail calls for proposals are also expected to contribute to European or international standards wherever possible (refer also to Article 16 – *Exploitation of results* – in Annex 5 of the Horizon Europe Model Grant Agreement). In this respect, the actions are also expected to contribute to the development of EU policies and legislation (including Technical Specifications for Interoperability and Common Safety Methods), System Pillar documents, and in this respect the granting authority, the European Commission, European Union Agency for Railways and the other bodies will require access to the relevant results (i.e. proposals for specifications, requirements, etc.) in accordance with the provision of Annex 5 of the Horizon Europe Model Grant Agreement – Article 16 - *Access rights for the granting authority, EU institutions, bodies, offices or agencies and national authorities to results for policy purposes — Horizon Europe actions.*

Regarding the dissemination obligations of the actions that will be funded under this call, considering that the actions contribute in an integrated manner to the achievement of the EU-Rail objectives established in the SBA and the Master Plan, there is a need to ensure that also the dissemination activities - participation to fairs, mid-term and final events, social media, etc. – are consistent and coherent with the EU-Rail Communication and Dissemination Strategy. Consequently, the actions must plan, design, coordinate and contribute to the EU-Rail Programme Communication and Dissemination activities, aligned with the Stakeholder Relations and Dissemination/structure and in agreement with the JU. This additional exploitation obligation starts from the design of the dissemination and communication activities in the proposal phase; it is established in accordance with Annex 5, Article17 - *Additional dissemination obligations*.

As regards the JU's private Members and their constituent or affiliated entities established in third countries, the interests of the Union and the JU on the grounds of security or public order should be safeguarded. To that end, the JU should be able to request private members to take appropriate measures. Such measures could include the appropriate handling of confidential information or limitation of certain entities in specific operational activities of the private Member as stated in recital 16 of the SBA.

2.3.8.2 LIST OF COUNTRIES ENTRUSTING THE JU WITH NATIONAL FUNDS FOR THE CALLS

EU-Rail is not expected to be entrusted by any country with national funds in 2026.

2.3.8.3 COUNTRY SPECIFIC ELIGIBILITY RULES

The conditions described in part B of the Horizon Europe Work Programme 2026-2027 General Annexes will be applied by EU-Rail without exceptions.

2.3.9 Calls for tenders and other actions

In 2026, EU-Rail is planning to implement the following call for tenders within the framework of the MAWP:

Procurement procedure	Title	Scope	Indicative timetable (Q-quarter)	Indicative budget (EUR)
Implementation framework contracts for services	Europe's Rail System Pillar	Implementation of a 6-year framework contract (3 lots) following an open call for tenders	Q1-Q4 2026	Specific contracts 2026 (3 lots): 8 000 000

Procurement procedure	Title	Scope	Indicative timetable (Q-quarter)	Indicative budget (EUR)
		procedure with a total value (3 lots) of EUR 58,6 million (ceiling increase through a procurement negotiated procedure[32]).		
Other procedures provided for in the EU-Rail Financial Rules	Programme management	The Europe's Rail Joint Undertaking has launched in 2022 and concluded in 2023 a contract, without having recourse to a public procurement procedure as provided in Article 43() of the Financial Rules for one or more contracts to set up a dedicated management structure for projects and foster synergies with other programmes, European, national, regional, etc.	Q4 2026	Contracts renewal 2026: 900 000
Framework contract's implementation	Passenger Perspective in Rail Transformation	Implementation of a 4-year framework contract with a total value of EUR 200.000	Q1 to Q4 2026	Specific contracts 2026: 50 000
Framework contract's implementation	Strategic Advice to Europe's Rail Joint Undertaking (support of external providers	Implementation of a 4-year framework	Q1 to Q4 2026	Direct and/or Specific contracts 2026

[32] Point 11.1(e) of Annex I to Financial Regulation (Reg. (EU, Euratom) 2024/2509)

Procurement procedure	Title	Scope	Indicative timetable (Q-quarter)	Indicative budget (EUR)
	in the fields of strategy advice and support to EU-RAIL programme management)	contract with a total value of EUR 1.200.000		550 000
Direct contract for supplies based on Article 43(4) of the EU-RAIL Financial Rules	Polarion licenses	Polarion licences for the programme *– this new contract will take over the current Polarion licences contract LVP_03-2023 that expires on 21/09/2026)*	Q32026	1 200 000
Implementation through various FWCs	Tool Set	Toolset is an EU-RAIL transversal platform to support the Research and Innovation activities. It includes a data validation tool, and the cost of hosting for the overall tool environment.	Q1 and Q4 2026	Specific contracts 2026: 777 000
Framework contract's implementation	Locomotive fleet retrofit and engineering solutions for DAC (and ERTMS)	Implementation of a 4-year framework contract following an EU-Rail open call for tenders procedure with a total value of 3 000 000	Q1 to Q4 2026	Specific contracts 2026: 2 000 000
Total		**Value of commitments for 2026**		**13 477 000**

As already indicated, in accordance with the SBA and HE, EU-Rail makes use of calls for tenders to implement the R&I Programme, performing studies, seeking for professional support and expertise to the partnership, and any other relevant activities requested by the Governing Board to complement other R&I activities. For clarity, in line with respective decisions of the Governing Board, these calls for tenders are not intended to replace functions entrusted to the Programme Office, although from the

pure accounting point of view, some of the related costs are accounted in the administrative lines of the general ledger.

Additionally, as part of other operational actions, in 2026 it is expected that, after the realization of the call for expression of interest in accordance with Article 7 of the SBA, taking into account in particular the new technological developments or the association of additional countries to Horizon Europe, and following an open and transparent procedure, the Associated Members have become part of the JU.

2.3.10 Follow-up activities linked to past calls: monitoring, evaluation and impact assessment

The former S2R Programme was administratively closed during 2024, which was preceded by finalization of all the S2R projects activities in 2023.

The ongoing EU-Rail projects are subject to continuous monitoring and evaluation to follow-up on their progress and also allowing to deal with different elements which may influence a demonstration to take place (e.g. necessary authorizations).

To manage the complexity of the EU-Rail Integrated Programme, the Flagship Projects will be subject to a monitoring carried out by the JU, described in the Governance and Process Handbook[33] chapter 7.4 – a control mechanism referred to as the "maturity checkpoints". This will enable a clear status to be reached before proceeding to the next phase and will facilitate consistency across the Flagship Areas and their mutual interaction, as well as the interaction with the System Pillar (which is also expected to undergo a similar process).

In addition, the monitoring and assessment of the EU-Rail projects, especially from the risk and control perspective, will also be subject to the procedures defined in the JU's HE Control Strategy for Grants, which was adopted end of 2023.

As for the link and continuity between the previous and the current JU's programmes, the specific details on how the outputs and achievements of the Shift2Rail projects will be applied for EU-Rail's research and innovation are provided per each Flagship Area and the Transversal Topic in the MAWP.

2.3.11 Cooperation, synergies and cross-cutting themes and activities

EU-Rail will strive for maximising its impact using also synergies with other European, national and regional programmes and activities. Beyond the involvement in the overall coordination of Horizon Europe, the JU will in particular focus on capturing synergies across the following:

Synergies within the "Climate, Energy and Mobility" cluster: EU-Rail will reach out to other mobility JUs with the aim to build, where possible, consistent projects and demonstrators for climate neutral mobility solutions. This may also address shared areas of intervention such as multi-modal transport, automation in vehicles and other assets, decarbonisation, use of alternative fuels, etc. In particular, specific coordination with the European Partnership Sesar 3, Clean Hydrogen, as well as with the Battery co-programmed partnership appear to be of key relevance. Follow-up will in particular be needed with action implementing the first synergy topic call (FP1-TRAVELWISE).

Synergies with the "Digital, Industry and Space" cluster: Considering the key challenges related to the digital transformation of rail, there are major expectations on how this cluster would be contributing with rail-critical applications. Artificial intelligence, cyber-security and high-performance computing are cross sectoral issues that require deep coordination especially for the development of use cases and the application of European standards. In addition, European space policy appears to be of key relevance, considering the ambition to introduce more and more satellite-based solutions for localization or data transmission. Here also synergies with EUSPA (and ESA) and SNS will be continued building

[33] https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/

upon the past experience and new ones be created in particular with Chip. Follow-up will in particular be needed with action implementing the synergy topic call (FP2-MORANE-2).

Synergies with the Co-Programmed Partnership on AI, Data and Robotics, which could support access to such technologies and relevant industrial partners and developers will be considered in the implementation of this Work Programme. Additionally, inspection and maintenance was one of the 4 priority areas defined under the robotics PPP, so there is knowledge to build on.

Synergies with EU Missions: EU-Rail will explore joint activities with the Climate-Neutral and Smart Cities Mission contributing to comprehensive climate-neutral and smart urban mobility solutions. Single ticketing and smart transport hubs integrating sub-urban and long-distance passenger and freight rail traffic with urban mobility are possible areas of collaboration.

Coherence and synergies in relation to major national (sectoral) policies, programmes and activities: It is estimated that around 15% of the EU stimulus package called Recovery and Resilience Facility -RRF- will be invested in different areas of rail national systems. There is a need to ensure maximum levels of complementarity and impact, including focusing on future-proof investments. This will require to leverage local, regional and national investments to complement the research and innovation activities performed at EU-Rail level and vice versa. In this respect, the States Representatives Group is expected to play a key role. Additionally, thanks to the input provided by the States Representative Group, synergies with national or regional research and innovation programmes are sought, including concrete actions taken or envisaged for the deployment and uptake of relevant technologies and innovative solutions.

In carrying out its activities, EU-Rail seeks to establish the necessary international connections in relation to rail research and innovation, in line with the Commission priorities. In this respect, the JU will cooperate with third countries and/or international organisations, in particular to contribute to the competitiveness of the European rail industry at global level.

EU-Rail will continue the cooperation started by S2R JU with a number of key international partners, such as FRA, APTA, FTA in the US and CUTRIC (CA). In line with the policy priority of the Commission in terms of rail international relations, further exchanges are expected to take place with other third countries.

The collaboration with the EU neighbouring countries, in particular Western Balkans, will continue with the aim to further explore the opportunities for joint activities and large scale demonstrations.

In addition, EU-Rail will ensure the collaboration with sectorial initiatives like (among others) the ongoing UIC project in relation to FRMCS. It will also ensure collaboration with the activities coordinated and carried out by RNE on Capacity allocation and management (link to FA1).

2.4 Support to Operations of EU-Rail in 2026

2.4.1 Communication, dissemination and exploitation

Communication and stakeholder relations

In order to ensure strong engagement from a wide range of stakeholders, communication must be truly *integrated* into the overall framework of the EU-Rail Programme and it is intrinsically related to the level of engagement with the membership, the rail sector and its stakeholders, as well as the broader transport and research sectors.

Reflecting this, the communication objectives defined jointly with the Founding Members, are listed in the JU Stakeholder Relations, Dissemination and Communication Strategy for 2022-2027.

The Communication activities for 2026 will continue to ensure that the JU's mission, vision and objectives, including the Innovation and System Pillars and the Deployment Group, are communicated and understood widely.

Ensuring that the objectives of the current Programme are well understood by the community is fundamental to have the necessary buy-in to cater since the beginning of the Programme for the future deployment of its results. Actions in this area aim to support and demonstrate the added value of the ongoing R&I activities as well as to inform on the new Calls for Proposals and the projects resulting from the Calls, including the results and outcomes of such projects.

A major point of attention in communication activities will be the need to ensure the involvement of stakeholders from the entire rail value chain, including actors from outside the traditional rail sector (as further elaborated in section 2.3.11). We will also focus on addressing decision makers, such as the EU institutions, as well as the private Founding Members and the Associated Members involving CEOs and CTOs levels to bring coherence of Europe's Rail R&I Programme with future deployment activities. This will be achieved through organisation and participation to a number of Europe-wide and global events, among other communication activities and campaigns.

Stakeholder Relations support the main objectives of the JU. Identified stakeholders will be targeted through direct relations and the identified communication and dissemination activities. At operational level, the challenge for 2026 will be to demonstrate the added value of the JU based on its results.

Communication efforts and dissemination of the EU-Rail R&I outputs in 2026 will be particularly important as we enter a critical moment of reflection and strategic positioning ahead of the 10th Framework Programme for Research and Innovation (FP10), and in parallel with the broader discussions around the future Multiannual Financial Framework (MFF).

EU-Rail communication activities aim to :

- **Continue to raise awareness about the JU and its Programme** among key stakeholders across Europe from the rail sector , given the ambition of a better integration of rail with other transport modes for both passengers and freight managers, and the need to establish synergies with other thematic areas and sectors as identified in the EU Green Deal and the Sustainable and Smart Mobility Strategy.

- **Support and promote the recognition of the JU's results at global level** with regard to its contribution to the competitiveness of the European railway industry.

- **Promote stakeholder engagement** along and across the value chain in order to facilitate cooperation and knowledge exchange across EU countries and regions, exploiting insofar as possible existing events. This objective will require the organisation of and participation to fora and conferences on specific topics stemming from the current Programme content and key project results and adaptation of key messages to each stakeholder.

  Both of the two latter aforementioned objectives will require close work with different stakeholders and their associations.

- **Promote the JU within the EU Institutional arena**. This objective consists of maintaining and further developing political support for EU-Rail from the EU institutions and EU Member States through the promotion of the JU, its objectives and achievements. Target audiences for this objective include the European Parliament and the Council (with particular attention to the rotating presidencies) and policymakers in EU Member States, the Committee of the Regions, the European Economic and Social Committee and other EU bodies, such as the European Union Agency for Railways (ERA), the European Environmental Agency (EEA), the European Agency for the Space Programme (EUSPA) and other Joint Undertakings, especially in the context of building operational and administrative synergies. This objective might require the organisation of events inside the European Parliament, participation in visibility events such as exhibitions, Open Days, and the production of publications, digital and audio-visual content and presentations of key achievements. It is essential to maintain efficient communication channels with DG MOVE and DG RTD and explore all possible collaboration with other DGs, EU Agencies and bodies where appropriate to further increase synergies between EU policy areas and rail transport. EU-Rail will also build synergies with other transport focused Joint Undertakings through joint projects stemming from Calls for Proposals (SNS JU, SESAR3 JU) and initiatives, such as events and digital campaigns, including social media, to further reinforce the collaborative message.

- **Lead a coherent dissemination strategy** regarding projects' activities, achievements, milestones and results notably via coordinating web, documents, audio-visual and digital content and event management of the projects, and their presence on the EU-Rail website with the development of an improved dissemination framework, as well as providing information to projects on Horizon Europe dissemination tools. This will include assisting the projects to disseminate their results through the JU's newsletter and social media channels and providing guidelines to the projects on issuing coherent communication products and activities in line with the JU's corporate branding and messages. To this effect, regular meetings and concrete actions will be organised with the Project Coordinators, Flagship Projects Managers and Work Package Leaders for

Communication and Dissemination. A dedicated Teams environment and EU Survey Tool for content collection will be further utilised to strengthen information exchange with the projects.

- Pro-actively **publish communication material** with regard to events directly organised by Europe's Rail, participation to external events, as well as meetings related to EU-Rail. A broad variety of dissemination materials of mostly such as digital factsheets, leaflets, reports, video content and other digital communication outputs will be developed to support not only events directly organised by Europe's Rail or external events we participate in, but also meetings and interactions more broadly related to EU-Rail. These will help enhance the visibility of the JU towards other stakeholders, including the general public.

- **Expand the network of press and media contacts** in order to achieve considerable visibility in both specialised and general media partnerships with wider-reaching and less thematic publications should be pursued to establish a more diverse media network. This network could be useful to provide visibility to the publication of press releases and specific articles related to EU-Rail's activities. Furthermore, the communication material produced by the JU will be disseminated through multipliers from the stakeholders base, as listed below.

- **Continue populating website, publishing news, newsletters, mailshots, various publications and animate the social media platforms** in order to stimulate the public interaction on key issues and improve public awareness on the JU's activities. To that effect, bi-annual meetings will be set-up with the Communication Officers of the Founding Members and other key Partners to identify joint communication activities and channels and to elaborate and create synergies on the presence of the JU at major events as well as agree on common practices regarding the dissemination of project results.

Further to the above, EU-Rail relies on key multipliers:

- European Commission Directorate-Generals, with a particular focus on DG MOVE and DG RTD
- JU private Members, including JU project coordinators, corporate Communication managers and project participants, who will communicate the success of the JU to various audiences;
- Presidencies of the European Union;
- Members of the States' Representatives Group (SRG);
- Members of the Scientific Steering Group (SSG);
- ERRAC
- Policy makers and decision-makers;
- Wider stakeholders reached through EU-Rail Information Days and online channels;
- Global stakeholders present at key events, within and outside the Union;
- European railway associations, including those in relation to passengers and staff;
- European Union National Contact Point clusters (for calls info-days);
- Rail trade media;
- Mainstream media;
- EU-Rail staff acting as ambassadors.

The implementation of the communication, dissemination and stakeholder relations activities will continue to be supported through a framework contract established with communication agencies as well as through inter-institutional framework contracts put in place by the European Commission. EU-Rail has established a joint framework contract for communication services together with the SESAR 3 and the Clean Aviation Joint Undertakings running until 16 February 2026. The services include editorial support, events management, digital communication and website support. A new framework contract will be put in place for similar services as of March 2026. EU-Rail has contributed to the preparation of the tender and will also take part in its evaluation. Europe's Rail will continue using the available services of communication framework contracts of the European Commission.

Dissemination

Dissemination of project results will be at the forefront of communication, dissemination and stakeholder relations activities in 2026. A major focus will be placed on ensuring that the key demonstration activities, milestones and results of the Flagship Projects are efficiently communicated to the relevant target audiences. Connecting relevant national or regional research and innovation programmes identified as potential areas of cooperation by the States' Representative Group. Efforts will also be made to further disseminate the results of the Exploratory Research and Other Activities projects, in complement to the Flagship projects, showcasing synergies and joint activities. Such dissemination efforts will be carried out taking into consideration the link with the projects and the System Pillar, as well as the Deployment Group. The results of the ongoing activities and of projects/tenders are disseminated by EU-Rail via its website, in particular the digital catalogue of Solutions, sections, press releases, newsletters, mailshots, presentations at internal (EC, Governing Board, Scientific Steering Group, States Representatives Group, System and Innovation Programme Board, General Assembly of the JU) and external (conferences, trade fairs, Info days, dedicated Innovation Days etc.) stakeholder events with a focus on InnoTrans 2026, and TRA,, as well as general mainstream press and through social media. Efforts to manage the projects community for a more efficient information exchange on the Teams platform will be further animated and encouraged. A particular focus will be placed on streamlining dissemination efforts of the Flagship Projects via a new and comprehensive set of guidelines and KPIs. The efforts should result in a series of communication outputs in article and video format available on the EU-Rail website.

EU-Rail will continue to participate to the different working groups established by the European Commission on dissemination and exploitation activities, to ensure that R&I results are integrated with the overall work performed in the rest of Horizon Europe and, where appropriate, in the ERA activities.

Communication on the projects results will be expanded with a shared planning, taking into consideration the best possible way to exploit the innovative solutions developed in EU-Rail. Regular meetings will continue to take place with the Project Coordinators/Flagship Project Managers/Communication Work Package Leaders on Communication to support projects in leading a coherent communication and dissemination campaign at JU corporate level ensuring the project level contribution and optimal dissemination of EU-Rail funded R&I. A cross check of main events at European level and beyond will be undertaken to best advise projects on opportunities for communication and dissemination at relevant events. EU-Rail will monitor the compliance of the Projects with the communication guidelines provided by EU-Rail.

The main events, where EU-Rail will showcase its results in 2026, are Call Info Days, the Europe's Rail General Assembly (December 2026), Women in Rail Awards. Additionally, Europe's Rail will continue organising Regional Info Days. Participation of the JU will be ensured at the following external events: ITF Summit (May 2026), Transport Research Arena (2026), Connecting Europe Days (2026), InnoTrans (2026). Potential other events relevant to the ongoing work of EU-RAIL will be attended.

In 2026 InnoTrans, Connecting Europe Days and TRA will remain key events where EU-Rail will showcase its main achievements, including the major results coming from the projects. During these events potential synergies with other EU bodies and institutions will be showcased.

In collaboration with the Human Resources, Internal communication will remain a priority. Team building exercises will be organised and regular team meetings will continue to take place, complemented by the bi-monthly Brown Bag Lunches initiative.

Exploitation

Although S2R Programme has already contributed to shortening of the innovation cycle in rail via an integrated research and innovation programme, EU-Rail is expected to accelerate further the introduction of innovative solutions. In order to deploy novel solutions, the sector needs to move towards new ways of working enabling the transformation of rail as one European integrated system. This new way of working will be based on more flexibility and adaptability to user needs, creating solutions much more focused on prototyping and large-scale demonstrations, and increased collaboration integrating new entrants, leading to a shorter innovation cycle and delivering impactful results.

There is a clear and shared sector vision that accelerating the market uptake of future proof technological and operational solutions requires for some solutions a coordinated deployment at EU level.

This is also the reason why the SBA foresees an important role of the Deployment Group as an advisory body to the Governing Board. Its tasks are detailed in Section 2.5.6.

Basic considerations regarding exploitation and deployment of results of R&I activities as per each Flagship Area and the Transversal Topic are included in EU-Rail's MAWP and detailed exploitation plans are part of each EU-Rail project grant agreement, with particular attention to the Flagship Projects.

2.4.2 Procurement and contracts

In order to reach its objectives and adequately support its operations and infrastructures, EU-Rail will allocate funds to procure the necessary services and supplies. In order to make procurement and contract management as effective and cost-efficient as possible, EU-Rail makes use of Service Level Agreements (SLAs) concluded with relevant Commission Services and inter-institutional framework contracts (FWCs) available to them.

In 2026, EU-Rail foresees to implement existing Framework contracts (FWCs), where EU-Rail is either the lead contracting authority or a participating contracting authority. When the services needed are not covered by FWCs already in force, EU-Rail will launch procurement procedures for middle or (very) low-value contracts.

In accordance with the SBA (see Section 2.4.3) and the back-office arrangements, EU-Rail will continue to develop synergies and efficiencies in procurement related activities with other Joint Undertakings. At this regard, a Service Level Agreement for Procurement Services ("BOA Procurement") has been signed between EU-Rail and other Joint Undertakings, which includes a joint bi-annual procurement plan.

The BOA Procurement will continue to create synergies among the JUs across 2026 as reflected in the endorsed by the Steering Committee Joint Public Procurement Planning ('JPPP').

Among the inter-institutional tender procedures planned for the 2026–2027 period, the renewal of a framework service contract for managed IT services is the most strategic priority.

It has been proven that by pooling a negotiation power, the BOA joint administrative calls for tenders draw the attention of higher number of economic operators, ensuring competitive bids and robust market responses.

Finally, in 2026 the BOA will further prioritize the digitalization of contract management processes with a strong focus on streamlining its operating framework.

For the inter-Joint Undertaking tender external accounting support and annual Accounts and the on-line data protection services, EU-Rail has taken the lead. The below EU-Rail procurement indicative planning and budget is therefore impacted by the joint JU procurement planning 2026 and their successive updates.

Title	Indicative budget (EUR)	Type of procedure	Indicative schedule (Q-quarter)
Communication and event services and supplies	550,000	Specific contracts/order forms implementing a FWC or negotiated procedure for low-value contracts	Q1 to Q4 2026
Subscriptions to journals & periodicals	10,000	Negotiated procedure for low-value contracts	Yearly
Basic Office Furniture	15,000	Specific Contracts/order forms implementing a FWC	Yearly
Catering services (implementation of BOA procurement)	35,000	Specific Contracts/order forms implementing a FWC or negotiated procedure for low-value contracts	Yearly

Title	Indicative budget (EUR)	Type of procedure	Indicative schedule (Q-quarter)
Water supplies & fountains (implementation of BOA procurement)	5,000	Specific Contracts/order forms implementing a FWC or negotiated procedure for low-value contracts	Yearly
IT support and supplies (implementation of BOA procurement and specific EU-Rail Information System)	311,000	Specific Contracts/order forms implementing a FWC or Negotiated procedure for middle or low value contract	Yearly
Team Building (implementation of BOA procurement) and Training	30,000	Negotiated procedure for low value contract or Specific Contracts/order forms implementing a FWC	Yearly
Implementation of the Back Office Arrangements (BOA) for Accounting services	50,000 / year out of the FwC for all JUs estimated at 440,000 year and with a total value of 3,894, 000 EUR (2 lots)	Implementation of Framework contracts External Support to the Back Office Arrangement for the Joint Undertakings for Statutory Audit Services (Lot 1) and Accounting Services and Other Assurance Engagements (Lot 2) for 10 JUs and for 5 years duration	Q1 to Q4 2026
Legal and operational support to data protection activities, including externalisation of DPO function and artificial intelligence services (implementation of BOA procurement)	40.000	Specific Contracts/order forms implementing a FWC of 4 years duration	Yearly
Legal assistance services (representation in litigation, legal support services for HR or IPRs etc.) (implementation of BOA procurement)	50,000	Low-value contract, ad-hoc expert contracts based on a Call for expression of interest or Specific Contracts/order forms implementing a FWC	Q1-Q4 2026

This list must not be considered exhaustive and other procurement procedures may need to be launched within the budgetary limits approved by the EU-Rail Governing Board and the budget flexibility clause included in part F of the Horizon Europe Work Programme 2026-2027 General Annexes. The Executive Director must report to the Governing Board about the procurement procedures put in place as part of the respective CAAR.

2.4.3 Other supporting operations

As indicated in the SBA, potential synergies and efficiencies with other Joint Undertakings could be gained through the set-up of back office arrangements between the European Institutional partnerships in areas such as HR, legal, IT, communication, accounting, audit and anti-fraud strategy and logistics/events/room management. Joint undertakings shall, within one year following the date of entry into force of the SBA, operate back office arrangements by concluding service level agreements, subject to the need to guarantee an equivalent level of protection of the Union's financial interest when entrusting budgetary implementation tasks to Joint Undertakings. Such arrangements are subject to confirmation of viability and following screening of resources.

Taking also account of guidance received from the European Commission, including general and specific principles and generic design options for service provision, the JUs' Executive Directors have already put in place particular back office arrangements for some areas, in accordance with Article 13 of the SBA, and in line with the foreseen solutions endorsed at the JUs GB level at the end of 2022. In particular, EU-Rail took the role of the Lead JU for the back-office arrangements for the accounting services of the JUs, with 3 JUs acting as accounting service providers (EU-Rail, CA JU, SESAR JU). While EU-Rail is also supporting other back-office arrangements in place, such as procurement services, HR and ICT.

During 2026, the BOA Facility Management will start functioning. The concept note is expected to be adopted by the Governing Boards of the Joint Undertakings having their seat at the White Atrium building in Brussels, and the relevant Service Level Agreement (SLA) will be signed. In the previous years, the activities related to the White Atrium building facility management were carried out by informal arrangements by a single JU (Clean Hydrogen JU until 2024 and Chips JU afterwards). To align with Article 13 of the Single Basic Act, a BOA Facility Management has been proposed. This section will be updated with further details when the concept note is adopted and the SLA is signed.

2.4.3.1 IT ACTIVITIES

EU-Rail has implemented common ICT tools designed and offered by the European Commission on the financial management, human resources management and HE call management. These tools are updated and maintained on a regular basis by the EC; they require continuous input from the side of the JU, on the one hand, in terms of future developments to meet the expectations of the partnership and, on the other hand, to correct mistakes.

Since 2018, the JU has implemented ARES (EC document management system) in order to streamline document flow as well as to ensure their proper archiving and registration, then implemented SYSPER for staff administration in 2019 and also implemented SYSTAL to manage the staff recruitment, thereby leveraging on the existing EC infrastructure and processes. EU-Rail makes use of the trainings dedicated to the applications offered by the EC (including the ones used in Programme management, most importantly Compass/SyGMa), to assure their correct usage and implementation by its staff.

EU-Rail shares its ICT infrastructure with other Joint Undertakings located in the White Atrium building. In order to provide an improved security, availability of the systems and staff mobility, the physical infrastructure was virtualized from 2017 to a cloud provider. From 2023, this service is managed by CA JU on behalf of the other JUs under the DIGIT Cloud II framework contract. Another example of collaboration is the tool for the management of the GDPR Register which EU-Rail has procured also on behalf of the other JUs and which has been in use since 2020.

Following a Data Protection Impact Assessment (DPIA) conducted in 2020, EU-RAIL started to migrate to Microsoft cloud services (M365) in 2021, to deliver an improved collaborative environment in combination with an even higher level of ICT security. EU-Rail started an initiative for 2025 to simplify, modernise and digitalise processes and ways of working to increase efficiency, using the newly deployed M365 features.

EU-Rail collaborates with the other JUs in synergy under a joint strategic ICT plan.

In addition to common actions defined in the BOA ICT common IT annual work plan, EU-RAIL continues its collaboration with other Commission services and IBAs, and implement their own specific actions.In continuation of the long-lasting coordination and collaboration practice on information and communication technology (ICT), and following the signature of the SLA of the BOA ICT in January 2025, the Joint Undertakings have developed and approved a common IT annual work plan for 2026. This plan identifies 7 action lines covering 4 service areas for 2026:

- Service area 1: Governance:
  - Common governance, decision-making and budget monitoring: in this area, the implementation of the IT annual work plan and budget for 2026 will be monitored, and the common annual work plan for 2027 will be prepared in view of an adoption by the BOA ICT Steering Committee before the end of 2026,
  - Management of shared infrastructure, which includes in particular the delivery of Infrastructure-as-a-service (IaaS) under MS 365 technology,
  - Investigation of AI implementation for the JUs;

- Service area 2: Management of shared infrastructure
  - Service delivery and monitoring of the service contract,
  - Preparation of a procurement procedure for the establishment of an FWC for ICT managed services, in coordination with the BOA Procurement,

- Service area 3: Workplace services provision
  - Workplace service delivery and monitoring of the service contract,
  - Continuous improvement of infrastructure in the White Atrium building (especially the meeting rooms);

- Service area 4: Security and compliance management, which includes the continuation of the implementation of the requirements of the Cybersecurity Regulation, and follow-up of other security requirements. This also includes the monitoring of the common business continuity plan and disaster recovery plan (BCP/DRP)

Ten Joint Undertakings are signatories of the BOA ICT, co-lead by the Clean Hydrogen JU and the IHI JU. The common work plan identifies, for each action, a specific JU lead responsible for implementing the action.

In addition to common actions defined in the BOA ICT common IT annual work plan, JUs continue their collaboration with other Commission services and IBAs and implement their own specific actions. As this regard, a pilot project related to the collaboration on the IT services among JUs will be performed by EU-Rail in collaboration with the support of Global Health EDCPT3 JU, who will cover with one of his staff the role of Local Cybersecurity Officer, and within the Back Office Arrangements IT lead by Clean Hydrogen and IHI JUs delivering a service-oriented solution to EU-Rail.

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2.4.3.2. DATA PROTECTION

As regards the processing of personal data, EU-Rail applies Regulation (EU) 2018/1725 of 23 October 2018[34], which entered into force on 11 December 2018.

The role of the Data Protection Officer (DPO) is exercised by the EU-Rail's Chief Legal Officer assisted by an external contractor since early 2021.

In addition, to ensure legal and regulatory compliance with the Artificial Intelligence Act[35], the EU-Rail's Chief Legal Officer has been nominated the EU-RAIL Artificial Intelligence Act Correspondent vis-à-vis the European Data Protection Supervisor (EU Supervisory Body).

Taken into consideration the synergies between the Artificial Intelligence Act and the Interoperable Europe Act[36] and in accordance with Article 18 of the Interoperable Europe Act which states that "any Union entity that regulates, provides or manages trans-European digital public services shall designate an interoperability coordinator under the oversight of its highest level of management to ensure the contribution of that Union entity to the implementation of this Regulation", the Chief Legal Officer and DPO is also nominated EU-RAIL Interoperability Coordinator.

EU-Rail, as a controller, maintains a record of processing activities under its responsibility in a central register (GDPR central)[37] and makes this register publicly accessible. In addition, EU-Rail takes appropriate measures to provide transparent information, communication and modalities for the exercise of the rights of the data subject. A collection of privacy notices[38] for each specific processing operation is available in the EU-Rail website. More information is available on the EU-Rail data protection and legal notices pages[39].

In accordance with the SBA (see Section 2.4.3) and the back-office arrangements, EU-Rail will continue to develop synergies and efficiencies in data protection related activities with other Joint Undertakings (see implementation of BOA Procurement in Section 2.4.2).

2.4.3.3 ACCOUNTING

The European Commission's Accrual Based Accounting system (ABAC) has been rolled out in the JU in 2016 and is used for accounting purposes. Starting from the 1st of January 2026, the current budgetary and accounting system will be replaced by a new SAP based solution, SUMMA. During 2025, the Joint Undertaking performed the pre-production testing to ensure a smooth transition to the new system.

EU-Rail implements its financial rules[40] which define, inter alia, powers and responsibility of EU-Rail's Accounting Officer. They also make an explicit reference to the possibility that this function could be attributed to the Accounting Officer of the EC, and such option was effectively utilised by the JU in the past.

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[34] Regulation (EU) 2018/1725 of the European Parliament and of the Council of 23 October 2018 on the protection of natural persons with regard to the processing of personal data by the Union institutions, bodies, offices and agencies and on the free movement of such data, and repealing Regulation (EC) No 45/2001 and Decision No 1247/2002/EC.

[35] REGULATION (EU) 2024/1689 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 13 June 2024 laying down harmonised rules on artificial intelligence and amending Regulations (EC) No 300/2008, (EU) No 167/2013, (EU) No 168/2013, (EU) 2018/858, (EU) 2018/1139 and (EU) 2019/2144 and Directives 2014/90/EU, (EU) 2016/797 and (EU) 2020/1828

[36] Regulation (EU) 2024/903 of the European Parliament and of the Council of 13 March 2024 laying down measures for a high level of public sector interoperability across the Union

[37] https://rail-research.europa.eu/dpregister/

[38] https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/

[39] https://rail-research.europa.eu/terms-of-use/

[40] The EU-Rail Governing Board have approved the decisions (GB Decision n° 02/2021) adopted under the former S2R JU that will continue to apply to the EU-Rail (called GB omnibus decision"), which includes, inter alia, the Financial Rules: https://rail-research.europa.eu/wp-content/uploads/2020/01/S2R-JU-Financial-Rules.pdf

However, in October 2021 the European Commission announced the intention to terminate their role of the Accounting Officer of the JU, except for the treasury function, which became effective as of 1 December 2022. The resulting situation was tackled by applying the back-office arrangements solution for the accounting function of the JUs. In fact, within this solution, EU-Rail is now performing the role of the Lead JU and is also, being one of the respective three JUs (with the Clean Aviation JU and the SESAR 3 JU), acting in the role of the accounting service provider.

2.4.4 Human resources

2.4.4.1 HR MANAGEMENT

In 2026, EU-Rail will be staffed with 33 staff members including 2 Seconded National Experts (SNEs), following the request EU-Rail made for additional staff funded by third countries. In line with the Establishment Plan, recruitment procedures are launched as necessary in order to fill the respective posts in case of staff departures. Where needed, the JU will make recourse to Interim Staff while the recruitment processes to hire statutory staff are completed or in case of specific and temporary peaks of activities. In addition to statutory staff members and the SNE's already in place, EU-Rail will also make use of the European Commission's Bluebook to hire trainees and possibly also non-bluebook trainee in the framework of the decision adopted by the Governing Board in 2020 prior to the COVID-19 pandemic. Further details are provided in the Staff Establishment Plan in the following Section.

In the upcoming period, the EU-Rail HR function will continue to ensure ongoing improvement of all HR processes and to develop its internal guidelines, policies and its legal framework, paying particular attention to how the Staff Regulations of Officials of the European Union and the Conditions of Employment of Other Servants of the European Union shall apply to the JU's particularities (in accordance with Article 110 of the EU Staff Regulations).

HR will strengthen risk control mechanisms to ensure compliance with internal procedures and regulatory requirements, including regular review of HR-related processes. Oversight and tracking of the HR budget will be enhanced to improve planning and monitoring. This must be supported by implementing HR dashboard and reporting metrics, such as staffing levels, turnover, vacancies, training participation, and performance appraisal completion.

HR will also continue efforts to streamline HR processes through process mapping, development of standard operating procedures, and digital solutions to reduce administrative burden.

Annual appraisal and reclassification exercises will be set up by HR within the limits of the Staff Establishment Plan and the EU-Rail Financial Rules.

Staff engagement and well-being must be further reinforced through support of individual development and/or learning plans as applicable and feasible, and periodic feedback mechanisms, such as staff engagement surveys supported by existing Framework Contracts.

Further to the adoption of the new decision on working time and hybrid working, EU-Rail will strive on a continuous basis for ensuring a good working environment and team spirit. For this purpose, social events and team building activities will be proposed on regular basis in 2026. Individual coaching sessions will be considered both for staff as well as for the management team. Staff well-being will also be supported through flexible commuting arrangements under a revised public transport contribution scheme, enabling staff to better combine hybrid work with sustainable transport options.

2.4.4.2 STRATEGY FOR ACHIEVING EFFICIENCY GAINS AND SYNERGIES

From the HR perspective, in 2026, the JU's major challenge will be to continue ensuing smooth implementation of the current EU-Rail Programme.

EU-Rail is committed to ensuring the well-being of staff and that every staff member reaches their full potential. Trainings are strongly encouraged and team building activities are organised on regular basis in order to reinforce the cohesion of the team, the staff engagement and motivation.

The JU will continue to implement the HR recommendations made further to the review of its way of working, and in this regard will give priority to the following HR aspects:

- Implement a fit-to-purpose competency framework;
- Review and update of Job Descriptions in line with the Governance and Process Handbook;
- Run a talent development plan;
- Enhance HR risk control mechanisms;
- Strengthen oversight and tracking of the HR budget.

According to Council Regulation (EU) 2021/2085, Joint Undertakings shall achieve synergies via the establishment of back-office arrangements (BOA), operating in some identified areas. Article 13 identifies Human Resources Support among the areas where common BOA could be set up. In that context, CBE JU is the lead JU for the BOA HR with IHI JU as "back-up JU". The BOA HR implements actions in three main areas of HR Support: recruitment, HR legal framework and HR digitalisation. Its objective is to maximise synergies among the JU's, harmonise procedures by valorising best practices, ensure coherent HR support services, achieve efficiencies and economies of scale, increase the negotiation power of JU's operating under the SBA towards contractors and service providers.

The Joint Undertakings established under Council Regulation (EU) 2021/2085 will contribute to BOA HR Support, together with EuroHPC and SESAR JU that will participate on specific initiatives in line with their internal priorities and according to their own specificities[41].

In terms of synergies and collaboration with the other Joint Undertakings, in 2026, the JUs will continue sharing the HR-related IT tools (e.g. the e-recruitment tool SYSTAL, SYSPER) and, where necessary, common calls for tenders, selection procedures, training courses for JUs staff and managers as well as a common approach to implementing rules of the EU Staff Regulations. In addition, EU-Rail will continue sharing information and best practices with the other JUs through meetings and working groups such as those among the Executive Directors, Heads of Administration, HR officers, Legal Officers etc. Moreover, in line with the hybrid way of working, further synergies among JUs will also be possible in facility management as several JUs are located in the same building and share joint business continuity planning, managing office spaces and organising procurements of common infrastructure. Finally, in alignment of the SBA and the back-office arrangements, close collaboration among the JUs is expected to improve. To this end, a joint analysis on possible synergies and cost-efficiencies among the JUs has been conducted in 2022 with the support of an external consultant and will continue to be implemented in the upcoming period.

In addition to the above mentioned, the application of lump sum form of grants in the EU-Rail Programme creates further space for increasing efficiency, in particular by enabling in the area of controls to refocus part of the capacities from activities related to costs actually incurred by the beneficiaries to controls aimed more on the qualitative aspects of the projects.

2.4.4.3 STAFF ESTABLISHMENT PLAN[42]

The Authorized Budget indicated in the tables below refers to the staffing of EU-Rail which started its activities on 30 November 2021 and reflects the data in the Legislative Financial Statements that represent part of the SBA legal framework applicable to the JU.

Further to the termination of DG Budget's accounting services to Joint Undertakings and the communication made by the Commission services to take over this function as part of the back-office arrangements (BOA) based on SBA Article 13, EU-Rail took over as the lead JU for this part of BOA. The Commission services confirmed that 3 additional contract agents that are already recruited to increase the reinforcement of the BOA, for activities previously performed by DG Budget not linked with the JU operational activities and therefore on top of the 17 contract agents foreseen in the LFS attached to the Commission Proposal for a Council Regulation establishing EU-Rail.

[41] SESAR JU despite being part of the SBA, is exempted by the provisions related to the Back-office arrangements.

[42] 2025 and 2026 staff figures are presented based on the Legislative Financial Statements annexed to the SBA but are subject to the adoption of the EU General Budget for each of the respective years.

The Staff Establishment Plan includes an authorised additional TA position from 2025 following the EU-Rail request to be financed by Third countries participating to Horizon Europe in accordance with the European Commission procedures.

The EU-Rail request for 2 additional CA FG IV positions to be financed by Third countries participating to Horizon Europe in accordance with the European Commission procedures, was not endorsed by the European Commission for the DB2026.

To be noted that as of 2025 and in accordance with European Commission request, 1 CA FG IV position is not financed by the EU Budget but from third countries participating to Horizon Europe.

Function group and grade	2024				2025				2026	
	Authorised budget		Filled as of 31/12/2024		Authorised budget		Filled as of 31/12/2025		Requested budget	
	Permanent posts	Temporary posts	Permanent posts	Temporary posts	Permanent posts	Temporary posts	Permanent posts	Temporary posts	Permanent posts	Temporary posts
AD 16										
AD 15										
AD 14		1		1		1		1		1
AD 13										
AD 12										
AD 11						2				2
AD 10		2		1		1		1		1
AD 9		1		1		1		2		1
AD 8		1		1				1		
AD 7						5				5
AD 6		4		4		1		3		1
AD 5		1		1				1		
AD TOTAL	**0**	**10**	**0**	**9**	**0**	**11**	**0**	**9**	**0**	**11**
AST 1-11	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
AST TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
AST/SC1-6	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
AST + AST/SC TOTAL	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
GRAND TOTAL	**10**		**9**		**11**		**9**		**11**	

Contract Agents	FTE corresponding to the	Headcount as of 31/12/2024	FTE corresponding to the	Headcount as of 31/12/2025	FTE corresponding to the

	authorised budget 2024		authorised budget 2025		authorised budget 2026
Function Group IV	15	9	15	8	15
Function Group III	4	7	5	8	5
Function Group II	1	2			
Function Group I					
TOTAL	**20**	**18**	**20**	**16**	**20**

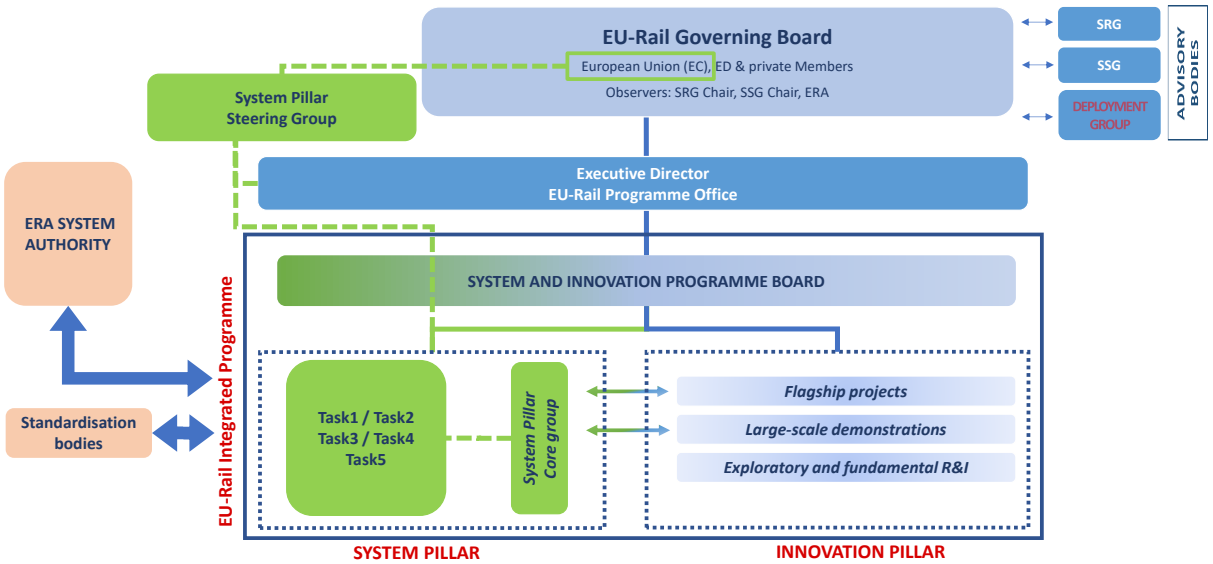
Seconded National Experts	FTE corresponding to the authorised budget 2024	Headcount as of 31/12/2024	FTE corresponding to the authorised budget 2025	FTE corresponding to the authorised budget 20265
TOTAL	**2**	**2**	**2**	**2**

Recruitment forecasts for 2026 following retirement/mobility or new requested posts					
Job title in the JU	**Type of contract (Official, CA, TA)**		**TA/Official**		**CA**
			Function group/grade of recruitment internal (Brackets) and external (single grade)		**Recruitment Function Group (I, II, III and IV)**
	Due to foreseen retirement/ mobility	**New post requested due to additional tasks**	**Internal (brackets)**	**External (brackets)**	
N/A	N/A	N/A	N/A	N/A	N/A

2.5 Governance activities

As follows from the provisions of the SBA, the JU is composed of the following bodies: the Governing Board, the Executive Director, the States' Representatives Group, the System Pillar Steering Group,

the Deployment Group and the Scientific Steering Group. In addition to these bodies, the System and Innovation Programme Board (ED-SIPB)[43] supports the Executive Director.



In the field of governance, the JU will continue in the process of the revision and updating of its key internal guiding documents, as necessary, most importantly the Governance and Process Handbook.

2.5.1 Governing Board

The Governing Board (GB) of EU-Rail was established after the Founding Members of EU-Rail other than the Union signed a letter of commitment detailing the scope of the membership in terms of content, activities and duration, as well as their contributions to the JU, including an indication of the envisaged additional activities referred to in Article 11(1), point (b) of the SBA.

Concomitantly to the signature of the letters of commitment, the Founding Members of EU-Rail other than the Union nominated their representatives and alternates to the GB. The first GB meeting was held on 21 December 2021 where the GB adopted its Rules of Procedure[44]. In the same meeting, the GB adopted the so-called "omnibus decision"[45], i.e., the list of decisions adopted by the S2R JU that will continue to apply for EU-Rail in accordance with Article 174(12) of the SBA.

The GB of EU-Rail is the decision-making body, having the overall responsibility for the strategic orientation, coherence with relevant Union objectives and policies, and operations of the JU. It shall also supervise the implementation of JU activities.

The body is composed of two representatives from the Commission on behalf of the Union and one representative from each of the Members other than the Union, the private Members.

The Governing Board was enlarged in 2025 with the inclusion of new private Members following the selection of the Governing Board of associated members with the potential to contribute to the achievement of the objectives of the Europe's Rail Joint Undertaking and its related open call procedure.

Representatives of the European Union Agency for Railways (ERA) and of the European Rail Research Advisory Council (ERRAC) are invited to attend meetings of the GB as observers.

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[43] The ED-SIPB provides advice to the Executive Director on resources, schedule, planning and synchronization, implementation, change management and monitoring of the Programme progress, as well as delivers strategic guidance and recommendations with regard to the management of the JU programme.

[44] GB Decision n°01/2021

[45] GB Decision n°02/2021

The chairperson and vice-chairperson of the States' Representatives Group (SRG) also have observer status in the GB meetings.

The chairpersons of the other bodies of the JU have the right to attend meetings of the GB as observers whenever issues falling within the scope of their tasks are discussed. Observers may take part in deliberations but shall have no voting rights.

The GB holds ordinary meetings at least twice a year. Extraordinary meetings may be convened at the request of the chairperson, the Executive Director, the Commission or a majority of the representatives of the members other than the Union or of the participating states. In addition, the GB meets once a year in a general assembly and all participants to the research and innovation activities of EU-Rail are invited to attend. The purpose of such assembly is to stimulate reflection on the overall direction of the JU activities, while conducting an open and transparent discussion on the progress of the Master Plan implementation.

In 2026, it is foreseen that the EU-Rail's Governing Board will hold three meetings, the latter to be followed by a General Assembly.

The GB's key planned activities are listed below:

Key activities in 2026 – timetable	
preliminary draft Annual Work Programme 2027 discussion and GB decision on project(s) selected for funding stemming from call 2025-02	Q2
adoption of the 2025 CAAR and of the Opinion on 2025 Final Annual Accounts, possible amendment Annual Work Programme 2026, project(s) selected for funding stemming from call 2026-01	Q2
adoption of the Annual Work Programme 2027, Potential IKAA plan update, possible amendment Annual Work Programme 2026, General Assembly to follow after the GB meeting	Q4

2.5.2 Executive Director

The Executive Director (ED) is the chief executive responsible for the day-to-day management of the JU in accordance with the decisions of the GB. The Executive Director is the legal representative of EU-Rail. The ED is accountable to the GB and is supported by the JU staff and advised by the System and Innovation Programme Board (ED-SIPB)[46].

2.5.3 Scientific Steering Group

In November 2023, the role of the JU's scientific advisory body was taken over by the Scientific Steering Group (SSG), formed following the GB Decision 13/2023 of 19 October 2023 on the appointment of the members of the Europe's Rail Scientific Steering Group and on the adoption of the reserve list.

The SSG shall carry out the following tasks:

- advise on the scientific priorities to be addressed in the work programmes including on scope of calls for proposals;
- advise on the scientific achievements to be described in the annual activity report;
- suggest corrective measures or re-orientations to the GB, where necessary;
- provide independent advice and scientific analysis on specific issues as requested by the GB, in particular as regards developments in adjacent sectors.

[46] The ED-SIPB provides advice to the Executive Director on resources, schedule, planning and synchronization, implementation, change management and monitoring of the Programme progress, as well as delivers strategic guidance and recommendations with regard to the management of the JU programme.

In 2026, three meetings of the Scientific Steering Group are foreseen (in Q1, Q2 and Q4).

2.5.4 States' Representatives Group

Members States and countries associated to the Horizon Europe framework programme were asked to nominate their representatives to the States' Representatives Group (SRG)[47]. There are currently 24 EU Member States and 5 Associated Countries represented.

The SRG shall be consulted, and in particular review information and provide opinions on the matters, such as:

- programme progress of the JU and achievement of its targets and expected impacts as part of Horizon Europe, including the information on calls for proposals and on the proposal evaluation process;
- updating of the Strategic Research and Innovation Agenda in line with the Horizon Europe strategic planning and with other Union and Member States funding instruments;
- links to Horizon Europe and other Union, national and, where relevant, regional initiatives, including cohesion policy funds in line with smart specialisation strategies;
- draft work programmes and consolidated annual activity reports;
- involvement of SMEs, start-ups, higher education institutions and research organisations, and measures taken for promoting participation of newcomers;
- actions taken for dissemination and exploitation of results along the value chain.

In addition, the Member States shall ensure that their respective representatives present a coordinated position that reflects their Member State's views expressed in:

- the Railway Interoperability and Safety Committee established by Article 51 of Directive (EU) 2016/797;
- the Programme Committee under Horizon Europe configuration "Climate, Energy and Mobility";
- the Single European Rail Area Committee established by Article 62 of Directive 2012/34/EU of the European Parliament and of the Council.

One of the key roles of the SRG is to ensure the interface with the JU on integration between the EU-Rail Programme and national, regional and local programmes and initiatives, in relation to R&I as well as dissemination and communications.

Dedicated meetings to cover subjects related to the activities of the System Pillar, the European DAC Delivery Programme and the Deployment group are foreseen all along 2026.

Further to the above, the SRG may also issue, on its own initiative, opinions, recommendations or proposals to the Governing Board or the Executive Director on technical, managerial and financial matters as well as on work programmes and other documents, in particular when those matters affect national or regional interests.

For the year 2026, three meetings of the SRG are planned (in Q1, Q2 and Q4).

The tentative key activities are listed below:

Key activities in 2026 – timetable	
1st Meeting of the SRG in which it will: – Provide updated information and discuss initiatives related to: regional and national research and innovation programmes to allow synergies;	Q1

47 Article 2.1 'Membership" of SRG rules of procedure foresees that each EU MS or associated country may have "up to two representatives and up to two alternates", the representatives are list are published on the EU-Rail Website: https://rail-research.europa.eu/europes-rail-states-representatives-group/.

dissemination and communication activities; deployment activities in relation to EU-Rail. – Provide a first feedback on the Annual Work Programme 2027.	
2nd Meeting of the SRG in which it will: – Provide opinion on the 2025 Annual Activity Report. – Provide updated information and discuss initiatives related to: regional and national research and innovation programmes to allow synergies; dissemination and communication activities; deployment activities in relation to EU-Rail.	Q2
3rd Meeting of the SRG in which it will: - Provide opinion on the 2027 Annual Work Programme - Provide a consolidated report describing national/regional policies in the scope of the JU and identifying specific ways of cooperation with the actions funded by the JU.	Q4

2.5.5 The System Pillar steering group

The System Pillar steering group (SP-STG) shall be an advisory body of the Europe's Rail Joint Undertaking in charge of providing advice on System Pillar issues.

It is composed of representatives of the Commission, representatives of the rail and mobility sector and of relevant organisations, the EU-Rail's Executive Director, the chairperson of the SRG and representatives of the ERA and of the ERRAC. The body is chaired by the Commission.

It is the task of the SP-STG to provide advice to the Executive Director and Governing Board on matters, such as the following:

- the approach to operational harmonisation and the development of system architecture, including on the relevant part of the Master Plan;
- delivering on the specific objective regarding introducing a unified operational concept and a functional, safe and secure system architecture; as well as an integrated European rail traffic management, command, control and signalling systems, including automated train operation;
- carrying out the task related to developing within the System Pillar a system view that reflects the needs of the rail manufacturing industry, the rail operating community, Member States and other rail private and public stakeholders, including bodies representing customers, such as passengers and freight and staff, as well as relevant actors outside the traditional rail sector;
- monitoring the progress of the System Pillar.

Four meetings of the SPSG are foreseen in 2026, one each quarter.

The System Pillar Steering Group is supported by the JU System Pillar Unit and the System Pillar Core Group.

Additionally, the System and Innovation Programme Board, in its advisory role to the Executive Director, supports the activities of the System Pillar steering, committed to advising on the coordination of resources, budgets and timescales, as well as interaction with the Innovation Pillar as well as change management and conflicts.

The EU-Rail Governing Board, as the body responsible for the overall oversight over the EU-Rail's activities, is the final decision body within the System Pillar decision-making process.

2.5.6 The Deployment Group

The role of the Deployment Group shall be to advise the Governing Board on the market uptake of rail innovation developed in the Europe's Rail Joint Undertaking and to support deployment of the innovative solutions.

The EU-Rail Deployment Group mainly consists in a High-Level Core Group which could be assisted on an ad-hoc basis by dedicated groups on specific topics requiring additional expertise. Such dedicated groups will be selected upon recommendation of the High-Level Core Group and in agreement of the Governing Board. The Deployment Group shall be open to all stakeholders. The composition of the Deployment Group shall ensure appropriate thematic focus and representativeness.

Following consultations with the European Commission and private Founding Members of the Europe's Rail Joint Undertaking, as well as the States' Representative Group and Scientific Steering Group (at that time still acting as the Scientific Committee), EU-Rail launched a GB written procedure for establishment of the Deployment Group in June 2023.

On 29 November 2024 the European Commission took the final decision[48] on the composition, structure, and list of candidates to become Members of the Deployment Group in accordance with Articles 22 and 97 of the Single Basic Act.

The activities of the Deployment Group started informally and in agreement with the Commission in 2024 and started its formal work and setup in 2025. The High-Level group appointed a dedicated subgroup on FRMCS (FRMCS Deployment Group for Europe). This FRMCS subgroup is delivering its recommendations as from 2025, up until and after first introductions and deployments in different European countries. Other Deployment recommendations are foreseen to be investigated in 2026, e.g. the need for coordination between deployment activities of different huge transformation programmes (ETCS, ATO, FRMCS, TMS, other).

2.6 Strategy and plans for the organisational management and internal control systems

2.6.1 EU-Rail organization

EU-Rail is organized in Units managed by their Heads, complemented with additional functions reporting directly to the Executive Director. EU-Rail organization is depicted in the chart provided in Annex II.

The Programme management falls under the remit of the Head of Innovation Pillar and Head of System Pillar, Communication and Outreach, they both report to the Executive Director.

The Head of Innovation Pillar is supported for the R&I activities by three Senior Programme Managers who supervise the work of the Programme Managers, and by the Programme & call coordinator officer and Programme assistant.

Head of System Pillar, Communication and Outreach has the responsibility for the activities of the System Pillar and Deployment Group supported by System Pillar Programme Managers, and is ensuring the communication, dissemination and stakeholder activities of the Joint undertaking supported by the Chief stakeholder relation and dissemination, the Communication and Ex Post Audit officer and the Communication assistant.

The Head of Corporate Services reports to the Executive Director, and is responsible for providing the necessary budgetary, financial, administrative, legal and compliance support in relation to the activities of the JU, with the support of Financial and budget assistants and the Chief Legal Officer and Grants & legal officer. The Head of Corporate Services also oversees the work of the BOA Accounting and the work of the Accounting Assistants with the support of the EU-Rail Accounting Officer.

Other functions of the Programme Office, such as the Assistant of the ED, the HR Officer and the Internal Control Coordinator report directly to the Executive Director.

[48] C(2024) 8368 final, 29.11.2024, approving the composition of the Deployment Group of the Europe's Rail Joint Undertaking

The organization has established its way of working - the “EU-Rail ingredients” - which builds on a series of elements defining the commitment of the staff to strive for a values-based organization.

2.6.2 Internal Control Framework

In 2019, the JU started the process of implementing the new Internal Control Framework (ICF) reflecting also the practices applied in this respect by the Commission, and being based on the COSO[49] Internal Control – Integrated Framework, with five basic components further broken into seventeen principles. Introduction of this new ICF aimed, besides other, at introducing a more pro-active approach in the design and implementation of internal controls, rather than focusing mostly on the compliance aspects. This process resulted in 2020 in the adoption of a revised ICF by means of the Executive Director’s Decision ED-20-08. The ICF will continue to be subject to ongoing amendments and fine-tuning, as deemed appropriate, in order to reflect the developments in the internal and external environment of the JU. Further details on the relevant JU’s control components are provided in the following Sections.

The EU-Rail’s ICF is designed to provide reasonable assurance regarding the achievement of the following objectives:

- Effectiveness, efficiency and economy of operations;
- Reliability of reporting;
- Safeguarding of assets and information;
- Prevention, detection, correction and follow-up of fraud and irregularities;
- Adequate management of the risks relating to the legality and regularity of the underlying transactions, taking into account the multiannual character of programmes as well as the nature of the payments concerned.

The achievement of these ICF objectives is built, besides other elements, on:

- procedures for selecting the best projects through independent evaluation, and for translating them into legal instruments;
- project and contract management throughout the lifetime of every project/contract;
- ex-ante checks and controls[50];
- certification by independent auditors of costs representing the in-kind contributions to additional activities provided by the private Members of the JU;
- ex-post controls[51];
- qualitative evaluation of project results.

Furthermore, the adherence to ethical and organisational values will continue to be one of the key roles of the Joint Undertaking, subject to monitoring by the Commission. The Executive Director, as the Authorising Officer, will promote a cost-effective system of internal control and management and will be required to report to the GB in this respect. The JU will monitor, with the oversight of its GB, the risk of non-compliance through the developed reporting system[52]. In the application of its control system, the JU will strive for striking a balance between attaining the desired qualitative level of project deliverables

[49] COSO = Committee of Sponsoring Organizations of the Treadway Commission, where the sponsoring organizations are: Amerincan Accounting Association, Association of International Certified Professional Accountants, Financial Executives International, The Association of Accountants and Financial Professionals in Business, The Institute of Internal Auditors.

[50] While for the EU-Rail H2020 grants based on actual costs, such ex-ante controls still include checks of claims, including receipt of audit certificates and ex-ante certification of cost methodologies, for the lump sum grants the focus of the ex-ante controls lies with the qualitative (technical/scientific) apsects of the actions funded by EU-Rail.

[51] While for the EU-Rail H2020 grants based on actual costs, such ex-post controls still include financial audits on a sample of claims as part of the Horizon 2020 ex-post audit strategy, for the lump sum grants the focus of the ex-post controls lies with the qualitative (technical/scientific) apsects of the actions funded by EU-Rail.

[52] For the EU-Rail H2020 grants based on actual costs, such reporting will still include following up on the results of ex-post financial audits performed by the CAS, including reporting on the cummulative residual error rate of the H2020 Programme.

on one hand, and a reasonable control burden on the other hand. In other words, the need to manage the budget in an efficient and effective manner, to prevent fraud and to ensure the agreed qualitative level of the projects' work packages delivery will be combined with the effort of avoiding of the Union's Research programme becoming less attractive for the stakeholders from the industry.

In Q1 2026, an annual assessment of the EU-Rail ICF will be conducted both at the level of its individual 17 principles, and from the perspective of the framework as a whole. The assessment will also take into account the available recommendations from the Internal Audit Service of the European Commission, as well as possible recommendations of the European Court of Auditors. The results of the ICF assessment will be presented in the EU-Rail 2025 Consolidated Annual Activity Report.

2.6.3 Financial procedures

EU-Rail shall fully comply with the requirements of Regulation (EU, Euratom) 2024/2509 of the European Parliament and of the Council of 23 September 2024 on the financial rules applicable to the general budget of the Union (recast)53 (the "EU Financial Regulation"), as complemented by the EU-Rail Financial Rules.

In compliance with Article 71 of the EU Financial Regulation, the Joint Undertaking shall respect the principle of sound financial management. In addition, the EU-Rail Financial Rules shall not depart from the model financial regulation except where their specific needs so require and subject to the Commission's prior consent. Monitoring arrangements, including through the Union representation in the Governing Board, as well as reporting arrangements, will ensure that EU-Rail can meet the accountability requirements both to the College and to the Budgetary Authority.

With regard to ICT tools applied to support its financial procedures, since 2016, the JU has utilized ABAC Workflow, while as of 2026 the JU will use SUMMA. At the time of deployment of ABAC, the JU adopted its Manual of Financial Procedures including the applicable Financial Circuits. This Manual of Financial Procedures was further revised in a new version in 2017, and amended again later in 2019, 2023 and January 2024.

The Manual of Financial Procedures has been designed to guarantee a segregation of duties and to apply the four eyes principle in JU's financial transactions. It describes in detail the financial circuits that EU-Rail implements per type of transactions and the roles and responsibilities of each actor involved. To a lesser extent, it also describes the basic principles related to the main processes (grants & procurements).

During the past years, the processes and procedures have been further reinforced with the introduction of the JU Cooperation Tool for the H2020 Programme (including for in-kind contribution declarations and certifications) while for Horizon Europe the integration of IKOP and IKAA is done in the Compass tool, the Governance and Process Handbook, implementation of ICT tool ABAC Assets and different specific procedures that enhance the sound financial management in the implementation of the activities. The functioning of the JU's financial procedures will continue to be subject to regular assessments of the current Internal Control Framework adopted in 2020, and adjustments may be introduced in the future, also taking into account practical experience gained with the implementation of these processes and procedures.

The JU will continue also in the future in reflecting the changes of its financial procedures, as the case may be, in its key internal guiding documents underpinning its day-to-day activities, such as the Governance and Process Handbook.

2.6.4 Ex-ante and ex-post controls

In 2026, the focus of ex-ante shifted from the previous S2R Programme, that was finalized, to the EU-Rail's current Programme under Horizon Europe (HE) launched in 2022, and it will also be gradually the case for the ex-post controls. In carrying out of these control activities, EU-Rail will follow the procedures for ex-ante and ex-post controls established in its Financial Rules, in the common guidelines applicable to HE introduced by the European Commission, as well as in its relevant internal documents, such as the HE Control Strategy for Grants.

53 OJ L, 2024/2509, 26.9.2024.

As for the **ex-ante controls** in general, the Article 21(1) of EU-Rail Financial Rules applies, providing that "*each operation shall be subject at least to an ex-ante control relating to the operational and financial aspects of the operation, on the basis of a multiannual control strategy which takes risk into account*". The ex-ante controls are considered essential to prevent errors and to avoid the need for ex-post corrective actions. They take the form of e.g. checking contracts and grant agreements, initiating, checking and verifying invoices and carrying out desk reviews (such as mid-term reviews carried out by external experts on JU's projects), etc. In addition to the controls following from the common guidelines put in place by the Commission as mentioned above, EU-Rail applies some additional control mechanisms defined internally, e.g. the maturity checkpoints for grants.

For the HE grants, EU-Rail has put in place its risk-based Control Strategy to also reflect on the audit recommendations of IAS and ECA. This strategy covers both ex-ante and ex-post controls for grants and fully reflects the fact that under its current Programme, EU-Rail intends to apply solely the lump sum form of funding. The main difference resulting thereof, in comparison to grants based on actual costs, is that the payments will not depend on claiming the costs actually incurred, that beneficiaries will not be obliged to provide the JU with audit certificates and keep/provide financial records, and that such records may not be requested by the JU during or after the implementation of the action[54].

These differences reflect under the new EU-Rail Control Strategy for Grants in putting emphasis on scientific/technical performance and output of projects, that is in shifting even more from quantitative (financial) type of controls to qualitative (technical) type of controls.

In addition, for its HE Programme, EU-Rail has launched all Flagship Projects application of a control mechanism for assessing the maturity of the technological developments – the process referred to as the "maturity checkpoints". This mechanism was created to ensure that the technical activities are on track, that they are reaching the desired TRL and that a sectoral alignment of the developed solutions is ensured in the context of other linked Flagship Projects and of the System Pillar. This process will also be supported by independent technical experts.

In accordance with the Article 22 of the EU-Rail Financial Rules, **ex-post controls** are defined as the controls executed to verify financial and operational aspects of finalised budgetary transactions. The main objectives of the ex-post controls are to ensure that the principles of legality, regularity and sound financial management (economy, efficiency and effectiveness) have been respected and to provide the basis for corrective and recovery activities, if necessary.

The ex-post controls of projects from the S2R Programme based on actual costs included financial audits which were covered by the Horizon 2020 Audit Strategy and carried out by the Common Audit Service (CAS) of the Commission. Depending on the timing of the actual finalization of the legacy financial audits performed by the CAS, EU-Rail will still be reporting the outcome of these ex-post audits in its Consolidated Annual Activity Reports for the respective year. This reporting will include the error rates identified and applicable to the JUs population of H2020 projects.

For the lump sum actions intended by EU-Rail to be applied as a sole form of grants under HE, in the absence of any obligations of beneficiaries to report on costs actually incurred, there will not be any financial ex-post audits conducted by the CAS for EU-Rail grants, as well as there will not be any error rate calculation. The JU will be implementing an alternative form of ex-post assurance activities, such as reviews, focused on qualitative/technical assessments of agreed work packages and beneficiaries. These control activities will also be subject to the EU-Rail risk-based Control Strategy for Grants, endorsed by the ED end of 2023 and updated in 2024, and which take account of the practical experience from the pilot ex-post review.

Further to the above-mentioned types of controls, the JU has been applying since 2018 an internal mechanism of ex-post controls on financial transactions related to administrative expenditure as another element in the control framework to complement the overall assurance on the effective implementation of the financial procedures. In 2026, the ex-post review on administrative expenditure will continue to be organised as an annual exercise.

2.6.5 Audits

[54] As follows from the decision authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025)

In accordance with *Article 28* of the EU-Rail Financial Rules, the internal audit function shall be performed by the European Commission's Internal Audit Service (IAS).

The internal auditor shall advise EU-Rail on dealing with risks, by issuing independent opinions on the quality of management and control systems, and by issuing recommendations for improving the implementation of operations and promoting sound financial management. Following their in-depth risk assessment of EU-Rail performed in Q4 2023, IAS introduced their Strategic Internal Audit Plan for the period 2024-2026 which includes the pre-selected prospective audit topics and reserve audit topics, subject to annual reassessments.

In 2026, EU-Rail will reflect on the outcomes of the IAS' audits by addressing in due time possible recommendations following thereof.

The financial audit of the JU's annual accounts is performed by an external audit firm that has been chosen under the Framework contract of the European Commission, on the basis of the joint tendering of the services by the EC, agencies and other JUs. From 2024 onwards, all the JUs would also have the possibility to make use of the audit and accounting support contract resulting from the respective tender which was awarded in 2023 in the context of the BOA for Accounting Services.

Each year, the European Court of Auditors (ECA) prepares a specific annual report on the JU in line with the requirements of Article 287(1) of the Treaty on the Functioning of the European Union. In preparing the report, the Court considers the audit work performed by the aforementioned independent external auditor and the action taken in response to their findings.

In 2026, EU-Rail will reflect on the outcomes of the ECA's audits and follow-up audits for previously issued recommendations in order to resolve the respective issues in due time. For horizontal ECA's observations common to several or all JUs, EU-Rail will continue to liaise with the concerned peer Joint Undertakings in finding the adequate ways of addressing those points.

With regard to the H2020 actions based on actual cost reporting funded by the JU, those grants may still be subject in 2026 to finalization of the legacy financial ex-post audits based on previous sampling exercises, in line with the Horizon 2020 common Audit Strategy implemented by the CAS (see also Section 2.6.4). Otherwise, the JU's grants under Horizon Europe, which will be solely based on lump sum form of funding, will by definition no longer be subject to CAS' financial audits where checking of costs actually incurred by the beneficiaries would be involved. However, those grants can still be subject to independent audit activities of the respective bodies (ECA, IAS) in line with their mandates, and based on their own methodology as applicable to the lump sum form of financing.

2.6.6 Risk Management

EU-Rail has an established process of risk management reflecting also the practices applied by the Commission, and being based on the COSO Internal Control – Integrated Framework in which risk assessment represents one of the five basic components of the internal control system. It is a continuous process involving clear communication to governance, staff and stakeholders on how EU-Rail positions itself in the management of risks and opportunities that can affect the achievement of its objectives, taking into consideration the assessment of the level of uncertainty that the JU is willing to accept (risk appetite). The Executive Director approves the policy and sets the tone, staff at the different levels implement the policy in the day-to-day operations. The Governing Board acknowledges the most relevant risks embedded in the JU's risk register brought to its attention by means of the Work Programme and of the Consolidated Annual Activity Report.

In the upcoming period, EU-Rail will continue, in addition to the ongoing ad hoc monitoring and in accordance with its Governance and Process Handbook and the EU-Rail risk-based Control Strategy for Grants, with the conduct of comprehensive annual risk assessment exercises to identify risks relevant for 2026. Such exercise will aim at updating the elements related to risks and opportunities already included in the JU's risk register, as well as at identifying potential new ones. Current internal and external factors and developments having influence on JU's business will be taken into account, as well as the views of IAS following from their assessments of the JU's risks. Due attention will be given also to the fraud risks.

In addition, more targeted assessments of risks related to individual projects/beneficiaries will be part of the implementation of the EU-Rail risk-based Control Strategy for Grants, which was introduced end of 2023 and updated in 2024, regarding the ex-post technical reviews.

Anti-fraud strategy By the end of 2025 EU-Rail will review and updated its current Anti-Fraud Strategy for 2022-2025[55] (adopted in July 2022) and if needed the corresponding Action Plan. This action is needed in order to align with the 2023 revision of the Commission Anti-Fraud Strategy Action Plan[56] and the 2023 update of the Common Anti-Fraud Strategy in the Research and Innovation Family.

The adoption of the Anti-Fraud Strategy for 2022-2025 was preceded by a thorough specific fraud risk assessment. Part of this assessment, in particular the one pertaining to the grant management fraud risks, was conducted commonly at the level of the entire Family of the EU Research & Innovation Services, Agencies and Joint Undertakings (Research Family) and steered by DG RTD.

This was complemented at EU-Rail level with the assessment of other risks of fraud, such as those related to procurement, recruitment, misuse of internal information, misuse of JU's reimbursement schemes, etc.

By means of its current Anti-Fraud Strategy, similarly to the previous one, EU-Rail will continue to cover, to the applicable extent, all four elements of the anti-fraud cycle, namely: prevention, detection, investigation and correction.

The main anti-fraud objectives of the JU are the following:

1) keeping the JU's internal legal framework related to anti-fraud policy up to date,

2) fostering an anti-fraud culture throughout the organisation,

3) maintaining a high level of awareness and knowledge among the staff members on the subject matter,

4) ensuring high level of reactivity towards OLAF/EPPO,

5) preventing the misuse of internal information/data.

The objectives will be pursued by means of particular measures and actions listed in the related action plan. The actions will be followed up and the action plan will be assessed for potential updates regularly, as a minimum, once a year. To assess the actual conduct and quality of performance of individual EU-Rail anti-fraud activities, several indicators will be used and the results presented in the Consolidated Annual Activity Report for the respective year.

In performing the above-mentioned activities, EU-Rail will continue in taking advantage of knowledge and experience gained by participating in FAIR Committee and its substructures. Developments with regard to the anti-fraud policies of the European Commission, of the Research Family, and of the JU's parent Directorate General - MOVE – will be considered as well.

Since the JU considers conflict of interest a potential prerequisite for possible fraudulent behaviour, various established measures will continue to be applied at EU-Rail to mitigate this inherent risk, such as:

- declarations on non-existence of conflict of interest by the staff members;
- utilization of independent experts in selection procedures who will be obliged to declare any potentially conflicting interests;
- annual declaration of interests by the Governing Board members and observers, as well as declaration of confidentiality and conflict of interest by all attendees to each EU-Rail's Governing Board meeting.

55 https://rail-research.europa.eu/wp-content/uploads/2022/07/ED-DECISION_ED-22-02_Anti-Fraud-Strategy-2022-2025_Annex_AFS.pdf

56 European Commission Anti-Fraud Strategy - European Commission

3 BUDGET 2026

In accordance with the General Annexes of the Horizon Europe Work Programme 2026-2027, with regard to budget flexibility, the budgets set out in the calls and topics are indicative. Unless otherwise stated, final budgets may change following evaluation. The final figures may change by up to 20% compared to the total budget indicated in each individual part of the Work Programme. Changes within these limits will not be considered substantial within the meaning of Article 110(5) of the EU Financial Regulation.

Budget 2026

Statement of Revenue, Title IV (Operational EU-Rail Programme):

Increase of commitment and payment appropriations from operational third countries excluding EFTA (R0) by EUR 9.666.666,68 as a result of the association of the United Kingdom to the Horizon Europe Programme, of the EU-Rail GB request as per decision n. 17/2023 on the commitment expressed by the private Members to match a possible increase in the Union contribution to the Europe's Rail Joint Undertaking, and of the endorsement of the Horizon Europe Steering Board based on a proposal by the European Commission. Decrease of commitment appropriations by EUR 4.000.000 for 2026, as a result of the European Commission's implementation of the Council Regulation 2023/0201 related to the revision of the EU Multi-Annual Financial Framework for 2021-2027, with the redeployment of EUR 2.1 billion from Horizon Europe in favour of other initiatives (notably the establishment of the Ukraine facility and the support to the objectives of the Strategic Technologies for Europe Platform (STEP) and the new instrument for NextGenerationEU interest financing).

A further reduction of 2,403,705.80 million Euro of the EU contribution should be implemented in 2026 following a reallocation of appropriations inside Horizon Europe by the European Commission to contribute to the AI gigafactories initiative. The total funding reduction for Europe's Rail JU is envisaged at EUR 4,131,326.85 split between the 2026 and 2027 budgets.

STATEMENT OF REVENUE				
Title Chapter	Financial Year 2026			
	Estimate Commitment Appropriations	In %	Estimate Payment Appropriations	In %
EU contribution (excluding EFTA and third countries contribution)[2]	**71.623.142,82**	83%	**79.179.913,10**	84%
of which (fresh C1) Administrative (Title 1&2)	**2.553.771,00**	3%	**2.553.771,00**	3%
of which frontloaded commitments (Title 1 and Title 2)	-		-	
of which Operational (Title 3)	**69.069.371,82**	80%	**76.278.346,00**	81%
Of which related to additional entrusted tasks	-		**347.796,10**	
EFTA and third countries contribution	**11.528.868,40**	13%	**11.716.301,73**	12%
of which Administrative EFTA(Title 1&2)	**66.398,05**	0%	**66.398,05**	0%
Of which administrative third countries excluding EFTA (Title 1&2)	-		-	
of which Operational EFTA (Title 3)	**1.795.803,67**	2%	**1.983.237,00**	2%
Of which operational third countries excluding EFTA (Title 3)	**9.666.666,68**	11%	**9.666.666,68**	10%
Financial Members other than the Union contribution	**2.620.169,05**	3%	**2.620.169,05**	3%
of which Administrative(Title 1&2)	**2.620.169,05**	3%	**2.620.169,05**	3%
of which Operational(Title 3)	-		-	
Financial Contributing partners contribution	-		-	
Interest generated	-		-	
Assigned Revenue	**p.m.**		**p.m.**	
Unused appropriations from previous years	**250.000,00**	0%	**250.000,00**	0%
Of which administrative	**250.000,00**	0%	**250.000,00**	0%
Of which operational	-		-	
TOTAL ESTIMATE REVENUE	**86.022.180,27**	100%	**93.766.383,88**	100%

STATEMENT OF EXPENDITURE					
Title Chapter	Heading	Financial Year 2026			
		Estimate Commitment Appropriations	% Ratio [Year N+1/year N]	Estimate Payment Appropriations	% Ratio [Year N+1/year N]
1- Staff					
Salaries & allowances					
- Of which establishment plan posts	**110**	1.596.500,00	110%	1.596.500,00	110%
- Of which external personnel	**111**	1.875.630,00	95%	1.875.630,00	93%
Expenditure relating to Staff recruitment					
Mission expenses	**130**	120.000,00	100%	120.000,00	120%
Socio-medical infrastructure					
Training	**150**	50.000,00	100%	50.000,00	116%
External Services					
Receptions, events and representation					
Social welfare					
Other Staff related expenditure	**190**	300.000,00	100%	300.000,00	96%
2-Infrastructure and operating					
Rental of buildings and associated costs	**200**	378.000,00	100%	378.000,00	49%
Information, communication technology and data processing	**210**	245.000,00	76%	245.000,00	66%
Movable property and associated costs	**220**	10.000,00	50%	10.000,00	204%
Current administrative expenditure	**230**	15.000,00	60%	15.000,00	54%
Postage / Telecommunications	**240**	15.000,00	150%	15.000,00	202%
Meeting expenses	**250**				
Running costs in connection with operational activities	**260**	110.000,00	96%	110.000,00	31%
Information and publishing	**270**	550.000,00	126%	550.000,00	218%
Studies					
Other infrastructure and operating expenditure	**290**	225.208,10	205%	225.208,10	71%
TOTAL ADMINISTRATIVE (1+2)		5.490.338,10	103%	5.490.338,10	91%
3-Operational					
TOTAL OPERATIONAL (3)		80.531.842,17	56%	88.276.045,78	131%
Unused Appropriations					
TOTAL Unused		-	0%	-	0%
ESTIMATE TOTAL EXPENDITURE		**86.022.180,27**	**57%**	**93.766.383,88**	**109%**

** Please note that the amount assigned on annual budget for 2027 will be subject to adjustment in the annual planning from 2025, in function of the results of the Associated Members call and its impact on the programme multi-annual implementation.*

Table of Financial programming per year until 2027 (incl annual instalments)

	2022	2023	2024	Total	Ratio vs maximum Union contribution (art10 SBA) - max 50%	Total 2022-2024
Total amount to be assigned via annual instalments (Calls)	*232.475,2*					
Amount of annual instalments 2022-1	*135.707,2*	*55.936,1*	*40.831,9*	***232.475,2***	***39,0%***	
Amount to be assigned on annual budget (other calls/tenders/experts)	*23.334,1*	*32.639,3*	*34.192,1*	*90.165,5*		
Available Commitment appropriations			*42.533,2*			
Total annual budget (operational EU-Rail Programme)	*159.041,3*	*88.575,4*	*117.557,3*			***365.174,0***

	2025	2026	2027	Total	Ratio cumulative budget of the residual years (min 20%)	Gran total 2022-2027
Total amount to be assigned via annual instalments (Calls)	*148.200,0*					
Available Commitment appropriations (A)	42.533,2	0,0				
Amount of annual instalments (B)	*82.797,4*	*22.869,4*		***148.200,0***		
Amount to be assigned on annual budget (other calls/tenders/experts)	*17.657,3*	*57.769,6*	*50.146,9*	*125.573,9*	***45,9%***	
Total annual budget (operational EU-Rail Programme)	*100.454,7*	*80.639,0*	*50.146,9*			***596.414,6***
Total instalment 2025 (A+B)	*125.330,6*					

4 ANNEXES

Annex I - IKAA plan

Additional Activities can be accounted for as private Members' In-Kind Contributions for Additional Activities, when they contribute to the objectives of EU-Rail and are directly linked to its activities, including non-eligible costs of indirect actions funded by EU-Rail, where this is provided for in the present annual additional activities' plan. Subject to the compliance with the aforementioned definition as stated in article 90 of the SBA, the adoption of the present annual additional activities' plan and the signature of the respective grants, Additional Activities will be considered eligible as In-Kind Contributions from the 1 March 2022, and up to two years following the end of the action.

AMENDED IKAA PLAN 2026

OVERVIEW ESTIMATED AMOUNT OF IKAA FOR 2026	Estimated annual value (in €) - Link to JU objectives / KPIs	Estimated annual value (in €) - Link to JU project
1. Support to additional R&I	**3.596.781,30**	**26.977.432,80**
Additional activities related to the EU -RAIL program	389.901,30	
Additional activities are part and contribute to the Member's activities performed and described within the Exploratory Research Projects in the context of achieving the objectives and KPIs of the related Flagship Area		120.635,15
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		4.223.029,85
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		11.162.468,07
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area		5.135.511,66
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area		3.110.405,78
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area		1.950.592,30
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area		1.230.790,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Projects 7 in the context of achieving the objectives and KPIs of the related Flagship Area		44.000,00
Automation Island	40.000,00	
DAC / DAK activities outside ERJU projects	400.000,00	
Digital Twin activities outside ERJU projects	100.000,00	
Intuitive design of remote control centers	30.000,00	
Monitoring and Maintenance of vehicle systems	43.440,00	
Neuromorphic hardware for railways	30.000,00	
Project NGT Fun System dynamics: Non-funded activities	50.000,00	
Project ProCo: Non-funded activities	455.000,00	
Projects InTra & TraCo: Non-funded activities	600.000,00	
Projects VMo4Orte, RoSto, ProCo: Non-funded activities	285.000,00	

System Pillar: Non-funded activities	313.440,00	
Development of future battery cell technology	750.000,00	
Complementary internal activities to support Flagship Area 2 demonstrators	110.000,00	
2. Scale-up of technologies	**103.001,00**	**1.399.232,36**
Additional activities related to the EU -RAIL program	103.001,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		256.655,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		664.818,92
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area		323.758,44
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area		24.000,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area		130.000,00
3. Demonstrators	**63.150,00**	**8.408.120,54**
Additional activities related to the EU -RAIL program	63.150,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		440.398,73
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		213.940,60
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area		1.326.743,48
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area		3.623.228,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area		2.618.809,73
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area		185.000,00
4. Creating new business opportunities	**-**	**1.200.000,00**
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area		1.200.000,00
5. Training and skills development		**233.000,00**
Additional activities are part and contribute to the Member's activities performed and described within the Exploratory Research Projects in the context of achieving the objectives and KPIs of the related Flagship Area		19.000,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		195.000,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		8.000,00

Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 6 in the context of achieving the objectives and KPIs of the related Flagship Area		11.000,00
6. Contribution to the development of new standards, regulations and policies	**302.326,00**	**406.982,51**
Additional activities related to the EU -RAIL program	122.326,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		206.982,51
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area		200.000,00
Project "Querkraftverstärkung bei Brücken mit glatten Stäben": Non-funded activities	30.000,00	
Project "TDR – Tunnel Drainage Rover": Non-funded activities	150.000,00	
7. Supporting ecosystem development	**1.000.000,00**	**90.000,00**
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		40.000,00
Participation in national organisations and possible pilots and support of initiatives in the shape of contributions towards new concepts and ideas (Railforum, Energy Roundtable, etc.)		50.000,00
Development of a digital tool to manage repairs and second-hand parts to enable circular economy	1.000.000,00	
8. Communication, dissemination, awareness raising, citizen engagement	**205.000,00**	**54.134,00**
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 2 in the context of achieving the objectives and KPIs of the related Flagship Area		20.000,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area		8.463,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 4 in the context of achieving the objectives and KPIs of the related Flagship Area		25.671,00
Participation in conferences and/or seminars to communicate and disseminate knowledge	205.000,00	
9. Other	**407.764,00**	**743.659,00**
Additional activities related to the EU -RAIL program	301.984,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 1 in the context of achieving the objectives and KPIs of the related Flagship Area		250.000,00
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 3 in the context of achieving the objectives and KPIs of the related Flagship Area	75.780,00	
Additional activities are part and contribute to the Member's activities performed and described within the Flagship Project 5 in the context of achieving the objectives and KPIs of the related Flagship Area	30.000,00	493.659,00
Grand Total	**5.678.022,30**	**39.512.561,21**

AMENDED IKAA PLAN 2026

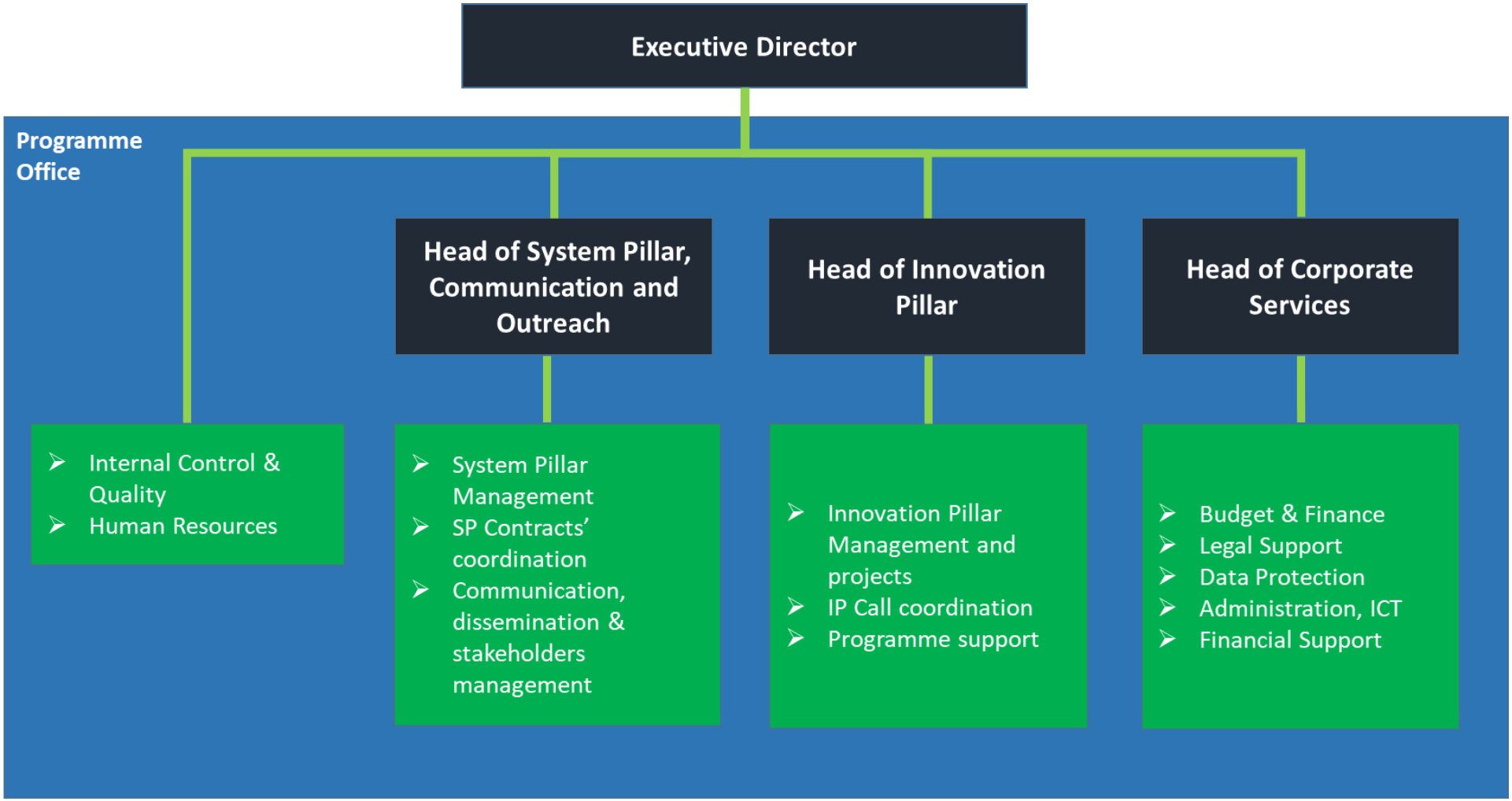
Country	Estimated annual value (in €) - Link to JU objectives / KPIs	Estimated annual value (in €) - Link to JU project
Austria	426.310,00	8.213.342,51
Belgium	60.000,00	577.500,00
Czechia	30.000,00	703.818,92
France	1.868.440,00	6.030.716,50
Germany	2.258.440,00	2.050.000,00
Italy	190.000,00	5.356.026,28
Netherlands		1.530.347,75
Norway		870.000,00
Poland	5.000,00	130.671,00
Portugal	195.930,00	565.157,29
Slovenia	188.552,00	
Spain	445.350,30	9.755.652,52
Sweden	10.000,00	3.489.328,44
Switzerland		160.000,00
United Kingdom		80.000,00
Grand Total	**5.678.022,30**	**39.512.561,21**

OVERVIEW CONSOLIDATED IKAA FOR THE PROGRAMME 2022-2026

AA category	Estimated annual value (in €) - Link to JU objectives / KPIs	Estimated annual value (in €) - Link to JU project
1. Support to additional R&I	13.056.403,15	185.891.911,08
2. Scale-up of technologies	956.244,00	15.028.038,50
3. Demonstrators	63.150,00	42.640.822,10
4. Creating new business opportunities	298.699,00	2.500.000,00
5. Training and skills development		2.102.636,51
6. Contribution to the development of new standards, regulations and policies	840.140,00	2.286.372,18
7. Supporting ecosystem development	1.200.000,00	6.285.205,09
8. Communication, dissemination, awareness raising, citizen engagement	995.000,00	166.434,39
9. Other	1.859.630,00	4.610.880,25
Grand Total	**19.269.266,15**	**261.512.300,09**

Country	Estimated annual value (in €) - Link to JU objectives / KPIs	Estimated annual value (in €) - Link to JU project
Austria	1.223.100,00	26.660.532,67
Belgium	100.000,00	4.100.000,00
Czechia	878.699,00	2.944.818,92
France	3.748.880,00	50.860.875,50
Germany	11.001.231,70	34.503.673,66
Hungary		1.754.367,68
India		78.000,00
Italy	1.061.000,00	39.556.787,98
Netherlands		15.214.010,56
Norway		3.480.000,00
Poland	10.000,00	6.062.650,97
Portugal	237.820,00	1.058.174,36
Slovenia	263.322,00	
Spain	730.213,45	53.379.036,39
Sweden	15.000,00	17.648.371,40
Switzerland		2.579.750,00
United Kingdom		191.250,00
USA		1.440.000,00
Grand Total	**19.269.266,15**	**261.512.300,09**

Annex II - Organisational Structure of the Programme Office of EU-Rail



Annex III – Key Performance Indicators for Europe's Rail Joint Undertaking[57]

TABLE I - Horizon Europe Common Key Impact Pathway Indicators[58]

Key Impact Pathway	Short-term	Medium-term	Longer-term
Towards scientific impact			
1-Creating high-quality new knowledge	Publications - Number of peer-reviewed scientific publications resulting from the Programme	Citations - Field-Weighted Citation Index of peer-reviewed Publications resulting from the Programme	World-class science - Number and share of peer-reviewed publications resulting from the projects funded by the Programme that are core contribution to scientific fields
2-Strengthening human capital in R&I	Skills - Number of researchers involved in upskilling (training, mentoring/coaching, mobility and access to R&I infrastructures) activities in projects funded by the Programme	Careers - Number and share of upskilled researchers involved in the Programme with increased individual impact in their R&I field	Working conditions - Number and share of upskilled researchers involved in the Programme with improved working conditions, including researchers' salaries
3-Fostering diffusion of knowledge and open science	Shared knowledge Share of research outputs (open data/publication/software etc.) resulting from the Programme shared through open knowledge infrastructures	Knowledge diffusion -Share of open access research outputs resulting from the Programme actively used/cited	New collaborations - Share of Programme beneficiaries which have developed new transdisciplinary/trans sectoral collaborations with users of their open access research outputs resulting from the Programme
Towards societal impact			
4-Addressing Union policy priorities and global challenges through R&I	Results - Number and share of results aimed at addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority) Including: Number and share of climate-relevant results aimed at delivering on the	Solutions - Number and share of innovations and research outcomes addressing identified Union policy priorities and global challenges (including SDGs) (multidimensional: for each identified priority) Including: Number and share of climate-relevant innovations and research	Benefits - Aggregated estimated effects from use/exploitation of results funded by the Programme on tackling identified Union policy priorities and global challenges (including SDGs), including contribution to the policy and law-making cycle (such as norms and standards) (multidimensional: for each identified priority) Including: Aggregated

[57] Current insights on how individual partnerships, such as EU-Rail, will contribute to Horizon Europe Key Impact Pathways, and how the partnerships will be monitored using common indicators, can be obtained from the document "Performance of European Partnerships: Biennial Monitoring Report 2022 on partnerships in Horizon Europe" available here: https://op.europa.eu/en/publication-detail/-/publication/a6cbe152-d19e-11ec-a95f-01aa75ed71a1/language-en/format-PDF/source-search
Partial list of common indicators for European Partnerships is provided in the document " A robust and harmonised framework for reporting and monitoring European Partnerships in Horizon Europe", Section 5, available here: https://op.europa.eu/en/publication-detail/-/publication/6b63295f-d305-11eb-ac72-01aa75ed71a1/language-en

[58] Based on Annex V to Regulation 2021/695/EU

	Union's commitment under the Paris Agreement	outcomes delivering on Union's commitment under the Paris Agreement	estimated effects from use/exploitation of climate-relevant results funded by the Programme on delivering on the Union's commitment under the Paris Agreement including contribution to the policy and law-making cycle (such as norms and standards)
5-Delivering benefits and impact through R&I missions	R&I mission results - Results in specific R&I missions (multidimensional: for each identified mission)	R&I mission outcomes - Outcomes in specific R&I missions (multidimensional: for each identified mission)	R&I mission targets met -Targets achieved in specific R&I missions (multidimensional: for each identified mission)
6-Strengthening the uptake of R&I in society	Co-creation - Number and share of projects funded by the Programme where Union citizens and end-users contribute to the co-creation of R&I content	Engagement - Number and share of participating legal entities which have citizen and end-users engagement mechanisms in place after the end of projects funded by the Programme	Societal R&I uptake - Uptake and outreach of co-created scientific results and innovative solutions generated under the Programme
Towards technological / economic impact			
7-Generating innovation-based growth	Innovative results - Number of innovative products, processes or methods resulting from the Programme (by type of innovation) & Intellectual Property Rights (IPR) applications	Innovations - Number of innovations resulting from the projects funded by the Programme (by type of innovation) including from awarded IPRs	Economic growth - Creation, growth & market shares of companies having developed innovations in the Programme
8-Creating more and better jobs	Supported employment - Number of full time equivalent (FTE) jobs created, and jobs maintained in participating legal entities for the project funded by the Programme (by type of job)	Sustained employment -Increase of FTE jobs in participating legal entities following the project funded by the Programme (by type of job)	Total employment - Number of direct & indirect jobs created or maintained due to diffusion of results from the Programme (by type of job)
9-Leveraging investments in R&I	Co-investment - Amount of public & private investment mobilised with the initial investment from the Programme	Scaling-up - Amount of public & private investment mobilised to exploit or scale-up results from the Programme (including foreign direct investments)	Contribution to '3 % target' - Union progress towards 3 % GDP target due to the Programme

TABLE II - Horizon Europe Partnership Common Indicators

Criterion addressed	Name of the Indicator	Baseline at the start of HE	Results for 2024 (and partially 2025 not yet part of a consolidated AAR)	Target 2027 (or partial earlier target)
Additionality	Progress towards (financial and in-kind) contributions from partners other than the Union – i.e. committed vs. actual	N/A	EUR 181.2M IKAA certified for a total 168M signed	Total In kind contribution: EUR 591 million Total financial contribution to the JU running costs: EUR 24 million
Additionality / Synergies	Additional investments triggered by the EU contribution, including qualitative impacts related to additional activities	N/A	Over the course of the programme, EU-Rail members contribute with additional activities, including mobilisation of private investment and national/regional programmes. Expected according to IKAA Plan 2022- 2024: 2024 amended = EUR 73M 2024 IKAA certified = 75.5M€ Estimated 2024 amended value of IKAA linked to JU objectives/KPIs - EUR 4.5M 2024 IKAA certified – 1M Estimated 2024 amended value of IKAA link to JU projects/topics - EUR 71.2M 2024 IKAA certified – 74.5M	Target 2022-2026: EUR 266.8 million Achieved 2022-2026 by 4/11/2025 (including non-reported yet in the CAAR2025): EUR 181.2 of IKAA certified

Directionality	Overall (public and private, in-kind and cash) investments mobilised towards EU priorities	0	EUR 284.2M funding in signed grants linked to the following EU priorities: - European Green Deal - Europe fit for digital age	EUR 615 million
International visibility and positioning	International actors involved	0	For new projects in 2024: 9 entities from Associated countries and Third countries are participating in projects as associated partners (2 from Norway, 4 from Switzerland, 2 from the UK, and 1 from Turkey) By type: 1 public organization (11%), 2 research organizations (22%), 5 private for profit organizations (56%) and 1 other organizations (11%)	N/A
Transparency and openness	Share & type of stakeholders and countries invited/engaged	0	In general the entire rail value chain. In projects: A total of 793 beneficiaries across all projects divided as follow: 371 unique entity beneficiaries (12 public organizations (3%), 58 higher or secondary education establishments (17%), 46 research organizations (14%), 234 private for profit organizations (61%) and 21 others (5%)) from: 27 countries (21 from EU and 6 associated and third countries) In the EU-Rail States' Representatives Group: 31 member states demonstrating interest (27 from EU and 4 associated countries)	N/A

Transparency and openness	No and types of newcomer members in partnerships and their countries of origin (geographical coverage)	0		Organisation Name	Category	Country	N/A
				ACCIONA Construcción S.A.	[PRV Other Industrial and/or profit Private organisation]	ES	
				Administrador de Infraestructuras	[PRV Other Industrial and/or profit Private organisation]	ES	
				Alstom Transport SA	[PRV Other Industrial and/or profit Private organisation]	FR	
				ANGELRAIL consortium led by MEI	[PRV Other Industrial and/or profit Private organisation]	IT	
				AŽD Praha s.r.o	[PRV Other Industrial and/or profit Private organisation]	CZ	
				Construcciones y Auxiliar de Ferro	[PRV Other Industrial and/or profit Private organisation]	ES	
				Asociación Centro Tecnológico CE	[RES Public research organisation (including international research organisation as well as private research organisation controlled by a public authority)]	ES	
				České dráhy, a.s.	[PRV Other Industrial and/or profit Private organisation]	CZ	
				Deutsche Bahn AG	[PRV Other Industrial and/or profit Private organisation]	DE	
				Deutsches Zentrum für Luft- und R	[RES Public research organisation (including international research organisation as well as private research organisation controlled by a public authority)]	DE	
				European Smart Green Rail Joint V	[PRV Other Industrial and/or profit Private organisation] + [RES Public research organisation (including international research organisation as well as private research organisation controlled by a public authority)]	ES	
				Faiveley Transport SAS	[PRV Other Industrial and/or profit Private organisation]	FR	
				Ferrovie dello Stato Italiane S.p.A.	[PRV Other Industrial and/or profit Private organisation]	IT	
				Frequentis AG	[PRV Other Industrial and/or profit Private organisation]	AT	
				Hitachi Rail STS S.p.A.	[PRV Other Industrial and/or profit Private organisation]	IT	
				INDRA SISTEMAS S.A & PATENTES TAL	[PRV Other Industrial and/or profit Private organisation]	ES	
				IP - Infraestructuras de Portugal S.	[UNI University and other higher education organisations] + [RES Public research organisation (including international research organisation as well as private research organisation controlled by a public authority)] + [PRV Other Industrial and/or profit Private organisation] +	PT	
				Jernbanedirektorate (Norwegian R	[PRV Other Industrial and/or profit Private organisation]	NO	
				Knorr-Bremse Systems für Schiene	[PRV Other Industrial and/or profit Private organisation]	DE	
				Kontron Transportation GmbH	[PRV Other Industrial and/or profit Private organisation]	AT	
				Österreichische Bundesbahnen-Ho	[PRV Other Industrial and/or profit Private organisation]	AT	
				Polskie Koleje Państwowe Spółka A	[PRV Other Industrial and/or profit Private organisation]	PL	
				ProRail B.V. & NS Groep N.V.	[PRV Other Industrial and/or profit Private organisation]	NL	
				Siemens Mobility GmbH	[PRV Other Industrial and/or profit Private organisation]	DE	
				Société nationale SNCF, société an	[PRV Other Industrial and/or profit Private organisation]	FR	
				Strukton Rail Nederland B.V.	[PRV Other Industrial and/or profit Private organisation]	NL	
				THALES SIX GTS France SAS	[PRV Other Industrial and/or profit Private organisation]	FR	
				Trafikverket	[PRV Other Industrial and/or profit Private organisation]	SE	
				voestalpine Railway Systems Gmb	[PRV Other Industrial and/or profit Private organisation]	AT	
				XLAB d.o.o.	[PRV Other Industrial and/or profit Private organisation]	SI	

Transparency and openness	No and types of newcomer beneficiaries in funded projects (in terms of types and countries of origin)	N/A	52 newcomers (48 EU & 4 Non-EU) of which 7 are SMEs. PRC: 36 PUB: 2 REC: 3 OTH: 7 HES: 4	
Coherence and synergies	Number and type of coordinated and joint activities with other European Partnerships	0	4 back office arrangements (2 of them as leading and lead backup contracting authorising)	7 arrangements among JUs in accordance with Art. 13 of the SBA
Coherence and synergies	Number and type of coordinated and joint activities with other R&I Initiatives at EU /national/regional/sectorial level	0	1. Coordinated activities at EU level with national / sectorial R&I actions on the Digital Automated Couplers with the European DAC delivery Programme, enabled by EU-Rail. 2. Coordinated at EU level with national / sectorial R&I actions on the deployment of the next generation rail mobile communication system (FRMCS) with the EU-Rail Deployment Group. 3. Rail system architecture coordinated in the System Pillar with national and sectorial input notably around signalling activities.	N/A

			4. Coordination also with Rail Net Europe on infrastructure capacity planning and R&I on traffic management.	
Coherence and synergies	Complementary and cumulative funding from other Union funds (Horizon Europe, National funding, ERDF, RRF, Other cohesion policy funds, CEF, DEP, LIFE, other)	0	EUR 0,7M for Smart Cities (Contribution Agreement between the European Union, represented by the European Commission, and EU-Rail, with the objective to provide a financial contribution to finance the implementation of the action “Pilot project - IRS Smart Cities project: new railway station concept for green and socially inclusive smart cities”) EUR 3M Joint topic call with SESAR, project resulting TravelWise , for an optimised and harmonised exchange of traffic management information for passengers between rail and air EUR 1M Joint topic call with SESAR, project resulting FP2-Morane2, for the EU-wide testing and validation campaign of the FRMCS V2 specifications, the next EU rail communication system Collaboration with the EU space programme through the contribution from the EU Agency for the Space Programme (EUSPA) as well as the contribution from the European Space Agency (ESA) with the project on EGNOS for rail, under the strategic leadership of the Commission and in full coordination with ERA, for delivering through R&I the technical and operational elements to reach competitive and resilient satellite-based rail services	N/A
International visibility and positioning	Visibility of the partnership in national, European, international policy/industry cycles	0	• Published 10 newsletters • Published 7 press releases • Released 2 publications • Organised 4 events • Participated in 58 industry events • Average number of tweets per month was 30 • 4.878 twitter followers by the end of 2024	N/A

			• 14.497 LinkedIn followers by the end of 2024 • 2.848 newsletter subscribers by the end of 2024 • 116 members in the general contact list (receiving the newsletter and mailshots) • 181 members in media list • 80 mentions in press articles • 31 project deliverables highlighted in the news section of the website • 205.441 unique visitors on the website • 40 articles produced by EU-Rail • •	

TABLE III - Key Performance Indicators specific for EU-Rail

A number of Key Performance Indicators (KPIs) have been identified in the Multi-Annual Work Programme for each Flagship Area. Each JU project will produce consistent quantitative and qualitative metrics during its implementation, so as to determine the actual R&I progress and results achieved.

Starting from this comprehensive list of KPIs that will constitute the basis for the Layer 1, a selection of the most relevant ones by Impact areas is presented in the table below. It is to be noted that further consolidation of KPIs, accompanied by modelling of the rail system/sub-systems impacts, will be performed in the course of the Programme.

This selection, using as a reference baseline the state of the art in 2020 (including results from S2R), will allow a more focused transformation of the operational work delivered with Projects technical and operational results into more tangible Societal Impact qualifications.

The Societal Impact measurement methodology will be developed in the first two years of the functioning of the Joint Undertaking on the basis the technical and operational KPIs provided here. The calculations of the impact will be provided after each round of demonstrators that is in 2025, 2027 and 2031.

Impact areas	Key performance indicators	Rationale	Driver Targets[1]
1. Customer requirements	Accuracy in total planned travel time of passengers from improved matching between supply and demand, #	Increase availability and predictability of intermodal rail transport offer	75%
	Traffic planning certainty, #	Planning certainty, considering the demand forecast, is a key requirement for planning on time, reliable and efficient service delivery	between 65% and 80%[1]
	Handling/response time for intermodal freight offers and regional passenger services, mins	Improve overall customer experience, including growing intermodal freight transport and regional passenger services	-50%
2. Improved Capacity	Trains on line per hour and direction, #	Increased frequency is a key element for improved capacity	At least +10%[2]
	Reduction of total freight transport time, *mins*	Reduced freight transport time leading to better asset utilization and increased capacity	-33%
	Increased average freight train length in existing infrastructure limitations or higher loads, meters	Increased length directly leads to more available capacity	Up to 1.500m
3. Reduced Costs	Overall OPEX and CAPEX costs of regional lines, incl. maintenance, infrastructure and vehicles	Direct link to lower costs of the regional lines	tbc[3]
	Maintenance costs, including thanks to the use of digital twins, €	Direct link to lower costs	-10%[4]
	Design and manufacturing costs, €	Leading to reduced investment cost	-20%
	Virtual certification tasks that can be conducted in a laboratory, #	Cost of virtual certification activities is much lower than cost of physical certification activities, hence more tasks done virtually leads to lower costs	+80%[5]
4. Sustainable and resilient transport	Optimized energy consumption and higher punctuality in regional services, *kWh per pax-km or tons-km;mins*	More efficient operations, leading to lower energy consumption (with lower CO2 emissions)	-10% (energy); +15% (punctuality)
	CO_2 equivalent emissions	Further decrease rail carbon intensity	Up to 30% for specific use cases (e.g. regional operation and heavy duty inspection vehicles)
	Traffic prediction performance, secs	Improve network resilience through dynamic infrastructure restriction handling, train regulation and automated conflict resolution	<120 secs[6]
	Time to respond and resolve a vulnerability (regarding cyber security), *mins*	Reduced impact of events and increased availability of the rail system	tbc[7]

Impact areas	Key performance indicators	Rationale	Driver Targets[1]
5. Harmonized approach	CCS system CAPEX and OPEX (of main line and regional lines systems), while maintaining or increasing the present safety level	Reducing costs associated with the interoperability of the network will enhance harmonization	CAPEX: -25% (regional lines) and -10% (main lines); OPEX -20% (regional and main lines)
	No new national technical rules triggered by innovative solutions coming from the Joint Undertaking and potential reduction of national rules in relation to ERTMS and interlocking	By decreasing the amount of national rules in force, rail transport will evolve towards the Single European Railway Area	N/A
	Reduction of answering time between the short term request of a cross-border train path and the answer with a firm offer, *mins*	Indicator for more efficient border crossing	down to 5 mins
	Operational dwell time at borders and other handover points relying also on relying on more homogenous system approaches (leading to increase number of trains on given infrastructure), *mins*	Indicator for more efficient border crossing	-50%
6. Reinforced role for rail	Accuracy in total planned travel time of passengers from improved matching between supply and demand, %	The combination of the indicators from Impact Areas 1 and 3 contribute to more effective and cost-efficient rail transport, thereby improving attractiveness of rail compared with other transport modes	75%
	Traffic planning certainty, #		between 65% and 80%[1]
	Handling/response time for intermodal freight offers and regional passenger services, *mins*		-50%
	Overall OPEX and CAPEX costs of regional lines, incl. maintenance, infrastructure and vehicles		Tbc3
	Maintenance costs, including thanks to the use of digital twins, €		-10%[4]
	Design and manufacturing costs, €		-20%
	Virtual certification tasks that can be conducted in a laboratory, #		+80%[5]
7. Improved	Maturity of innovative technologies	Innovative technologies will deploy rail capabilities and leverage potential competitive advantages for the EU rail industry	TRL 8

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1 *Depending on point in time, e.g. one week in advance or one hour in advance*
2 *At the moment this KPIs is linked with the outcome of FA2 only, in the course of the programme a consolidated KPI will be measured*
3 *The nature of the activity requires a full system approach analysis from improvements at components level, which will be conducted during the course of the programme*
4 *In specific use cases for both rolling stock and infrastructure and asset management*
5 *Costs only related to the execution of the on-site tests*
6 *In a typical scenario of at least 100 trains running in a 2h interval ahead of actual time*
7 *Due to the confidentiality nature of the baseline, a KPI measure will be assessed and consolidated during the course of the programme*
8 *As reflected in the ERA database(s) in relation to OPE TSI Appendix A, annex C and other TSIs in relation to ERTMS and interlocking*

Annex IV – System Pillar working method and System Engineering management plan

The System Pillar working method aims at fast and balanced decision making with full sector involvement. Integrated teams within one place - the System Pillar - work on and propose developed positions for sector consideration:

To ensure best results, the System Pillar design process ensures clarification and agreement on objectives and requirements early in the process as a basis for the subsequent decisions on operational design and architecture.

- The aim is to have developed positions put forward by the tasks and associated domain teams based on concentrated resource and a short interaction flow on system design level within the System Pillar teams, enabling speed of development. For this purpose, a detailed working plan, following the concepts of sprints, is established for 2024 for most of the System Pillar Teams. It specifies in detail the process flow and timeline for the development of the target railway system architecture, comprising the conception and modelling of operational capabilities and processes, system capabilities and functional chains as well as logical and physical architecture of the different subsystems (onboard, trackside CCS, etc.). Every design phase of the target architecture (described by the architecture level) is divided into a specification and review phase, aiming at fast and efficient content generation and a reliable, high-quality review.
- To ensure an effective and efficient use of the available resources, the detailed work planning includes the allocation of the resources to specific roles: Specifiers are responsible for developing the architecture concepts and models, requiring a high level of resource commitment to enable the most efficient content generation. The created content is then reviewed and revised by the advisor group, with limited time but a high level of expertise to ensure the high quality of the created content.
- The quality of the System Pillar deliverables is ensured by a review and approval process, defined in the Review and Approval process of the SEMP. Outcomes of a task/domain are first reviewed internally, including the related mirror groups, to ensure the high quality and sector alignment for the performed specification work. Afterwards, the internally approved deliverable is sent to the Core Group for review and approval. Once approved, the deliverable is presented at the Steering Group for decision and final approval before official release.
- Where appropriate, sector organizations are encouraged to support their representatives in the System Pillar teams and the Core Group with input - consolidated positions, early consideration of issues etc.

On all hierarchical levels of the decision-making process a balanced sector representation will ensure that developed and fully considered positions are put forward to the System Pillar Steering Group and Governing Board.

A detailed description of the model-based system engineering process and the related working arrangement including specification work, review and approval can be found in the 2nd version of the System Engineering Management Plan (SEMP). The SEMP is structured along the following content:

- The engineering processes describing the workflow of engineering regarding:
    - System Design Processes: e.g. process steps to get from use cases down to functional design, conception and modelling of the levels of the railway target architecture.

- Management Processes: e.g. how to collect, decide or allocate requirements or project management processes, or change management processes, how to monitor progress and verify consistency with Common Business Objectives.
- Review and approval processes: how to ensure a high-quality review by relevant sector stakeholders and a transparent approval of SP deliverables.
- Publication/Standardisation Processes: e.g. TSI input processes, specification maintenance.

- Definition of design methods:
  - Methods: e.g. how hazards should be linked to risks, and risks be linked to requirements.
  - Ontology, vocabulary: e.g. how to name results of SP or things in the railway landscape.
  - Design and modelling standards, notation: e.g. template structures for documents like “system definition”, or how to describe and draw a function or interface, or how requirements or use cases should be formulated.
- Tools to be used:
  - Design Tools: e.g., to write traceable content, for modelling, approval tools, model proving, etc.
  - Management tools: e.g. project management, issue management, workflow automation, etc.
  - Information flow automation: Carrying, converting and linking files from different tools, manage exchanges between teams.

Annex V – System Pillar deliverables and milestones

The deliverables and milestones for 2026 will be finalised in upon signature of the contract with the System Pillar consortium. The current draft reflects the text in the Request for Service sent July 2025.

Engineering Environment Team

DELIVERABLES

The domain has as a support team mostly continuous reactive task.

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Domain planning with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

SP meta-data management

No	Deliverable	Milestone
01	**SP meta-data management** • **Description of Deliverable:** The valid system requirement set of the SP in its current managed state is accessible via Polarion in a structured way • **Intermediate Milestones:** o Glossary release including list of references o Status report on the overall SP requirement set and traceability • Glossary release including list of references • **Definition of Done:** Release notes including status description, links to the Polarion reports (with defined revisions), open points, assessment of the quality status. • **Interaction with other Domains/IP: All domains**	Q3 2026 Q1 2026 Q2 2026 Q3 2026

SEMP updates

No	Deliverable	Milestone
02	**System engineering management plan** • **Description of Deliverable:** The SEMP is updated according to current needs and application.	Q3 2026

	• **Intermediate Milestones:**	
	o Draft SEMP V5: SEMP light, list of topics that require updating defined and agreed	Q1 2026
	o SEMP V5	Q3 2026
	• **Definition of Done:** The SEMP is consistent, applied, and does not contain unused elements.	
	• **Interaction with other Domains/IP: All domains**	

Formal quality checks and configuration management:

No	Deliverable	Milestone
03	**Formal quality checks and configuration management:**	Q3 2026
	• **Description of Deliverable:** All output documents have been checked according to the rules as defined in the SEMP, including the review, approval and release processes. A periodic gap report is created to support domains in resolving open points.	
	• **Intermediate Milestones:**	
	o Status report on document quality	Q4 2025
	o Status report on document quality	Q1 2026
	o Status report on document quality	Q2 2026
	o Status report on document quality	Q3 2026
	• **Definition of Done:**	
	• **Interaction with other Domains/IP:** All domains	

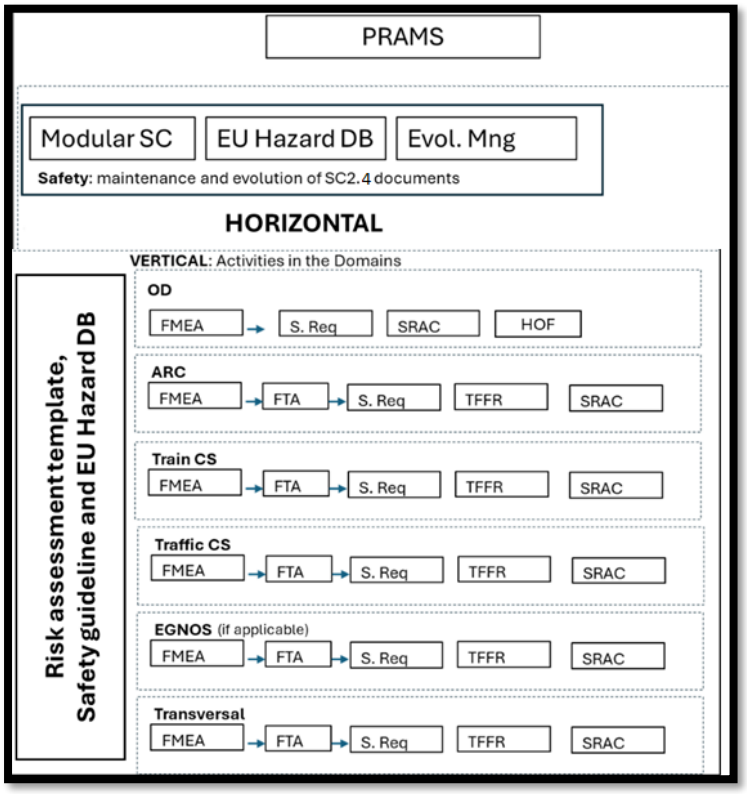
Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity**	continuous
	• **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar	
	• **Intermediate Milestones:** to be defined (if applicable)	
	• **Definition of Done:** To be agreed with the SPCG	
	• **Interaction with another Domains/IP:** to be defined (if applicable)	

PRAMS

DELIVERABLES

As described above in the following picture we can see the deliverables structure of the SAFETY Domain.



The Vertical activities shown in the picture for each domain are related to the canonical safety process. Each domain together with SAFETY team and CG will use the process according to the design status and specific needs of the domain.

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Q4 2026 Bi-Monthly

Support and coordination of Vertical Activities

No	Deliverable	Milestone
01	**Support and coordination of Vertical activities.** • **Description of Deliverable:** Each domain according to their development phase will deliver the related SAFETY deliverables according to the principles and methods defined by SAFETY, so called Horizontal Activities.	Continuous task

	SAFETY domain will support and coordinate those activities assuring the right quality and conformity to the defined principles and methods. To continue the support and coordination of vertical activities: a) Continue to support to SP Domains when dealing with safety activities in using the SAFETY templates and tools: i. EU Hazard Database, ii. Handling of control loops iii. FMEA: Failure mode and Effect Analysis iv. FTA: Fault Tree Analysis v. Safety Requirements definition vi. TFFR: Tolerable Functional Failure Rate (from ERJU Hazard Database). vii. SRAC: Safety Related Application Condition (if any) b) Continue to support the Train CS, Traffic CS, Trackside Assets, Cyber-security, Computing Environment, Transversal CCS teams to define the Architecture of the systems and ensure it is compliant with regulations, standards, and the RAMS requirements. c) Support EGNOS project in certification activities. • **Intermediate Milestones:** o Animate regular SAFETY Functional team meetings to synchronise safety activities between different SP domains o Regular reporting to SPCG and PMO • **Definition of Done:** The glossary items are checked and approved, no redundant entries, the synchronization and link to ERA ontology is assured, the glossary is used in the domains. • **Interaction with other Domains/IP:** All domains.	Q3 2026 Bi-Monthly

EU Hazard Database

No	Deliverable	Milestone
02	**EU Hazard Database** • **Description of Deliverable:** To extend the list of accidents and hazards with risk acceptance principles and quantified values (i.e. for top level system hazards having explicit risk estimation as risk acceptance principle) to fasten the realisation of risk assessment and harmonized practices among manufacturers and RUs/Ims in line with risk assessment process defined in SC2.4.. The quantified values to be defined based on an analysis of hazards and contributing conditions leading to the accidents classified within the ERJU and defined risk assessment process. The list of accidents and hazards is based on the future regulation CSM-ASLP but will consider a larger scope with actual lists of accidents and hazards at national level (i.e. SIRF, VDE, ESF) and feedback coming from safety analyses from SP domains.	Q3 2026

	To improve the EU Hazard Database which aims at mutualizing the use of standardized accidents and hazards for railway projects: a) Integrate additional hazards from other sources (e.g. NSA, suppliers), b) Consolidate the link between the EU Hazard Database and FMEA/FTA activities. c) Integrate in the database the feedbacks coming from SP domains safety analyses. (EU Hazard Database and Risk Assessment process and templates are complementary and mandatory to get efficient SAFETY activities realized within SP Domains)	
	• **Intermediate Milestones:** o Start the review process for the intermediate release of updated EU Hazard Database to be shared for review with other domains and ERA including extended list of accidents and hazards and their connections.	Mar-26
	o Updated release of EU Hazard Database addressing comments from other SP Domains and ERA and updates on list of hazards/accidents and their connections.	Jun-26
	• **Definition of Done:** 2nd version Released to the sector. • **Interaction with other Domains/IP:** All Domains and IPs • **STIP Reference (if applicable):** STIP_80	

Risk assessment process and templates

No	Deliverable	Milestone
03	**Risk assessment process and templates**	Q3 2026
	• **Description of Deliverable:** Consolidation of risk assessment process and templates (i.e. CENELEC Phase 3, 4 and 5) presenting all safety activities within SP Domains (up to Phase 5). The following activities are planned: a) HAZOP for analyzing the conditions leading to accidents (on Railway System level - bird's eye perspective) -> What hazards have to be taken into account? (align with existing ones of the database) -> What risk mitigation principles have to be defined? (align with existing ones of the database) - definition of a complete set b) Development of a RiskScore Matrix approach (acc. to VDE V 0831-103, based on CSM-DT) for deriving and quantifying system safety functions based on the risk mitigation principles defined in Hazard EU Hazard DB. c) Fault Tree Analysis: apportionment and quantification (template and guideline provided by SAFETY team) of hazards and system safety functions of Railway System level to lower level of the System Pillar Reference Architecture (e.g. L3: CCS, L4: Traffic CS, L5: ETPS). d) (*EU Hazard Database* and *Risk Assessment process and templates* are e) complementary and mandatory to get efficient SAFETY activities realized within SP Domains)	
	• **Intermediate Milestones:** o Start the review process for the 1st version of HAZOP according to SEMP process	Mar-26

	○ Start the review process for the 1st version of Safety Functions list according to SEMP process	Jun-26
	○ Updated release of HAZOP and Safety functions list addressing comments from other SP Domains and ERA.	Oct-26
	• **Definition of Done:** 2nd version Released to the sector.	
	• **Interaction with other Domains/IP:** All domains and IPs	
	• **STIP Reference (if applicable):** not applicable	

Generic Design Safety Case Structure

No	Deliverable	Milestone
04	**Generic Design Safety Case Structure**	Q3 2026
	• **Description of Deliverable:** To establish and consolidate a "Generic Design Safety Case structure" adequate to the new harmonised modular architecture of SP; and to provide the specific process for their application and authorisation (e.g. how to assess them, integrate them, deal with authorisation/approval). It is a structure made to benefit from the new railway standardised modular architecture of SP. This structure will allow to drastically reduce the number of SRAC, support parallel developments between systems and drastically reduce effort, needed resources and completion time when integrating modular building blocks into subsystems, vehicles and railway systems authorised for operation. In the SC2.4 contract the Modular Safety Case Structure has been developed and will be reviewed in the Sector .. From SC2.6 additional features will be added to address all required elements mandatory to get an efficient deployment of the System Pillar Reference Architecture. To consolidate the Generic Design Safety Case (GDSC) approach which helps at integrating the modular components into specific application with maximizing the reuse between different projects: a) Define DSC templates and their hierarchical interactions and validate them by the AsBo Cooperation Group, b) Define the structure of a EU Safety Related Application Condition (SRAC) database. c) Define roles and tasks for each stakeholder involved in the GDSC imbricated safety cases (e.g. assign responsibilities to the CCS-OB integrator in the vehicle) d) Define a new cross-acceptance process to ease the reuse of ISA/NoBo certificates in real projects (Generic Design Safety Case and Evolution Management in a Modular Architecture are complementary and mandatory to get efficient future projects using modular systems based on SP reference architecture)	
	• **Intermediate Milestones:**	
	○ Start the internal System Pillar Review Process according to the SEMP	May-26
	○ Second release updated according to the feedbacks/comments from the sector (NoBo/AsBo organizations to be involved and feedback is expected in SC2.6)	Sep-26
	• **Definition of Done:** 3rd version Released to the sector.	

	• **Interaction with other Domains/IP:** All Domains and Ips, AsBo Corporation group • **STIP Reference (if applicable):** STIP_79	

Evolution Management of Safety Related Systems in a Modular Architecture

No	Deliverable	Milestone
05	**Evolution Management of Safety Related Systems in a Modular Architecture**	Q3 2026
	• **Description of Deliverable:** Changes to the existing regulations to improve the management of evolutions of a safety-related system (including cyber-security related and RAM related evolutions in a safety-related system). To consolidate the Evolution Management process for safety related systems which help at reducing the lifecycle management of modular systems: a) Improve the connection with the Assessment Bodies (AsBo) Cooperation Group and NB Rail association initiated in SC2.4 to consolidate the process (e.g. integration in the next CSM-RA), b) Update the process by developing the integration activities regarding testing and assessment from modular component to overall modular system at railway level. c) Update the process to ensure a complete alignment with Train CS, Traffic CS, Trackside Assets, Cyber-security, Computing Environment, Transversal CCS, concerning the design, development, homologation, and deployment of software evolutions. d) Update the process to consider the hardware evolutions. e) Update the process to consider the conclusions from the FP2 DATO WP26 Modular Platform Specification "D26.4 – Summary of findings and recommendations from study on modular certification and homologation". (*Generic Design Safety Case Strategy* and *Evolution Management of Safety Related Systems in a Modular Architecture* are complementary and mandatory to get efficient future projects using modular systems based on the SP Reference Architecture)	
	• **Intermediate Milestones:** o Start the System Pillar Review Process according to the SEMP regarding SC2.4 deliverables o New release updated according to the feedbacks/comments from the sector plus the point b) to e) (adjustments may be done after the first intermediate milestone depending on the inputs' availability) (NoBo/AsBo organizations to be involved and feedback is expected in SC2.6)	May-26 Sep-26
	• **Definition of Done:** 3rd version Released to the sector. and no more opened comments from external reviewers. • **Interaction with other Domains/IP:** All Domain, IPs, NB Rail, AsBo Corporation group • **STIP Reference (if applicable):** STIP_81	

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone

6	**Task Collaboration with STIP related topics** • **Description of Deliverable:** Maintenance of SAFETY STIP Documents. Publish the Change Request(s) to specify the necessary evolutions in the standards and evolutions to allow a modular architecture • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks i. Maintenance of Existing document if necessary: 1. STIP_79 - Modular Safety Case Structure 2. STIP_80 - EU Hazard Database 3. STIP_81 - Evolution Management in a Modular Architecture • **Definition of Done:** Maintain the existing STIP documentation in case is necessary. • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):** STIP_79, STIP_80, STIP_81	Q3 2026 Cont.

Cybersecurity

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain (0,5 FTEs)** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable maintained in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

SP Cybersecurity Specification (v1.1 or v2.0)

No	Deliverable	Milestone
01	**SP Cybersecurity Specification (v1.1 or v2.0) (0,4 + 0,1 FTEs)**	Sep 26

	• **Description of Deliverable:** Release of updated SP Cybersecurity Speciation (four main document + supporting documents), structure the Polarion project data along SEMP.
	• **Intermediate Milestones:**
	  o Review version available and start of review
	  o Review comments incorporated
	  o Approval version available
	• **Definition of Done:** Approved and released SP Cybersecurity specification v1.1 or v2.0
	• **Interaction with other Domains/IP:** Transversal, Traffic CS, Train CS, DAC,…
	• **STIP Reference (if applicable):** C11
		
		Jun 26
		Aug 26
		Sep 26

Security CR for TSI CCS

No	Deliverable	Milestone

02	**Security CR/technical input to ERA TWG for TSI CCS (0,2 FTEs)**
	• **Description of Deliverable:** CR to address security gaps in TSI CCS
	• **Intermediate Milestones:**
	  o Draft version of CR template content and update of the preassessment template content if necessary
	  o Final version of CR template content
	  o Approve version of CR
	• **Definition of Done:** Approved CR by SPSG
	• **Interaction with other Domains/IP:** as applicable (depends of TSI)
	• **STIP Reference (if applicable):** STIP_175
		Oct 26
		
		Dec 25
		Jun 26
		Oct 26

Security CR for TSI ENE

No	Deliverable	Milestone

03	**Security CR/technical input to ERA TWG for TSI ENE (0,1 FTEs)**
	• **Description of Deliverable:** CR/technical input to ERA TWG to address security gaps in TSI ENE
	• **Intermediate Milestones:**
	  o Draft version of CR template content /technical input to ERA TWG and update of the preassessment template content if necessary
	  o Final version of CR template content /technical input to ERA TWG
	  o Approve version of CR template content /technical input to ERA TWG
	• **Definition of Done:** Approved content by SPSG
	• **Interaction with other Domains/IP:** as applicable (depends of TSI)
	• **STIP Reference (if applicable):** STIP_175
		Oct 26
		
		Dec 25
		Jun 26
		Oct 26

Security CR for TSI Telematics (TAF/TAP)

No	Deliverable	Milestone

04	**Security CR/technical input to ERA TWG for TSI Telematics (TAF/TAP) (0,1 FTEs)**	Oct 26
	• **Description of Deliverable:** If required review of the SC2.4 outcomes. CRs to address security gaps in TSI Telematics (TAF/TAP)	
	• **Intermediate Milestones:**	
	○ Draft version of CR template content /technical input to ERA TWG and update of the preassessment template content if necessary	Dec 25
	○ Final version of CR template content /technical input to ERA TWG	Jun 26
	○ Approve version of CR template content /technical input to ERA TWG	Oct 26
	• **Definition of Done:** Approved content by SPSG	
	• **Interaction with other Domains/IP:** as applicable (depends of TSI)	
	• **STIP Reference (if applicable):** STIP_175	

Security CR for TSI OPE

No	Deliverable	Milestone
05	**Security CR for TSI OPE (0,1 FTEs)**	Oct 26
	• **Description of Deliverable:** CRs to address security gaps in TSI OPE	
	• **Intermediate Milestones:**	
	○ Draft version of CR template content /technical input to ERA TWG and update of the preassessment template content if necessary	Dec 25
	○ Final version of CR template content /technical input to ERA TWG	Jun 26
	○ Approve version of CR template content /technical input to ERA TWG	Oct 26
	• **Definition of Done:** Approved content by SPSG	
	• **Interaction with other Domains/IP:** as applicable (depends of TSI)	
	• **STIP Reference (if applicable):** STIP_175	

Security approval process description

No	Deliverable	Milestone
06	**Security approval process description (0,2 FTEs)**	Q3 2026
	• **Description of Deliverable:** Description of security approval aligned to existing safety approval process	
	• **Intermediate Milestones:**	
	○ Draft approval process description	Q2 2026
	• **Definition of Done:** approved description	
	• **Interaction with other Domains/IP:**	
	• **STIP Reference (if applicable):** new STIP entry?	

Technical migration path description

No	Deliverable	Milestone
07	**Technical migration path description (0,2 FTEs)**	Q2 2026

	• **Description of Deliverable:** Description of the technical migration path (update of existing systems, system extension, interfacing to legacy systems) for CCS • **Intermediate Milestones:** o Draft technical migration description • **Definition of Done:** approved description • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):** new STIP entry?	Q1 2026

Cooperation with SP domains and IP projects

No	Deliverable	Milestone
08	**Cooperation with System Pillar Domains and Innovation Pillar (0,3 FTEs)** • **Description of Deliverable:** Cooperation with System Pillar Domains and Innovation Pillar demonstrator projects for continuous support of the integration of the SP security requirements. • **Intermediate Milestones:** o Meeting plan with other domains • **Definition of Done:** Meetings held • **Interaction with other Domains/IP:** **a.** SP domains (Train CS, Traffic CS, TMS, Architecture, Transversal) **b.** selected IP demonstrator projects (DAC, ATO, FRMCS (MORANE), EGNOS, …) • **STIP Reference (if applicable):**	Continuous task Q4 2024

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity (0,1 FTEs)** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics (FTEs incl. in 1.3.0 Management of the domain)	

	• **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks i. STIP_175 • **Definition of Done:** • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):**	Cont. Cont.

Task 1 Railway System

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Monthly

High level system architecture on system level 2 (Global Architecture To-Be Model)

No	Deliverable	Milestone
01	**High level system architecture on system level 2: Names of the subsystems and interfaces** • **Description of Deliverable:** Defining and providing the TO-BE architecture according to the SEMP. Technological neutral System architecture description, with description of the functions and interfaces and derived High-Level recommendations to other Tasks. • **Sub-Milestones:** o Transfer to Polarion the exiting Task 1 work including:	Q3 2026 Jan 2026

	i. Analysis of “Operate Train” (SC2.3/4) Capability (Includes the Sectoral Feedback) ii. Analysis of “Manage Energy” (SC2.3/4) Capability (Includes the Sectoral Feedback) iii. Analysis of “maintain and monitor infrastructure” (SC2.4) Capability (Without Sectoral Feedback) o Transfer to Polarion the first draft TO-BE Global Architecture Model o Publishing pain point analysis and sending to the mirro group for feedback o Sending to Mirror Group on each capability. o 1st Version of Global Architecture Model based on process and interactions over time between railway entities (scenario-based dynamic view) o Integrate TO-BE architecture with Task 3 and mirror group inputs • **Definition of Done:** First stable DRAFT approved by SPCG • **Interaction with other Domains/IP:** o Task1/Task3: Alignment on modelling according to T1 model o **Task1/T2,T4,T5: To be defined during SC2.6** o FP4 Manage Energy & other capabilities : alignment on high level architecture o Collaboration with ERA on railway system definitions • **STIP Reference (if applicable): STIP_192**	Jan 2026 Oct 2026 Oct 2026

Improvement or update of “To-Be” Global Architecture Model based on interactions with FPs & SP Tasks (if necessary)

No	Deliverable	Milestone
02	**Check and align with Flagship Projects (FPs) and SP Tasks on pain points and requirements and adapt the to-be architecture if necessary.** • **Description of Deliverable: Improvement or update** of “To-Be” Global Architecture Model based on interactions with FPs & SP Tasks (if necessary) • **Sub-Milestones:** **a. Improvement or update** of Global Architecture Model “To-Be” based on interactions with FP4 (if necessary) **b. Improvement or update** of Global Architecture Model “To-Be” based on interactions with Task 2 (if necessary) **c. Improvement or update** of Global Architecture Model “To-Be” based on interactions with Task 3 (if necessary) **d. Improvement or update** of Global Architecture Model “To-Be” based on interactions with Task 4 (if necessary) **e. Improvement or update** of Global Architecture Model “To-Be” based on interactions with Task 5 (if necessary) • **Definition of Done:** Updated first stable DRAFT after interactions (if necessary) approved by SPCG • **Interaction with other Domains/IP:**	Oct 2026 Continuous Oct 2026

	○ Task1/Tasks: Alignment on modelling according to T1 model (if necessary) ○ **Task1/ FPs:** Alignment on modelling according to T1 model (if necessary) • **STIP Reference (if applicable): -**	

Collaboration with ERA and the relevant outcomes on railway system definitions

No	Deliverable	Milestone
03	**Collaboration with ERA and the relevant outcomes on railway system definitions** • **Description of Deliverable:** ○ Collaboration with ERA and the relevant outcomes on railway system definitions • **Definition of Done:** First stable DRAFT after interactions with ERA (if necessary) approved by SPCG • **Interaction with other Domains/IP:** ○ Interactions with ERA on railway system definitions • **STIP Reference (if applicable): -**	On request/ Continuous Oct 2026

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	Continuous

STIP TASKS

Task 1 Collaboration with STIP related topics

No	Deliverable	Milestone
09	**Task 1 Collaboration with STIP related topics** • **Description of Deliverable:** Collaboration for STIP related topics/deliverables. • **Intermediate Milestones:** ○ Identification of activities and joint plan with related Tasks and Domains, ○ Description of foreseen actions. ○ Review the STIP and any applicable update considering Domain developments ○ LEAD the following STIP related Deliverables/Tasks • STIP_192 ○ SUPPORT the following STIP related deliverables/tasks	Cont.

	•	

Task 2 CCS: Domain Architecture and Release Coordination

DELIVERABLES

The ARC domain is a management support team which does not produce own specification, it only protocols coordination activities and summarizes the architecture conclusions for the domains. All results and designs are documented in domain deliverables. The ARC domain does not report on deliverables.

The work of the ARC domain is continuously documented by the following documentation in Polarion:

1. Journal of ARC activities
    a. Conclusion protocols from ARC (coordinators)
    b. Conclusion protocols from ARC-F (Lead by SPCG)
2. TSI CR Pre-Assessment plan and documents
3. System Pillar Release Plan and document lists

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Domain planning with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Journal of ARC activities

No	Deliverable	Milestone
01	**Journal of ARC activities** • **Description of Deliverable:** Journal including a description of ARC performed activities, including: • Conclusion protocols from ARC (coordinators) • Conclusion protocols from ARC-F (Lead by SPCG) • **Intermediate Milestones:** o Semestral Journal • Semestral Journal	Q3 2026 Q1 2026 Q3 2026

	• **Definition of Done:** Journal with ARC activities is approved by the SPCG • **Interaction with other Domains/IP: All domains**	

TSI CR Pre-Assessment plan and documents

No	Deliverable	Milestone
02	**TSI CR Pre-Assessment plan and documents**	Q3 2026
	• **Description of Deliverable:** TSI CR Pre-Assessment	
	• **Intermediate Milestones:**	
	○ First submission to the ERA CCM of all CR for next iteration of TSIs	Dec 2025
	○ Pre-Assessment documents available up to March 2026	Q1 2026
	○ Pre-Assessment documents available up to October 2026	Q3 2026
	• **Definition of Done:** approved by the SPCG	
	• **Interaction with other Domains/IP: All domains**	

System Pillar Release Plan and document lists

No	Deliverable	Milestone
03	**System Pillar Release Plan and document lists**	Q3 2026
	• **Description of Deliverable:** The deliverable includes a list of all relevant available System Pillar documents, including classification (type of document)	
	• **Intermediate Milestones:**	
	○ Update of the System Pillar Release Plan and document list	Q1 2026
	○ Update of the System Pillar Release Plan and document list	Q3 2026
	• **Definition of Done:** approved by the SPCG	
	• **Interaction with other Domains/IP:** All domains	

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity**	continuous
	• **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar	
	• **Intermediate Milestones:** to be defined (if applicable)	
	• **Definition of Done:** To be agreed with the SPCG	
	• **Interaction with another Domains/IP:** to be defined (if applicable)	

Task 2 CCS: Domain Operational Harmonisation

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain**	

	• **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Harmonized CCS-related operational processes for ETCS L2 and ATO GoA 1/2

No	Deliverable	Milestone
01	**Guideline for harmonized CCS related operational processes for ETCS L2 and ATO GoA 1/2** • **Description of Deliverable:** TSI OPE 2026 - Guideline for harmonized CCS related operational processes for ETCS L2 and ATO GoA 1/2 (based on the entity/actor analysis and the analysed operational use cases of SC2.3). For the case of radio-based ETCS alone operation, operational rules described as detailed situation and configuration specific processes for all actors (incl. signaller), for degraded modes, and with a binding time-ordered sequence of actor and system actions with defined input and output. The operational design is based on specific system and engineering requirements which define a more restricted trackside implementation for radio based ETCS alone operation. The recommended amendment for TSI OPE in the form of actor specific Rulebooks. Includes operational rules now also described as detailed situation and configuration specific processes for all actors (incl. signaller), for all degraded modes, and with a binding time-ordered sequence of actor and system actions with defined input and output. The work includes the preparation of TSI CR where necessary. User interface description is part of the specification, and includes the list of functionalities and displayed information, as well as basic layouts and catalogue of symbols. • **Milestone overview for S 2.4 – SC2.7: Capabilities to be specified** • **SC 2.4** • **Release 1 (15.4.2025)** • Movement A to B (subtopics part 1) • Revoke Movement Permission (subtopics part 1) • **Release 2 (15.7.2025)** • Manage Usage restrictions (subtopics part 1) • Movement A to B (subtopics part 2) • Boarding and disembarking of passengers • **Release 3 (30.9.2025)** • Revoke Movement Permission (subtopics part 2)	Q3 2025 Previous contract

	• Preparation to train departure • Approaching Stop Location • Train arrival (ending journey)	

	• **Operational Processes**
	  • **Release 4**
	  • Finalisation of release 3 topics
	  • Change of train orientation
	  • Configuration update
	  • Movement A to B (subtopics part 3)
	  • **Release 5**
	  • Moving in SR
	  • Continue after trip
	  • Handling train after loss of communication
	  • OS sweeping
	  • Runaway vehicle
	  • Proceed after TIMS failure
	  • Pass a technically non-supervised point
		15.4.2026
		
		15.10.2026

	• **ETCS L2 Rulebook**
	  • **Release x+1**
	  • **Release x+2**
	• *X - Dependant on the finalization of SC2.4 Rulebook results.*
		15.4.2026
		15.10.2026

	• Definition of Done: Rulebook with filled chapters for the topics of SC2.6, aligned with existing TSI or running TSI CR (e.g. EUG guidelines), approved on domain level and by the Coregroup. Major harmonization impacts are prepared as a compressed harmonization decision list, ready for the Steering Group. • **Interaction with other Domains/IP:** Traffic CS, Task 3, TrainCS • **STIP Reference (if applicable):** STIP_2	

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity	continuous

	checkpoint reviews of the Innovation Pillar, or reviews of TrafficCS system specification. • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics	
	• **Description of Deliverable:**	
	• **Intermediate Milestones:**	
	○ Identification of activities and joint plan with related Tasks and Domains,	
	○ Description of foreseen actions.	
	○ Review the STIP and any applicable update considering Domain developments	
	○ LEAD the following STIP related Deliverables/Tasks	Cont.
	i. STIP_2	
	○ SUPPORT the following STIP related Deliverables/Tasks:	
	i. STIP_19	
	ii. STIP_102	Cont.
	iii. STIP_103	
	iv. STIP_104	
	• **Definition of Done:**	
	• **Interaction with other Domains/IP:**	
	• **STIP Reference (if applicable):**	

Task 2 CCS: Domain Traffic Control and supervision

INTERMEDIATE MILESTONES FOR THE DELIVERABLES ATO-TS, ETPS, PES

The following list defines the intermediate milestones per contract and release:

- **Release 1**
  - Movement A to B (subtopics part 1)
  - Revoke Movement Permission (subtopics part 1)
- **Release 2**
  - Manage Usage restrictions (subtopics part 1)
  - Movement A to B (subtopics part 2)
  - Boarding and disembarking of passengers

- **Release 3**
  - Revoke Movement Permission (subtopics part 2)
  - Preparation to train departure
  - Approaching Stop Location
  - Train arrival (ending journey)
- **Release 4**
  - Finalisation of release 3 topics
  - Change of train orientation
  - Configuration update
  - Movement A to B (subtopics part 3)
- **Release 5**
  - Moving in SR
  - Continue after trip
  - Handling train after loss of communication
  - OS sweeping
  - Proceed after TIMS failure
  - Pass a technically non-supervised point
- **Release 8 (goal: finish release v1)**
  - Handling of emergency situation
- **Release 9 (start release v2)**
  - HO between ETCS Systems
  - Entry Transition to CCS area
  - Exiting Transition to CCS area
- **Release 10 (goal: finish release v2)**
  - Splitting trains
  - Joining trains
  - Pass level crossing
  - Pass a non-protected level crossing
  - Shunting inside controlled areas
- **Maintenance Release**

- **release v3**
  - **Release X**
    - Reversing
    - SPP-18263 - txx - 305 Overrunning/routed in wrong direction
    - Working area excluding normal train operation
    - Entering non-controlled area

- SPP-18236 - txx - 152 Entering non-controlled area
- Exiting from non-controlled area
- SPP-18238 - xx - 153 Exiting from a non-controlled area
- Manage Usage restrictions (subtopics part 2)

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

System specification and interfaces ATO Trackside *function* (perh. incl. interface to PES)

No	Deliverable	Milestone
01	**System specification and interfaces ATO Trackside *function*** • **Description of Deliverable:** The result document structure (along SEMP configuration plan) is completed concerning topics package 1 and concerning the ATO trackside function • **Intermediate Milestones: See previous chapter** • **Release 4** • **Release 5** • *X - Dependant on the finalization of SC2.4 results.* • **Definition of Done:** The topic workitem traces are complete, aligned with existing TSI documents or running CR, and reviewed by SPCG. Major design decisions are described ready for decision in STG. The topic requirements are described and approved as SRS and for all harmonized system and user interfaces as FiS/FFFiS. Impact to existing interoperability specifications (in CCS TSI) is identified including harmonization of functional/engineering rules and proposed changes to existing requirements. • **Interaction with other Domains/IP:** OD, Train CS, Task 3 • **STIP Reference (if applicable):** STIP_19, STIP_104	Q3 2026 15.4.2026 15.10.2026

System specification Trackside Protection System (ETPS) incl. interface to adjacent CCS area

No	Deliverable	Milestone

02	**System specification and interfaces of the European trackside protection system**
	• **Description of Deliverable:** The result document structure (along SEMP configuration plan) is completed concerning the topics package 1 and concerning the European trackside protection system
	• **Intermediate Milestones: See previous chapter**
	  • **Release x+1**
	  • **Release x+2**
	• *X - Dependant on the finalization of SC2.4 results.*
	• **Definition of Done:** The topic workitem traces are complete, aligned with existing TSI documents or running CR, and reviewed by SPCG. Major design decisions are described ready for decision in STG. The topic requirements are described and approved for all harmonized system and user interfaces as FiS/FFFiS. Impact to existing interoperability specifications (in CCS TSI) is identified including harmonization of functional/engineering rules and proposed changes to existing requirements.
	• **Interaction with other Domains/IP:** OD, Train CS, Task 3, Lot 3
	• **STIP Reference (if applicable):** STIP_102, STIP_101
		Q3 2026
		
		15.4.2026
		15.10.2026

System specification and interfaces of the Plan Execution System

No	Deliverable	Milestone

03	**System specification and interfaces of the Plan Execution System**
	• **Description of Deliverable:** The result document structure (along EN50126, phase 1-5, and for the design safety case) is completed concerning topics package 1 and concerning the execution and adaption layer system
	• **Intermediate Milestones: See previous chapter**
	  • **Release x+1**
	  • **Release x+2**
	• *X - Dependant on the finalization of SC2.4 results.*
	• **Definition of Done:** The topic workitem traces are complete, aligned with existing TSI documents (like EUG guidelines) or running CR, and reviewed by SPCG. Major design decisions are described ready for decision in STG. The topic requirements are described and approved for all harmonized system and user interfaces as FiS/FFFiS. Impact to existing interoperability specifications (in CCS TSI) is identified including harmonization of functional/engineering rules and proposed changes to existing requirements.
	• **Interaction with other Domains/IP:** OD, Train CS, Task 3
	• **STIP Reference (if applicable):** STIP_103
		Q3 2026
		
		15.4.2026
		15.10.2026

Trackside migration analysis

No	Deliverable	Milestone
04	**CCS Trackside migration analysis** • **Description of Deliverable**: Deliverables build on the SC2.4 results.	Q3 2026

	• **Definition of Done:** To be agreed with the SPCG. • **Interaction with other Domains/IP:** OD, Train CS, Task 3 • **STIP Reference (if applicable):** -	

Ad Hoc and technical concepts

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks . STIP_19 i. STIP_102 ii. STIP_103 iii. STIP_104 o SUPPORT the following STIP related Deliverables/Tasks: . STIP_2 • **Definition of Done:** • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):**	Cont. Cont.

Task 2 CCS: Domain Train Control and supervision

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Ethernet CCS consist network (full stack)

No	Deliverable	Milestone
01	**Ethernet CCS consist network (full stack)** • **Description of Deliverable:** Concept for addressing Common Onboard Network in TSIs. Complete harmonized onboard CCS communication layer full stack without the current options for layers 3-6 incl. safety integrity layer. For time-critical safety applications a safe time layer (similar to Subset-056) for Ethernet CCS consist of network shall be analysed and aligned with IEC TC9 working group WG43 (IEC61375-2-3).. Application layer SUBSETs shall be updated according to the new Ethernet CCS communication layers which include the required Cyber Security measures. Application layer subsets are to be updated accordingly. Safe time Layer is needed for time-critical safety applications which establishes a relative but safe time synchronisation for safe timestamping. The deliverable are the mature CR solution proposal for the different CR identified as necessary to cover this topic • **Intermediate Milestones:** o CR solution proposal draft and delivery of comments to IEC specifcaiton process o CR solution proposal agreed • **Definition of Done:** • **Interaction with other Domains/IP:** FP2 • **STIP Reference (if applicable):** STIP_68	Q3 2026 Feb. 2026 Sep. 2026

Train interfaces enhancement

No	Deliverable	Milestone
02	**Train interfaces enhancement**	Q3 2026

	• **Description of Deliverable:** Functional enhancement for the train interface to allow for CCS onboard systems to be deployed on vehicles as a product from different vehicle suppliers. (ensure CCS onboard exchangeability) • **Intermediate Milestones:** o CR agreed problem description and first input necessary for the CCM database of the agreed CR within the bundle o Mature solution proposal for each of the CR included in the CCM database • **Definition of Done:** • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):** STIP_71	 Dec. 2025 Q32026

Multi Display solution

No	Deliverable	Milestone
03	**Multi Display Concept** • **Description of Deliverable:** Train Display System – Multiple display system concept. Define Multiple DMI concept based on existing documents / information and specific topics. • **Intermediate Milestones:** o Document structure and properties in Polarion, identified task associated and detailed scope added o Continuation of Train CS Task Remit 10.3.3 from SC 2.4 contract o Update basic concept of Phase 2.4 (Basic concept of apportionment of the logic of applications for the “Multi Display System”) o Update Demonstrator requirements • **Definition of Done: Document is approved at domain level and reviewed by SP CG** • **Interaction with other Domains/IP: TCCS** • **STIP Reference (if applicable):** STIP_69	Q3 2026 Q4 2025 Q1 2026 Q1 2026 Q2 2026

Train interface adaption for integrity handling and train length / overall consist length

No	Deliverable	Milestone
04	**Train interface adaption for integrity handling and train length / overall consist length** • **Description of Deliverable:** Joint analysis and decision of the train length merging function and its interfaces with task 4 according decision from SC2.4. TLMF and its interfaces are specified in cooperation with FA 5 • **Intermediate Milestones:** o CR agreed problem description and first input necessary for the CCM database of the agreed CR within the bundle. For TLMF inluding Interface to DAC control unit (Traction Control Unit LCU) a System Pillar documents in Polarion shall be elaborated. No CR. o Mature solution proposal for each of the CR included in the CCM database • **Definition of Done:** TSI Document ready for sector review	Q3 2026 Dec. 2025 Q3 2026

	• **Interaction with other Domains/IP:** Task 4, FP2, FP5 • **STIP Reference (if applicable):** STIP_73	

On board modularity and upgradeability

No	Deliverable	Milestone
05a	**On board modularity and upgradability**	Q3 2025
	Based on the results of SC 2.4. . Update of the System Architecture Definition of Train CS specific tasks and the associated updated Train CS Architecture. Continuation of the CCS-OB migration recommendations based on the result of SC 2.4Based on the results of the architecture work in train CS to include considerations of results of FRMCS V2 or cyber	
	•**Intermediate Milestones:**	
	• snapshot of System Architecture Definition, including revised content from Train CS remit groups and update on cybersecurity and FRMCS considerations	Q1 2026
	• updated of System Architecture Definition, including revised content from Train CS remit groups and update on cybersecurity and FRMCS considerations	Q3 2026
	•**Definition of Done:** : Achievement of defined milestones approved by SPCG and/or SPSG	
	• **Interaction with other Domains/IP: FP2 / CE / Safety /TCCS**	
	• **STIP Reference (if applicable): STIP 135**	
05b	On board modularity and upgradability	Q3 2026
	Identify current painpoints and cost/complexity drivers for CCS onboard updates (mainly SW changes, e.g. error corrections) and upgrades (including the migrations steps from SAD), Propose solutions or mitigations	
	•Intermediate Milestones:	
	• Identify main painpoints for updates and upgrades	Dec. 2025
	• Identify mitigations or solutions to these pain points	Q3 2026
	•Definition of Done: : Achievement of defined milestones approved by SPCG and/or SPSG	
	• Interaction with other Domains/IP: FP2 / CE / Safety /TCCS	
	• STIP Reference (if applicable): STIP 135	

Basic advanced safe train positioning: Full ASTP preparation, Odometry enhancement and Robustness clarification

No	Deliverable	Milestone
06	**Basic advanced safe train positioning: Full ASTP preparation, Odometry enhancement and Robustness clarification**	
	• **Description of Deliverable:** Basic ASTP aim to increase the current odometry performances, specify availability requirements and to prepare for the upgrade to Full ASTP. It includes objectives to: • - Modify the specified performance accuracy of distances measured on-board in a technology-agnostic manner , compatible with current odometry system in operation, and valid for basic and full ASTP. • - Clarify the “robustness” requirements of the odometry (based on the state of current odometry systems already in operation). The goal is to unambiguously specify under which conditions the performance requirements shall be fulfil and what the allowed degraded mode. Clear availability and reliability targets shall be defined, aligned on operational	

	needs. Additionally, efforts will be made to make the accuracy target model requirements more testable. • Create a test and validation concept for the ETCS odometry to define the conditions under which the performance has to be achieved as well as the methods to measure. This should consider also the different sensors currently in use. • Based on an agreed economic and technical approach, specify a. New standard “odometry output available for all OB systems specifying a first version of the new odometry output” b. interface taking into account user needs (e.g. potentially balise information) which shall be previously defined by Train CS and potential other consumers external to CCS-OB c. Finalization of EGNOS for Rail deliverable 3.3.1.3 • **Intermediate Milestones:** o CR agreed problem description for the next CCS TSI update and first input necessary for the CCM database of the agreed CR within the bundle o Mature solution proposal for each of the CR included in the CCM database o E4R deliverable 3.3.1.3 finalizes • **Definition of Done: Achievement of defined milestones** • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):** STIP_29, 68, 71	Dec. 2025 Feb 2026 Q3 2026

No	Deliverable	Milestone
07	**Multiple Display Concept** • **Description of Deliverable:** Train Display System – Multiple display system concept. Define Multiple DMI concept based on existing documents / information and specific topics. • **Intermediate Milestones:** o Document structure and properties in Polarion, identified task associated and detailed scope added o Continuation of Train CS Task Remit 10.3.3 from SC2.4. contract o Update Basic concept of Phase 2.4 (Basic concept of apportionment of the logic of applications for the “Multi Display System”) o Update Demonstrator requirements • **Definition of Done:** Document is approved at domain level and reviewed by SPCG • **Interaction with other Domains/IP:** TCCS • **STIP Reference (if applicable):** STIP_69	Q3 2026 Q4. 2025 Q1 2026 Q1 2026 Q2 2026

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity**	continuous

	• **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks i. STIP_29 - Basic advanced safe train positioning: Full ASTP preparation, Odometry enhancement and Robustness clarification (Train CS) ii. STIP_68 - Ethernet CCS consist network (full stack) iii. STIP_71 - Train interfaces enhancement iv. STIP_73 - Train interface adaption for integrity handling and train length / overall consist length o SUPPORT the following STIP related Deliverables/Tasks: i. STIP_8 Service Function Configuration (Phase 1) ii. STIP_174 (include or not? Sector opinion requested) Functional and technical impact from analysis of driving rules for freight trains iii. STIP_135 ETCS CR enhancements o LEAD/SUPPORT CCS onboard CR process: i. Definition and drafting of CR problem description, preassessment template, mature solution proposal for the different CCS CR that would be proposed by SP to ERA CCM process related to the technical scope of traffic CS ii. Review and opinion of any external CCS CR that would be received from ERA CCM process related to the technical scope of traffic CS iii. Review and opinion of Driving rules for ATO GoA2 for Freight and loco hauled trains	Cont. Cont.

Task 2 CCS: Domain Trackside Assets Control & Supervision

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Draft update of EU-RAIL Trackside Assets Specification

No	Deliverable	Milestone
01	**Draft EU-RAIL Trackside Assets Specification BL5** • **Description of Deliverable:** Draft update of the next baseline of the EU-RAIL Trackside Assets Specification, including error corrections and completion of backlog topics on specifications. The expected scope of the work to be considered in the preparation of the update is: o Update of SCI specifications according to the CRs as needed by Service Function Configuration o Backlog CR topics, such as enhanced support of multi-element controller o Update according to the needs identified by other domains, e.g. OD and Traffic CS o Enhancement of Test Catalogue specification • **Intermediate Milestones:** o BL5 scope drafted o BL5 scope agreed o BL5 first draft available • **Definition of Done:** BL5 first draft available and on track for publication in 2027 • **Interaction with other Domains/IP:** TCCS and OD/Traffic CS • **STIP Reference:** STIP_176	Q3 2026 Q1 2026 Q2 2026 Q3 2026

Handover generic documents to CONEMP Domain

No	Deliverable	Milestone

02	**Handover generic documents to CONEMP Domain** • **Description of Deliverable:** Generic specification documents for Service Function Diagnosis and Service Function Configuration are handed in an agreed and managed process to CONEMP Domain (was: Transversal Domain). All CRs are properly managed and full traceability between SP/EULYNX BL4R4 version of the documents and the new BL5 documents is ensured. Specification documents under responsibility of TACS (e.g. SDI information models and all SCI) are updated as needed to ensure consistency with generic documents (e.g. glossary/terminology). o Eu.Doc.77 Interface definition SDI o Eu.Doc.94 Interface specification SDI Generic o Eu.Doc.76 Interface definition and specification SMI • **Intermediate Milestones:** o Handover process agreed with CONEMP Domain o Handover completed • **Definition of Done:** All CRs are properly managed and full traceability between SP/EULYNX BL4R4 version of the documents and the new BL5 documents is ensured. • **Interaction with other Domains/IP:** TCCS • **STIP Reference (if applicable):** STIP_8, STIP_10	Q1 2026 Q4 2025 Q1 2026

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions.	

	○ Review the STIP and any applicable update considering Domain developments ○ LEAD the following STIP related Deliverables/Tasks . STIP_176 ○ SUPPORT the following STIP related Deliverables/Tasks: . STIP_8 - Service Function Configuration (Phase 1) i. STIP_9 - Service Function Configuration (Phase 2) ii. STIP_135 - ETCS CR enhancements iii. STIP_193- Requirements specification and C-ITS interface specification for subsystem Level Crossing. iv. STIP_194 - Use cases and requirement specification for different interfaces allowing information flow wayside to on-board	Cont. Cont.

Task 2 CCS: CONEMP Domain

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** ○ Remit Deliverables preliminary structure and detailed scope is defined in Polarion ○ Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. ○ Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Concept of Employment for CCS

No	Deliverable	Milestone
01	**Concept of Employment (CONEMP) for CCS** • **Description of Deliverable:** Re-use and integrate the existing artefacts (Traffic CS, Train CS, TCCS, CE, TACS) into one consistent overall CCS CONEMP. Harmonization scope for CONEMP processes defined, evaluated, prioritized and approved. Finalize Operational Analysis & process description of CONEMP processes in harmonization scope (Onboard & Trackside Elements). Define ambition level and harmonization scope for operational processes, link to CBOs and level of automation and ensure approval with stakeholders. In particular specify and complete exported constraints and requirements for external processes, such as	

	validated topo and engineering data, based on ERA-ontology. Ensure SL3-5 specification (capella, polarion) for transversal functions and computing environment is fully consistent with CCS CONEMP and update where needed.	
	• **Intermediate Milestones:**	
	○ Overall CCS CONEMP consolidated based on existing input	Q1. 2025
	○ Overall CCS CONEMP finalized and ambition level defined	Q2 2025
	○ Overall CCS CONEMP approved and released as ER-Rail internal publication	Q3 2026
	○ SL3-5 specifications for transversal functions updated as needed	Q4 2026
	• **Definition of Done:**. CONEMP harmonization scope evaluated and prioritisation approved. Stakeholder requirements defined and approved, all relevant operational processes [including precise actor roles] specified and approved, EU-RAIL internal publication of documents, and breakdown to SL3-5 specifications updated, SL4 functional allocation agreed with domains, overall consistency and traceability checked.	
	• **Interaction with other Domains/IP:** OD/Traffic CS, Train CS, TACS, Task 3 (TMS/CMS)	
	• **STIP Reference (if applicable):** -	

ERA-ontology extension for CCS

No	Deliverable	Milestone
02	**ERA-ontology extension for enabling the CCS/TMS Data Model**	Q3 2026
	Description of Deliverable: Update the contributions to extending and amending the ERA-ontology for enabling the derived CCS/TMS Data model according to the evolution of SP Domain specifications and based on feedback from current reference implementations of the model. Contribute to the extension of the ERA-ontology also for Diagnosis and ETCS-UI related data, in close cooperation with ERA TWG on Driver Route Book. Provide automated process for extension of ERA-ontology to ensure CCS/TMS Data model is fully derivable from ERA-ontology. Guide and support FP 1 TT in developing the planning data validation method and tooling for ERA-ontology (rdf).	
	• **Intermediate Milestones:**	
	○ ERA-ontology extension proposal delivered	Q1 2026
	○ CCS/TMS Data model updated as a resulting process of ERA-ontology extension	Q3 2026
	○ Planning data validation tooling reviewed, corrections and amendments proposed to ERJU	
	• **Definition of Done:** CCS/TMS Data model updated and derived from ERA-ontology, Planning data validation reviewed and amended	
	• **Interaction with other Domains/IP:** All system design domains, in particular Traffic CS, Task 3 (TMS/CMS), Task 4 (FDFTO/DAC), Task 5 (HERD), IP FP 1 TT (Data validation tooling prototype), IP FP2 i.e. WP27 and WP44/45	
	• **STIP Reference (if applicable):** STIP_11	

Service Function Diagnosis Specification

No	Deliverable	Milestone
03	**Service Function Diagnosis Specification**	Q3 2026

	• **Description of Deliverable:** Updated Service Function Diagnosis Specification (SL3-SL5) based on feedback from other SP System Design Domains and from reference implementations e.g. from the IP. Utilize the newly developed toolchain in close cooperation with EET to scale the approach for diagnostic product group models creation with other domains and tasks. Define/extend the data models for Computing Environment architecture (I1-CE) to Service Function diagnosis specification elements. Finalize handover of generic SDI documents from TACS in a controlled change management process with full traceability, to ensure full integration into SP environment and ERA-ontology for o Eu.Doc.77 Interface definition SDI o Eu.Doc.94 Interface specification SDI Generic	
	• **Intermediate Milestones:**	
	o Handover process agreed with TACS Domain	Q4 2025
	o Handover completed	Q1 2026
	o I1-CE requirements integrated	Q2 2026
	o Service Function Diagnosis Specification (SL3-SL5) updated	Q3 2026
	• **Definition of Done:** All CRs are properly managed and full traceability between SP/EULYNX BL4R4 version of the documents and the new BL5 documents is ensured. Service Function Diagnosis Specification (SL3-SL5) updated according to the feedback received from other SP system design domains or IP reference implementations. ERA-ontology extended for the needs of diagnosis. Backwards compatibility clarified and migration strategy defined if necessary	
	• **Interaction with other Domains/IP:** Safety and IP (FA1, FA2, FA3), Train CS, TACS, Traffic CS, Task 4 (FDFTO/DAC), Task 5 (HERD	
	• **STIP Reference (if applicable):** STIP_10	

Service Function Configuration Specification

No	Deliverable	Milestone
04	**Service Function Configuration Specification**	Q3 2026
	Description of Deliverable: Updated Service Function Configuration Specification (SL3-SL5) based on other SP System Design Domains and from reference implementations e.g. from the IP. Integrate CCS specific requirements from Computing Environment work (I1) to Service Function Configuration specification elements to cover CE use-cases (e.g. multistage deployment with separate preload and activation for each stage and Functional System deployment Rules (FSDR)). Requirements from shared security services fully integrated or covered. Finalize handover of generic SMI documents from TACS in a controlled change management process with full traceability to ensure full integration into SP environment and ERA-ontology for o Eu.Doc.76 Interface definition and specification SMI	
	• **Intermediate Milestones:**	
	o Handover process agreed with TACS Domain	Q4 2025
	o Handover completed and I1 requirements integrated	Q1 2026
	o Service Function Configuration Specification (SL3-SL5) updated	Q2 2026
	• **Definition of Done:** All CRs are properly managed and full traceability between SP/EULYNX BL4R4 version of the document and the new BL5 documents is ensured. Service Function Configuration Specification (SL3-SL5)	

	updated according to the feedback received from other SP system design domains or IP reference implementations. Backwards compatibility clarified and migration strategy defined if necessary. • **Interaction with other Domains/IP:** All system design domains, in particular Traffic CS, Safety and IP (FA1, FA2, FA3), Train CS, TACS, Traffic CS, • **STIP Reference (if applicable):** STIP_8	

Service Function Configuration Safety analysis

No	Deliverable	Milestone
05	**Service Function Configuration Safety analysis**	Q3 2026
	• **Description of Deliverable:** Finalize and approve Safety risk analysis for full configuration management process, identifying all hazards and risk acceptance criteria (Safety Requirements) and operational consequences / conditions and performance in line with the overall CONEMP process and SL5 specifications. • Note: To cover the end-to-end process, the risk analysis should also refer to the SRACs defined for engineering/configuration data of overall CCS system (or on lower subsystem level)	
	• **Intermediate Milestones:**	
	o Safety risk analysis updated	Nov 2025
	o All Safety Requirements and Operational Conditions identified and agreed	Q1 2026
	o Safety risk analysis approved by all impacted domains	Q2 2026
	• **Definition of Done:** PRAMS risk analysis decided on SP STG level as ERJU internal release • **Interaction with other Domains/IP:** Safety, TACS, OD/Traffic CS, Train CS • **STIP Reference (if applicable):** STIP_8	

Computing Environment specifications for I2 and I3

No	Deliverable	Milestone
06	**Computing Environment specifications for I2 and I3**	Q2 2026
	Description of Deliverable: Specifications of the Computing Environment interfaces I2 (hardware abstraction interface) and I3 (virtualization interface). Integration of artefacts into CONEMP and SL3-5 specifications of CONEMP Domain including full linking and traceability between the Polarion work items and Capella models. Finalize alignment with other system domains and release of SL5 specifications of I2 and I3.	
	• **Intermediate Milestones:**	
	o Polarion and capella artefacts aligned and linked with overall CONEMP Domain specification	Q4 2025
	o I2 and I3 requirements aligned with all system domains	Q1 2026
	o I2 and I3 specifications approved and submitted to SP STG	Q2 2026
	• **Definition of Done:** I2 and I3 decided on SP STG level as ERJU internal release • **Interaction with other Domains/IP:** Safety, TACS, OD/Traffic CS, Train CS, Cybersecurity	

	• **STIP Reference (if applicable):** STIP_4	

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks . STIP_8 - Service Function Configuration (Phase 1) i. STIP_10 - Service Function Diagnosis ii. STIP_11 – ERA-ontology extension and amendment enabling CCS/TMS Data Model iii. STIP_74 - ETCS related UI representation (including catalogue of symbols, rules, tools and guidelines o SUPPORT the following STIP related Deliverables/Tasks: . STIP_18 - Function distribution and Interface between TMS/TrafficCS i. STIP_29 - Basic advanced safe train positioning: Full ASTP preparation, Odometry enhancement and Robustness clarification (Train CS) ii. STIP_135 - TSI ETCS CR enhancements	Cont. Cont.

Task 3: TMS & CMS

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Function distribution and Interface between TMS/TrafficCS

No	Deliverable	Milestone
01	**Maintain Function distribution and Interface between TMS/TrafficCS** **Description of Deliverable:** Maintain document in case Traffic CS provides additional inputs. • Consistent splitting of the features of a Supervision system between the two systems (TMS and TrafficCS, functional allocation on System Level 3) which implement the former and finalization of the specification of the interface between TMS and TrafficCS, based on SCI-OP. Finish and maintain Capella model and linking with TrafficCS on System Analysis level. • **Intermediate Milestones:** o Maintenance of document (if applicable, Traffic CS provides additional inputs) o Maintenance of document (if applicable, Traffic CS provides additional inputs) o Maintenance of document (if applicable, Traffic CS provides additional inputs) o Maintenance of document (if applicable, Traffic CS provides additional inputs) • **Definition of Done:**. TMS/TCS Document is aligned with Traffic CS and other possible Task 2 related domains and in line with related operational capabilities harmonized in Operational Rulebook of OD/Traffic. • **Interaction with other Domains/IP:** Traffic CS, CONEMP Domain (TCCS+CE) • **STIP Reference (if applicable):** STIP_18	Q3 2026 Q4. 2025 Q1. 2026 Q2 2026 Q3 2026

Proposal for updates of the Telematics TSI

No	Deliverable	Milestone
02	**Proposal for updates of the Telematics TSI**	

	• **Description of Deliverable:** Functional enhancements for the Telematics TSI for Capacity Management as well as Traffic Management including harmonized processes, messages and data sources in the area of . rolling planning and framework agreements a. ticket sales and validation b. prioritisation rules based on socioeconomic modelling (for example conflict resolution / capacity congestion relief) c. harmonised approach recommendation on priority rules for traffic management d. harmonised rules and procedures for network cooperation between national Traffic Control Centers e. defining common tool for communication and cooperation scenarios and rules for incident management f. harmonised approach for common risk management g. harmonised procedures, reports and dashboards for post-analysis of delays **h.** definition of KPIs to assure a high data quality	
	• **Intermediate Milestones:** o Analysis of operational processes o Proposal of functional allocation and description o Specification drafted o CR bundle pre-assessment submitted	Q4/2025 Q1/2026 Q3/2026
	• **Definition of Done:** CR bundle pre-assessment submitted and agreed with ERA representatives • **Interaction with other Domains/IP: FA1** • **STIP Reference (if applicable): STIP16, STIP_2.0_173**	

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:**	

	• **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks . STIP_16 - Definition of functional enhancements for capacity management i. STIP_18 - Function distribution and Interface between TMS/TrafficCS ii. STIP_173 - Traffic Management based upon the "European Network Principles" o SUPPORT the following STIP related Deliverables/Tasks: . STIP_11 - CCS/TMS Data Model i. STIP_135 - ETCS CR enhancements ii. STIP_17 - Function distribution and Interface between TMS/CMS (with FP1)	Cont. Cont.

Task 4: DAC/FDFTO

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain** • **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

EU DAC Operational harmonisation

No	Deliverable	Milestone
01	**EU DAC Operational harmonisation** • **Description of Deliverable:**	Oct 2027

	– **EU DAC Rulebook,** encompassing provisions for degraded and emergency modes based on return of experience (REX) from training activities and the start of Pioneer-DAC-Trains (PDT) – Definition of a European DAC Rulebook Organization: an entity tasked with the development, maintenance, and dissemination of updates to the DAC Rulebook. This organization shall operate in alignment with ongoing technological developments and incorporate feedback from DAC Pioneer Trains and Full Deployment Trains. It is intended to succeed the existing FP5 systems and procedures organization upon the conclusion of the FP5 project. • **Intermediate Milestones:** o Degraded and emergency modes and extension to full deployment o Development of a concept of Digital Content Management System o First iteration of implementation of REX from training PDT • **Definition of Done:** DAC Rulebook incl. degraded and emergency modes; EU DAC Rulebook CMS concept • **Interaction with other Domains/IP:** Task 2 OD, FP5-TRANS4R-M • **STIP Reference (if applicable):** STIP_38	Jun 2026 Oct 2026 Dec 2026

FDFTO Central Instance (FCI)

No	Deliverable	Milestone
02	**FDFTO Central Instance (FCI)** • **Description of Deliverable**: data organization coherent with Federated Data Space as per following indications from FP1 *Motional* WP31 *Rail Data Space* • **Intermediate Milestones:** o Revision with stakeholders (EDDP, UIP, and others) • **Definition of Done:** SP Document is published • **Interaction with other Domains/IP:** FP5-TRANS4R-M, FP1-MOTIONAL (TT part) • **STIP Reference (if applicable):** STIP_47	June 2026 June 2026

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone

	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks i. STIP_38 - Operational standards ii. STIP_47 - FDFTO Central Instance (FCI) o SUPPORT the following STIP related Deliverables/Tasks: i. STIP_32: EN 18171 ii. STIP_33: New standard for electrotechnical equipment of freight wagons and locos equipped with automatic coupler iii. STIP_34: New standard for e-coupler and the electrical energy system of freight wagons and locos equipped with automatic coupler iv. STIP_35: EN 15839 update v. STIP_36: FDFTO Train Functions vi. STIP_37: Sufficient migration of the DAC vii. STIP_39: RID/ TSI WAG (EU) 321/2013 update viii. STIP_40: TSI WAG (EU) 321/2013 update ix. STIP_41: TSI Loc&Pas (EU) 1302/2014 update x. STIP_42: TSI Loc&Pas (EU) 1302/2014 update xi. STIP_43: EN 15227 update xii. STIP_44: TSI Loc&Pas (EU) 1302/2014 update xiii. STIP_45: EN 15663 update xiv. STIP_46: EN 15528 update xv. STIP_73: Train interface adaption for integrity handling and train length / overall consist length • **Definition of Done:** • **Interaction with other Domains/IP:** FP5-TRANS4R-M	Cont. Cont.

Task 5: Harmonised Diagnostics

DELIVERABLES

Management of Domain

No	Deliverable	Milestone
0	**Management of Domain**	

	• **Description of Deliverable:** Management activities to ensure that the below described deliverables are provided in form and time. • **Intermediate Milestones:** o Remit Deliverables preliminary structure and detailed scope is defined in Polarion o Kanban Board with expected tasks required for each Remit deliverable is set up in Polarion. o Reporting to SPCG and PMO based on detailed action report per task area (solved tickets) • **Definition of Done:** Planification, monitoring, intermediate and final reporting are done • **Interaction with other Domains/IP:** Coordination required with all domains. • **Preparation of the HDDI PoC implementation in Wave 1:** Start in SC2.6, to be continued in SC2.6, and to be completed by end of 2026.	Continuous task Nov. 2025 Q4 2025 Bi-Monthly

Harmonised Diagnostic Data Interface (generic document/template)

No	Deliverable	Milestone
01	**Harmonised Diagnostic Data Interface (generic document/template)** • **Description of Deliverable:** The purpose of HDDI is to ensure the compatibility of use-case specific data generated by different systems, suppliers and/or in different European countries to improve railway asset management and to generate sustainable benefits for all stakeholders. Each HDDI specification is generated for the specific use case. This generic document will be used as a template for future use case dependant specifications and will be continuously developed. It should not be published jet. • **Intermediate Milestones:** o Internal review o First revision • **Definition of Done:**. Template is released on the T5 share point • **Interaction with other Domains/IP: -** • **STIP Reference (if applicable):** STIP_164	Q4 2025 Nov 2025 Dec 2025

HDDI for wheel monitoring diagnostic data

No	Deliverable	Milestone
02	**HDDI for wheel monitoring diagnostic data** • **Description of Deliverable:** Specification of the HDDI for the wheels monitoring diagnostics using wayside train monitoring systems (WTMS). • **Intermediate Milestones:** o Implementation of the input from SDI-WTMS o Mirror group review o Final version • **Definition of Done:** Document is ready for SPCG review • **Interaction with other Domains/IP: SP/TT, IP/FP3**	Q3 2026 Q1 2026 Q2 2026 Q3 2026

	• **STIP Reference (if applicable):** STIP_165	

Investigation of the need of pantograph data harmonisation

No	Deliverable	Milestone
04	**HDDI for pantograph diagnostics (initial investigations)**	Q3 2026
	• **Description of Deliverable:** Collection of user requirements for the pantograph diagnostics using Check Points and Video Gates for the use case specification.	
	• **Intermediate Milestones:**	
	o Interviews with stakeholders are completed	Q4 2025
	o Stakeholder analysis done	Q3 2026
	• **Definition of Done:**. Document is released on the T5 share point	
	• **Interaction with other Domains/IP:**	
	• **STIP Reference (if applicable):** STIP_168	

Additional activity: Collaboration with Innovation Pillar FA3

No	Deliverable	Milestone
05	**FP3 WAVE 1: Deliver support to FP3/WP7 in Wave 1 (2026) for preparation of the HDDI-Demonstrator and PoC implementation**	12/2026
	• **Description of Deliverable:** ÖBB-Holding and ADIF, as member of SP-Task 5 (HERD), will start a new subtask in FP3/WP7.5.4 from 01/2026 until 11/2026 to prepare the input for the implementation of the HDDI (WTMS) demonstrator (PoC) in collaboration with FP3/WP7. This is a direct contribution to the FP3-targets (see next bullet-point below). Planned outcome by end of 2026: a. Definition of the interfaces to WP7 in terms of harmonisation of the diagnostic data in two UC: o WTMS o Pantograph monitoring **b.** Preparation of the time-schedule and alignment with the relevant stakeholders	
	• **Intermediate Milestones:**	
	a. Interfaces to FP3 WP7 in terms of harmonisation of the diagnostic data in two UC: o WTMS o Pantograph monitoring	Q3/2026
	• **Definition of Done:** PoC included in FA3 proposal for 2. call	
	• **Interaction with other Domains/IP: FP3**	
	• **STIP Reference (if applicable):** STIP_164 / _165	

Dissemination

No	Deliverable	Milestone
05	**Dissemination of the HERD outcome** • **Description of Deliverable:** Regular participation in international conferences. Join the IP-MID-Term conferences. Presentation in the Innotrans 2026. • **Intermediate Milestones:** o Identify the conferences and workshops as well as the people to present. o Presentation on the Innotrans 2026. • **Definition of Done:** mind. 3 presentations and HERD participation in Innotrans. • **Interaction with other Domains/IP:** • **STIP Reference (if applicable):**	Q3 2026 Q4 2025 Q3 2026

Ad Hoc

No	Deliverable	Milestone
99	**Ad Hoc Activity** • **Description of Deliverable**: There may be additional requests to be accommodated on an ad hoc basis, for example contribution to maturity checkpoint reviews of the Innovation Pillar • **Intermediate Milestones:** to be defined (if applicable) • **Definition of Done:** To be agreed with the SPCG • **Interaction with another Domains/IP:** to be defined (if applicable) • **STIP Reference (if applicable): -**	continuous

STIP TASKS

Collaboration with STIP related topics

No	Deliverable	Milestone
	Task Collaboration with STIP related topics • **Description of Deliverable:** • **Intermediate Milestones:** o Identification of activities and joint plan with related Tasks and Domains, o Description of foreseen actions. o Review the STIP and any applicable update considering Domain developments o LEAD the following STIP related Deliverables/Tasks i. STIP_162 - Definition of the HERD framework **- delivered** ii. STIP_163 - Framework Process of Accepting of new Use Cases for Harmonisation of Railway Diagnostic Data **- delivered** iii. STIP_164 - Harmonised Diagnostic Data Interface- Template iv. STIP_165 - HDDI for wheel monitoring diagnostic data	 Cont.

v. STIP_168 – HDDI for pantograph diagnostics

Annex VI – Call(s) for proposals 2026

EU-Rail has to deliver a high-capacity integrated European railway network by eliminating barriers to interoperability and providing solutions for full integration, covering traffic management, vehicles, infrastructure and services, aiming to achieve faster uptake and deployment of projects and innovations. That should exploit the huge potential for digitalisation and automation to reduce rail's costs, increase its capacity and enhance its flexibility and reliability, and should be based upon a solid reference functional system architecture shared by the sector, in coordination with the European Union Agency for Railways.

The European Green Deal objective is to reach climate neutrality by 2050, the Fit for 55 package sets medium-term greenhouse gas emissions reduction objectives, and the Digital Decade sets the path to bring Europe to the forefront of digitalisation and automation.

The Sustainable and Smart Mobility Strategy articulates the pathways towards digitalising and greening the transport sector and sets specific milestones for the railway sector.

The railway sector will contribute to those objectives by increasing its capacity for passenger and goods transport, enabling an increase in the use of rail transport, and by reducing further the greenhouse gas emissions of the railway sector itself.

In order to foster the transformation of the railway system, the EU encourages research and innovation with its new EU Framework Programme for Research and Innovation - Horizon Europe.

The objectives of EU-Rail have been set to address the EU policy objectives, rail sector vision, and the challenges inherent to the transformation of the rail system as set in its Master Plan[59] and Multi-Annual Work Programme[60].

In order to achieve the aforementioned objectives, EU-Rail performs its activities via calls for proposals and calls for tenders. The 2026 Call for Proposals is structured around one combined topic for Destination 6 and 7 and one topic for Destination 7.

- **Destination 6 – Regional Rail Services / Innovative rail services to revitalise capillary lines**. Regional railways are essential as a link to other transport services but also to serve Europe's regions, its citizen and businesses, which is why their long-term viability should be ensured. To this end, total costs of ownership are to be reduced while maintaining high service quality and operational safety. The concept to be developed will be tailored to the regional railways and will include digitalisation, automation, and the use of new and mainstream technologies.
- **Destination 7 – Innovation on new approaches for guided transport modes**. EU-Rail promote forward looking activities, tackling disruptive technologies and thinking, performing exploratory research to accelerate the pace towards radical system innovations in the guided transport modes and supporting the evolution of the Innovation Programme in scope and targets.

1. Call: HORIZON-JU-ER-2026-01

CONDITIONS FOR THE CALL

Indicative budget(s)

Call	Budgets (EUR million)	Deadline
	2026	

[59] Master Plan available at https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/

[60] MAWP available at https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/

HORIZON-JU-ER-2026- 01	6.1	07/05/2026
Minimum overall indicative budget	6.1	

By analogy with the Horizon Europe Work Programme call conditions, The EU-Rail Executive Director may decide to open the call up to one month prior to or after the envisaged date(s) of opening as well as may decide to delay the deadline(s) by up to two months. This provision apply to all call topics here-in detailed.

DESTINATIONS 6 & 7 – Regional rail services / Innovative rail services to revitalise capillary lines & Innovation on new approaches for guided transport modes

Topics	Type of Action	Expected EU contribution per project (EUR million)[61]	Number of projects expected to be funded
	Opening: 04/02/2026 Deadline(s): 07/05/2026		
HORIZON-JU-ER-2026-FA6/FA7-01	RIA	3.1	1
Overall indicative budget		3.1	

DESTINATION 7 – Innovation on new approaches for guided transport modes

Topics	Type of Action	Expected EU contribution per project (EUR million)[62]	Number of projects expected to be funded
	Opening: 04/02/2026 Deadline(s): 07/05/2026		
HORIZON-JU-ER-2026-FA7-01	RIA	3	1
Overall indicative budget		3	

[61] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

[62] Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

General conditions relating to this call	
Admissibility conditions	The conditions are described in part A of the Horizon Europe Work Programme 2026-2027 General Annexes
Eligibility conditions	The conditions are described in part B of the Horizon Europe Work Programme 2026-2027 General Annexes
Financial and operational capacity and exclusion	The criteria are described in part C of the Horizon Europe Work Programme 2026-2027 General Annexes.
Award criteria	The criteria included in part D of the Horizon Europe Work Programme 2026-2027 General Annexes are complemented with additional elements as specified in Annex VIII to this Work Programme.
Documents	The documents are described in part E of the the Horizon Europe Work Programme 2026-2027 General Annexes.
Procedure	The procedure is described in part F of the Horizon Europe Work Programme 2026-2027 General Annexes.
Legal and financial set-up of the Grant Agreements	The rules are described in part G of the Horizon Europe Work Programme 2026-2027 General Annexes, complemented by the call topic specific conditions

DESTINATION 6 AND DESTINATION 7 – REGIONAL RAIL SERVICES / INNOVATIVE RAIL SERVICES TO REVITALISE CAPILLARY LINES & INNOVATION ON NEW APPROACHES FOR GUIDED TRANSPORT MODES

HORIZON-JU-ER-2026-FA6/FA7-01: Innovation for regional rail services and new guided transport systems

Specific Conditions	
Expected EU contribution per project	EU-Rail estimates that an EU contribution of EUR 3.1 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.
Indicative budget	The total indicative budget for the topic is EUR 3.1 million. Applicant Private[63] Members of the EU-Rail part of consortia responding to this topic must provide in-kind contributions to additional activities to be declared via the template model available on the F&T portal. The amount of total in-kind

[63] As defined in Article 2(5) of Council Regulation (EU) 2021/2085.

	contributions (i.e. in-kind contributions for operational activities and in-kind contributions for additional activities) must be no less than 1.263[64] times the funding request, in aggregate, of these applicant Private Members. Any discrepancy must be well and duly justified. In this respect, the grant agreements will set, in principle, annual deliverable on in-kind contributions for the projects selected under this topic, as well as mandatory reporting requirements, for those applicants who are Private Members of EU-Rail.
Indicative project duration	42 months. This does not preclude submission and selection of a proposal with a different project duration.
Type of Action	Research and Innovation Action
Technology Readiness Level	Activities are expected to achieve a minimum between TRL 4 and TRL 6, depending on the enabler addressed, or higher by the end of the project – see part B of the Horizon Europe Work Programme 2026-2027 General Annexes for a guide to the TRL definitions and criteria to be used.
Admissibility conditions	Regarding admissibility conditions and related requirements, part A of the Horizon Europe Work Programme 2026-2027 General Annexes applies with the following exception: the limit for a full Research and Innovation Action application is set to 70 pages.
Contribution to the monitoring and implementation, standardisation of the EU-Rail Programme	Applicants are expected to deliver relevant information (data, results, etc.) as mutually agreed, to the JU and the Linked Project[s] to contribute to the advancement of the Innovation and System Pillars[65] activities, as well as in view of the development and implementation of EU policy and legislation (including Technical Specifications for Interoperability and Common Safety Methods) and the development of European standards. As specified in section 2.3.8.1 of the Work Programme, and to facilitate contributions to European or international standards, the EU-Rail grant agreements will include an additional information obligation related to standards. Beneficiaries must inform EU-Rail (up to four years after the end of the action) if the results can be reasonably expected to contribute to European or international standards.
Linked Projects	As specified in section 2.3.8.1 of the Work Programme, in order to facilitate the contribution to the achievement of the EU-Rail objectives, the options regarding 'linked actions' of the EU-Rail Model Grant Agreement and the provisions therein, is enabled in the corresponding EU-Rail Grant Agreements. The action that is expected to be funded under this topic will be complementary to the following projects: • FP6-FutuRe (GA number: 101101962) • FP7-Pods4Rail (GA number: 101121853) The action that is expected to be funded under this topic will be complementary to the actions that are expected to be funded under the following topics:

[64] In order to support a leverage factor of no less than the ratio between the contribution from members other than the Union and the Union financial contribution, as on the basis of Articles 88 and 89 of Council Regulation (EU) 2021/2085.

[65] Refer to the revised Multi-Annual Work Programme available https://rail-research.europa.eu/wp-content/uploads/2024/06/Annex_GB-Decision_08_24_Revised_MAWP.pdf

	• HORIZON-JU-ER-2025-FA1-TT-01: Network management planning and control & Mobility Management in a multimodal environment and Digital Enablers • HORIZON-JU-ER-2025-FA2-01: Digital & Automatic up to Automated Train Operations • HORIZON-JU-ER-2025-FA3-01: Intelligent & Integrated asset management • HORIZON-JU-ER-2025-FA4-01: A sustainable and green rail system • HORIZON-JU-ER -2025-FA6-01: Regional rail services / Innovative rail services to revitalise capillary lines Please note that the list is non-exhaustive as additional Linked Projects may follow at a later stage of the programme implementation to complement the activity.
Funding of only one project per topic	EU-Rail may award up to one project with funding depending on the outcome of the evaluation and the complementarity of the proposed actions.
Retroactive starting date of the grant	The starting date of grants awarded under this topic may be as of the submission date of the application. Applicants must justify the need for a retroactive starting date in their application. Costs incurred from the starting date of the action may be considered eligible.
Lump Sum grant	Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) – and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [[This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf]].
Award criteria additional details	The award criteria included in part D of the Horizon Europe Work Programme 2026 – 2027 General Annexes are complemented with additional criteria as specified in Annex VIII to this Work Programme.
Additional dissemination obligations	In addition, as specified in section 2.3.8.1 of the Work Programme, and to facilitate contributions to considering the key contributing role of this topic, in designing the dissemination and communication activities, the proposal shall consider that the project will be part of the overall EU-Rail Programme and to ensure coherence across the programme and alignment with Europe's Rail objectives will have to follow the Europe's Rail Communication and Dissemination Guidelines for Europe's Rail Funded Projects as described in the EU-Rail Governance and Process Handbook (https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/)

Expected Outcome

Building upon the results of S2R, Europe's Rail FP6-Future and Pods4Rail projects as well as EU-member states rail research and innovation activities, the action stemming from this topic is expected to contribute to provide sustainable, attractive and passenger centred solutions to regional and suburban areas by developing light weight and cost efficient rolling stock and an automated Multi-Modal Mobility-System with "moving infrastructures".

Workstream 1: Flagship Area 6 Rolling Stock cluster

Work-stream 1 aims at further developing a regional railway vehicle which is a small lightweight vehicle based on the results of EU-Rail FP6-Future[66], adapted according to numerous specific requirements influenced by the different lines and the corresponding categories of regional lines (e.g. topography, passenger capacity, etc.). The key objectives are the cost reduction and adaptation to the corresponding infrastructure of capillary lines (poor superstructure, narrow curves etc.). These factors have a high influence on the mechanical and electrical architecture of the vehicle and thus on the car body design and the running gears.

To ensure t alignment with the key objectives, close monitoring will be implemented using key performance indicators (KPIs). Within FA6 a set of High level KPIs has been identified, targeting the main impacts foreseen for the Flagship Area.

- Reduced vehicle CAPEX & OPEX through innovative and lighter design: The vehicles for low-density lines must be designed to deliver the service at these lines at a significant lower CAPEX/OPEX:
    - Targeting 50% reduced CAPEX and OPEX, in a LCC perspective.
- Notwithstanding the previous KPI, passenger vehicles development should aim for step changes in weight reduction and track force reduction, while being tolerant to higher unevenness of the tracks:
    - up to 60% for some parts of the vehicle and up to 30% of weight reduction for the vehicle.

Work-stream 2: Automated Multi-Modal Mobility-System with "moving infrastructures"

This work-stream should further develop an Automated Multi-Modal Mobility-System system design, based on the results of the EU-Rail Pods4Rail[67] project which defined the foundations for such a system. Design concepts for the Carrier on rail but also on road and conceptual design of a selected sample Transport Units, as well as for components and equipment for the Transport Units were drafted.

This work-stream should specify the technical requirements of the main subsystem of a pod system with specific focus on the Carrier, Transport Unit and the Handling System. The focus should remain on the railway application, however, intramodality should be ensured by considering road and ropeway carriers.

This workstream should further work on the development of the Mobility Management System already started in the Pods4Rail project and to further detail the technical basis for the autonomous operation of the system, including the investigation of system components of the Mobility Management System in a laboratory environment.

In addition, the political, economic, social, technical, legal and environmental (PESTLE) consideration of the realisation of a pods system should be assessed as well as developing concepts for integration into existing multimodal mobility environment.

Scope:

The project stemming from this topic should develop under the following capabilities the enablers and any other which may contribute to deliver the afore-mentioned expected outcome:

Workstream 1: Flagship Area 6 Rolling Stock cluster

This work-stream should develop a **virtual concept design** for lightweight modular regional vehicles for both G1 (Group 1: regional lines with significant connection with mainline) and G2 (Group 2 regional lines with no or limited connection with mainline) lines (TRL4/5) based on the technical parameters defined for solutions developed in FP6-Future D5.1[68] coming from additional requirements collected from regional rail operators and considering potential dual use operation (civilian and military

[66] https://rail-research.europa.eu/rail-projects/fp6-future/

[67] https://rail-research.europa.eu/rail-projects/pods4rail/

[68] https://rail-research.europa.eu/pages/fp6-future/deliverables

purposes). The virtualisation should focus on the following not extensive list of key vehicle components such as the car body, running gear and powertrain.

- Car body
  - virtual model of the car body concept using a cost-effective, sustainable and lightweight design approach which also considers the use of e.g. multi material design and fiber reinforced polymers with specific focus on mechanical performance (e.g. according to EN 12663), crash-worthiness (e.g. according to EN 15227) and functional structure e.g. by 3D printing (combine weight reduction with vehicle functions). The comparison between a design for G1 lines and G2 lines (e.g. for G2 without crash scenario with different trains) is intended here to analyse potential lightweight construction and cost-saving potentials of this application-specific design. Input for the activities must be based from public Deliverables of FP6-FutuRe D5.1
  - virtual model of selected component (e.g. front end cab) made of innovative materials (e.g. with natural fiber reinforced polymers) with new production technologies (e.g. based on tooling technologies with additional use of sustainable materials).
- Running gear
  - Based from public Deliverables of FP6-FutuRe D5.1, for G1 application, virtual model of the relevant mechanical part of steering, track-friendly, requirement adapted, highly integrated motorized single axle running gear supporting vehicles by implementing active suspension systems with and without compressed air system.
- Powertrain
  - Based on the activities carried out in FP6, further develop virtual model of the drivetrain incl. range-extender solutions (modular, scalable energy storage system, hydrogen system, power electronics, traction machines) for optimising energy requirements for G2 lines taking into account the interface to the battery recharging infrastructure and their locations. Variable auxiliary loads (e.g. heating, air conditioning and compressed air) should be included in the system design and energy functions for different operating conditions defined, considering several different conditions such as altitude, distance and temperature.

The action should demonstrate the safety with an appropriate safety assessment method. In addition, it shoulddemonstrate the benefit deriving from the new vehicle concept on Society Reediness (SR), on weight and energy consumption reduction as well as on cost saving both for CAPEX and OPEX in a quantitative manner. The results should support European standardisation activities to ensure a broad market uptake coming from the new vehicle concept.

Develop, test and validate the following **components** considering a small vehicle concept for G1 lines up to intended environment:

- Based on the virtual concept design, validation of the mechanical lightweight performance of a representative, structural section of the car body in the highly loaded area above the running gear including destructive tests on a test bench. (TRL4/5);
- Based on the virtual concept design, physical Demonstrator with alternative materials as a significant part of the front end cab (TRL4/5);
- Validation of selected vehicle dynamic performance indicators of the single axle running gear concept supporting vehicles without compressed air system to be realised by 1:5 scale model of the running gear to be tested on a scaled roller rig. In addition, the advantage of active wheelset steering to be demonstrated and validated. Comparison with the simulated performance in the virtual demonstration. (TRL4/5);
- Physical demonstration of a running gear with independent rotating wheels (TRL6);
- Test the battery electric solutions for the powertrain incl. range-extender solutions for situations where the availability of charging stations is limited and longer range than

batteries can offer is needed. The tests should include traction machines, power electronics and electric energy storage to verify the energy savings and the benefit of split power traction machines and regenerative energy capacity with respect to the charge level dependent power limitation of the electrical energy storage which will be carried out in a test bench with the use cases defined in D10.1. (TRL4/5).

Work-stream 2: Automated Multi-Modal Mobility-System with "moving infrastructures

- Development of the Carrier:
    - Detailed specification and interface definition for Carrier-Components, e.g., running gear, energy supply, drive technology, and equipment for autonomous driving, further enhance the concept design based on the preliminary work of Pods4Rail (TRL3);
    - Safety study on "Active versus passive safety" for Rail carrier for structural design to derive recommendations also for lightweight design;
    - Due to the intermodal aspect for the pod system, design validation of the carriers for ropeway, road and rail based on structural boundary conditions should be carried out (TRL 3).
- Development of the Transport Unit (TU)
    - Study on manufacturing conditions and processes e.g. additive technologies and sustainable materials for different TU based on the design concept developed in Pods4Rail and based on the safety aspects and most promising use cases based on the preliminary work of Pods4Rail;
    - Development and simulation of the TU structure using sustainable materials in lightweight design considering the load cases based on the preliminary work of Pods4Rail (TRL3/4);
    - Validation of mechanical design, safety aspects, ergonomics and user experience for one passenger Transport Unit (TRL4).
- Detailed requirement definition for a multipurpose handling system taking into consideration the work carried out in Pods4Rail (TRL 3/4).
- Validation of different loading scenarios in industrially relevant environment, such as joint loading with a passenger and cargo TU, interface design positioning tolerances and coupling system design (using a real scale Transport Unit Mock-Up) (TRL5).
- Mobility Management System and automation
    - Optimised and high-performance Pods operational management for intermodal environment (such as rail and road) and communication (TRL3/4);
    - Digital maintenance planning of the TU, Carrier, Handling Systems, location for storage and infrastructure with the consideration of digital maintenance planning and results from asset condition assessment and predictive maintenance coming from Flagship Area 3 for operations management (TRL3/4);
    - Operational flow analysis concept integrating pod systems into the intermodal transportation environment rail, road and ropeway.
- PESTLE analysis
    - Design concept study for intermodal connectivity at stations, hubs and logistical hubs, especially for rail, road and ropeway (TRL2);
    - Proposal for industrial roadmap for Transport Unit;

- Characterisation of the normative framework and discussion of the boundary conditions to be created for the realisation of a pod system, based on the "Legislative and normative framework analysis" from Pods4Rail (D3.1) [69];
- Reevaluate the work done in Pods4Rail (D4.3) [70] based on the pods system defined within the project and further detail the economic analysis of the system;
- Reevaluate the work done in Pods4Rail (D5.1 and D5.2) [71] based on the pods system defined within the project and develop quantitative Business Case Studie(s);
- Carry out an environmental impact assessment based on the benefit that the pods system brings to an intermodal transport network;
- Develop a system architecture for the overall pods system including subsystem; description and the interfaces between the subsystems based on Pods4Rail results (D2.1) and based on developed requirements and specification defined in the project. System architecture shall be assessed against key customer criteria: reliability, efficient handling, affordability, accessibility, comfort.

Key Performance Indicators

Work-stream 1 should actively contribute to measure and monitor the specific quantitative KPIs as defined in the expected impact, including its contribution to the Europe's Rail Master Plan impacts. Outcomes are to be delivered at a calendar annual basis by each year end.

Collaboration work required with other Destinations

Work-stream 1 should foresee activities/tasks related to the regional rail architecture and integrated demonstration concept to the actions to be funded under HORIZON-JU-ER-2025-FA6-01.

Interaction with the System Pillar

The System Pillar aims to guide, support and secure the work of the Innovation Pillar (i.e. to ensure that research is targeted on commonly agreed and shared customer requirements and operational needs, compatible and aligned to the system architecture), and the Innovation Pillar will impact the scope of the System Pillar where new technologies or processes mean that innovations can drive a change in approach, as well as delivering detailed specifications and requirements. In this respect, the proposal should allocate necessary resources that would be dedicated to areas linked to the System Pillar conceptual and architecture works – particularly addressing specification development and demonstration activities following architectural aspects.

The alignment of the activities will primarily take place during the Grant Preparation Phase and ramp up phase of the awarded proposal, and there will be continued, structured and regular interaction through the life of the project.

The action should actively contribute to the update of the EU-Rail Standardisation and TSIs input plan (STIP) wherever relevant. Similarly, the action should contribute to the development and implementation of EU policy and legislation including Technical Specifications for Interoperability (especially input on weight reduction impacting the TSI LOC and PASS) and Common Safety Methods, as well as to publications of the System Pillar.

Gender dimension

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Other

[69] https://pods4rail.eu/#deliverables
[70] https://pods4rail.eu/#deliverables
[71] https://pods4rail.eu/#deliverables

It is expected that the project stemming from this topic:

- will involve sufficient European geographical representation of academia and ensure that all needed expertise for the described activities reflects the Special skills and/or capabilities expected from the Applicant(s) as described in the specific topic conditions.
- will be compliant with the EU Data Policy 2020 and associated legal instruments. This requires adherence to EU framework, including but not limited to the Open Data Directive (EU) 2019/1024 and associated implementing Regulation (EU) 2023/138 on high-value data sets, the Data Governance Act (Regulation (EU) 2022/868), the Data Act (Regulation (EU) 2023/2854), and the Interoperable Europe Act (Regulation (EU) 2024/903). Ensuring compliance involves verifying that data management, processing and sharing comply with applicable EU framework.
- will consider the necessary resources – FTE and/or other – to ensure the monitoring of the project via regular reporting, reporting of data for the Programme KPIs, etc. The EU-Rail Governance and Process Handbook is available here for more information: https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/

DESTINATION 7 Innovation on new approaches for guided transport modes

Based on current trends and forecasts, the number of passengers will significantly increase in the upcoming decades, and the existing transport modes may face capacity limitations without infrastructure investments. Emerging technology for guided transport systems could be a complementary solution for the increased demand, increasing also the availability of sustainable transportation solutions. Hyperloop technology could be a promising alternative, since it promises very high-speed travel with low energy needs while relying on electricity.

Hyperloop is an unconventional fast track-bound transport system based on magnetic levitation and with “capsules” movement inside a vacuum tube. To ensure the applicability of this system, the safety level of this system should be demonstrated and had to be proven that this solution is at least as safe as the existing modes of transport such as rail or aviation. This call aims to develop the safety requirements, method and guidelines as well as identify certification processes which can be applied overall in Europe. In addition, it should validate some key safety components of the hyperloop system based on the defined safety guidelines which can directly support the CEN/CLC-JTC20 activities. The action will collaborate closely with CEN/CLC/JTC 20 “Hyperloop” and other relevant technical committees (e.g. CEN/TC 256, CLC/TC 9X, CEN/TC 391, ISO/TC 292) to support the definition of safety and performance requirements.

HORIZON-JU-ER-2026-FA7-01: Safety and certification guidelines and demonstration of safety components for hyperloop

Specific Conditions	
Expected EU contribution per project	EU-Rail estimates that an EU contribution of EUR 3 million would allow these outcomes to be addressed appropriately. Nonetheless, this does not preclude submission and selection of a proposal requesting different amounts.

Indicative budget	The total indicative budget for the topic is EUR 3 million. Applicant Private[72] Members of the EU-Rail part of consortia responding to this topic must provide in-kind contributions to additional activities to be declared via the template model available on the F&T portal. The amount of total in-kind contributions (i.e. in-kind contributions for operational activities and in-kind contributions for additional activities) must be no less than 1.263[73] times the funding request, in aggregate, of these applicant Private Members. Any discrepancy must be well and duly justified. In this respect, the grant agreements will set, in principle, annual deliverable on in-kind contributions for the projects selected under this topic, as well as mandatory reporting requirements, for those applicants who are Private Members of EU-Rail.
Indicative project duration	36 months. This does not preclude submission and selection of a proposal with a different project duration.
Type of Action	Research and Innovation Action
Technology Readiness Level	Activities are expected to achieve a TRL 4 sub-system validation– see part B of Horizon Europe Work Programme 2026-2027 General Annexes for a guide to the TRL definitions and criteria to be used.
Admissibility conditions	Regarding admissibility conditions and related requirements, part A of the Horizon Europe Work Programme 2026-2027 General Annexes applies, with the following exception: the limit for a full Research and Innovation Action application is set to 70 pages.
Special skills and/or capabilities expected from the Applicant(s)	Applicants should ensure that their proposals and consortium reflect the aggregated expertise to perform the activities and achieve the objectives set by the topic. This includes but is not limited to technical, engineering and operational competencies. The applicants are expected to gather and reflect expertise from hyperloop technology providers and promoters, European Research Institutes, rail stakeholders to encompass Knowledge and vision on hyperloop solutions, bring the necessary expertise to deliver a design of concept and subsystem validation as well as contribute to the process of innovation. In additional, expertise on system engineering, certification and safety management processes as well as knowledge on standardisation, regulatory aspects and risk analysis are required.
Funding of only one project per topic	EU-Rail may award up to one project with funding depending on the outcome of the evaluation and the complementarity of the proposed actions.
Contribution to the monitoring and implementation, standardisation, of the EU-Rail Programme	Applicants are expected to deliver relevant information (data, results, etc.) as mutually agreed, to the JU to contribute to the advancement of the Innovation and System Pillars[74] activities, as well as in view of the development and implementation of EU policy and legislation (including Technical Specifications for Interoperability and Common Safety Methods) and the development of European standards. As specified in section 2.3.8.1 of this Work Programme, and to facilitate contributions to European or international standards, the EU-Rail grant agreements will include an additional information obligation related to standards. Beneficiaries must inform EU-Rail (up to four years after the end

[72] As defined in Article 2(5) of Council Regulation (EU) 2021/2085.

[73] In order to support a leverage factor of no less than the ratio between the contribution from members other than the Union and the Union financial contribution, as on the basis of Articles 88 and 89 of Council Regulation (EU) 2021/2085.

[74] Refer to the Multi-Annual Work Programme available at https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/europes-rail-key-documents/

	of the action) if the results can be reasonably expected to contribute to European or international standards.
Linked Projects	As specified in section 2.3.8.1 of the Work Programme, in order to facilitate the contribution to the achievement of the EU-Rail objectives, the options regarding 'linked actions' of the EU-Rail Model Grant Agreement and the provisions therein, is enabled in the corresponding EU-Rail Grant Agreements. The action that is expected to be funded under this topic will be complementary to the following projects: • Hyper4Rail (GA 101196142)
Retroactive starting date of the grant	The starting date of grants awarded under this topic may be as of the submission date of the application. Applicants must justify the need for a retroactive starting date in their application. Costs incurred from the starting date of the action may be considered eligible.
Lump Sum grant	Eligible costs will take the form of a lump sum as defined in the Decision of 7 July 2021 authorising the use of lump sum contributions under the Horizon Europe Programme – the Framework Programme for Research and Innovation (2021-2027) - and in actions under the Research and Training Programme of the European Atomic Energy Community (2021-2025). [This decision is available on the Funding and Tenders Portal, in the reference documents section for Horizon Europe, under 'Simplified costs decisions' or through this link: https://ec.europa.eu/info/funding-tenders/opportunities/docs/2021-2027/horizon/guidance/ls-decision_he_en.pdf
Award criteria additional details	The award criteria included in part D of the Horizon Europe Work Programme 2026-2027 General Annexes are complemented with additional criteria as specified in Annex VIII to this Work Programme.
Additional dissemination obligations	In addition, as specified in section 2.3.8.1 of the Work Programme, and to facilitate contributions to considering the key contributing role of this topic, in designing the dissemination and communication activities, the proposal shall consider that the project will be part of the overall EU-Rail Programme and to ensure coherence across the programme and alignment with Europe's Rail objectives will have to follow the Europe's Rail Communication and Dissemination Guidelines for Europe's Rail Funded Projects as described in the EU-Rail Governance and Process Handbook (https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/)

Expected outcome:

The Project stemming from this topic should address all the following work streams and is expected to provide the associated outcomes:

Work-stream 1: Safety and certification guidelines support

Safety is an indispensable element for the development and operation of any mass public transport system. In this regard, for the hyperloop system it is an even more essential part given it is a new proposed transport mode, not only for gaining public acceptance but firstly to ensure the demonstration of the safety and reliability for this potentially new unconventional fast track-bound transport mode operating in a low-pressure environment. This workstream aims to propose safety guidelines and safety and performance requirements to support future European standardisation activities. This is in view of

analysing common safety target and methodology for the proposed hyperloop technology. Results available from the EU-Rail Hyper4Rail[75] should be also considered within this work-stream.

As hyperloop is considered as a cross-border transport solution, there is a need for a consistent and harmonised safety framework. This workstream should specify regulatory requirements and certifications procedures for hyperloop with close collaboration with CEN/CLC/JTC2076 and other relevant technical committees (e.g. CEN/TC 256, CLC/TC 9X, CEN/TC 391, ISO/TC 292) while considering safety practices from existing transport modes such as rail and aviation.

Work-stream 2: Functional validation of safety components for hyperloop

Key hyperloop technologies should be validated in laboratory environment against the proposed safety requirements and procedures developed in Work-stream 1, so that their compliance can be assessed and open points of the proposed safety parameters can be potentially closed with the results of the testing activities. In addition a full proof of concept should be developed and tested to validate safety requirements and should demonstrate that certification procedures developed in Work-stream 1 can be successfully applied and verified in practice. This approach can further support the hyperloop promoters to pave the way to a creation of a solid regulatory framework for a unconventional fast track-bound transport mode.

Scope

To successfully address the expected outcomes, the action to be funded under this topic should research, develop, and deliver upon all following research activities :

Work-stream 1: Safety and certification guidelines support

Within Work-stream 1 the following research activities should be carried out:

- Definition of proposals for technical safety requirements
    - Analyse the safety needs of the hyperloop technology following and supporting the work done in CEN/CLC/JTC20;
    - Collect best practices and data from the implementation of transport systems;
    - Benchmark existing safety regulatory requirements of other transport modes and define the commonalities;
    - Propose possible technical safety requirements related to infrastructure, design, operational protocols and system reliability for hyperloop systems for both passenger and freight in view of contributing to the prEN 18166:2025;
    - Specify a detailed list of possible safety requirements at the level of sub-system and component defined in the action.
- Development of a technical safety guideline proposal and input to standards:
    - Analyse the system architecture defined in Hyper4Rail and EN 17930:2024 and specify a list of key sub-system and components relevant for safety and propose a detailed system definition for future European standards;
    - Carry out a sensitivity analysis of performances/operations and safety requirements for the hyperloop system with the aim to identify the target safety level based on results coming from Hyper4Rail;
    - Analyse the safety practices from existing transport modes such as rail and aviation and propose a common risk assessment approach for risk mitigation;

[75] https://rail-research.europa.eu/rail-projects/hyper4rail/

[76] https://standards.cencenelec.eu/dyn/www/f?p=205:7:0:::FSP_ORG_ID:2739090&cs=182927FD714A2A1F4116CCDD5C71BFF46

- Identify and collect hazards built on the work done in Hyper4Rail and establish a safety method taking into account safety methods from other existing transport modes such as rail and aviation;
- Recommendations for a common safety method for operations and maintenance of the hyperloop system including methods to verify compliance with the technical safety requirements;
- Consultation with relevant regulatory bodies and collaboration with CEN/CLC/JTC20 and if relevant with other relevant technical committees (e.g. CEN/TC 256, CLC/TC 9X, CEN/TC 391, ISO/TC 292);

- Develop a Certification Roadmap proposal:
  - Identify the legal requirements and processes for certification of future hyperloop solutions based on experience from existing transport solutions;
  - Develop a roadmap including timelines, estimated costs (taking into account also the tests performed in WS2), and high-level designs of necessary certification facilities based on the hyperloop concept developed in Hyper4Rail;
  - Propose a basic decision-making structure (Including the possibility of using existing regulatory bodies EASA, ERA) leading to the authorisation of running operation in Europe of the hyperloop new potential transport system: on regulatory, standard and industry standard levels;
  - Consultation process with regulatory bodies: EASA, ERA, and others applying relevant regulations.

Work-stream 2: Functional validation of safety components for hyperloop

Within work-stream 2 the following research activities should be carried out:

- Functional validation of key technologies, components, and subsystems critical for passenger safety in laboratory environment (TRL4), with at least:
  - Validation of control command and signalling system with special focus on the communication aspects in low frequency but high density environment;
  - Validation of at least 2 key components of the vehicle (e.g. braking systems or traction bogies) in a low pressure environment;
  - Validation of the functional interface for passenger exchange door on board the vehicle / platform screen door for passengers exit station.
- Validation of the above systems according to the defined requirements and means of verification developed in work-stream 1 and testing activities performed in view of addressing the open point identified in wok-stream 1 .Design of the procedure and test environment needed to validate all safety requirements and to apply and verify the certification process defined in work-stream 1.

Gender dimension

In this topic the integration of the gender dimension (sex and gender analysis) in research and innovation content is not a mandatory requirement.

Other

It is expected that the project stemming from this topic:

- will be compliant with the EU Data Policy 2020 and associated legal instruments. This requires adherence to EU framework, including but not limited to the Open Data Directive (EU) 2019/1024 and associated implementing Regulation (EU) 2023/138 on high-value data sets,

the Data Governance Act (Regulation (EU) 2022/868), the Data Act (Regulation (EU) 2023/2854), and the Interoperable Europe Act (Regulation (EU) 2024/903). Ensuring compliance involves verifying that data management, processing and sharing comply with applicable EU framework.

- will consider the necessary resources – FTE and/or other – to ensure the monitoring of the project via regular reporting, reporting of data for the Programme KPIs, etc. The EU-Rail Governance and Process Handbook is available here for more information: https://rail-research.europa.eu/about-europes-rail/europes-rail-reference-documents/functioning-of-the-europes-rail-ju/

Annex VII – List of private Members (other than the European Union) of the Europe's Rail Joint Undertaking[77]

NAME OF PRIVATE FOUNDING MEMBER	REGISTRATION DETAILS
Administrador de Infraestructuras Ferroviarias (ADIF), Entidad Pública Empresarial	public corporate company registered under Spanish law (registration number: Q2801660H), with its registered office at Calle Sor Ángela de la Cruz, 3, 28020 Madrid, Spain
Alstom Transport SA	registered under French law (registration number 389 191 982), with its registered office in 48, rue Albert Dhalenne, 93482 Saint-Ouen, France
ANGELRAIL consortium led by MER MEC S.p.A.	registered under Italian law (registration number: 05033050963), with its registered office in Via Ob70, 70043 Monopoli (BA), Italy
AŽD Praha s.r.o.	registered under Czech law (registration number: 48029483), with its registered office in Žirovnická 3146/2, Záběhlice, 106 00, Praha 10, Czech Republic
Construcciones y Auxiliar de Ferrocarriles, S.A. (CAF)	registered under Spanish law (registration number: Volume 983, Folio 144, Sheet number SS-329, entry 239ª), with its registered office in calle José Miguel Iturrioz nº 26, 20200, Beasain (Gipuzkoa), Spain
Asociación Centro Tecnológico CEIT	registered under Spanish law (registration number: 28/1986 Registry of Associations of the government of the autonomous community of the Basque Country), with its registered office in Paseo Manuel Lardizabal, nº 15. Donostia-San Sebastián, Spain
České dráhy, a.s.	registered under Czech law (registration number: 70994226, entered in the Commercial Register kept by the Municipal Court in Prague, section B, insert 8039), with its registered office in Prague 1, Nábřeží L. Svobody 1222, postal code 110 15, Czech Republic
Deutsche Bahn AG	established in Potsdamer Platz 2, 10785 Berlin, Germany

[77] Please note that THALES SIX GTS France SAS terminated its membership in EU-Rail on 24 July 2025.
This results from Art. 8.3 of the SBA which stipulates that the termination of membership becomes effective and irrevocable six months after its notification to the Executive Director of EU-Rail. THALES termination notice was sent by e-mail received onon 24 January 2025.

NAME OF PRIVATE FOUNDING MEMBER	REGISTRATION DETAILS
Deutsches Zentrum für Luft- und Raumfahrt e.V. (DLR)	registered under German law (registration number: VR 2780 at Amtsgericht Bonn), with its registered office in Linder Höhe, 51147 Cologne, Germany
European Smart Green Rail Joint Venture (eSGR JV), represented by Centro de Estudios de Materiales y Control de Obra S.A (CEMOSA)	registered under Spanish law (registration number: A-29021334), with its registered office in Benaque 9, 29004 Málaga, Spain
Faiveley Transport SAS	registered under French law (registration number 323 288 563 RCS Nanterre), with its registered office in 3, rue du 19 mars 1962, 92230 Gennevilliers, France
Ferrovie dello Stato Italiane S.p.A. (FSI)	registered under Italian law (registration number: R.E.A. 962805), with its registered office in Piazza della Croce Rossa 1, 00161 Roma, Italy
Hitachi Rail STS S.p.A.	registered under Italian law, registration number R.E.A. GE421689, with its registered office in Genova, Italy
INDRA SISTEMAS S.A & PATENTES TALGO S.L.U.:	
INDRA SISTEMAS S.A.	registered under Spanish law (registration number: A-28599033), with its registered office in Avenida de Bruselas nº 35, 28108 Alcobendas, Madrid, Spain
PATENTES TALGO S.L.U.	registered under Spanish law (registration number: B-84528553), with registered office in Paseo del tren Talgo, nº 2, 28290 Las Rozas de Madrid, Madrid, Spain
Jernbanedirektorate (Norwegian Railway Directorate)	established in Biskop Gunnerus gate 14A, 0185 Oslo, Norway
Knorr-Bremse Systeme für Schienenfahrzeuge GmbH	registered under German law (registration number: HRB91181), with its registered office in Moosacher Str. 80, 80809 München, Germany
Österreichische Bundesbahnen-Holding Aktiengesellschaft (ÖBB-Holding AG)	registered under Austrian law (registration number: FN 247642f), with its registered office in Am Hauptbahnhof 2, 1100 Wien, Austria
Polskie Koleje Państwowe Spółka Akcyjna (PKP)	registered under Polish law (registration number: 0000019193), with its registered office in Aleje Jerozolimskie 142A, 02-305 Warszawa, Poland
ProRail B.V. & NS Groep N.V.	
ProRail B.V.	registered under Dutch law (registration number: 30124359), with its registered office at Moreelsepark 3, 3511 EP, Utrecht, The Netherlands
NS Groep N.V.	registered under Dutch law (registration number: 30124358), with its registered office at Laan van Puntenburg 100, 3511 ER, Utrecht, The Netherlands
Siemens Mobility GmbH	registered under German law (registration number HRB 237219), with its registered office in Otto-Hahn-Ring 6, 81739 Munich, Germany
Société nationale SNCF, société anonyme	registered under French law (registration number: 552 049 447), with its registered office in 2 Place aux Étoiles, 93200 Saint-Denis, France

NAME OF PRIVATE FOUNDING MEMBER	REGISTRATION DETAILS
Strukton Rail Nederland B.V.	registered under Dutch law (registration number: 30139439 Chamber of commerce Utrecht), established in Westkanaaldijk 2, Utrecht Postbus 1025, 3600 BA Maarssen, The Netherlands
Trafikverket, a Public Sector Body	registered under Swedish law (registration number: 202100-6297), with its registered office in 781 89 Borlänge, Sweden
Voestalpine Railway Systems GmbH	registered under Austrian law (registration number: FN 126714w), with its registered office in Kerpelystrasse 199, 8700 Leoben, Austria

NAME OF ASSOCIATED MEMBER[78]	REGISTRATION DETAILS
Frequentis AG	Joint-stock corporation established under Austrian law, with its registered office in InnovationsstraBe 1, 1100 Vienna, Austria
ACCIONA Construcción S.A	Private company established under Spanish law (tax number A81638108) with its registered office in Calle Mesena 80-28003 Madrid, Spain
Kontron Transportation GmbH	Limited liability company established under Austrian law, with its registered office in Lehrbachgasse 11, A-1120 Vienna, Austria
IP – Infraestruturas de Portugal S.A.	Alliance of 8 organisations represented by IP – Infrastruturas de Portugal S.A.: - IP-Infrastruturas de Portugal S.A.: public limited company established under Portuguese law, with its registered office in Praça da Portagem, 2809-013, Almada, Portugal - CP – Comboios de Portugal, EPE: public corporate entity established under Portuguese law, with its registered office in Calçada do Duque, Nº 20 1249-109, Lisboa, Portugal - Evoleo Technologies, Lda.: limited liability company established under Portuguese law, with its registered office in Rua Gonçalo Mendes da Maia 1350 1ºH, 4425-656, Maia, Portugal ISQ - Instituto de Soldadura e Qualidade: non-profit private legal entity of public utility established under Portuguese law, with its registered office in Taguspark, Talaíde, Av. Prof. Dr. Cavaco Silva, 33, 2740120, Porto Salvo, Portugal ISEP – Instituto Superior de Engenharia do Porto: institution established 242 243 Rua Dr. António Bernardino de Almeida, 431, 4249-015, Porto, Portugal - IST – Instituto Superior Técnico: public institution of higher education, with its registered office in Avenida Rovisco Pais, 1, 1049-001, Lisboa, Portugal

[78] The list of Associated Members is the result of the "Call for expression of interest with a view to selecting associated members with the potential to contribute to the achievement of the objectives of the Europe's Rail Joint Undertaking" adopted by the Governing Board on 21 June 2024 (GB Decision n° 09/2024).

	- SOLVIT, Innovation & Development on Telecommunications, Lda.: private company established under Portuguese law, with its registered office in Rua de Baixo de São Pedro, 37, 9700-025, Angra do Heroísmo, Portugal - Universidade do Porto, through Faculdade de Engenharia do Porto: public foundation established under Portuguese law, with its registered office respectively in Praça Gomes Teixeira, s/n, 4099-002, Porto, and Rua Dr. Roberto Frias, s/n 4200-465, Porto, Portugal
XLAB d.o.o	Alliance of 3 organisations represented by XLAB d.o.o.: - XLAB d.o.o.: limited liability company established under Slovenian law, with its registered office in Pot za Brdom 100, Ljubljana, Slovenia - Vías y Construcciones S.A. (VIAS): private company established under Spanish law, with its registered office in Avenida Camino de Santiago 50, Fuencarral-El Pardo 28050, Madrid, Spain - Slovenske železnice (SZ): national operator, established in Kolodvorska 11, Ljubljana, Slovenia

Annex VIII – 2026 Call for proposals – Evaluation Criteria

Part D of the Horizon Europe Work Programme 2026-2027 General Annexes applies regarding the award criteria, scores and weighting upon which the proposals will be evaluated, with the following addition:

- Under the criteria “Excellence”, “quality of the proposed joint activities to achieve the deliverables”
- Under the criteria “Impact”, “quality and credibility of the action to contribute achieving the EU-Rail Master Plan objectives and the expected impact of the EU-Rail Multi-Annual Work Programme”.
- Under “quality and efficiency of the implementation”, “Appropriateness of the project management structure and quality of the proposed coordination”.

	Excellence[79]	**Impact**	**Quality and efficiency of the implementation**
Research and innovation actions (RIA) **Innovation actions (IA)**	• Clarity and pertinence of the project’s objectives, and the extent to which the proposed work is ambitious and goes beyond the state of the art. • Soundness of the proposed methodology, including the underlying concepts, models, assumptions, inter-disciplinary approaches, appropriate consideration of the gender dimension in research and innovation content, and the quality of open science practices, including sharing and management of research outputs and engagement of citizens, civil society and end-users where appropriate. • **Quality of the proposed joint activities to achieve the deliverables.**	• Credibility of the pathways to achieve the expected outcomes and impacts specified in the work programme • Suitability and quality of the measures to maximise expected outcomes and impacts, as set out in the dissemination and exploitation plan, including communication activities. • **Quality and credibility of the action to contribute achieving the EU-Rail Master Plan objectives and the expected impact of the EU-Rail Multi-Annual Work Programme**	• Quality and effectiveness of the work plan, assessment of risks, and appropriateness of the effort assigned to work packages, and the resources overall. • Capacity and role of each participant, and the extent to which the consortium as a whole brings together the necessary expertise. • **Appropriateness of the project management structure and quality of the proposed coordination.**

[79] The following aspects will be taken into account, to the extent that the proposed work corresponds to the description in the work programme.