Transforming Europe’s Rail System

Source: Sector High Level Paper

9 June 2020
The European Commission requested this High Level Paper to:

- UNIFE / CER (with the technical support of UIC) / EIM / UITP / EURNEX / ERRAC
- S2R, other than the Union, Founding Members

S2R JU identified as coordinator and in supporting role
# Context & Problem Definition: ERRAC

## Challenges for the Mobility of 2030

### Attractiveness & Convenience
- End-user/citizen driven services (passenger & logistics)
- Integrated door-to-door mobility
- Minimising journey time, no waiting times
- Punctual, reliable & secure
- Comfortable & quiet
- Affordable and tailored for all needs

### Maximised Affordable Capacity
- Matching capacity with demand
- Affordable and minimising infrastructure changes
- Resilient transport system and quick recovery
- Customised & Flexible: adaptable to changing needs

### Sustainability/Security
- Decarbonised mobility
- Energy efficiency
- Reducing congestion in populated areas
- Limiting noise, vibration and ground space
- More secure and resilient

*“The rail sector addresses these challenges as the backbone of integrated mobility”*

## The Rail Sector’s Answers to These Challenges (Supported by Horizon Europe)

### Digitalisation
- Connected & integrated railways
- Intelligent & cost efficient asset management
- Cyber-security solutions
- End-User/citizen-centric services
- Digital control command

### Automation
- Real-time operational management
- Trains running closer together
- Platooning & virtual coupling
- Autonomous trains
- Automated freight operation
- AI & Robotics
- Extracting value from data

### New Mobility Solutions
- Seamless integration between modes of transport
- Smaller and more frequent trains
- New types of rail transport solutions (gods & others)
- Stations and terminals as mobility hubs

### Sustainable Solutions
- Green energy technologies
- Interconnection between Energy and mobility systems
- Apply digitalisation to energy
- Silent railways
- Pro-active security
- Non-invasive inspection solutions

### Cost Savings and Deployment of Innovation
- Improved deployment, bottom-up transport-system standards solution, better adapted /regulation/certification (virtual), rapid deliveries...
Common Vision, Objectives & Expected Impacts

European Green Deal: decarbonisation through sustainable and smart mobility

EU policy priorities
- A Europe fit for the digital age: Shaping Europe’s Digital Future
- An economy that works for people: New Industrial Strategy
- Europe in the world

EU rail policy objectives
- SERA: interoperability + safety + connectivity
- Guaranteed interconnected urban mobility driven by citizens’
- Passenger focused Customer experience, accessible mobility
- Rail freight improved performance and competitiveness
- Faster modernisation of the rail industry including deployment

iPP general objectives
- Integrated European transport networks
  - Urban
  - SERA

iPP specific objectives
- Deliver a European Traffic Management Layer enabled by automation and digitalization, building upon the national and local systems, including urban
- Competitive green rail freight fully integrated into logistic chain
- Accessible and safe Mobility on Demand
- Deliver a sustainable and resilient rail system
- Bring into market new land guided transport solutions

Delivering European rail industry competitiveness
Bridge the innovation “valley of death” through coordinating live, large-scale demos
Necessity for a European Partnership

Rail is a complex system of systems to deliver value to its customers, in terms of mobility and transport services. Mobility and transport solutions of the Green Deal rely on a rail system capable to meet the urgent needs of decarbonisation answering them together with other modes, delivering societal cohesion, integrating socio-economic developments with a systemic, smart and sustainable concept of operations. A new Rail R&I European Partnership Art. 187 TFEU is the strategic pillar to transform the rail system. Only through forward looking cutting edge, integrated and systemic research and innovation, it will be possible to tackle the complexities of rail and maximize the benefits of the R&I investment.

Requirements:

- Need to gather diverse expertise to bring innovation to the rail system
- Long-term commitment of actors involved on the basis of risk sharing and regulatory stability needs to be guaranteed
- Contribution to policy design and standardisation
- Efficient cooperation with other transport modes
- Synergies with other European and/or National Programmes
Rail R&I iEP General Objectives 2031

**Delivering Integrated European Rail Networks**
To deliver the Single European Railway Area bringing to the market an integrated, sustainable and digital rail system of systems, for the high-speed network, freight and commuter lines, integrating regional lines for the robustness and resilience of corridors operations; guaranteed interconnected urban mobility driven by citizens’ needs with urban rail as a backbone.

**Delivering multimodality**
To deliver, upon the Green Deal ambition on an automated and connected multimodal mobility, “door-to-door mobility” and “on-demand door-to-door mobility” through the introduction of digital technologies, technological and operational solutions that would maximize the performance of urban rail transport, looking for synergies, and where needed integration, with rail mainlines services and other transport systems.

**Delivering European rail industry competitiveness**
To deliver through R&I excellence in tackling socio-economic challenges and ability “to demonstrate their impact in real life conditions,” and “the support to large-scale deployment innovations is instrumental to market uptake.”
Vision of the architectural layers for future system evolution
Rail R&I iEP Specific Objectives 2031

Design, establish and initiate the operations of an ETML (European Rail Traffic Management Layer) and European Rail Network Manager.

Design and establish a new generation of traffic management solutions serving optimised integrated mobility at local level, with urban rail at the core.

Competitive green rail freight fully integrated into the logistic value chain.

Accessible and safe Mobility on Demand.

Deliver a sustainable and resilient rail system.

Bring into market new land guided transport solutions.

Ensure, through cutting-edge Rail R&I, the European leadership of the sector around the globe.
A R&I Programme estimated at EUR 2.5 ~ 3.0 bln

**Rail R&I iEP funding EUR 1.5 bln (request)**

- **Exploratory and Fundamental Research**
  - Integrating the research community, innovators/start-ups and other R&I institutions to work together with the rail sector to explore and generate new ideas
  - EUR 200 million

- **Applied Research and Innovation**
  - Wanted market solutions will be pushed to move towards market deployment or terminated because not progressing as expected
  - EUR 800 million

- **R&I Large Scale Operational Demos**
  - Integrated R&I activities to show the possible benefits that would come from the future European deployment of new solutions
  - EUR 500 million
Target Groups & Stakeholders

- The operating community
- Manufacturers of rail systems
- Start ups
- The scientific community
- Freight forwarders and logistic providers
- Passengers
- Representatives of rail staff
- National Supervisory Authorities
- ERA
- EU standardisation bodies
- Sector Associations
Partners’ Composition

New Rail R&I

European Union and Core Members
  - Listed in the Regulation
  - Indicatively 15
  - Participation in the full/large part of the Programme
  - Balanced sector representation

Programme Members
  - Project Members
    - Commitment to part of the Programme: SMEs, “subsystem” suppliers, RC & univ, RU / IMs and Urban Operators with R&I activities, etc.
  - Other Project Partners
    - Commitment to part of the Programme: RU / IMs and Urban Operators focusing on specs and demos, etc.

Any other third party
  - It might join the programme at any moment for specific tasks or subcontractors or in specific areas outside the Programme membership

Any other third party
Resources

• **Members**: The overall investment made by the core members, in terms of Total Project Costs established in accordance with their usual accounting standards, is expected to be funded by the new Rail iEP at 50%.

• **Programme** Members in the forms of Project Members committed to performing some part of the Programme activities or Projects or different cycles of R&I. The model should be similar to the one for the core members, but with a lighter administrative process, with a **funding rate at 50%**.

• **Programme Members in the form of Associated Participants** will contribute to the definition of specifications and possibly testing the overall results; the **funding rate might differentiate compared to the activities to be performed**.

• **Other participants** will be subject to the **H.E. funding rates** for RIA or IA or CSA, mostly involved in lower TRLs or possibly in the highest ones.

• **Financial contributions** – beyond the net internal contributions to be provided by the different categories of members, it is expected that they would get involved with cash contributions to the running costs of the new Rail iEP based on the value of their net contributions, in a % estimated between 3 and 5%.
Governance: Lessons Learned from S2R JU

• Clear distinction of competences, to ensure the most appropriate delivery oriented approach and propose attractive ways to join the R&I work;

• Transparent, simplified governance structure: simple regulatory framework, to give the Governing Board the possibility to clarify the approach for programme implementation;

• Emphasize commitment over representation: incentivize the weight of SMEs and start-ups from across Europe;

• An effective and efficient decision-making process towards delivering an ambition Programme and,

• To take on board the programme members with a key role in defining the specifications and requirements of future rail systems, including urban, such as operators and infrastructure managers.
An integrated Programme for a complex system

**HORIZON EUROPE**
- Fundamental research and « blue sky »
- R&I
- DEMO
- S2R solutions with S2R JU supervision

**BREAKTHROUGH IDEAS**
- TRL: 0 -> 2

**APPLIED RESEARCH**
- TRL: 3 -> 7

**LARGE SCALE OPERATIONAL DEMOS**
- TRL: -> 9

Transforming overarching project:
*Future Railway System as a whole, with connection with other transport modes*

**DEPLOYMENT ACTIVITIES**
- CEF / BLENDING / OTHER
  - Deployment Proj
  - Deployment Proj
  - Deployment Proj
  - Deployment Proj
Governance

General Assembly
European Union (EC) and Core Members, Programme Members, ED
Observers: SRG Chair, SC Chair, ERA

Guidelines
Suggestions for improvements
Endorsement of documents, recommendations

Reports
Documents for discussion
Progress of the Programme

Governing Board
European Union (EC) and Core Members, Executive Director
Observers: SRG Chair, SC Chair, ERA

Decision making body of the JU
Strong focus on strategic and operational activities
Stronger accountability of the Core Members in reporting on the activities

Executive Director

SYSTEM PILLAR
SECTOR BOARD

SC

SRG

INNOVATION PILLAR
ED PROGRAMME BOARD
RAIL INTEROPERABILITY AND SAFETY COMMITTEE (RISC) MEMBER STATES

EUROPEAN COMMISSION (DG MOVE)
- Legislate (Interoperability/Safety Directives)
  - Strategic guidance on overall vision
  - Follow-up and monitoring
- Mandates for TSI change and standardisation requests

S2R JU & Successor
Single coordinating Body for the sector to converge on the operational concept, the functional system architecture, and associated specifications and standards to fulfil the overall vision
Manages all EU funded Rail R&I
- operational concept
- functional system architecture,
  - and associated...
- migration plans, pipeline of the future regulatory framework or standard, if and when necessary.
- specifications and standards
- operational and technological solutions
-...

ERA
Act as System Authority
Deploy appropriate working parties
- assessment of S2R results
- additional specifications to be harmonised at European level
- TSI OPE
- harmonization of operational rules

RU & IM
- Needs
- Requirements, Specs
- Operations
- Services
- Etc.

Suppliers
- Design
- Development
- Systems
- Etc.

Others

• Specific needs in standardisation, studies, validations or tools identified as necessary
• Evolutive maintenance
R&I Programme: the Transforming Projects

- ETML (European Rail Traffic Management Layer) and European Rail Network Manager
- Automated and/or autonomous and/or remotely piloted operations
- Railways Digital Twin, Simulation and Virtualisation
- Smart Asset Management and Maintenance of the Future
- Smart integration for door-to-door mobility
- Emerging Transport Models and Systems (Moving Infrastructure System (pods)/MaaS, hyper speed systems)
- Environmentally Friendly and Attractive Sustainable Mobility
- Rail as the backbone of a green freight logistic chain
- Network management planning and control
- Socio-economic area
- Safe and healthy mass transportation area