ERTMS and CCS TSI (EU) 2023/1695 + 2026/693

ERTMS Unit

27 October 2026 / Dublin
TSI Workshop Ireland 2026

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AGENDA

1. *Signalling – principles of train protection*
2. *Migration to ERTMS in Europe – SERA*
3. *Basics on ERTMS*
4. *Legal approach to removal of technical barriers*
5. *CCS TSI Revision 2023 + 2026 Amendment*

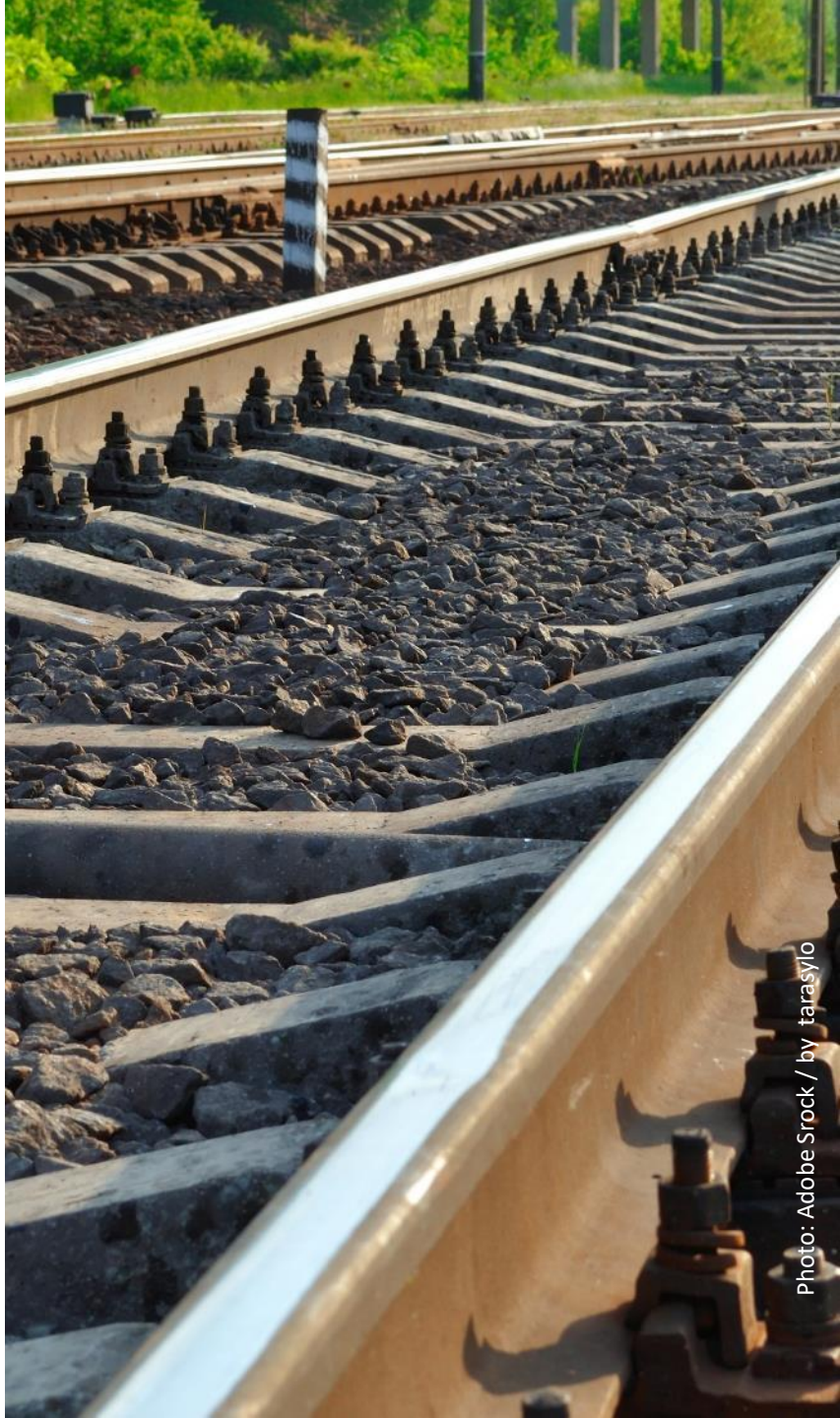


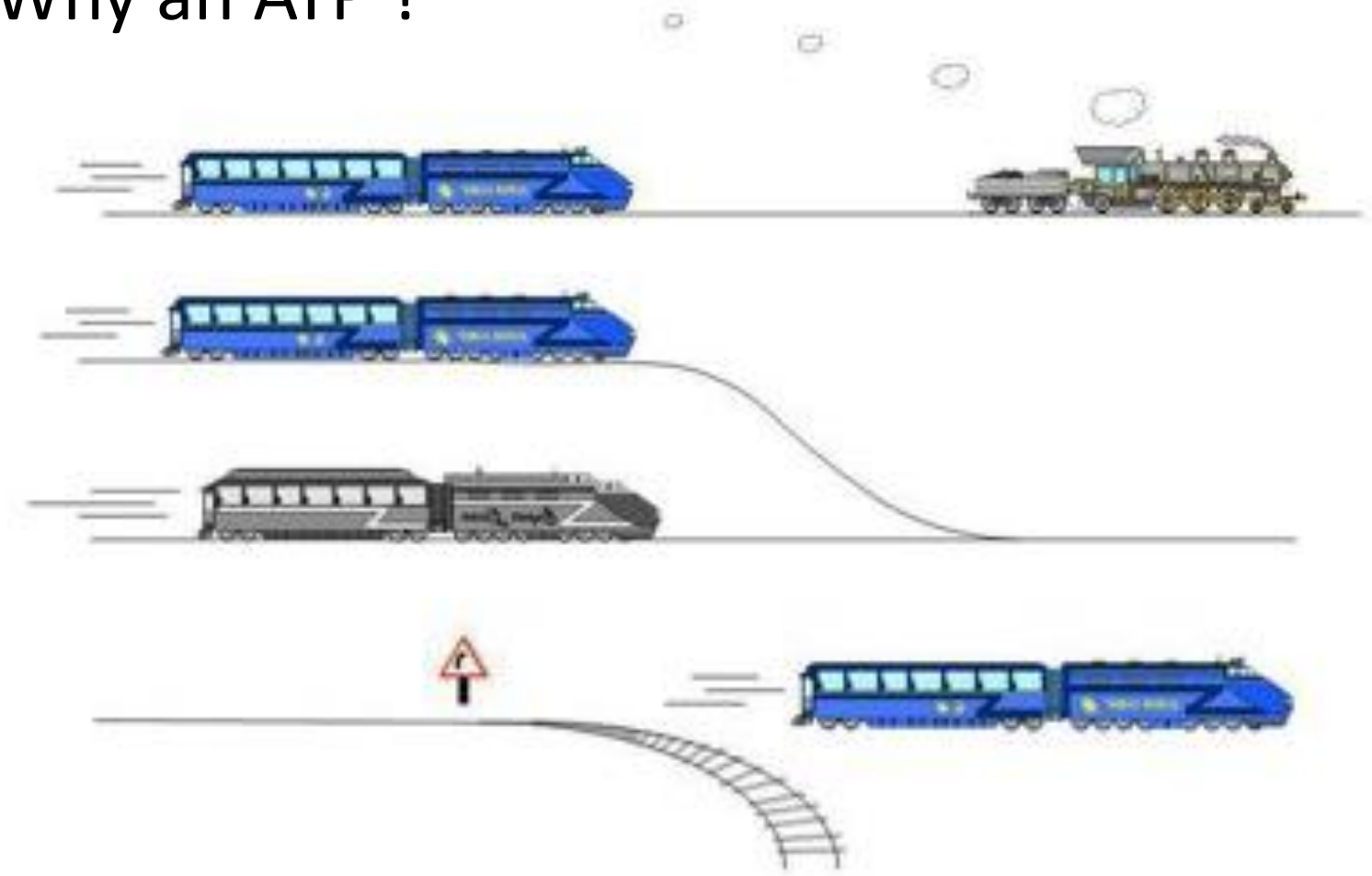
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1. SIGNALLING – PRINCIPLES OF TRAIN PROTECTION



Why an ATP ?



Main Signaling systems used in EU Member States



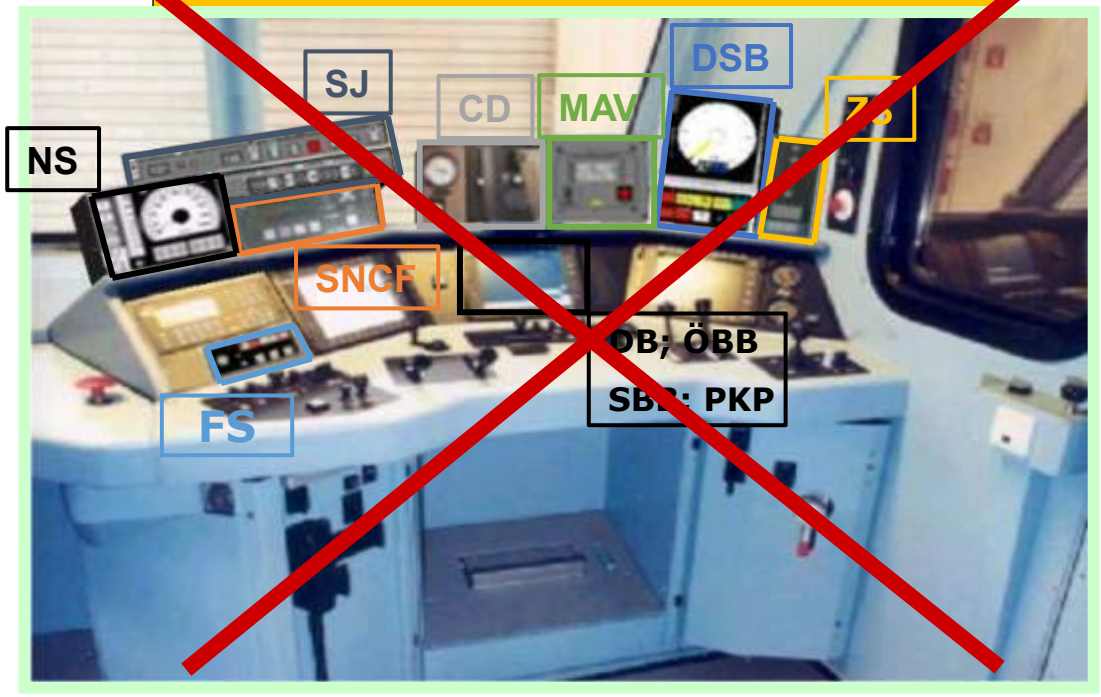
Systems vary in functionality :

- simple -> complex
- warning -> stop
- Stop -> full train protection

In order to facilitate the establishment of a **“Single European Railway Area”** (SERA), there is a need for a harmonized Signalling system
-> This is ERTMS !

The Single European Rail Area (SERA)

Conventional approach for Driver Machine Interface:
Simply adding legacy display systems does not work!



New development:
Central ETCS display
→ single interface for driver

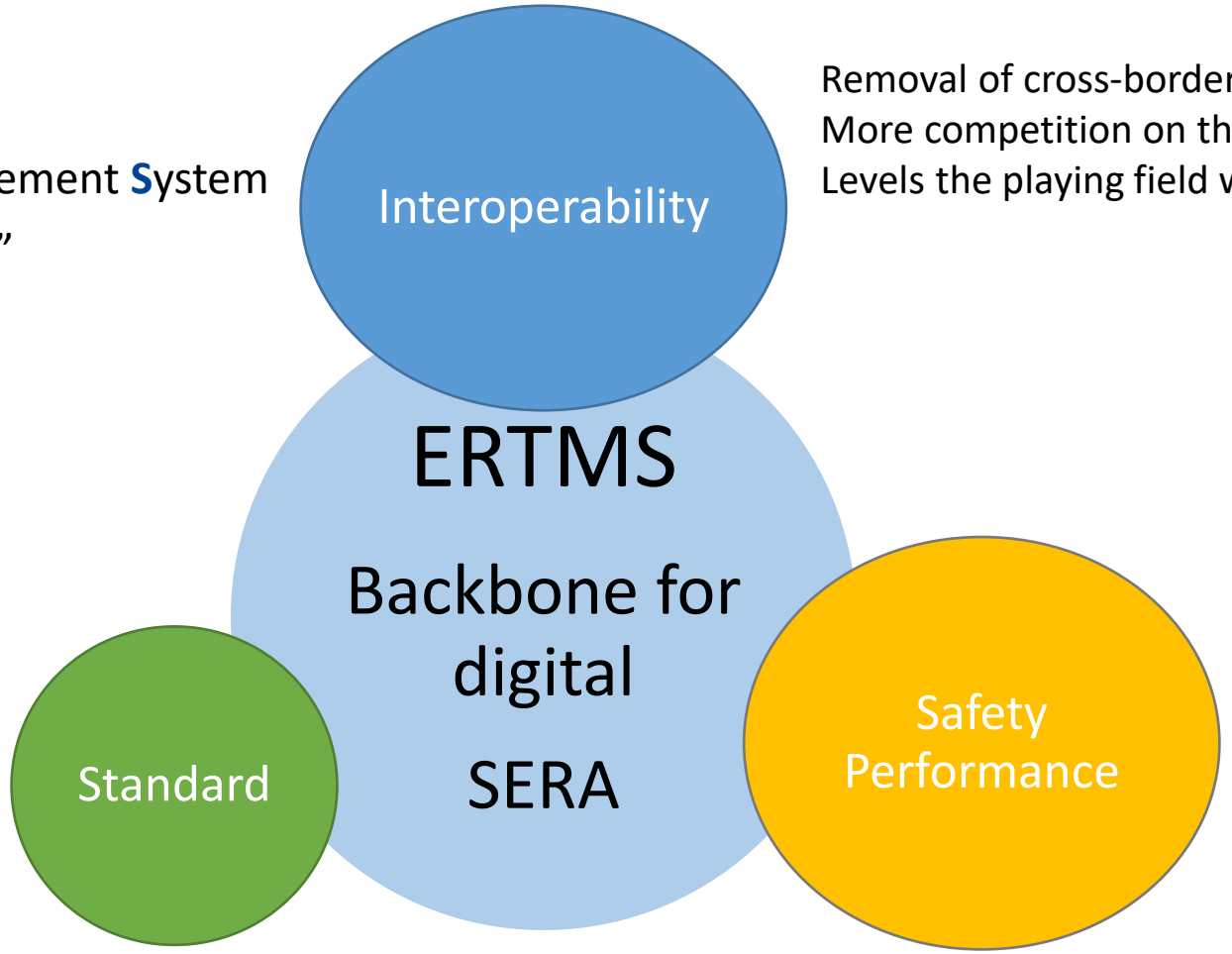


Standard TRAXX driver's desk

Single European Railway Area

European **R**ail **T**raffic **M**anagement **S**ystem

"One system to rule them all"



Removal of cross-border barrier
More competition on the railway market
Levels the playing field with road transport

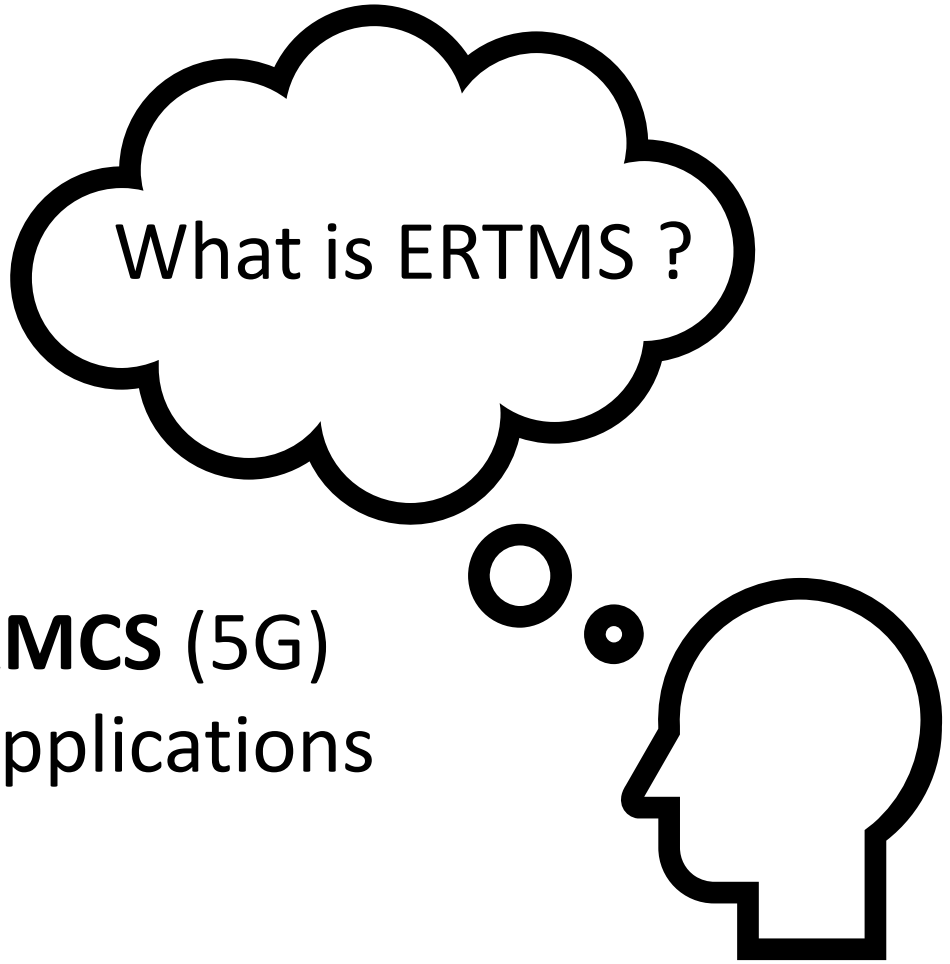
Universal system
Standardised products
One system, multiple suppliers
Opening worldwide market opportunities for suppliers

Increase capacity and speed
Improved safety
Increased reliability and reduced journey times
Cost decrease (capital, maintenance and training)

3. BASICS ON ERTMS



ERTMS and CCS TSI



European **R**ailway **T**raffic **M**anagement **S**ystem

ETCS (European Train Control System) = ATP (Automatic Train protection system)

+

RMR (Railway Mobile Radio) **GSM-R** (2G)/**FRMCS** (5G) = Radio communication for Voice and Data applications

+

ATO (Automatic Train Operation)

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4. LEGAL APPROACH TO REMOVE TECHNICAL BARRIERS



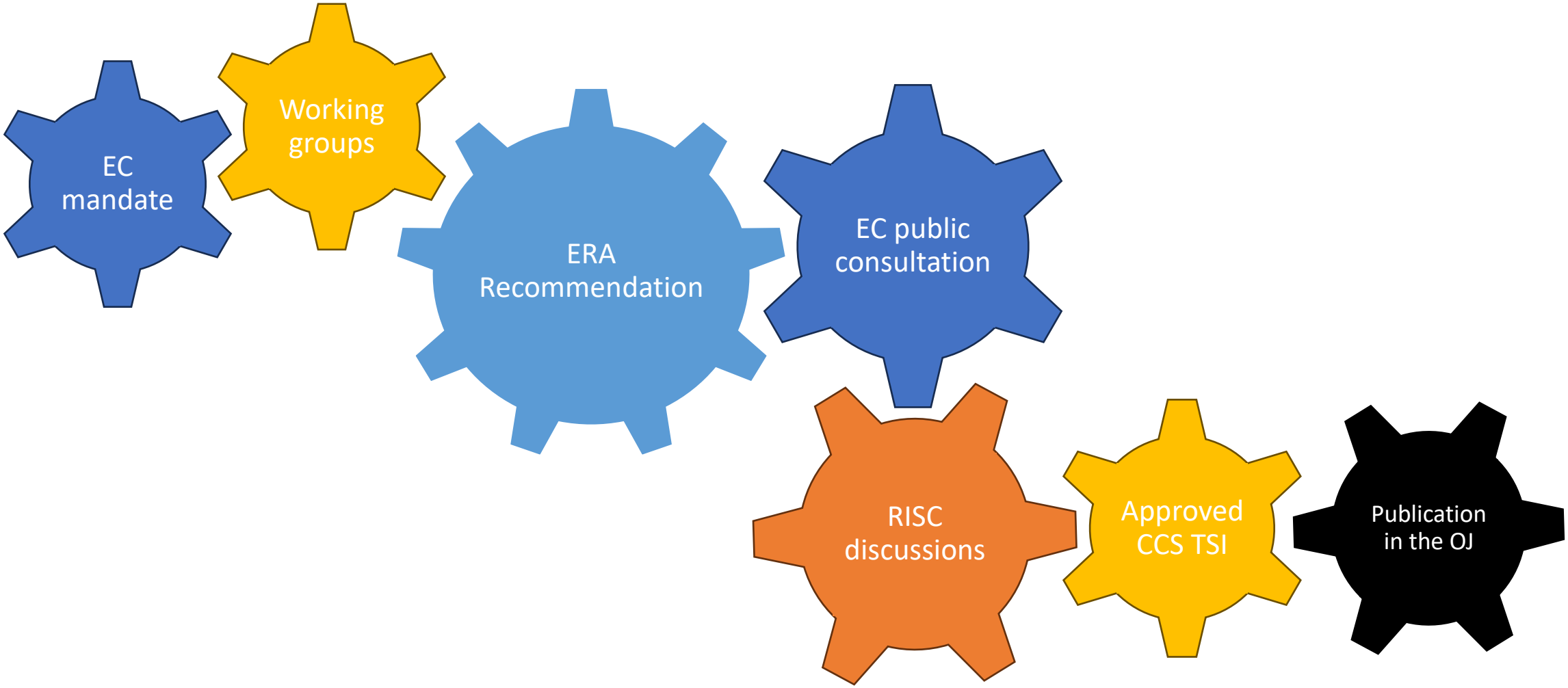


4th Railway Package!!

https://www.youtube.com/watch?v=1iTIoymejSM

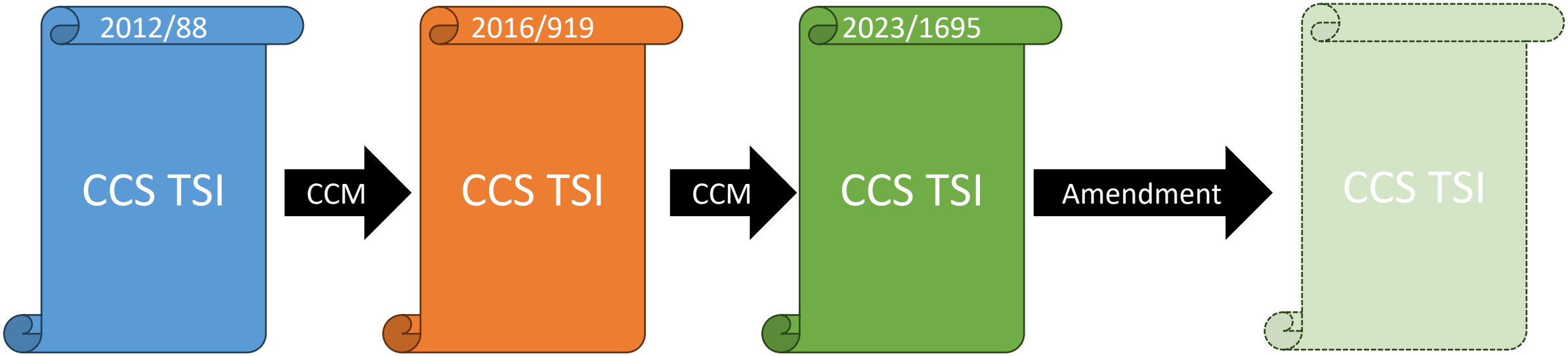
- Regulation (EU) 2016/796 on the European Union Agency for Railways and repealing Regulation (EC) n° 881/2004
- Directive (EU) 2016/797 on the interoperability of the rail system within the European Union (Recast of Directive 2008/57/EC)
- Directive (EU) 2016/798 on railway safety (Recast of Directive 2004/49/EC)

CCS TSI creation process



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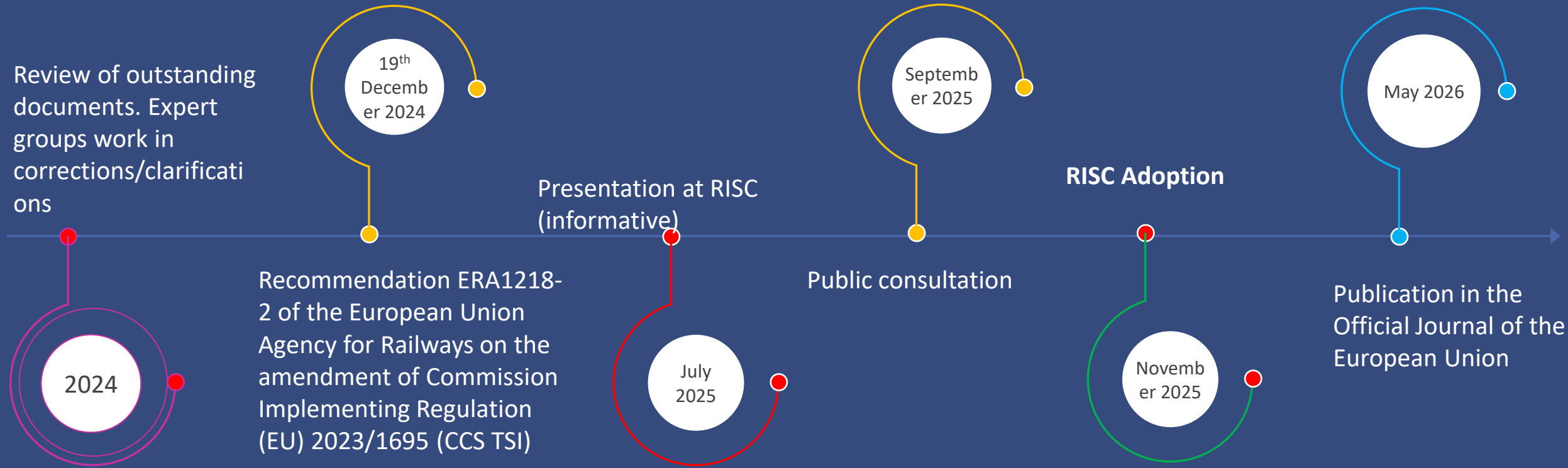
Legal Framework



- CCS TSI characterizes ERTMS
- Evolution is made with the support of the railway sector
- Formal process to address the required changes is followed
- Final version of the TSI is voted in the RISC Committee by the Member States

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CCS TSI 2026 amendment



Principles on CCS TSI

- One **TSI** covering **two Subsystems: CCS On-board** and **CCS Trackside**
- It does not cover all the subsystem, optimal level of harmonisation (overlay)
- Much more prescriptive than the other TSI (detail specs in Appendix A)

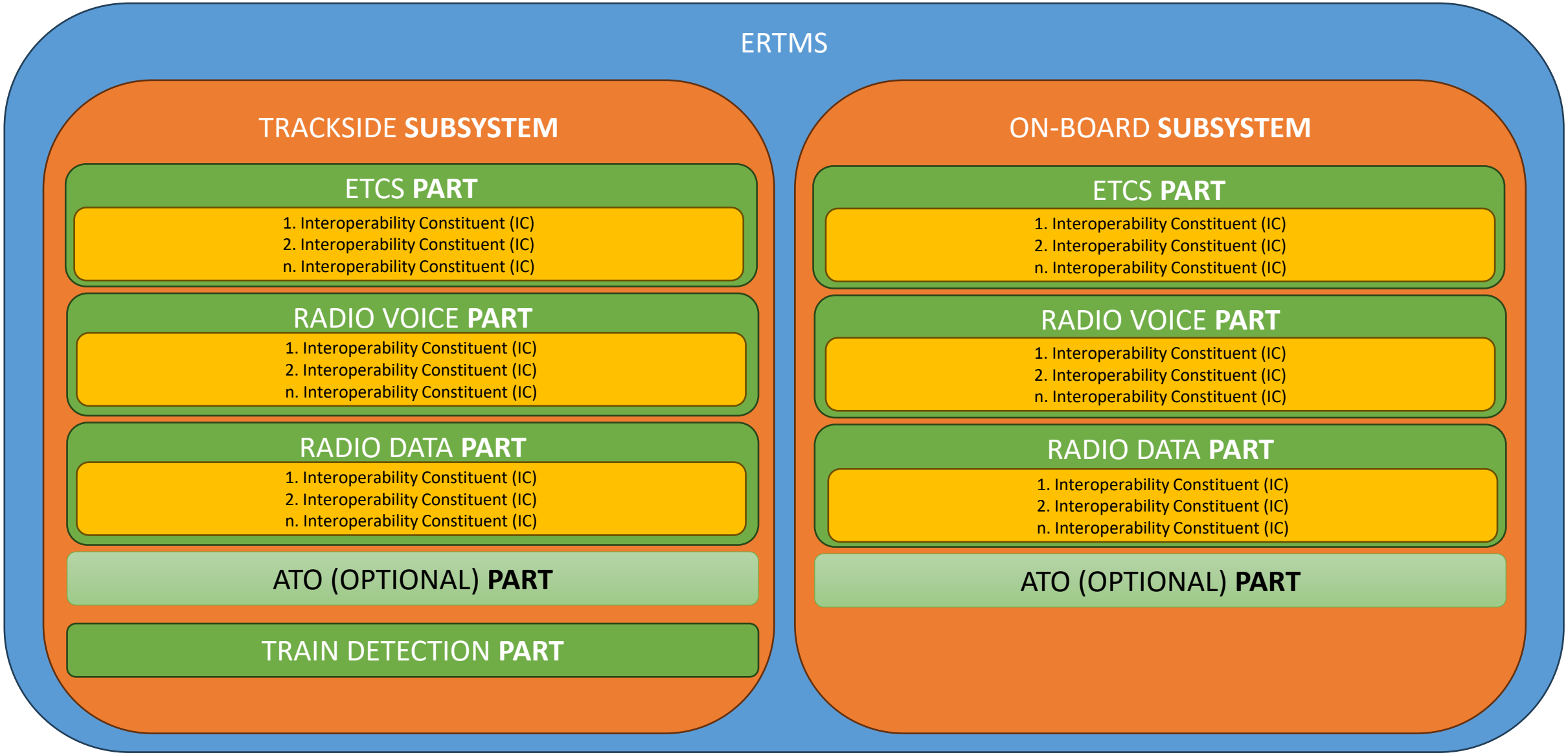


- Composed of **five parts** (CCS TSI Table 4.1)
  - Train Protection: The **Class A** system is **ETCS** whilst the
  - **Radio voice:** The **Class A radio system** is **RMR (GSM-R / FRMCS)**
  - **Radio data:** The **Class A radio system** is **RMR (GSM-R / FRMCS)**
  - **ATO:** This part is optional.
  - **Train detection:** Only for the **Trackside** Subsystem.
- **Class B**
  - The legacy systems are referred to as **Class B** (ATP, Radio) or **Non-TSI** (Train detection)
  - **Decommissioning** is required by TEN-T Regulation.

Objective: towards a Single European Railway Area (SERA)

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Principles on CCS TSI



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Evolution of Appendix A sets of specs



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ERTMS Specifications – Evolution of ETCS Baselines/ETCS System versions

CCS TSI 2016/919

set #1

ETCS B2

(envelope of ETCS system versions up to 1.0)



set # 2

ETCS B3 MR1

(envelope of ETCS system versions up to 2.0)

(= B2 functions + error corrections and functional enhancements incl. harmonised braking curves and limited supervision)



set #3

ETCS B3 R2

(envelope of ETCS system versions up to 2.1)

(= B3MR1 functions up to 2.0 + error corrections and functional enhancements incl. online key management and GPRS/PS)



CCS TSI 2023/1695 with ETCS Baseline 4 (Release 1)

ETCS B4 R1

(envelope of ETCS system versions up to **2.1**)

(= B3R2 functions + all error corrections + relocation without linking CR 1370)

SS-153 indicates which on-board requirements/documents do not apply or are modified compared to ETCS up to system version 3.0



ETCS B4 R1

(envelope of ETCS system versions up to **2.2**)

(= B4 R1 functions up to 2.1 + ATO)

SS-153 indicates which on requirements/documents do not apply or are modified compared to B4R1 (ETCS up to system version 3.0)



ETCS B4 R1

(envelope of ETCS system versions up to **3.0**)

(=B4R1 functions up to 2.2 + all other functional enhancements incl. ETCS readiness for FRMCS/DAC)



ERTMS Specifications – Evolution of ETCS Baselines/ETCS System versions

Translation table between System Version and Baseline/SRS/Set of specs

System Version	Baseline	SRS versión	Set of specs
1.0	B2	2.3.0d	#1
2.0	B3MR1	3.4.0	#2
2.1	B3R2	3.6.0	#3
2.1	B4R1	4.0.0 + SS-153	TSI 2023/1695
2.2	B4R1	4.0.0 + SS-153	TSI 2023/1695
3.0	B4R1	4.0.0	TSI 2023/1695

The difference between SV 2.1 B3R2 and SV 2.1 B4R1 are the error corrections.

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Main changes in the CCS TSI (EU) 2023/1695



CCS TSI Text Recast

- Framework to manage the specification changes
  - Error Corrections (Section 7.2.10)
  - B4R1 set of specs in Appendix A
  - Removal of partial fulfilment (Appendix G)
- Stronger deployment requirements
- Transition regimes (Appendix B) and notification from IM (in RINF)

Appendix A – Technical changes

- ATO up to GoA2 (As a new optional part)
- First complete Level 2 + train integrity specifications (Former Level 3 - Merged)
- ETCS readiness for FRMCS and DAC (the interface and needed functionality as far as possible)
- System versions 2.2 and 3.0

Train Detection Compatibility

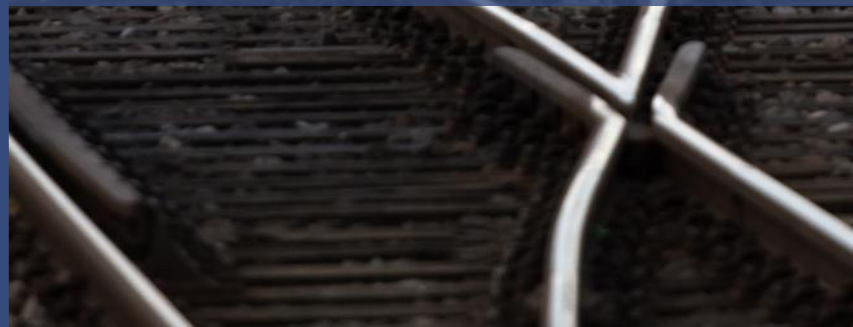
- Target system defined. Specific Cases for non-TSI compliant systems to allow unique authorization

Others

- Cleaning NTR & revised interface with RST (SS-034)
- OPE aligned up to SV 2.2.
- Updated parameters in ERATV and RINF
- Only **one** remaining open point: Reliability



- Published in the official journal on the **08/09/2023** (EUR-Lex link)
- Entry into force 20 days after (28/09/2023)
- Appendix A documents (link).



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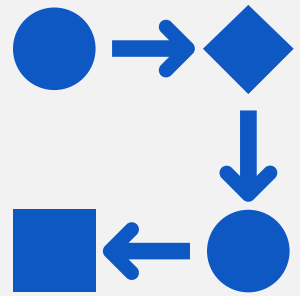
CCS TSI (EU) 2023/1695 Error Corrections



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ERTMS Specifications – Error corrections – Transition Regime (7.2.10)

A sequence of events if needed to define a proper process



- **2 conditions to start the process:**
  1. Entry into force of the TSI **AND**
  2. Publication of BCA and answers to the questionnaires
- **Updated deadline for IM registering the CR in RINF:**
  - 6 months from the start conditions.
  - Next events follows This registration.

CCS TSI 2023/1695 (Amended). 7.2.10.3.1

The Infrastructure Manager shall register in the related RINF (*) parameter which error corrections are applicable (i.e. the errors preventing normal service in the network) for the on-board. Error corrections shall be registered: for the first time no later than 6 months after the publication by the Agency of the Baseline Compatibility Analysis (BCA) including the answers to the questionnaires; and whenever there is a change in the applicable error corrections due to new or upgrade trackside implementation within the infrastructure manager's network.

*The Network Statement can be used as tool in case RINF is not upgraded yet to notify this change.

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CCS TSI (EU) 2023/1695 Transition Regime



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CCS TSI Transition Regimes

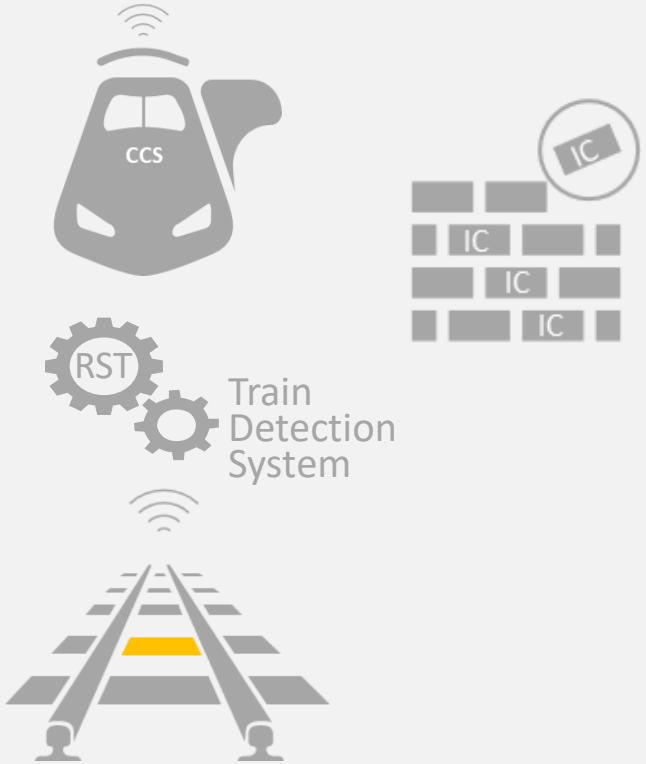
Introduced for the first time in the CCS TSI (Appendix B):

- Synchronised approach for the vehicle.
- Cascade principle.

Specific requirements for:

- CCS On-board Subsystems (Table B1.1).
- RST Subsystem (TDC) (Table B1.2).
- CCS Trackside Subsystems (Table B2).
- CCS Interoperability Constituents (Table B3*).

*CCS Subsystem transition periods apply unless specified in this table.





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CCS On-board example

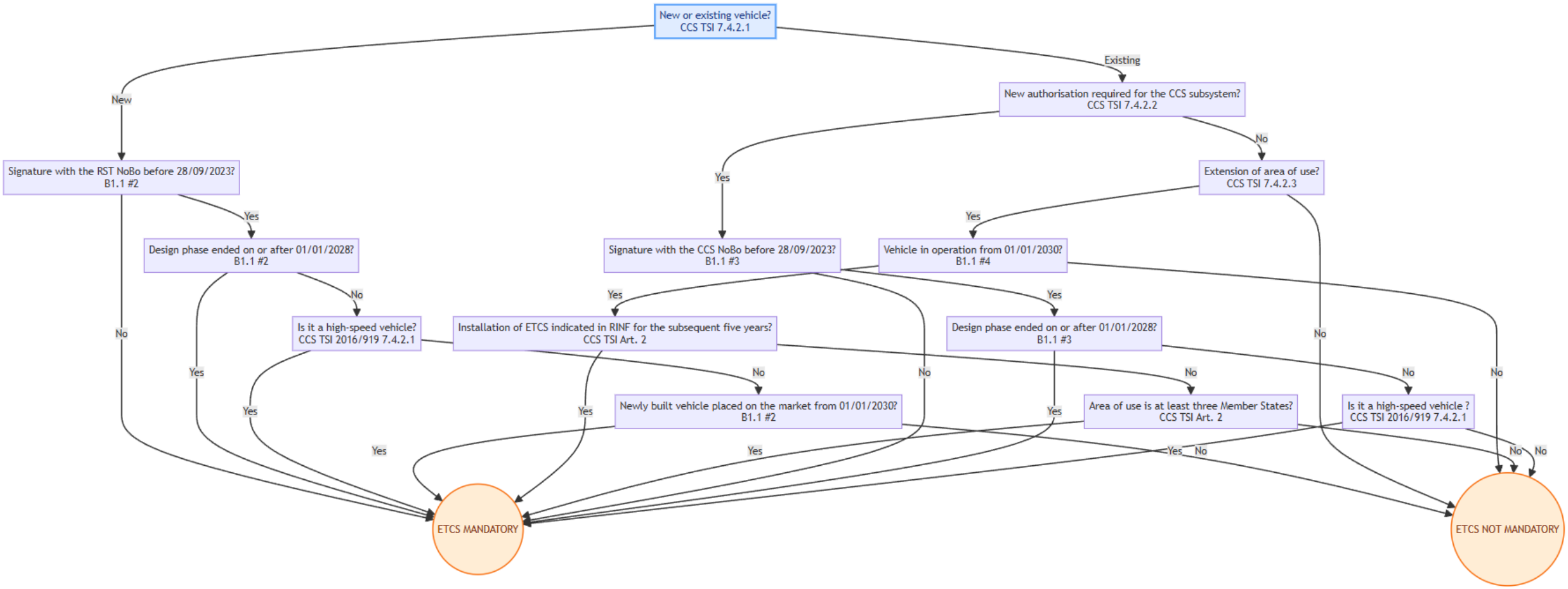
CCS TSI 2023/1695 (amended)

Table B1.1 row 2 ETCS On-Board implementation

No	TSI point(s)	TSI point(s) in previous version established by Regulation (EU) 2016/919	Explanation on CCS TSI change introduced by this Regulation	Transition regime			
				Design phase started after 28 September 2023	Design phase started before 28 September 2023	Production phase	Vehicle in operation
2	Points 7.4.2.1, and 7.4.3	7.4.2.1.2. and 7.4.3(2) grants exemptions for new vehicles to be equipped with ETCS	7.4.2.1.2. and point 7.4.3(2) deleted. All newly built vehicles shall be equipped with ETCS.	Directly applicable *Note:* Design phase started after TSI enters into force here relates to 'RST design phase' for any vehicles without ETCS. For special vehicles applicable from 1 January 2026 unless Member States have issued decisions in accordance with 7.4.3.2.	Applicable if design phase ends on or after 1 January 2028 *Note:* Design phase started before TSI enters into force here relates to 'RST design phase' for any vehicles without ETCS. For special vehicles applicable if design phase ends on or after 1 January 2030 unless Member States have issued decisions in accordance with 7.4.3.2.	Applicable for newly built vehicles placed on the market on or after 1 January 2030 For special vehicles applicable for newly built vehicles placed on the market on or after 1 January 2030 unless Member States have issued decisions in accordance with 7.4.3.2.	Not applicable

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CCS On-board example. Transition regime Flowchart. ETCS implementation



Note: Web tool developed with the Application Guide

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CCS TSI (EU) 2023/1695
Technical enhancements



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New Features in Appendix A

ATO
Introduction GoA 2

Reduced envelope **SS-153** (B4R1 set of specifications)

Modularity

FRMCS v1
ETCS/ATO **readiness for FRMCS**

Train Detection Compatibility updated to V5.0 (closing all related open points)

Level 2
with/without train integrity (**merge level 2 and 3**)

ETCS **DAC readiness**



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ETCS system version 3.0



Why?

- **Obsolescence of GSM-R** / introduction of FRMCS.



- New functionalities (enhancements) requested by the sector (e.g. supervised manoeuvres).



What will it bring?

- Possibility to optimise investment when equipping ETCS for first time.
- Opportunity to decouple railway applications from telecom transport layers in the future. (easy update for 6G,7G,8G,…)

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CCS TSI (EU) 2023/1695
Removal of partial fulfilment



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Removal of partial fulfilment

Obtain a **better alignment** between the products and the specifications.

- In case **new errors** are detected (mostly for newly introduced functionality) proprietary solutions are allowed until an harmonised solution is agreed, based on validation of the CR - Point 6.5 (2).
- "**Overspecification**": Create a CR to amend the specifications.
- **Exceptional cases**: Appendix G
  - DMI SIL-0 in case of B2 fleet upgrade.
  - Functions for on-board SV 2.1 and 2.2.
  - SS-034 options at IC (catenary independent engines).
- Trigger events for the update.



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CCS TSI (EU) 2023/1695 Application Guide



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CCS TSI Application Guide

Application Guide



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Application Guide
GUI/CCS TSI/2023

Guide for the application of the CCS TSI 2023/1695 amended by Regulation (EU) 2026/693

In accordance with Article 19(3) of Regulation (EU) 2016/796 of the European Parliament and of the Council of 11 May 2016

Released by European Union Agency for Railways

This guide does not contain any legally binding advice. It may serve as a clarification tool without however dictating in any manner compulsory procedures to be followed and without establishing any legally binding practice. The guide provides explanations on the provisions contained in the TSIs and should be helpful for understanding the approaches and rules described therein. However, it does not substitute for them.
The guide is publicly available, and it will be regularly updated to reflect progress with European standards and changes to the TSIs.
The reader should refer to the website of the European Union Agency for railways for information about its latest available edition.

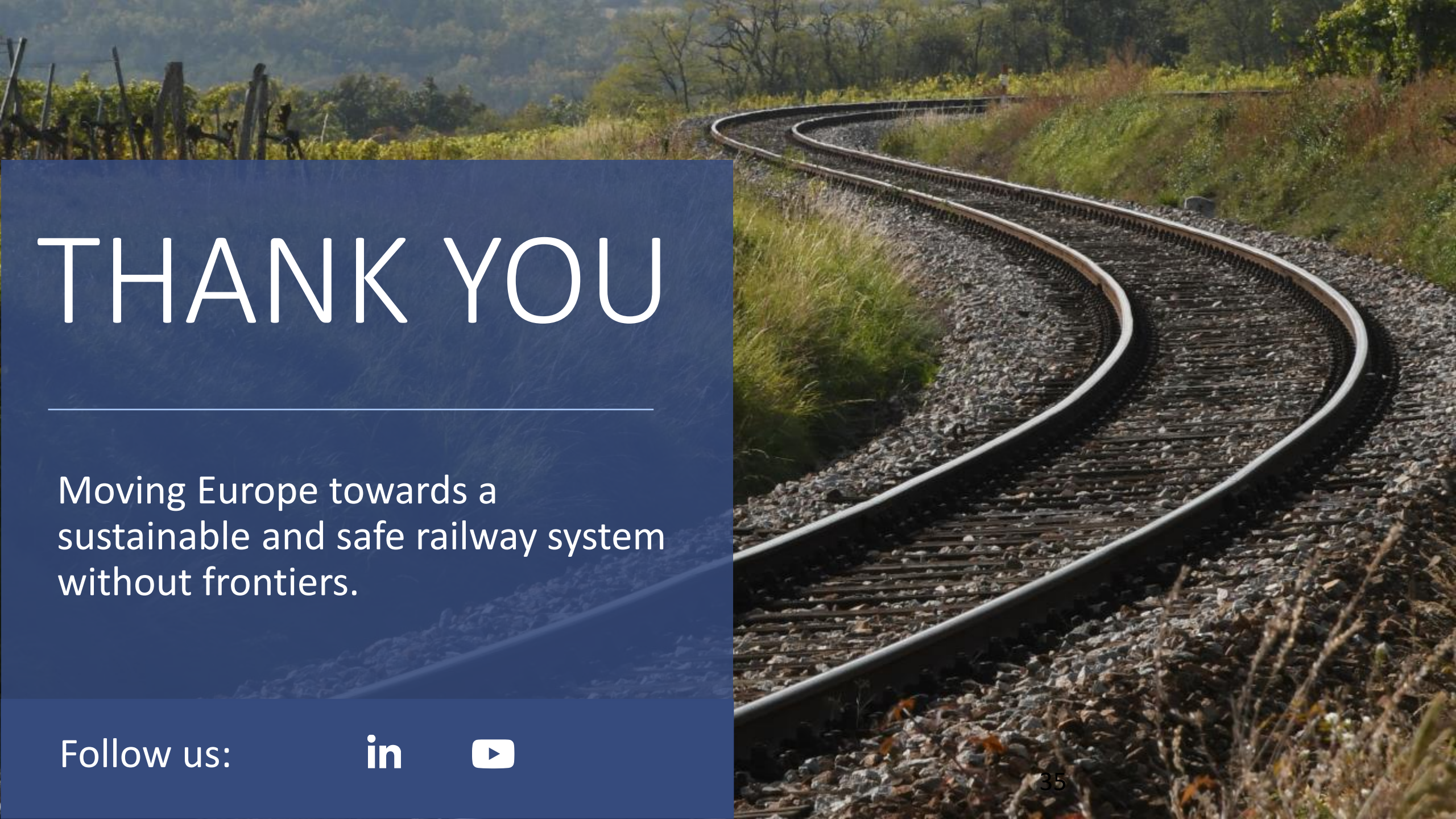
https://www.era.europa.eu/sites/default/files/2024-12/ccs-tsi-2023-application-guide.pdf

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Questions & Answers







THANK YOU

Moving Europe towards a sustainable and safe railway system without frontiers.

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