RAIL FREIGHT CORRIDOR 1&3 NSA WORKING GROUP

GUIDELINE FOR CCS AUTHORISATION
ON RAIL FREIGHT CORRIDORS

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Amendment record

Version	Date	Section number	Modification/description	Author
1.0	12.12.13	all	Final issue for publication	SB
1.0b	01.06.16	ch.1 and 7 updated, all chapters edited	Major Update 2016, including - update of legal references (chapter 1) - update of chapter 7 (clarifications on TTSV) - update of List of recommendations (Annex III) - deletion of Annex I (now part of ERA documentation) - editorial improvements	SB
1.0d	17.06.16	ch. 3 ch. 4, 7, 8 Annex III	Update after June meeting: - figure 1 updated to TSI structure - R41 and R43 included - editorial improvements	SB
1.0e	01.09.16	several	Update after August meeting: - figure 5 & 6 updated to TSI structure - only one DoV for EC and NR - R44 included - editorial improvements	SB
1.0f	26.10.16	title ch. 5.2.1 (footnote)	Version after October meeting - editorial improvements	SB
2.0	21.12.16	title & authors list	Final issue for publication	SB

Table of contents

1.   References, terms and abbreviations

1.1.   Reference input documents

Document reference	Title	Version
European documents		
Interoperability Directive 2008/57/EC[1]	The Interoperability Directive 2008/57/EC on the interoperability of the rail system within the Community (repealing Directives 96/48/EC and 2001/16/EC)	17 June 2008, amended by Directive 2013/9/EU on 11 March 2013
Recommendation 2014/897/EU ("DV29bis")	Commission Recommendation on the authorisation for the placing in service of structural subsystems and vehicles under Directive 2008/57/EC	05 December 2014
CSM Regulation 402/2013/EU (CSM RA)	Commission Implementing Regulation on the common safety method for risk evaluation and assessment and repealing Regulation (EC) No 352/2009/EC	30 April 2013, amended by Commission Implementing Regulation 2015/1136/EU of 13 July 2015
Safety Directive 2004/49/EC	Directive 2004/49/EC of the European Parliament and of the Council on safety of the Community's railways	29 April 2004, amended by Directive 2009/149/EC on 27 November 2009
Decision 2012/88/EU (TSI CCS)	Commission Decision on the technical specification for interoperability relating to the control-command and signalling subsystems of the trans-European rail system (repealing Decisions 2006/679/EC and 2006/860/EC)	25 January 2012, amended by Decision 2012/696/EU of 06 November 2012[2] and Decision 2015/14/EU of 05 January 2015[3]
Regulation 2016/919/EU (TSI CCS)[4]	Commission Regulation on the technical specification for interoperability relating to the 'control-command and signalling' subsystems of the rail system in the European Union (repealing Decision 2012/88/EU)	27 May 2016
Decision 2009/965/EC	Commission Decision on the Reference Document referred to in Article 27(4) of Directive 2008/57/EC	30 November 2009
Decision 2011/155/EU	Commission Decision on the publication and management of the Reference Document referred to in Article 27(4) of Directive 2008/57/EC	9 March 2011
NLF Flowcharts	Part 3 of the Reference Document – NLF flowcharts for vehicle authorisation	(latest version)
Subset-110/-111/-112	ss-110: UNISIG Interoperability Test – Guidelines ss-111: Interoperability Test Environment Definition[5] ss-112: UNISIG Basics for Interoperability Test Scenario Specifications	v 3.5.0 of 17 February 2016 (all parts)[6]

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[1] *A recast of the Interoperability Directive has been published (Directive 2016/797/EU of 11 May 2016). It is to be adopted by national legislation until 16 June 2019; therefore it has not yet been taken into account for this Guideline.*

[2] *Introducing ETCS Baseline 3 (SRS 3.3.0)*

[3] *Introducing Maintenance Release 1 (B3MR1) for ETCS Baseline 3 (SRS 3.3.0 replaced by SRS 3.4.0)*

[4] *Introducing Release 2 (B3R2) for ETCS Baseline 3 (SRS 3.6.0)*

[5] *Contains 5 parts: General, FFFIS for TCL-OBU Adaptor, FFFIS for TCL-RBC Adaptor, FFFIS for TCL-RBS Adaptor, FFFIS for TCL-RIU Adaptor*

[6] *These documents are public and can be obtained from UNISIG*

Document reference	Title	Version
	Rail Freight Corridor 1	
	Corridor A MoU signed on June 7th 2007	7 June 2007
	Corridor A common declaration	26 May 2009
	Rotterdam declaration of transport ministries (B, CZ, F, D, I, Lith, L, NL, P, CH)	14 June 2010
	EC introduction to the new TEN-T multi-modal transport network (introducing the new multi-modal corridors) [7] http://ec.europa.eu/transport/themes/infrastructure/news/ten-t-corridors_en.htm	17 October 2013

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[7] *The Core Network Corridor (CNC) Rhine-Alpine is almost identical with the Rail Freight Corridor (RFC) 1. ERTMS Corridor A is part of it. The RFCs are the railway backbones of the multi-modal CNCs.*

1.2. Terms and abbreviations

Abbreviation	Term	Reference
APS	Authorisation for Placing in Service	Directive 2008/57/EC Art. 15 and ch. V
AOB	Authorisation On-Board	Used in the tables of this Guideline
ATR	Authorisation Trackside	Used in the tables of this Guideline
AV	Authorisation Vehicle	Used in the tables of this Guideline
CCS	(TSI) Control-Command and Signalling	http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
CIC	Confomity of IC	Used in the tables of this Guideline
CoC	'EC' Certificate of Conformity	Directive 2008/57/EC Art. 11.2 and Art. 18.5
CoV	'EC' Certificate of Verification	Directive 2008/57/EC Annex VI.3
CR	Conventional Rail (system)	http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
CSM (RA)	Common Safety Methods (on Risk Assessment)	Regulation 402/2013/EU
CSM AsBo	CSM Assessment Body	Regulation 402/2013/EU Art. 3 (14)
D1, D2, …	Documents (results of activities of a stage)	Used in the tables of this Guideline
DeBo	Designated Body	Directive 2008/57/EC Art. 17(3)
--	Design Operating State	Recommendation 2014/897/EU, 2a: 'design operating state' means the normal operating mode and the foreseeable degraded conditions (including wear) within the range and conditions of use specified in the technical and maintenance files. It covers all conditions under which the subsystem is intended to operate and its technical boundaries.
DoC	'EC' Declaration of Conformity (of interoperability constituents)	Directive 2008/57/EC Annex IV
DoV	'EC' Declaration of Verification (of subsystems)	Directive 2008/57/EC Annex V
EC	European Commission	
ECM	Entity in Charge of Maintenance	Directive 2008/57/EC Art. 2 (z), Directive 2004/49/EC Art. 3(t)
EMC	Electro-Magnetic Compatibility	
ENE	(TSI) Energy	http://www.era.europa.eu/Document-Register/Pages/HS-ENE-TSI.aspx
ETCS	European Train Control System	
ERA	European Railway Agency	Regulation 881/2004
ERTMS	European Rail Traffic Management System	
HS	High Speed (rail system)	http://www.era.europa.eu/Document-Register/Pages/HS-ENE-TSI.aspx, http://www.era.europa.eu/Document-Register/Pages/HS-RST-TSI.aspx
IC	Interoperability Constituent	Directive 2008/57/EC Art. 2 (f), Decision 2012/88/EU and Regulation 2016/919/EU ch. 5

Abbreviation	Term	Reference
IM	Infrastructure Manager	Directive 2004/49/EC Art. 3(b)
INF	(TSI) Infrastructure	http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
IRL	International Requirements List	www.rail-irl.eu
ISA	Independent Safety Assessor	NB-Rail RFU 2-000-16 of 01 April 2006
ISV	'EC' Intermediate Statement of Verification	Directive 2008/57/EC Annex VI, 2.2.1
LEU	Lineside Electronic Unit	Decision 2012/88/EU and Regulation 2016/919/EU, ch. 4.2.3
LOC&PAS	(TSI) Locomotives and Passenger rolling stock	http://www.era.europa.eu/Document-Register/Pages/TSI-Application-Guide-CR-LOC-and-PAS-TSI.aspx
MS	(EU) Member State	*Note: in this Guideline, the term MS includes also Switzerland, as they adopt the European legislation on ERTMS in their national legal framework*
NB-Rail	Co-ordination group of Notified Bodies for Railway products and systems	CIRCABC database; browse from https://circabc.europa.eu via "NB-Net – Notified Bodies Network" to "NB-Rail"
--	Network	A network is a set of routes that use the same engineering principles, operational scenarios and solutions of the manufacturers[8]
NLF	National Legal Framework	ERA Application Guide for part 3 of the Reference Document http://www.era.europa.eu/Core-Activities/Cross-Acceptance/Pages/Part-2-and-Part-3-of-the-Reference-Document.aspx
NoBo	Notified Body	Directive 2008/57/EC Art. 2(j)
NOI	(TSI) Noise	http://www.era.europa.eu/Document-Register/Pages/CR-Noise-TSI.aspx
NR	National Rule(s)	Directive 2008/57/EC Art. 17.3 *Note: "National Rule" ("NR") is used in this Guideline as the equivalent term for rules that are national, notified and technical according to art. 17.3*
NSA	National Safety Authority	Directive 2008/57/EC Art. 2 (v), Directive 2004/49/EC Art. 16
Odo	Odometry	
OPV	Operation of Vehicle	Used in the tables of this Guideline
OPE	(TSI) Operation	http://www.era.europa.eu/Core-Activities/Interoperability/Pages/TSI-Application-Guide.aspx
OTS	Operational Test Scenario	Decision 2012/88/EU ch. 6.1.2 and Regulation 2016/919/EU ch. 6.1.2.2, ERA ERTMS/ETCS test format for operational testing version 1.2 of 24/05/2011
P1, P2, …	Preconditions (for activities of a stage)	Used in the tables of this Guideline

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[8] *Definition introduced for the purpose of this Guideline (see ch. 7.2). This is an extension to the definition in Directive 2008/57/EC Art. 2 (d).*

Abbreviation	Term	Reference
PRM	(TSI) Persons with Reduced Mobility	http://www.era.europa.eu/Document-Register/Pages/PRM-TSI.aspx
RBC	Radio Block Center	Decision 2012/88/EU and Regulation 2016/919/EU ch. 4.2.3
RFC	Rail Freight Corridor	http://www.corridor1.eu
RFU	Recommendation For Use	A RFU is a document for INTERNAL USE within NB Rail, recording questions, issues or concerns and the agreed answers (see NB-Rail)
RINF	Register of Infrastructure	Directive 2008/57/EC Art. 35
RIU	Radio Infill Unit	Decision 2012/88/EU and Regulation 2016/919/EU ch. 4.2.3
RST	(TSI) Rolling Stock	http://www.era.europa.eu/Document-Register/Pages/HS-RST-TSI.aspx
RU	Railway Undertaking	Directive 2004/49/EC Art. 3(c)
--	Safe Integration	Recommendation 2014/897/EU, 2 (c): 'safe integration' means the action to ensure the incorporation of an element (e.g. a new vehicle type, network project, subsystem, part, component, constituent, software, procedure, organisation) into a bigger system, does not create an unacceptable risk for the resulting system
--	Satisfy itself	German: sich überzeugen dass Dutch: ervan overtuigd zijn dat Italian: convincersi, persuadersi
SMS	Safety Management System	Directive 2004/49/EC Art. 2 (i)
SRAC	Safety Related Application Conditions	Rules, conditions and constraints relevant to functional safety which need to be observed in the application of the system/sub-system/equipment (EN 50129, B.5)
SRT	(TSI) Safety in Railway Tunnels	http://www.era.europa.eu/Document-Register/Pages/SRT-TSI.aspx
SS	(structural or functional) Subsystem	Directive 2008/57/EC intro (26), Art. 2 (e), Annex II
STM	Specific Transmission Module	Decision 2012/88/EU and Regulation 2016/919/EU ch. 6.2.4.2
T1, T2, …	Tasks (activities of a stage)	Used in the tables of this Guideline
TC	Test Case	ERTMS/ETCS test format for operational testing version 1.2 of 24/05/2011
TCN	Technical Compatibility with the Network	Introduced for the purpose of this Guideline[9]
--	Technical Compatibility	Recommendation 2014/897/EU, 2 (e): 'technical compatibility' means an ability of two or more structural subsystems or parts of them which have at least one common interface, to interact with each other while maintaining their individual design operating state and their expected level of performance
TSI	Technical Specification for Interoperability	Directive 2008/57/EC intro (12)
TTSV	Track-Train System Validation	Introduced for the purpose of this Guideline[10]

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[9] *See ch. 7.3*

Abbreviation	Term	Reference
UNISIG	Union Industry of Signalling (industrial consortium, assoc. member of UNIFE)	www.ertms.net/ertms/about-unisig.aspx
VOB	(EC) Verification On-Board	Used in the tables of this Guideline
VTR	(EC) Verification Trackside	Used in the tables of this Guideline
WG	Working Group	

Note: All definitions according to Directive 2008/57/EC, Art. 2 are also valid for this Guideline.

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[10] *See ch. 7.3*

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2.   Introduction

2.1.   Objective of this Guideline

2.1.1.   On 26 May 2009, the Dutch, German, Swiss and Italian Ministers asked the National Safety Authorities with the support of EC/ERA, notified bodies, IMs and industry to develop a common process for authorising the placing in service of CCS systems on the Corridor A[11] railway infrastructure and vehicles.

The aim is to create transparency and efficiency to all the parties involved related to the authorisation process.

2.1.2.   This Guideline is intended to describe a common approach for authorisation which is taking into account the current quality/maturity level of specification and products.

2.1.3.   It is considered that vehicle authorisation is complex, that it has cross border impact and the greatest potential for cost reduction, e.g. by process harmonisation and cross acceptance.[12] This potential has also been acknowledged in the Copenhagen MoU of 2012.

2.2.   Scope of this Guideline

2.2.1.   This Guideline is primarily focussing on the authorisation activities related to the on-board CCS subsystem as part of the vehicle authorisation. Trackside authorisation is also considered in the overall framework.[13]

2.2.2.   The Guideline follows the European approach as laid down in the Interoperability Directive 2008/57/EC. However, as the Interoperability Directive 2008/57/EC enables some freedom of interpretation in which steps are necessary to ensure technical compatibility and safe integration, some special arrangements for Rail Freight Corridors have been agreed on. They will be described in the subsequent chapters.

2.2.3.   Based on the European framework, this Guideline describes the roles and responsibilities within the authorisation process for the CCS subsystem. In particular this Guideline addresses what has to be done for the on-board CCS part of the vehicle authorisation by the NSAs of Rail Freight Corridors.

2.2.4.   This Guideline reflects the understanding of the Rail Freight Corridor 1&3 NSA Working Group and what is considered to be the right way forward.

2.2.5.   This Guideline is applicable in the Member States mentioned on page 2.

2.3.   Structure of this Guideline

2.3.1.   Chapter 3 gives a general overview of the system, process and involved parties.

2.3.2.   Chapters 4, 5, 6, 7 and 8 are related to on-board / vehicle authorisation. Chapter 5 is describing the details regarding the authorisation process to be applied for a first authorisation. Chapter 6 is about what to do if new, additional and subsequent authorisations are requested.

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[11] *At that time it referred to Corridor A; later more NSAs have joined the NSA Working Group*

[12] *It is recognised that some time trackside realisations will remain different, e.g. because of the underlying Class B and signalling systems. Nevertheless, activities have started to reduce unnecessary trackside differences (elaboration of engineering guidelines, database of operational test cases).*

[13] *The infrastructure managers of Corridor Rhine-Alpine have stated in the Progress Report of the Executive Board of August 2011 of that they are not able to deliver a harmonised customer requirement specification for the ETCS-infrastructure on Corridor A. The benefit of one harmonised process for the placing in service of the infrastructure is not given any more. This fact has led to the change of the focus of the NSA Working Group towards the definition of a harmonised process for the on-board CCS subsystem as part of the vehicle authorisation.*

2.3.3.   Annex I (intentionally deleted – content has been taken over in ERA documentation)

Annex II gives considerations how the amount of testing can be reduced.

Annex III lists recommendations related to the authorisation process, which would help to streamline the application of the European legal framework but could not be solved in the frame of the NSA working group.

Annex IV shows how IMs can support the testing approach of this Guideline.

Annex V gives recommendations on the use of languages.

Annex VI is related to the certification of ICs. However, this is not in the scope of the NSAs and given here for completeness.

Annex VII is related to authorisation of trackside subsystems. However, this is not in the scope of this Guideline and given here for completeness.

Annex VIII is related to network access and operation, which is outside the scope of authorisation.

3. Overview

3.1. The essential requirements

3.1.1. The Railway Interoperability Directive 2008/57/EC requires that the subsystems and the interoperability constituents including interfaces meet the essential requirements set out in general terms in Annex III to the Directive.

3.1.2. The essential requirements are:

    1) Safety,
    2) Reliability and availability,
    3) Health,
    4) Environmental protection,
    5) Technical compatibility,
    6) Accessibility.[14]

3.1.3. The essential requirements for Class A systems are described in Decision 2012/88/EU and Regulation 2016/919/EU, Chapter 3. The requirements for Class B systems are in the responsibility of the relevant Member State having the obligation to notify these as a NR to the EC.

3.2. Overview of the system

3.2.1. The following scheme of the system (Figure 1) shows the different subsystems and the interfaces to be taken into account for integration and authorisation of a vehicle equipped with an on-board CCS subsystem. It highlights the subsystem CCS on-board, which is in the scope of this Guideline.

The colour code for both system overview and process overview is given in Figure 2.

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[14] *Accessibility has been introduced by Directive 2013/9/EU, amending the Interoperability Directive 2008/57/EC. However, it is not mentioned in Decision 2012/88/EU and Regulation 2016/919/EU and will probably not be relevant for CCS subsystems.*

System overview – interfaces of the on-board CCS subsystem
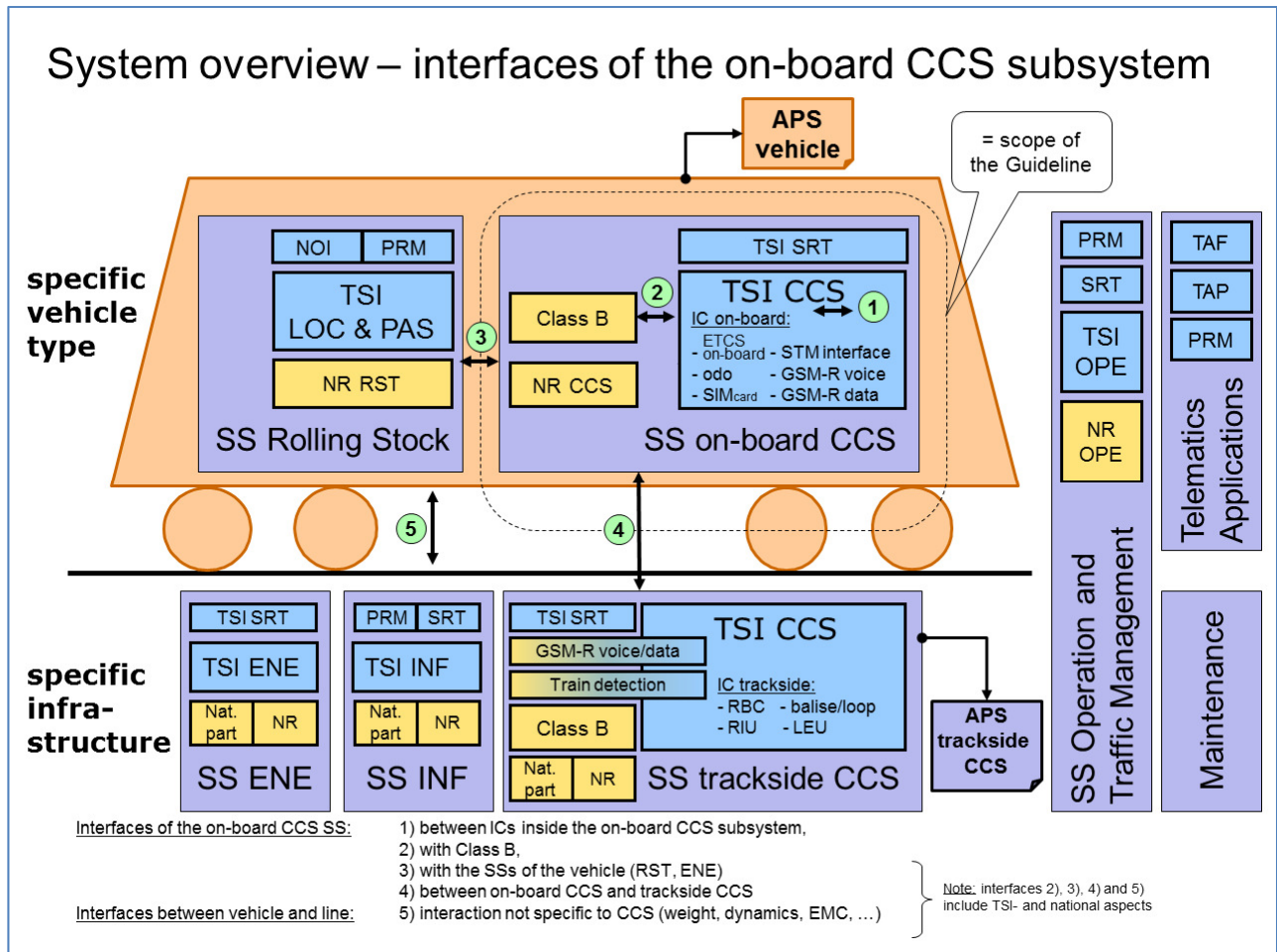
Figure 1: System Overview

Colour code

European part		subsystem	
national part		vehicle	
safety assessment		testing	
③ on-board relevant interfaces			

Interfaces of the on-board CCS SS:
1) between ICs inside the on-board CCS subsystem,
2) with Class B,
3) with the SSs of the vehicle (RST, ENE)
4) between on-board CCS and trackside CCS

Interfaces between vehicle and line:
5) interaction not specific to CCS (weight, dynamics, EMC, …)

Note: interfaces 2), 3), 4) and 5) include TSI- and national aspects

Figure 2: Colour Code

3.2.2.   The essential requirements will be fulfilled based on rules laid down in TSIs (rules necessary to achieve interoperability with Class A systems), NRs and other standards, as shown in Figure 3.

The part fulfilled by mandatory rules shall be certified by assessment bodies. The part fulfilled by voluntary rules shall be covered by the quality management systems of the manufacturer/applicant. The part fulfilled by voluntary rules will be taken into account by the assessment bodies to check the fulfilment of the essential requirements.

The fulfilment of all essential requirements shall be declared by the applicant when submitting the documents for authorisation.
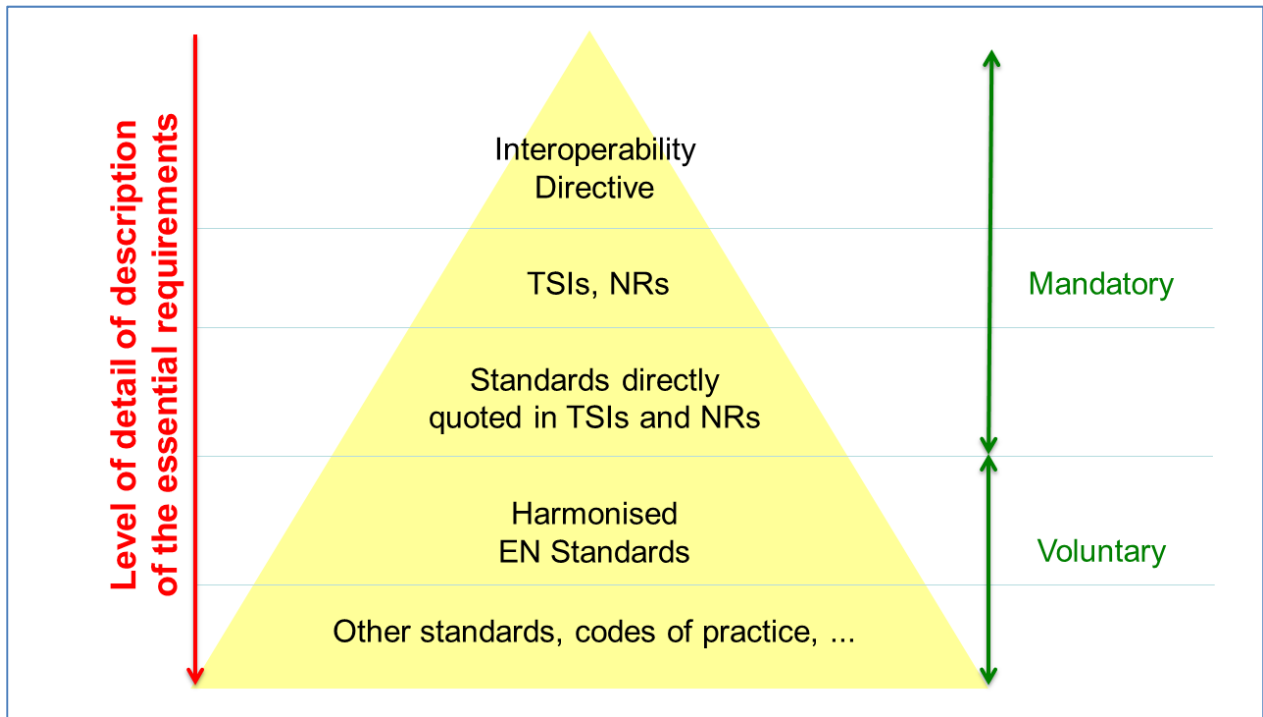
Figure 3: Level of detail of the specifications[15]

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[15] *Based on Recommendation 2014/897/EU, No.31*

3.3. Overview of the authorisation process

3.3.1. From a general point of view Directive 2008/57/EC regulates the technical characteristics (mainly design, production, and final testing) of the subsystems and vehicles and the process of their authorisation for placing in service, and Directive 2004/49/EC regulates the entities that use, operate and maintain them, as shown in Figure 4.
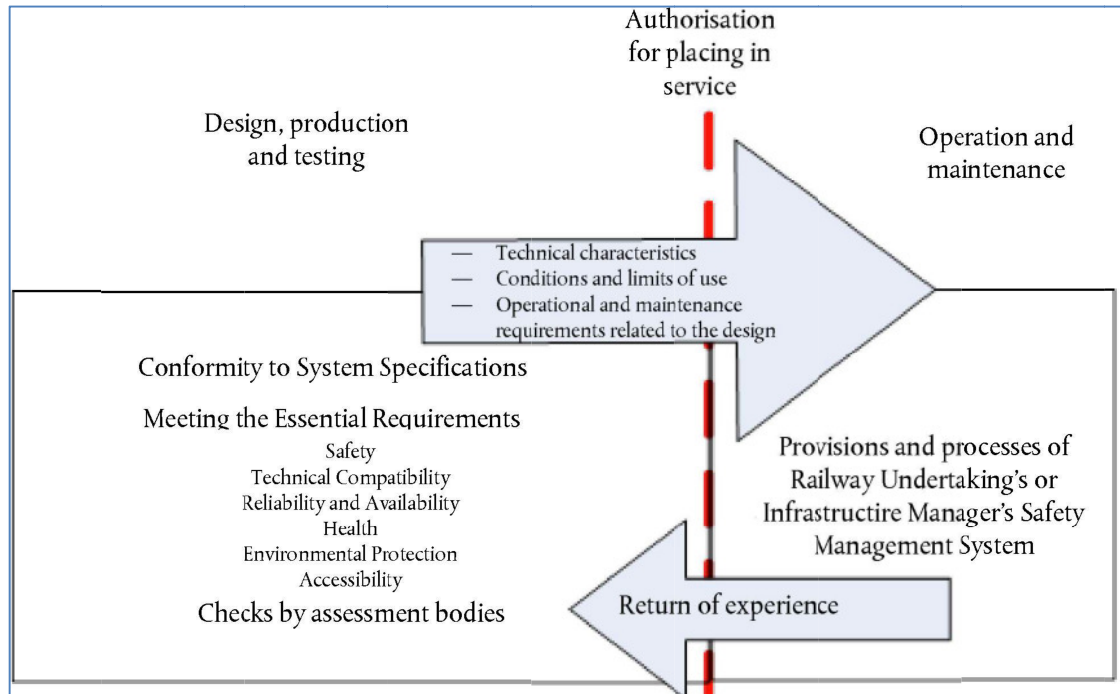
Figure 4: Activities before and after an authorisation for placing in service of a structural subsystem[16]

3.3.2. Figure 5 shows a possible schematic classification of milestones for vehicles and trackside equipment including related tests as used in this Guideline.

The overall process can be divided in four main stages, depicted as A, B, C and D. The Guideline focuses on stages B and C for the CCS on-board subsystem.

The colour code is given in Figure 2.

3.3.3. The overview figure also highlights the subsystem CCS on-board, which is in the scope of this Guideline.

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[16] *See Recommendation 2014/897/EU, No.3*
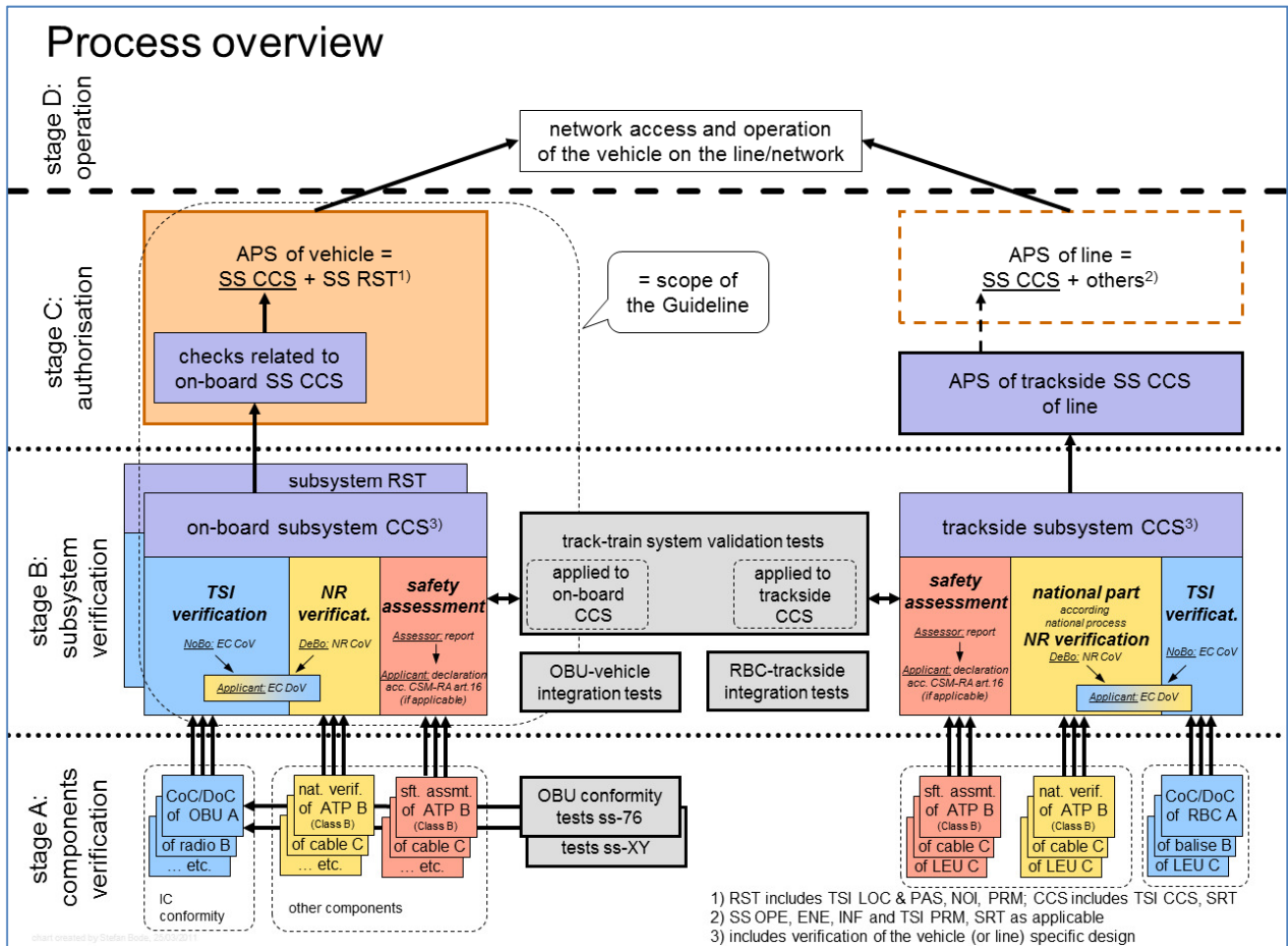
Figure 5: Overall process overview

3.3.4. Stage A: Components Verification

Certificates of conformity and declarations of conformity for ICs are not put into question during authorisation by the NSA. It is however relevant that any restriction and condition of use will be forwarded to the 'EC' verification process (see also Annex III, R7).

3.3.5. Stage B: Subsystem Verification

a) The assessment bodies NoBo, DeBo, CSM AsBo (if applicable) assess the CCS subsystem as a whole, including the integration of the ICs within the CCS subsystem and the integration with the other vehicle subsystems and the trackside CCS subsystem.

b) Track-train system validation (TTSV) is the process to provide evidence for technical compatibility between an on-board CCS subsystem in its design operating state and a certain network, i.e. under the functional, technical, environmental and operational conditions of the network where the on-board subsystem will be used.

Other vehicle authorisation cases (new, additional, renewed) may require a reduced effort, depending on the nature and/or amount of changes compared to the first authorisation. It remains in the responsibility of the applicant to define and provide the necessary assessments and related documentation submitted for authorisation.

3.3.6.   Stage C: Authorisation

The NSA will grant authorisation based on the results of stage B and the checks according to Directive 2008/57/EC article 15 and chapter V.

The types must be registered in ERATV (European Register of Authorised Types of Vehicles).[17]

3.3.7.   The current national implementations of the European Process will be published as "national legal framework" (NLF) on the ERA website http://www.era.europa.eu/Core-Activities/SRIS/Pages/Part-2-and-Part-3-of-the-Reference-Document.aspx.

The authorisation process for vehicles with CCS on-board should be NLF compliant.

3.3.8.   Stage D: Operation

This stage after APS is in the responsibility of the IM, RU and ECM, each for her part of the railway system.

Before the train can be taken into operation, the individual vehicles must be registered in NVR (National Vehicle Register).[18]

Return of experience will give input for future authorisations.

3.4.   Overview of vehicle authorisation cases

According to Directive 2008/57/EC, authorisation can be granted according to different cases.

The following cases have been developed and described in the generic NLF flowcharts (see ERA Application Guide for part 3 of the Reference Document):

- First authorisation for vehicle type/vehicle

- New authorisation for upgraded/renewed vehicle type/vehicle

- Additional authorisation for vehicle type/vehicle already authorised by an MS (on other networks or on parts of other networks)

- Renewed authorisation for a type authorisation that is not valid anymore (e.g. after change of TSI requirements, NRs, verification procedures)

- Subsequent authorisations of vehicles conforming to an authorised vehicle type (authorisation of vehicles of the same type)

3.5.   Overview of roles and responsibilities

3.5.1.   The roles and responsibilities of the actors during the authorisation process are described in the Directive 2008/57/EC, Directive 2004/49/EC and Recommendation 2014/897/EU.

3.5.2.   Assessment bodies NoBo, DeBo, safety assessor and CSM AsBo

a) The NoBo is responsible for the aspects that are contained within the TSIs.

b) The DeBo is responsible for the aspects that are contained within the National Rules.

c) On vehicle level it is necessary to ensure that all essential requirements are met related to the vehicle design operating state.[19]

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[17] *On ERATV, see also footnote in AV/T8*
[18] *On NVR, see also footnote in OP/T1*
[19] *This could be done e.g. by the DeBo*

In case of significant change, the demonstration of compliance with the safety requirements is to be supported by independent assessment by a CSM assessment body (CSM AsBo) according to Regulation 402/2013/EU.

The tasks and roles of the assessment bodies are defined in CENELEC 50129, Directive 2008/57/EC, Regulation 402/2013/EU and Recommendation 2014/897/EU.

The different roles of NoBo, DeBo and CSM Asbo could be fulfilled by the same person/body if they have the correct competence/accreditation/recognition.

3.5.3. ISA

"ISA" is a term introduced by NB-Rail into the railway domain to indicate a person able (according to competence and independence characteristics) to perform certain verification tasks to help a manufacturer/designer:

> *"Hence, Safety, which is an essential requirement, may be assessed by an ISA which is not necessarily a Notified Body. Note that the scope of ISA assessment can be an IC, a subsystem, or a part of an IC or a subsystem such as an electronic board, software, or a sensor."*[20]

The ISA is an option if the applicant wants to procure technical assistance but this is not mandatory for authorisation according to EU legislation. In any case, the safety assessment is in the responsibility of the applicant.

The ISA can also have a role in case of a non-significant change and as part of the CENELEC process.

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[20] *RFU 2-000-16 of 01 April 2006, introducing the term ISA and criteria for ISA acceptance for the railway domain; CENELEC only mentions safety assessment*

4. Main principles

4.1. Legal background

4.1.1. The **Interoperability Directive 2008/57/EC** sets the legal framework for the authorisation of subsystems and vehicles. Therefore, the Directive had to be transposed into national law by the Member States of the European Union.

The Interoperability Directive 2008/57/EC introduces the technical specifications for interoperability (TSI). The TSIs specify the essential requirements for each subsystem and the functional and technical specifications to be met by these subsystems and their interfaces.[21]

4.1.2. According to **Directive 2008/57/EC article 15**, "Member States shall take all appropriate steps to ensure that these subsystems may be placed in service only if they are designed, constructed and installed in such a way as to meet the essential requirements concerning them when integrated into the rail system."

In particular, technical compatibility and safe integration[22] of these subsystems shall be checked.

4.1.3. **Regulation 402/2013/EU** on the common safety method for risk evaluation and assessment describes the process of risk management the proposer has to implement in case of any change to the railway system.

4.1.4. **Recommendation 2014/897/EU** sets out some principles and directions for Member States to improve the common understanding and facilitate the harmonisation of the procedures for the authorisation for placing in service of structural subsystems and vehicles.

4.2. Concept of the Guideline

The signatories of the document propose to apply the following concept for the authorisation of vehicles with on-board CCS subsystem.[23]

4.2.1. The APS is intended to be valid on the network(s).

A network is a set of routes that use the same engineering principles, operational scenarios and solutions of the suppliers.

4.2.2. There will be no separate APS for the structural subsystem on-board CCS. The activities related to the CCS subsystem will be part of the overall APS for the vehicle.[24]

4.2.3. For subsystems that are affected by the change of the CCS installation, new declarations of verification in the framework of the vehicle authorisation are required.

4.2.4. Directive 2008/57/EC mandates under Article 15.1 the NSA to check the safe integration of structural subsystems into the rail system.

Obtaining authorisation by an applicant is not a change to the railway system. Only when a vehicle/subsystem is used by an RU/IM under its SMS may the railway system possibly be considered to be changed.

Applicants shall provide, in the technical file, all the information necessary for any RU to make use of the vehicle type (including but not limited to the restrictions and

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[21] *As far as Decisions are concerned, also the TSIs have to be put in force by national law of the MS*

[22] *According to Recommendation 2014/897/EU No.39, the term 'safe integration' may be used to cover (inter alia): (a) safe integration between the elements composing a subsystem; (b) safe integration between subsystems that constitute a vehicle or a network project; and, for vehicles: (c) safe integration of a vehicle with the network characteristics.*

[23] *Considerations on trackside authorisation can be found in Annex VII*

[24] *See also Recommendation 2014/897/EU, No.4*

conditions of use) and to apply the Regulation 402/2013/EU when planning to use a vehicle on a route.

4.2.5. Decision 2012/88/EU and Regulation 2016/919/EU mandates under chapter 3.2.1 the use of Regulation 402/2013/EU to fulfil the essential requirement safety for CCS subsystems. For Class A, the application of subset-091 as a code of practice is mentioned.

4.2.6. The NSA takes the decision for APS of the vehicle based on the provisions described in Directive 2008/57/EC. The necessary information is assumed to be provided by the following documents issued by the applicant and submitted for authorisation.

1. For each subsystem constituting the vehicle, the applicant declares that all essential requirements are met and submits the following documents:

- 'EC' declaration of verification – based on the NoBo's and DeBo's assessments

- An assessment report regarding the safe integration and technical compatibility in relation to the design operating state of the vehicle[25]

- And in case of significant change[26]: declaration of the proposer as stated in Art. 16 of Regulation 402/2013/EU – based on the safety assessment report of the CSM AsBo[27]

2. Other documents to be submitted for authorisation

4.2.7. According to Directive 2008/57/EC Art. 15(1) the Member State has to check technical compatibility and safe integration before subsystems may be placed in service.

4.2.8. Before APS can be granted, the proof of safe integration and technical compatibility <u>related to the design operating state</u> of the vehicle shall be provided by the applicant.

In this Guideline, if not otherwise specified, safe integration and technical compatibility are related to the design operating state of the vehicle, subsystem or part of subsystem.

4.2.9. The applicant bears the full responsibility for the completeness, relevance and consistency of the declarations and the technical file. This will be checked by the NSA before authorisation.[28][29]

4.2.10. All relevant information, including restrictions and conditions of use, has to be provided in these documents in such a way, that the user of the authorised subsystem or vehicle can apply them according to its SMS.[30]

This includes all parameters which have been considered within the construction and authorisation of the vehicle and which have to be checked by the RU to ensure safe integration and technical compatibility before placing the vehicle in operation (see also Annex VIII – Operation).

4.2.11. All tests related to the generic network characteristics have to be done before authorisation. No additional tests shall be needed after APS to check route suitability. All information related to the use of the vehicle has to be explicit in the technical file.

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[25] *Definition of safe integration, technical compatibility and design operating state see chapter 1.2*

[26] *See Annex III, R15*

[27] *All changes to the vehicle are covered by the Directive 2008/57/EC and the TSIs, only if the vehicle/subsystem is introduced into the railway system the Regulation 402/2013/EU has to be applied*

[28] *See Recommendation 2014/897/EU, No.58*

[29] *As long as the NLF still requires check of correctness, this check will also be a task of the NSA*

[30] *See Recommendation 2014/897/EU, No.40*

4.2.12.   The NSA checks if the process required by the national legal framework has been correctly applied.

4.2.13.   During the authorisation process information shall be shared[31] on issues (e.g. from other projects) that might be relevant for the authorisation, such as:

- known issues/problems from the subsystem under authorisation or parts of it (accidents, incidents, …)

- known issues/problems with the involved bodies (accreditation, safety authorisation, safety certificate, complaints, …)

- known issues/problems with the application of the process required by the national legal framework by the involved bodies

The NSA shall satisfy itself that the applicant has taken into account these above mentioned issues.[32]

4.2.14.   National safety authorities should not repeat any of the checks carried out as part of the verification procedure. However in case of justifiable doubts the NSA may call third party verifications into question.[33]

Justifiable doubts can be in particular

- if before APS for a subsystem or vehicle it becomes known to the NSA that for an already authorised subsystem, which is in its construction or functions comparable, the preconditions are fulfilled for the NSA to decide on supervision activities because of an anticipated concrete risk,

- if an information has been registered in the safety information system of the NSA,

- if the NSA has to decide for surveillance measures according to Art. 14 Par. 1 and 2 of Directive 2008/57/EC, or

- if the NSA has information on poor fulfilment of tasks of notified bodies, designated bodies or assessment bodies which are involved in the respective authorisation process.

In case of justifiable doubts the NSA has the right to request additional checks from the applicant.

4.2.15.   As a basic principle, no restriction should be accepted for APS. However, where restrictions are unavoidable, they should be kept to a minimum.

4.3.   Consequences of the concept

4.3.1.   The concept does imply several links and interfaces inside and outside the scope of the NSA. These connecting issues require a dedicated consideration which is not in the scope of this Guideline.[34]

4.3.2.   In Annex III are listed recommendations to help streamline the process of APS.

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[31] *The NSA can only share as much as legally possible information on issues (e.g. from other projects) that might be relevant for the authorisation. Confidential information shall not be shared.*

[32] *These checks are necessary for the NSA to ensure that "all appropriate steps" of Directive 2008/57 Art. 15.1 are taken*

[33] *See Recommendation 2014/897/EU, No.60, 61 and 62*

[34] *This Guideline is a concept for authorisation. Therefore the following issues are not covered: market and railway supervision, recognition and accreditation of assessment bodies, processing of derogations from the TSI CCS, processing of NRs, financing and funding, support and supervision of interoperability and European harmonisation, referee function in case of divergent positions of interest groups, cross-acceptance*

5. Main steps of the concept

5.1. Scope of this chapter

5.1.1. This Guideline is focusing on the on-board stages B and C of the overall process from design to operation. It does neither introduce specific arrangements for the stages A and D nor for the trackside process (stages A, B, C, D).

5.1.2. This chapter gives a detailed description of stages B and C (CCS on-board) for a first authorisation.[35]

To put the vehicle authorisation in a wider context,

- Stage A is described in Annex VI

- Stages B and C related to trackside are described in Annex VII

- Stage D is described in Annex VIII.

5.1.3. For unambiguous reference, the following abbreviations are used in the tables of this chapter and Annexes VI, VII, VIII:

Stage A	CIC	conformity of interoperability constituent
Stage B	VOB	verification on-board
	VTR	verification trackside
Stage C	AOB	authorisation on-board
	ATR	authorisation trackside
Stage D	OV	operation of vehicle

5.2. Stage B: 'EC' verification of the on-board CCS subsystem
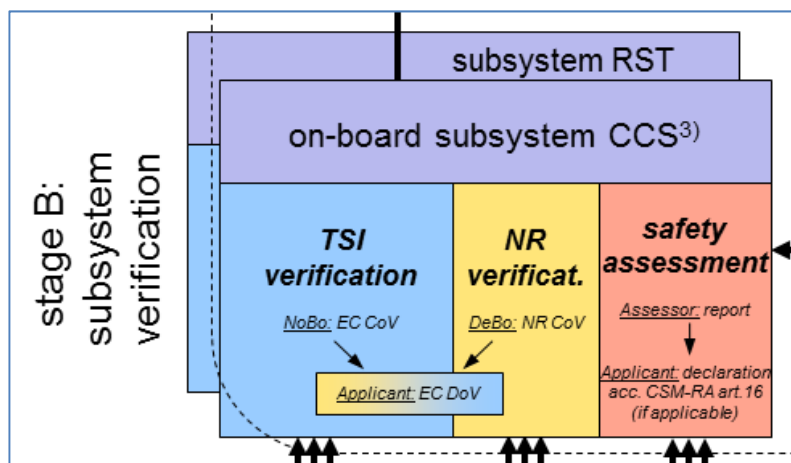

Figure 6: On-board stage B part of process overview

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[35] *Chapter 6 is about what to do if new, additional and subsequent authorisations are requested*

5.2.1.   Overview table

	Preconditions	**Responsible**
VOB/P1 [36]	'EC' certificates of conformity (CoC) for all constituents (alternatively for groups of constituents)[37]	NoBos (for ICs)
VOB/P2	'EC' declarations of conformity (DoC)	Applicant
VOB/P3	An ETCS infrastructure allowing verification[38] of the on-board CCS subsystem	Applicant[39]
VOB/P4	National Rules (NRs)[40]	Member State
VOB/P5	The on-board CCS subsystem has been configured for a specific vehicle	Manufacturer
	Tasks to be performed	**Responsible**
VOB/T1	'EC' verification of the subsystem according to TSI CCS ch. 6.3 with table 6.2 ("what to assess"), the chosen module according to TSI CCS ch. 6.3.2, and Directive 2008/57/EC Annex VI ("verification procedure for subsystems")[41] The technical file for 'EC' verification (NoBo) shall follow the standard structure given in Directive 2008/57/EC Annex VI ch. 2.4	NoBo (for subsystem)
VOB/T2	Verification of conformity with NRs according to Directive 2008/57/EC Art. 17	DeBo
VOB/T3	Unless other evidence can be provided, TTSV testing shall be used to validate that each network where the vehicle is intended to run can operate with the on-board. If a problem occurs, the analysis according to paragraph 7.4.3 shall take place.	Applicant
VOB/T4	Perform risk assessment[42] according to CENELEC 50126/50128/50129[43]	Applicant
VOB/T5	In case of significant change: independent assessment according to CSM Regulation 402/2013/EU Note: this assessment includes the integration of the interfaces 1)…5), details see Figure 1	CSM Assessment Body

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[36] *VOB=(EC) Verification On-Board (for unambiguous reference)*

[37] *In case of too many non-conformities, it is up to the NoBo to decide if a certificate can be issued; see also Annex III, R7 and R10. The relevant information about non-conformities shall be made available for the assessments of stage B. The NoBo has to take into account the non-conformities of the constituents in the subsystem 'EC' certificate of verification.*

[38] *This infrastructure may be equipped with only a part of all possible functionalities. This infrastructure may be available in lab only. 'EC' verification can mainly be executed in lab.*

[39] *The applicant has to use the infrastructure provided by infrastructure manufacturer and/or IM or labs*

[40] *On the management of National Rules, see decision 2011/155/EC and ERA's Application Guide (Part 1 of the Reference Document envisaged by Article 27 of the Railway Interoperability Directive)*

[41] *This assessment includes checks of vehicle configuration data, or the verification that the checks have been correctly performed (for ETCS baseline 3 see subset-091, v3.2.0, ch. 9.3 "Integrity Requirements for On-board Data Preparation", for ETCS baseline 2 see subset-091 v2.5.0 ch. 9.4)*

[42] *Including safe integration*

[43] *This is in line with the application of the CSM Regulation 402/2013/EU*

VOB/T6	Compile the technical file for 'EC' verification of the CCS subsystem	Applicant
	Documents	**Responsible**
VOB/D1	'EC' certificate of verification (CoV), indicating any restrictions and conditions of use and including the underlying assessment report *Note: this 'EC' certificate may be based on 'EC' ISV(s) for parts or stages of the subsystem; in this case the relevant checks need not to be repeated*	NoBo
VOB/D2	Certificate of NR verification, indicating any restrictions and conditions of use, including the assessment report and the underlying technical documents	DeBo
VOB/D3	TTSV test report	Applicant
VOB/D4	An assessment report regarding the safe integration in relation to the design operating state of the vehicle[44] – based on the risk assessment VOB/T4	Applicant
VOB/D5	In case of significant change: the declaration of the proposer as stated in Art. 16 of Regulation 402/2013/EU – based on the safety assessment report of the CSM assessment body	Applicant/ Proposer[45]
VOB/D6	'EC' declaration of verification (DoV) according to Directive 2008/57/EC Annex V, indicating any restrictions and conditions of use – based on the NoBo's and DeBo's assessments Any restriction and condition of use shall be stated in the declaration in such a way that the details are easy to find for the NSA	Applicant
VOB/D7	The technical file for the CCS on-board subsystem	Applicant

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[44] *See ch. 1.2 for definition of safe integration and design operating state*
[45] *According to the Regulation 402/2013/EU the proposer shall draw the declaration. In the framework of this Guideline the proposer is always the applicant*

5.3.   Stage C: APS related checks of the on-board CCS subsystem

5.3.1.   These checks on the on-board CCS subsystem are part of the activities for the APS of the vehicle, see section of process overview, Figure 7.
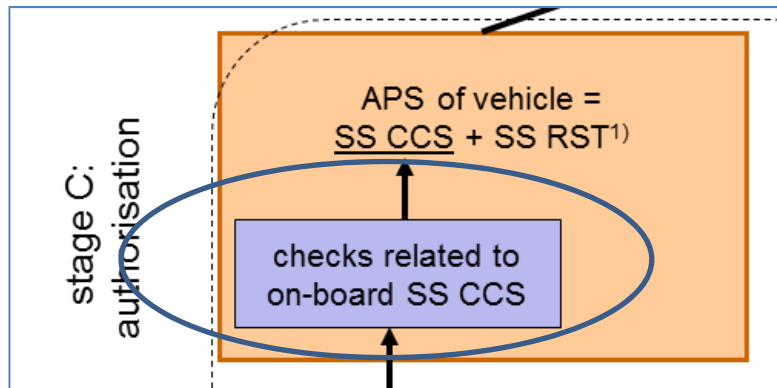

Figure 7: On-board stage C – CCS subsystem part

5.3.2.   Overview table

	Preconditions	**Responsible**
AOB/P1 [46]	The deliveries from stage B, i.e. the documents VOB/D1…VOB/D8. Note: the additional underlying technical documents of NR verification are not always to be submitted, e.g. because of property rights. They may be requested by the NSA.	Applicant
	Tasks to be performed	**Responsible**
AOB/T1	Check of completeness, relevance and consistency of the documents provided by the applicant	NSA
AOB/T2	Information shall be shared[47] on issues that might be relevant for the authorisation process, such as: • known issues/problems from the subsystem under authorisation or parts of it (accidents, incidents, …) • known issues/problems with the involved bodies (accreditation, safety authorisation, safety certificate, complaints, …) • known issues/problems with the application of the process required by the national legal framework by the involved bodies	Applicant, NSA
AOB/T3	The NSA shall satisfy itself that the applicant has taken into account these above mentioned issues. In case of justifiable doubts the NSA may call third party verifications into question and request additional checks from the applicant.[48]	NSA
AOB/T4	The NSA shall check that restrictions and conditions of use are given by the applicant in the technical file and are acceptable	NSA

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[46] *AOB=Authorisation On-Board (for unambiguous reference)*
[47] *See footnote under 4.2.13. about shared information*
[48] *See ch. 4.2.14. about justifiable doubts*

	Documents	**Responsible**
AOB/D1	The on-board CCS subsystem related part of the technical file of the vehicle or vehicle type	Applicant

5.4.   Stage C: APS of the vehicle

5.4.1.   These checks are part of the activities for the APS of the vehicle, see section of process overview, Figure 8.
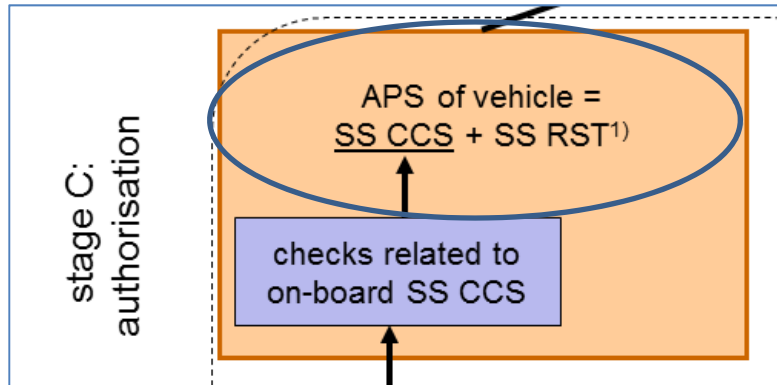

Figure 8: On-board stage C – vehicle

5.4.2.   Overview table

	Preconditions	Responsible
AV/P1[49]	The on-board CCS subsystem related part of the technical file for APS of the vehicle or vehicle type (see AOB/D1)	Applicant
AV/P2	The same file for the rolling stock subsystem	Applicant
AV/P3	Assessment of the fulfilment of all essential requirements at vehicle level[50]	Applicant
AV/P4	Application for authorisation of the vehicle	Applicant
	Tasks to be performed	**Responsible**
AV/T1	The NSA checks that the process required by the national legal framework has been correctly applied	NSA
AV/T2	Compile the technical file of the vehicle (including the parts related to the on-board CCS and rolling stock subsystems)[51]	Applicant
AV/T3	Declare that all essential requirements are met and submit all documents for authorisation including the required declarations	Applicant
AV/T4	Check of completeness, relevance and consistency of the documents provided by the applicant[52]	NSA

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[49] *AV=Authorisation Vehicle (for unambiguous reference)*

[50] *This may be done by providing a safety case according to CENELEC for the vehicle. It is assumed that this assessment can be further reduced as the integration between the subsystems during their 'EC' verification will more and more cover all relevant aspects.*

[51] *If required by the NLF, the advise of the IM on technical compatibility with the generic network characteristics shall be included*

[52] *As long as the NLF still requires check of correctness, this check will also be a task of the NSA*

AV/T5	Information shall be shared[53] on issues that might be relevant for the authorisation process, such as: • known issues/problems from the subsystem under authorisation or parts of it (accidents, incidents, …) • known issues/problems with the involved bodies (accreditation, safety authorisation, safety certificate, complaints, …) • known issues/problems with the application of the process required by the national legal framework by the involved bodies	Applicant, NSA	
AV/T6	The NSA shall satisfy itself that the applicant has taken into account these above mentioned issues. In case of justifiable doubts the NSA may call third party verifications into question and request additional checks from the applicant.[54]		
AV/T7	The NSA shall check that restrictions and conditions of use are given by the applicant in the technical file and decide that this is not too much to grant the authorisation	NSA	
AV/T8	Entries in ERATV (European Register of Authorised Types of Vehicles) database[55]	NSA, Applicant	
	Documents	**Responsible**	
AV/D1	Authorisation for placing in service (APS) of the vehicle (resp. vehicle type/series) for each relevant network[56], including restrictions and conditions of use (e.g. 1 vehicle only) Note: APS for a vehicle or for a vehicle type may be time limited[57]	NSA	
AV/D2	Registration in ERATV completed	NSA, Applicant	

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[53] *See footnote under 4.2.13. about shared information*

[54] *See ch. 4.2.14. about justifiable doubts*

[55] *For vehicle type authorisation, the data for ERATV have to be provided at this stage. Currently, ERATV may be not yet a precondition for registration in the National Vehicle Register (NVR). See also recommendation R27.*

[56] *The network may include routes equipped with ERTMS, Class B and border crossings (Class B to Class B) commanded by ETCS*

[57] *There are different reasons for time limitation of type authorisation: 1) to avoid vehicles being built forever according to old legal framework, 2) there are too many non-conformities and time limitation should ensure that these points will be closed*

6. Principles for new, additional and subsequent authorisations of vehicles

6.1. General issues

6.1.1. In case new, additional or subsequent authorisations are requested, the following clauses will provide principles how to act. Depending on the requested authorisation, the appropriate elements from chapter 5 are to be applied in order to compile the documents for the authorisation.

6.1.2. Any modification of the CCS system or the installation of a new CCS system or the installation of an additional CCS system shall be evaluated by the applicant in respect to the modified parts. The application for a new or additional APS shall limit to the changes and the impact of the changes to the other parts of the vehicle.

The applicant is also responsible for arranging the necessary TTSV tests and assessments to ensure technical compatibility with existing infrastructure for which the vehicle was already authorised. It is assumed that the infrastructure manager will collaborate to make this possible.

6.1.3. In case of an installation of a new or additional on-board CCS subsystem the process to obtain a new or additional vehicle authorisation shall comply with the concept described in chapter 4. In case of addition of a Class B system the proof of technical compatibility and safe integration follows the relevant national legal framework.

For ERTMS, Directive 2008/57/EC Art. 23 or 25 applies for additional authorisation of the vehicle.

For the ERTMS part, in case of additional authorisation, only issues strictly related to technical compatibility between vehicle and network shall be checked. This is also supported by TTSV testing.

6.1.4. In case of a subsequent authorisation Directive 2008/57/EC Art. 26.3 shall apply. Subsequent APS should be based only on the declaration of conformity to the authorised type.[58]

6.1.5. If a vehicle is intended to operate on different networks (e.g. within a Rail Freight Corridor), the preferred way to achieve authorisation should be to share between the NSAs the work necessary for all authorisations. One of the NSAs issues the first/new authorisation, and the other NSAs issue additional authorisations. The applicant chooses the NSA for first/new authorisation.

6.1.6. For each NSA, there shall be one dedicated set of documents, including the necessary declarations. They are based on documents for common aspects plus documents for network specific aspects (class B systems, NRs, technical compatibility with the network). The documents for common aspects shall be taken from the first authorisation.[59]

6.1.7. For any further additional/new authorisation, the result of first or additional authorisation shall be treated as equal in respect to the common aspects and will be accepted without further judgement. The NSA will satisfy itself that no new issues are introduced.

6.2. Impact of the changes

6.2.1. New and additional authorisation shall focus on the impact of the change (the "delta approach").

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[58] *This is common practice in many MS, even if it is not clear in the Interoperability Directive.*
[59] *For the language, the NLF shall be taken into account, see also Annex V*

6.2.2.   The following table is an example for the application of the "delta-approach". For each project, it has to be analysed which interfaces have to be checked (see Figure 1). The NSA may request for evidence.

	Examples of integration cases	Interfaces to be checked (see Figure 1)				
	Who is responsible?	Applicant	Applicant	Applicant	Applicant	Applicant
	Who will assess?	NoBo	DeBo	NoBo and DeBo	NoBo and DeBo (dependent on NR)	NoBo and DeBo (dependent on NR)
		Between ICs inside the on-board CCS subsystem	With Class B	With the subsystems of the vehicle	Between on-board and trackside CCS subsystems	Interaction not specific to CCS subsystem
1	STM (Class B system) integration					
2	CCS subsystem in new vehicle					
3	Additional APS					
4	Additional APS with new TSI					
5	New APS after a new installation of ETCS					
6	New ETCS Software version (e.g. Baseline 3)					
7	Installing an option as part of an existing TSI into a vehicle which was authorised without that option (not used and tested before) [60]					

6.2.3.   Technical enhancements are necessary to keep the vehicles up to a technical state of the art. However, if after a change in one subsystem of an existing vehicle, the whole vehicle has to be re-authorised according to new rules (e.g. TSI), technical progress could become economically impossible.

6.2.4.   Therefore, the authorised vehicle and all of its subsystems, before the change, shall be considered to meet the essential requirements including safety, even if they have been authorised according to rules not in force anymore.

6.2.5.   Only for the new components or functions the new rules shall be applied (i.e. "delta-approach"). Reverse or conflicting effects on existing parts of the system and their documentation shall be taken into account.

6.2.6.   In case the change has no impact on the verification or there is no change in the results of the verification (stage B), no new or additional authorisation is required. The related underlying documents will be updated.

6.2.7.   When adding ERTMS to a vehicle already authorised, the impact on the other on-board subsystems has to be considered during integration of the on-board CCS subsystem.

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[60] *Example: Euroloop integration into a vehicle authorised without Euroloop*

6.2.8.   Consequently, in case of changes to a vehicle already authorised, new or additional authorisation shall be necessary if one of the following documents has changed:[61]

- the content of the declaration of the applicant, that all essential requirements are met

- the 'EC' declaration of verification

- in case of significant change: the declaration of the proposer as stated in Art. 16 of Regulation 402/2013/EU.

6.2.9.   In case of new or additional authorisation, the impact of all changes since the last authorised state – minor and therefore not subject to authorisation - has to be taken into account.

6.2.10.   In case of renewed authorisation, the impact of all changes in the legal framework since the last authorised state has to be taken into account.

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[61] *In Italy, the NSA issues authorisation also when there is a "change in vehicle configuration".*

7.   Principles for Track-Train System Validation

7.1.   TSI requirements related to tests for CCS subsystems

7.1.1.   Operational test scenarios

Decision 2012/88/EU ch. 6.1.2 defines basic ERTMS testing principles for CCS subsystems. Therefore, each Member State

"… shall make available to the Commission the operational test scenarios for checking the ERTMS/ETCS and GSM-R part of the Control-Command and Signalling Track-side Subsystem and its interaction with the corresponding part of the Control-Command and Signalling On-board Subsystem."

Furthermore, the ERA shall build and publish a database of operational test scenarios, make sure they conform with the specification, and assess if further mandatory test specifications are necessary.

Regulation 2016/919/EU ch. 6.1.2.2 defines "operational test scenarios" as

"… description of the intended railway system operation in situations relevant for ETCS and GSM-R (…), by means of a sequence of trackside and on-board events related to or influencing the Control-command and Signalling subsystems (…) and the specified timing between them […] based on the engineering rules adopted for the project."

Furthermore, ch. 6.1.2.3 requires that for each trackside project

"… the engineering rules and the preliminary operational test scenarios related to the interactions of its ETCS and GSM-R parts […] are made available to the European Railway Agency as soon as possible."

and

"The European Railway Agency shall publish the engineering rules for the trackside parts of ETCS and GSM-R and the operational test scenarios."

7.1.2.   On-board CCS subsystem – recommended part[62]

Decision 2012/88/EU ch. 6.2.4.1 defines for the use of the operational test scenarios:

"… to increase confidence that the on-board ERTMS/ETCS can be correctly operated with different track-side applications, it is recommended that the on-board ERTMS/ETCS be tested using scenarios from the data base managed by the Agency… The documentation accompanying the certificate shall indicate the database scenarios against which the interoperability constituent has been checked."

Regulation 2016/919/EU ch. 6.2.5 states:

"To increase confidence that the On-board ETCS Interoperability Constituent will operate correctly when installed in On-board Control-command and Signalling Subsystems running on different Trackside Control-command and Signalling applications, it is recommended that it is tested using relevant scenarios from the ones published by the Agency; see point 6.1.2 […]

These tests are not mandatory for the certification of the On-board ETCS Interoperability Constituent."

Regulation 2016/919/EU ch. 6.5 states:

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[62] *There is some inconsistency in the TSI: ch. 6.2.4.1 (new TSI 6.2.5) is about ETCS on-board IC, ch. 6.1.2 about on-board SS. This is however alleviated by the fact that the ETCS function of the on-board subsystem can well be proven by lab testing of the ETCS on-board interoperability constituent.*

"To support the operators to take appropriate decisions on the use of an On-board (respectively, Trackside) Control-Command and Signalling subsystem, the applicant for EC Verification, at the request of the relevant operator, shall perform compatibility tests (on-site or in laboratories providing a simulated environment) where the subsystem interacts with Trackside (respectively, On-board) subsystems that are relevant for its intended use."

7.1.3.   On-board CCS subsystem – mandatory part

Decision 2012/88/EU and **Regulation 2016/919/EU** table 6.2 require for tests under operational conditions:

"Test the behaviour of the subsystem under as many different operational conditions as reasonably possible (e.g. gradient, train speed, vibrations, traction power, weather conditions, design of Control-Command and Signalling track-side functionality). The test must be able to verify:

1. that odometry functions are correctly performed – basic parameter 4.2.2

2. that the on-board Control-Command and Signalling Subsystem is compatible with the rolling stock environment – basic parameter 4.2.16

These tests must also be such as to increase confidence that there will be no systematic failures. The scope of these tests excludes tests already carried out at earlier stages: tests performed on the interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account."

7.1.4.   Trackside CCS subsystem – mandatory part

Decision 2012/88/EU and **Regulation 2016/919/EU** table 6.3 require for integration with control-command and signalling on-board subsystems and with rolling stock:

"Reports of tests of the operational scenarios specified in Section 6.1.2 with different certified Control-Command and Signalling On-board Subsystems. The report shall indicate which operational scenarios have been tested, which on-board equipment has been used and whether tests have been performed in laboratories, test routes or real implementation."

7.1.5.   Reduction of scope of operational tests

Decision 2012/88/EU and **Regulation 2016/919/EU** table 6.2 and 6.3 require for both on-board and trackside CCS subsystems:

"The scope of these tests excludes tests already carried out at earlier stages: tests performed at the level of interoperability constituents and tests performed on the subsystem in a simulated environment shall be taken into account."

7.1.6.   The scope of the **Subset-076** is to define tests to be used in proving the technical conformity and functionality of the "ETCS on board subsystem"[63] against requirements of the subset-026. The operational use of the ETCS on-board subsystem and the trackside engineering of real lines where the train will run are out of scope of the ss-076.

7.2.   Network

7.2.1.   **A network is characterised by the use of engineering principles, operational scenarios and solutions of the manufacturers.**

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[63] *Although ss-076-7 v3.1.0 refers to the "ETCS on board subsystem", this Guideline follows the Decision 2016/919/EU ch. 6.2.4.1 (1) which refers to the IC.*

7.2.2.   The following diagram illustrates that validation of an on-board subsystem with real trackside can cover only the network characteristics of the network(s) used. This is the case even if all subset-026 functions (the whole inner circle) are implemented in the ETCS on-board, which should be the case.

Therefore, it is necessary to indicate the scope of validation in the technical documentation of the vehicle. This scope is indicated by the "network characteristics implemented in the corridor projects" part of the figure.

However, additional checks may only be requested if not yet validated network characteristics are added in a network. In this case, the validity of authorisation will be extended to the new network characteristics.
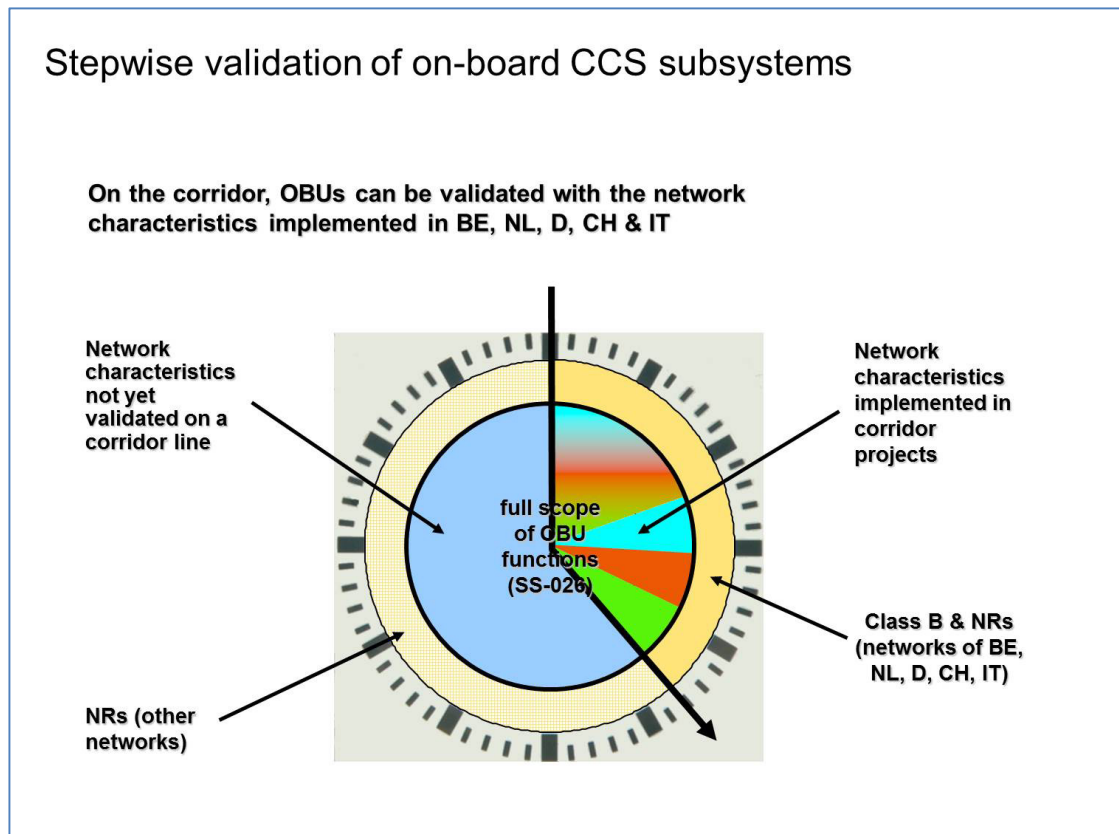
Figure 9: Stepwise validation of on-board CCS subsystems

7.2.3.   A vehicle can be authorised for a certain network, i.e. a set of routes that use the same engineering principles, operational scenarios and solutions of the manufacturers, and for which the technical compatibility has been demonstrated.

The meaning of "same" in this context is that the parameters are similar in a way that it can be assumed that test results are equivalent. This may be analysed during an "ex ante" study to create e.g. a common test set for the corridor, or, more pragmatically, during a vehicle authorisation project (see Annex II, item II-3 d).

7.2.4.   Therefore, an extension of the network using the same engineering principles, operational scenarios and solutions of the manufacturers will not lead to the need of a new authorisation of vehicles already operating on the network.

7.2.5.   The validation of the technical compatibility between the on-board CCS subsystem and the specific network shall be supported by track-train system validation (TTSV).

7.3. Track-train system validation

Figure 10: TTSV pyramid

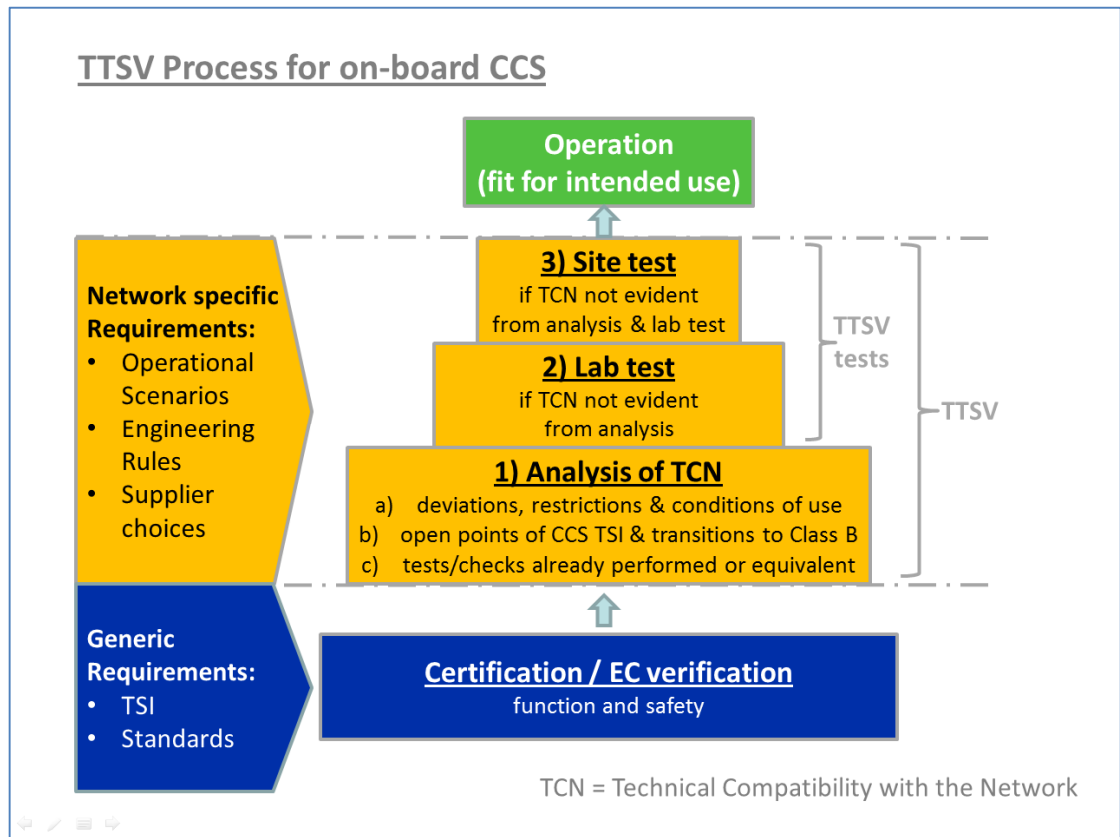7.3.1. Even a successful certification process cannot always exclude that, when an on-board CCS subsystem interacts with a trackside CCS subsystem, one of the subsystems repeatedly fails to function or perform as intended under certain conditions. This may be due to deficiencies in the specifications, different interpretations, design errors or equipment being installed incorrectly.[64]

7.3.2. E.g. the aim of the ETCS test specifications in subset-076 is to prove the technical conformity and functionality of the ETCS on-board subsystem against requirements of the SRS (subset-026, system requirements specification). However, this conformity assessment will not always validate the technical compatibility between a train equipped with its ETCS on-board and a specific network, because:

- Subset-076 reflects the functions as defined in the SRS, and the flexibility of the ETCS specifications allow different use in the application

- The operational use of the ETCS on-board subsystem and the trackside engineering of real lines where the train will run are out of scope of the ss-076.[65]

- The number of combinations from telegrams and variables is almost infinite; subset-076 testing can therefore only cover some sensible variants, i.e. not all variants can be checked exhaustively

- Subset-076 does not cover the issues arising from the integration of the ETCS on-board into a specific train

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[64] *See Regulation 2016/797/EU, enacting act (9)*
[65] *See subset-076-7, v3.1.0, ch. 3.1.1.1*

7.3.3.	**TTSV is the process to provide evidence for technical compatibility[66] between an on-board CCS subsystem** in its design operating state[67] **and a certain network**, i.e. under the functional, technical, environmental and operational conditions of the network where the on-board subsystem will be used. [68]

It is an obligation of the Member States to check this technical compatibility (see ch. 4.1).

7.3.4. The TTSV process is based on the assumption that

   a) the TSI parts of the on-board and trackside subsystems under consideration have successfully been verified by a NoBo,
   b) the risk management process has successfully been assessed by a CSM AsBo,
   c) all deviations, restrictions and conditions of use are properly described in the certificates and declarations (technical file of the applicant),
   d) it is ensured that the trackside implementation does not require on-board functions/performance beyond TSI and NR requirements.

7.3.5. The TTSV process can be divided in three phases: Analysis, Lab test and Site test (see figure 10). Analysis and tests may be executed/continued in parallel.

7.3.6. The **Analysis phase** shall ensure that

   a) all relevant aspects of the CCS subsystem are evaluated regarding their technical compatibility with the specific network – see chapter 7.2
   b) the minimum necessary lab and/or site tests to bring the evidence for technical compatibility with the network are identified
   c) the amount of TTSV tests will be limited to provide evidences that are not covered by analyses or tests already performed (e.g. during 'EC' verification or during TTSV with other networks)[69]
   d) all known deviations, restrictions and conditions of use are evaluated regarding their impact in the specific network

7.3.7. The **Lab test phase** shall take into account

   e) evidences for technical compatibility with the specific network that are not covered by analysis
   f) significance of the tests regarding the lab environment (e.g. radio network effects, timing effects, real HW/SW versions …)
   g) experience with the on-board product

7.3.8. The **Site test phase** shall take into account

   h) evidences for technical compatibility with the specific network that are not covered by analysis or lab test

7.3.9. The TTSV process shall cover **any network specific interaction between on-board CCS subsystem and trackside CCS subsystem** (interface 4 in figure 1), for example[70]:

   a) National Rules[71],

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[66] *Definition of technical compatibility see chapter 1.2*

[67] *Definition of design operating state see chapter 1.2*

[68] *"TTSV" is a term introduced by this Guideline for analyses and tests intended to increase confidence that the on-board can correctly be operated with different trackside applications, i.e. to ensure from a practical point of view that systematic failures or divergent interpretations of the specifications do not cause incompatibilities between on-board and trackside*

[69] *TTSV analysis may include a "technical compatibility matrix" of tracks and on-boards, to be able to verify for which tracks an on-board has been already checked and vice versa*

[70] *A more exhaustive list will be elaborated and added in a later version*

b) Class B functions,

c) Class A/B and Class B/B transitions,

d) GSM-R voice and data (end-to-end)[72],

e) EMC between on-board CCS (including ETCS and Class B systems) and trackside CCS (e.g. balise and other CCS antennas against track circuits)[73],

Interaction of the structural subsystems CCS with the functional subsystem operation and traffic management should be taken into account (however not to be assessed).

Any other interaction is not in scope, for example:

f) EMC between rolling stock (traction current etc.) and trackside CCS,

g) Integration of the on-board CCS in the vehicle (bus issues, etc.)[74],

h) Transition between on-board Class B and on-board ETCS (handover of responsibility)[75].

7.3.10. The applicant is responsible that the TTSV analyses and tests are carried out and appropriate means of evidence are provided.

The NSA will check completeness, relevance and consistency of the evidences provided. If necessary, the NSA may ask additional evidences or even tests.[76]

7.3.11. In case of new issues after APS, which lead to new restrictions, a) if new APS is needed, the normal Guideline/TTSV process applies, b) if no new APS is needed , the usual change process applies (keeper updates own documentation).

7.4. Management of issues during track-train system validation

7.4.1. TTSV shall be considered as check of a certified trackside implementation against a certified on-board. If a problem occurs, the following cases shall be analysed (in the following order):

1) the trackside is designed in a way that non specified functions/ performance of the on-board would be necessary. This is an error in trackside design;

2) trackside and on-board are designed with non-compatible assumptions/ interpretations about a function or performance, because of unclear or missing requirements in the TSI. This is a case of TSI deficiency;

3) the functions or performances specified in the TSI do not allow technical compatibility or safe integration. This is a case of error in the TSI;

4) the on-board is not compliant with the TSI (even if erroneously "certified"). This is an error in the on-board design.

7.4.2. To improve the preconditions (specifications, development, testing), it shall be analysed and made transparent to the relevant party what has caused the problems detected during TTSV.

7.4.3. In case of product or implementation failure, the issue shall also be analysed to identify possible improvements of the certification process.

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[71] *Notified National Rules are to be checked by the DeBo*

[72] *For the network specific parts of GSM-R, see figure 1*

[73] *Conditions should be transparent and a generic solution for each network is preferred (see also List of Recommendations, R40)*

[74] *This is part of the on-board safety case, to be checked by the NoBo during 'EC' verification (specific application safety case/physical integration)*

[75] *This is part of (generic, i.e. not network specific) vehicle integration, however there should be relevant operational concepts/requirements available*

[76] *The magnitude of the TTSV tests in each project may vary dependent a) on experience with the products (failures -> less confidence -> more tests) and b) on relevance of the tests for the project*

7.4.4.   If during TTSV errors and deficiencies in the European specification are identified, ERA shall be informed according to the Change Control Management (CCM) process.

7.4.5.   This approach allows the definition of clear actions to take, whenever a problem is detected, and these actions converge to improvement of TSIs and improvement of products. The risk that a new change prejudices the compatibility of the on-board with "old" trackside is kept under control, because parameters are known to all stakeholders (changes are recorded in the certificates of equipment and the requirements of the TSIs).

7.5.   Track-train system validation tests

7.5.1.   TTSV tests are a temporary solution to create confidence in the system/products, until a certain level of experience and maturity is reached.

They shall be reduced as soon as possible, see Annex II.

After a period of building confidence on the fact that systematic failures or divergent interpretations of the specifications do not cause any more incompatibilities between on-board and trackside, tests for additional authorisations can be reduced to a minimum, focusing on class B transitions and some specific issues[77] in the generic network characteristics.

7.5.2.   The operational scenarios to be used for TTSV shall be made available[78], with clear indication of performance requirements (e.g., timing), distinguishing what is done by trackside and what answers/reactions are expected by the on-board, including behaviour in degraded conditions (e.g., a message is lost or delayed more than a given time).

7.5.3.   Mandatory TTSV tests for a network shall be notified as National Rules (NR). Consequently, the DeBo will assess the results of those TTSV tests.

If the tests are published in the network statement, a reference to the network statement has to be notified.

7.5.4.   TTSV tests shall take into account

- Line engineering principles (→ engineering rules of the IM, solutions of the manufacturers)

- Intended use of the route (→ operational scenarios of the IM)

- How the functions are used and implemented (→ solutions of the manufacturers)

TTSV tests shall focus on network specific interface issues, including transitions. In particular, TTSV tests shall cover all relevant operational test scenarios (OTS) of the IM/MS. They must take into consideration all relevant operational procedures, in particular in degraded conditions.

7.5.5.   TTSV tests have not to be repeated if already done under equivalent conditions (see Annex II, item II-3 d and II-4).

7.5.6.   Laboratory tests as an option for TTSV testing

For Rail Freight Corridors it is recommended that in the framework of TTSV the applicant requests from the manufacturer that laboratory tests are implemented

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[77] *This may include issues related to open points, specific cases, or specific operational scenarios, messages or timing conditions not used in other networks*

[78] *In Belgium, currently the TTSV test cases are property of the DeBo*

according to the technical principles[79] laid down in "UNISIG Interoperability Test Guidelines" (subset-110), "Interoperability Test Environment Definition" (subset-111) and "UNISIG Basics for Interoperability Test Scenario Specifications" (subset-112).

It is recommended that each ETCS on-board type will be tested in laboratory against the trackside (including engineering data) for each corridor route equipped.

These laboratory tests can result in a written statement of the manufacturer, part of the technical file for authorisation, confirming the completeness and coverage of the testing:[80]

- Manufacturers of trackside equipment provide a statement on the completeness/coverage of the testing with the on-board systems requested by the IM.

- Manufacturers of on-board equipment provide a statement on the completeness/coverage of the testing with the relevant trackside systems.

The test reports and/or the statements shall contain information which tests have been accomplished, which were the findings, the allocation of the findings and how they were closed.

The statement of the manufacturer shall indicate any known error, deviation, restriction and condition of use related to the relevant subsystem.

7.5.7.   How IMs can support the testing concept of this Guideline

The applicant is fully responsible for arranging all necessary tests and assessments. RU and IM shall give full support to the applicant. The NSA will ask for sufficient evidence of technical compatibility and safe integration, however not prescribe the way to fulfil this task.[81]

Also, the IMs can support the testing concept of this Guideline by implementing in their contracts clauses to ensure that the manufacturers provide the necessary tools and conditions. Therefore it is recommended that the IMs implement in their contracts the measures listed in Annex IV.

7.6.   Network standard and Rail Freight Corridor standard

7.6.1.   IMs are recommended to create for each network a **network standard**, i.e. a stable set of functions, engineering solutions and operational conditions used on that network.

Consequently, all network specific TTSV requirements of a Rail Freight Corridor will develop into a stable set defining the functional and operational characteristics for compatibility with the whole Rail Freight Corridor.

7.6.2.   It is also recommended that IMs co-operate on harmonisation of operational and engineering rules along the whole corridor.[82]

7.6.3.   The end of the TTSV for a certain on-board subsystem on a Rail Freight Corridor is assumed to be reached when all possible ETCS applications on the Rail Freight

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[79] *Contractual restrictions and non-disclosure principles of subset-110 are not requested by this Guideline. Transparency should be ensured when analysing issues for possible improvements of the mandatory certification process.*

[80] *These statements may be required by the NLF*

[81] *Though, in Switzerland IOP testing is required by FOT as a national requirement and the contractor (IM) has to request the IOP for the trackside from the manufacturer, which has to bring the evidence.*

[82] *It is recognised that engineering principles may be implemented in the track geometry and therefore harmonisation of engineering and operational rules is not always possible.*

Corridor (L1 B3, L2 B2/B3, L1LS, etc.) have been successfully checked and authorised.

7.7.   Types of test

7.7.1.   Testing is part of verification and validation to support product development, IC conformity, subsystem integration, subsystem verification, and validation of technical compatibility and safe integration. The following table shows what kind of test can be expected in which stage.

Type of test	To be arranged by	Test reference	Remarks
Product tests	Manufacturer	Proprietary test specification and environment	Before stage A Testing is part of product development No specific Rail Freight Corridor arrangements
IC conformity tests	Manufacturer, NoBo, accredited laboratory	Test specification and environment specific for each IC For ETCS on-board IC: subset-076, subset-094	Stage A Testing is part of conformity assessment No specific Rail Freight Corridor arrangements
ETCS on-board - vehicle integration tests[83]	Manufacturer, NoBo	a) Lab test bench with vehicle simulator and reference trackside (optional) b) Real vehicle	Stage B Vehicle parameter specific Decision 2012/88/EU and Regulation 2016/919/EU defines in table 6.2 that ETCS on-board - vehicle integration has to be checked by the NoBo during the 'EC' subsystem verification No specific Rail Freight Corridor arrangements
RBC-trackside integration tests[84]	Manufacturer, NoBo	a) Lab test bench with RBC, interlocking, and reference ETCS on-board b) Real trackside	Stage B Track parameter specific Decision 2012/88/EU and Regulation 2016/919/EU defines in table 6.3 that RBC-trackside integration has to be checked by the NoBo during the 'EC' subsystem verification No specific Rail Freight Corridor arrangements
Track-train system validation (TTSV) tests a) applied to on-board SS CCS b) applied to trackside SS CCS	Applicant for APS a) for vehicle b) for trackside	Options: - Lab test bench with RBC, interlocking, Control Center, ETCS on-board - Remote labs - Real trackside - Real vehicle Operational test cases	Stage B TTSV tests are means to provide evidence for technical compatibility between the on-board and trackside CCS subsystems[85] TTSV tests are not meant to check route compatibility of a vehicle. This check is part of the RU's responsibility during operation and shall be possible without any test Rail Freight Corridor arrangements on TTSV testing are defined and explained in chapter 7.5

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[83] *This includes, for example, testing of communication and transitions between STMs and between ETCS and STMs, bus communication and failure diagnosis / revelation / detection, ...*

[84] *Although this chapter focuses on on-board issues, this test is mentioned here for completeness of the overall process*

[85] *See chapter 7.5*

8. Considerations on system integration

8.1. Principles to be applied for system integration

8.1.1.   It is assumed that the manufacturers have implemented effective development processes according to CENELEC 50126/128/129 for the production stage.

8.1.2.   Related to development and production of components it is mandatory that all TSI harmonised products fulfil the TSI safety requirements.

8.1.3.   According to Decision 2012/88/EU and Regulation 2016/919/EU, table 6.2 (on-board) and 6.3 (trackside), integration of interfaces is part of the subsystem 'EC' verification. This includes for the CCS on-board subsystem 5 classes of interfaces, (see Figure 1):[86]

   1)   Between ICs inside the on-board CCS subsystem

   2)   With Class B

   3)   With the subsystems of the vehicle (RST, ENE…)

   4)   Between on-board CCS and trackside CCS

   5)   Interaction not specific to CCS (weight, dynamics, EMC, …)

8.1.4.   Related to each particular interface, the applicant shall include in the technical file all restrictions and conditions of use for the integration of the subsystem[87] that may be relevant for the essential requirements.[88]

8.1.5.   On vehicle level, these five classes of interfaces shall be addressed in the assessment report on safe integration and technical compatibility.

8.1.6.   In general, safe integration includes:[89]

   (a)   safe integration between the elements composing a subsystem;

   (b)   safe integration between subsystems that constitute a vehicle or a network project;

   (c)   safe integration of a vehicle with the network characteristics;

   (d)   safe integration of vehicles into the SMS of railway undertakings, including interfaces between vehicles, interfaces with the staff who will operate the subsystem, and maintenance activities by an ECM;

   (e)   safe integration of a train with the specific routes it operates over;

   where:

   –   points (a),(b), and (c) are part of the authorisation process;

   –   points (d) and (e) are not part of the authorisation process but all the information needed by a railway undertaking to determine train characteristics and establish train-route compatibility (e.g. conditions of use, values of interface parameters) should be included in the technical file referred to in Article 18 of Directive 2008/57/EC.

8.1.7.   Generic product / generic application / generic safety case

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[86] *The operator holding a safety certificate shall respect all TSIs, including OPE. The OPE rules must be taken into account by the operator's SMS, they have no impact on the certification / authorisation of the CCS subsystem.*

[87] *E.g. current, tension, timers, ...*

[88] *This principle should ensure that after changes (e.g. addition of Euroloop function) the authorisation effort can be limited to the implications on the affected interfaces.*

[89] *See Recommendation 2014/897/EU, No.39*

The European Directive only describes vehicle and vehicle type authorisation, similar to specific applications in the CENELEC standards. However, the CENELEC concepts of generic products and generic applications are a useful option to structure the certification work and to avoid repetition. For generic products a generic safety case may be established.

The use of generic products and generic applications is a choice and under the responsibility of the manufacturer. In some Member States an APS or type approval may be granted for them.

The application of this concept is explicitly encouraged, as it can lead to significant reduction of efforts for certification and assessment.

8.1.8.   Availability

Availability is an open point in Decision 2012/88/EU and Regulation 2016/919/EU Annex G; requirements may be notified as national rule, to be checked by the DeBo.

With regard to the authorisation, i.e. to the design operating state, the NSA is not responsible for RAM requirements beyond those originating from National Rules and documents provided by the applicant.

In particular, it is not the responsibility of the NSA to make sure a vehicle can be operated with all restrictions and conditions of use (usability/performance), as long as it is safe and all legal requirements have been fulfilled.[90]

8.2.   Management of restrictions and conditions of use

8.2.1.   As a basic principle, no restriction should be accepted for APS. Authorisation can not always be granted without restrictions and conditions of use, because for example some restrictions and conditions of use are inherited from CoV/DoV or from the safety assessment. However, where restrictions are unavoidable, they should be kept to a minimum.

8.2.2.   According to Directive 2008/57/EC Art. 21.6, APS "may stipulate conditions of use and other restrictions".

8.2.3.   The restrictions and conditions of use have to be clearly stated in the APS.

8.2.4.   The exported restrictions and conditions of use will have to be allocated to someone (operation, maintenance) and will result in operation conditions/limitations and then later in the "right hand side" (see Figure 4) of the process be managed through the SMS of RU and IM and supervised (audited) by NSAs.

8.2.5.   The applicant has to bring the restrictions and conditions of use in a transparent way. RUs have to ask for restrictions and conditions of use when buying/leasing a vehicle. This is to be ensured by their SMS. The RU/keeper shall also ensure that all relevant information is communicated to the ECM for him to up-date the maintenance file.

8.3.   Use of ISV

8.3.1.   CoC and DoC can also be issued for one of the parts listed in Decision 2012/88/EU and Regulation 2016/919/EU, ch. 2.2 (train protection, voice and data radio communication, train detection)[91].

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[90] *However in extreme cases, i.e. if it is obvious that a vehicle can not be used in practice, the NSA will take measures to prevent its unrestricted authorisation.*

[91] *Decision 2012/88/EU does not yet divide radio communication in voice and data parts*

8.3.2.   'EC' ISV certificate and 'EC' ISV declaration can be issued for "certain parts" (to be defined by the applicant) or "stages" of a subsystem.

8.3.3.   In both cases, the certificate and declaration may be issued with restrictions and conditions of use.

8.3.4.   However, an APS can not be granted based on an ISV.

Annex I – Intentionally deleted

Annex II – Considerations regarding the reduction of testing

II-1. Today, evidence that all relevant operational situations will work can only be given for the networks respective operational situations tested. This is due to issues related to immaturity, such as:

   a) Not fully validated specifications

   b) Not fully validated test cases and test environment

   c) Certificates / subsystems with restrictions and conditions

   d) Not fully validated track-train integration

   e) Not fully mature products and product implementation[92]

   f) Different implementation principles caused by freedom of engineering using ERTMS specs

   g) Limited experience with (harmonised) transitions from one system/level to the other

II-2. The applicant for APS of a vehicle has to prove integration of his vehicle with each network where it is intended to run.[93] However, exhaustive field testing shall be only a transitory situation:

   a) The technical development will allow to transfer more and more tests into laboratories.

   b) With the growth of experience, stability and validation of the specifications and products, the amount of tests for track-train system validation will stepwise be reduced to a minimum.

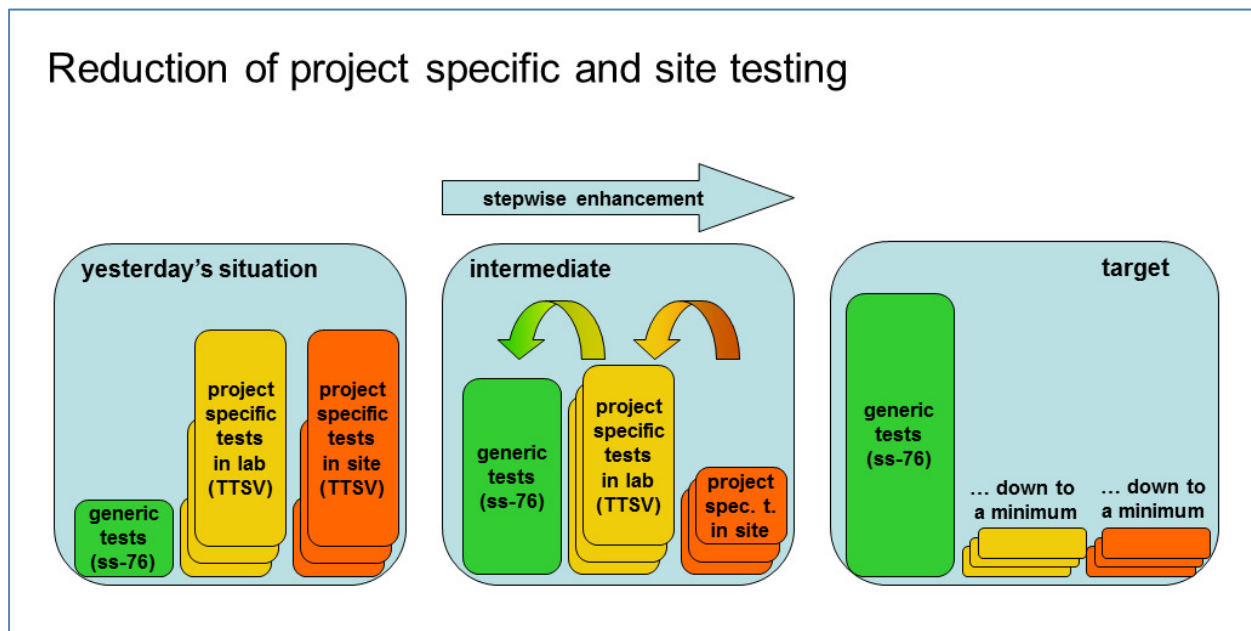*Figure 11: Reduction of project specific lab and site testing*

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[92] *In fact, during tests in Switzerland only few issues have been found to be solved on specification level, but hundreds of issues to be solved on product level.*

[93] *Example Kijfhoek: trains authorised for L1 and L2 routes have to be tested when L1 and L2 routes will be integrated to ensure they can do the L1-L2 transition.*

II-3. The applicant has several possibilities to demonstrate that tests have become no longer necessary. Some options are given here for information. However, it is not the task of the NSA to prescribe which options are to be used:

a) The TTSV test applied to an on-board SS CCS is proven to be fully covered by mandatory <u>conformity tests</u> (subset-076).

b) <u>Lab tests</u> can be taken into account if they have been performed in a way that ensures the same system behaviour in field.

c) TTSV field tests can re-use the <u>manufacturer's field tests</u> during their ETCS on-board - vehicle (or RBC - trackside) integration tests, if those cover the TTSV test cases.

d) TTSV tests of a vehicle related to a specific route or network can be reduced by those <u>tests</u> successfully passed <u>on other routes or networks</u> if the conditions of the other routes or networks (engineering rules, operational scenarios) ensure the same system behaviour (equivalent test conditions).

e) The same generic product has already been tested in a <u>different vehicle</u>.

II-4. The full scope of TTSV tests will be executed only in the first projects. In the target situation, only conformity tests and a small set of final route or network specific tests will be necessary to re-authorise a vehicle for a network. TTSV testing will finally be reduced to a few site tests for verification of TSI open points and some daily applied operational scenarios, see Figure 12.

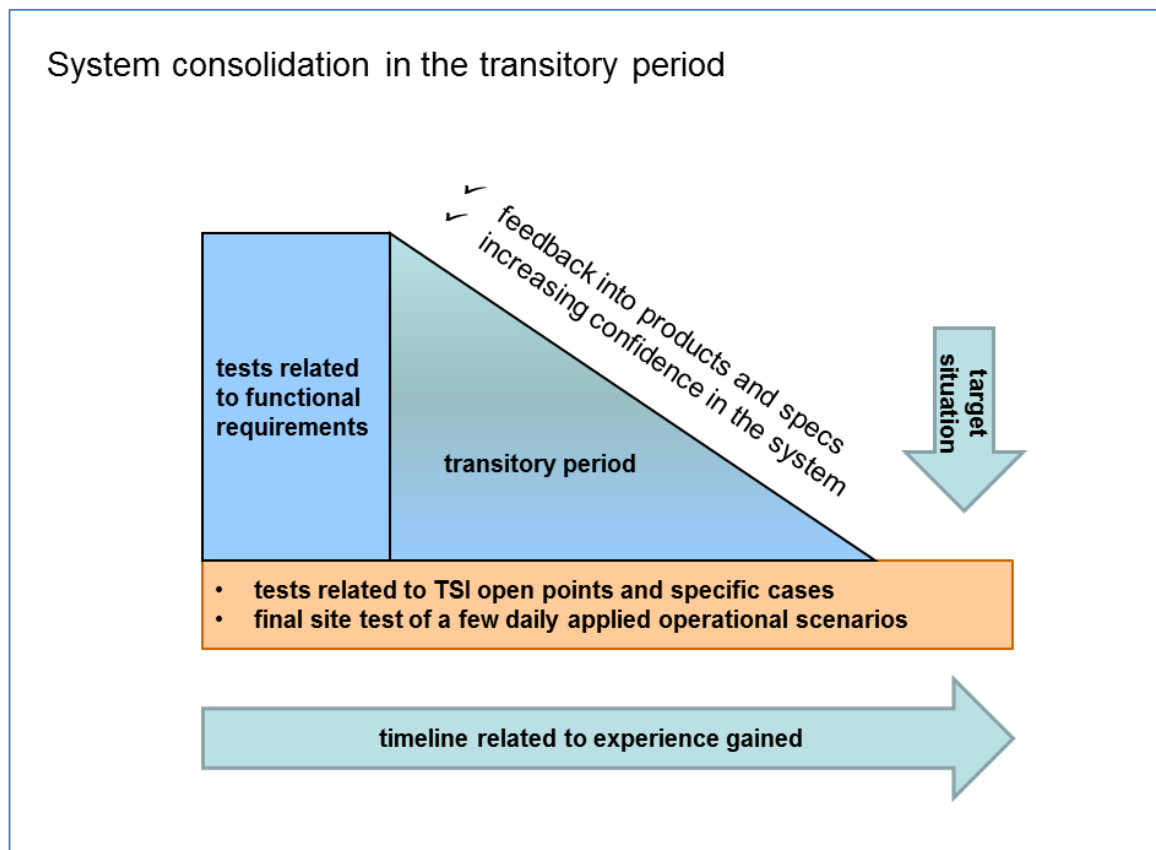*Figure 12: Reduction of TTSV testing in the transitory period*

II-5. In the transitory period, processes should be installed to consolidate the experience gained during TTSV testing with the aim to reach a stable target situation in a few years. These processes should include:

a) Feedback on <u>product</u> related issues into the products (e.g. software maintenance)

b) Feedback on <u>specification</u> issues into the system specifications (e.g. subset-026, Change Request process)

c) Feedback on missing <u>test conditions</u> into the mandatory test specifications (subset-076, …)

d) Feedback on <u>operational conditions and operational r</u>ules into the operational test scenario database and into national operational rules

e) Feedback on <u>line engineering</u> solutions into the IM's engineering rules and into European engineering guidelines

f) Feedback on missing <u>National Rules</u> into the reference documents database

g) Feedback on issues regarding the <u>certification and authorisation process</u> into European and national legal framework or into harmonised standards and guidelines

The end of this process is reached when all products are fully compliant and interoperable, and no new issues will be detected during TTSV testing. The more efficient the feedback process is organised, the earlier this goal will be achieved.

II-6. <u>Note:</u>

According to Directive 2008/57/EC Art. 16, line specific tests may always be required by Member States except the applicant can provide sufficient evidence that the subsystem has already been verified with identical requirements (= test cases) under identical operational conditions (= line engineering & operational rules).[94]

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[94] *This is the understanding of the WG of what is not clear in Directive 2008/57/EC*

Annex III – List of recommendations

In order to streamline the application of the European legal framework and to enhance the procedural harmonisation, this Annex lists recommendations, related to the authorisation process, that have been identified during the work on the Guideline, but could not (yet) be solved in the frame of the NSA working group.

No.	Description	Task of
R5	Authorisation documents It is recommended to specify common formats for applications and APS (Authorisation File). It is recommended to specify common criteria for completeness and consistency of the documents handed over by the applicant to the NSA for vehicle authorisation.	ERA
R7	Restrictions and conditions of use It is recommended to harmonise the representation of restrictions and conditions of use in the declarations and technical files. The APS document should contain explicit references in which document non-conformities and conditions are found. The aim is to avoid duplication of this information in the APS document. Any restriction and condition of use shall be stated in the declaration in such a way that the details are easy to find for the NSA, the APS document will refer to it. If too complex, information may be in the technical file but explicit reference has to be given. Additional requirements like DC (designer choice) change requests (not only missing requirements) shall be mentioned in certificates.	ERA
R10	Too many restrictions It is recommended to develop criteria when there are too many restrictions and conditions of use to continue the authorisation process. (RISC impact)	NSA WG

No.	Description	Task of
R13	<u>Technical compatibility and safe integration</u> It is recommended to provide a legal definition of • Technical compatibility • Safe integration These terms are used in Directive 2008/57/EC without legal definition, which leads to different interpretations.It is also recommended to clarify the relationship between safe integration (of a subsystem, of a vehicle) and the fulfilment of the essential requirement safety (for a subsystem, for a vehicle). It is recommended to provide a more detailed description for the assessment of technical compatibility and safe integration. This should include a clarification if the scope of safe integration in Directive 2008/57/EC is the same as in Regulation 402/2013/EU. No common understanding for the assessment of technical compatibility and safe integration is used today by the assessment bodies. It should be clarified which activities for technical compatibility and safe integration are related to the design operating state and which are related to operation and maintenance. Check of the safe integration is stated as a Member State task with reference to the APS in the Directive 2008/57/EC and as a CSM assessment body task with reference to significant changes in Regulation 402/2013/EU.	ERA
R15	<u>Major and significant change</u> It is recommended to give more guidance on the use of the terms major from the Directive 2008/57/EC and significant change from the Regulation 402/2013/EU. They are stated as decision questions with reference to changes on the railway system (here the CCS subsystem). A harmonised approach to the decision if a change related to CCS is significant or not can avoid ambiguity on the need of a CSM AsBo. It is recommended to define the template that the applicant compiles to give evidence that a change is not significant according to Regulation 402/2013/EU. In an interoperability scenario among many MS/NSAs, it would be better to define a template of the "written statement" to share the main information that it has to contain.	ERA
R22	<u>TTSV tests</u> To support the mutual acceptance of test results during the TTSV analysis phase, TTSV tests should use a harmonised format for test reporting.	ERA
R26	<u>Languages in technical files</u> It is recommended to use common principles for the use of languages in technical files on Rail Freight Corridors. A proposal can be found in Annex V.	open

No.	Description	Task of
R27	<u>Vehicle types and registers</u> It is recommended to give more guidance for a common approach on the use of vehicle types, subsequent authorisation, registration in ERATV (European Register of Authorised Types of Vehicles) / NVR (National Vehicle Register) and related time limitations. Some MS do not authorise vehicles but only register them according to authorised type. They require design change of all vehicles registered under this type if the type design changes. Some MS authorise each vehicle and require no change to authorised vehicles if the original type design changes. There is also no common approach on the time limitation for vehicle and type APS. It is recommended to set up a process how to share information between NSAs which is important for authorisation.	NSAs and ERA
R28	<u>Harmonised safety targets</u> It is recommended to develop harmonised safety targets on European level. This would be a major contribution to the mutual acceptance of safety assessments.	NSAs and ERA
R37	<u>TTSV mandatory for APS</u> It is recommended to require TTSV as a condition for APS (see definition in NSA Guideline). No tests shall be necessary after APS.	NSAs
R40	<u>Information about national infrastructure requirements</u> Applicants are sometimes obliged to do additional on track tests in Member States after having EC certification, e.g. to prove that the existing infrastructure (e.g. axle counters) is 'not negatively influenced by Rolling Stock that is certified against new legislation'. It is recommended that the Ministries in the Member States take the initiative to make all relevant technical requirements available to applicants.	Member States
R41	<u>CENELEC and CSM</u> It is recommended to clarify that the application of CENELEC 5012x fulfils the requirements set out in CSM regulation 402/2013/EU.	ERA

No.	Description	Task of
R42	<u>DMI constituent</u> The DMI is per definition part of the ERTMS/ETCS on-board interoperability constituent and not separately certifiable. This definition contradicts two typical project requirements: Firstly the certification of an interoperability constituent is defined in a generic way and should not be repeated again for different projects. Secondly the DMI is different for almost every vehicle, which requires a new EC conformity certificate of the ERTMS/ETCS on-board for almost every project. Sometimes the DMI is supplied by the vehicle manufacturer and not the ETCS on-board supplier, which makes re-certification of the ERTMS/ETCS on-board even more complex. Possible solution: The TSI CCS should respect the above mentioned project requirements. Either the DMI will be defined as a separate interoperability constituent or the TSI CCS should include a paragraph which makes changing the DMI possible under certain circumstances (e.g. the new DMI has to demonstrate compliance with the TSI CCS requirements within the EC verification process without performing re-certification of the ERTMS/ETCS on-board interoperability constituent).	ERA
R43	<u>Impact on a national network</u> It is recommended to clarify who is responsible to do the evaluation of the impact of restrictions and conditions of use on a national network, and which body (if any) is checking this.	ERA
R44	<u>Mitigating ERTMS implementation risks at project management level</u> A sincere recommendation for wayside and on-board project managers when setting up a project organization and writing tender(s) to be aware of the possibility that certified and/or authorised ETCS applications may not always work under all circumstances. The reasons could be due to aspects, for example, not covered by the SUBSET-076 test specification, failures in specifications, national technical rules, engineering rules, operational rules or simply failing products in wayside and/or on boards. This risk shall be managed in a non-discriminatory and transparent manner by all parties involved, for example under the supervision and competence of a national ETCS system authority and the European Union Agency for Railways (ERA).	open

Annex IV – Possible measures of IMs to support the testing approach of this Guideline

The test and authorisation process for sections of Rail Freight Corridors should be organised in a way that the authorisation of vehicles for operation on Rail Freight Corridors will be facilitated.

It is therefore recommended that the IMs include in their contracts the following provisions to be fulfilled by the manufacturer of the trackside ETCS equipment:

1.	Technical information	The manufacturer has to provide the track description, engineering data and track-train system validation test cases for the implementation of the contracted trackside ETCS equipment in accordance to a common standard, based on subset-112.
2.	Test cases	The manufacturer has to provide all test cases that are required to prove safe and interoperable operation under the specific conditions of this ETCS infrastructure system. The test cases shall meet the specified operational conditions in combination with on-board CCS subsystems certified to comply with the European standard.
3.	Operational test scenarios	For this purpose, the infrastructure manager will provide a set of operational test scenarios in European standardised format, that cover the operation of ETCS on the Corridor. The manufacturer has to demonstrate that these operational test scenarios are fully covered by his tests. Any deviation has to be agreed with the infrastructure manager.
4.	Lab test interfaces	The manufacturer has to use a laboratory test environment according to the technical principles of UNISIG subset-110/-111/-112.
5.	TTSV test with different ETCS on-boards	On request of the infrastructure manager, the manufacturer[95] has to perform track-train system validation tests with on-board units of different suppliers before the trackside subsystem will be accepted.[96]
6.	Lab test environment	The laboratory tests shall be performed using the above mentioned track description and engineering data together with, for level 2 sections, the real RBC hardware and software version.
7.	Lab access for on-board applicants	For the purpose of authorisation of rolling stock the trackside manufacturer[97] has to provide the laboratory test environment including technical support for tests with ETCS on-boards of applicants that apply for authorisation on the Corridor.
8.	Technical support for RUs	If necessary, the manufacturer has to cooperate in field tests and test result analysis that have to be performed with ETCS vehicles of railway undertakings for their authorisation on the Corridor.
9.	Cross tests	Before placing in operation the trackside equipment, on request of the infrastructure manager, the manufacturer has to support cross field tests with vehicles equipped with ETCS on-boards of different suppliers.
10.	Information exchange	All IMs of Rail Freight Corridors should set up an information platform where they can share information on their test cases and test results.

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[95] *Alternatively, the tests could also be managed by the IM himself*
[96] *Some IMs require at least 3 different on-board subsystems*
[97] *Alternatively, the test environment could also be owned/managed by the IM himself*

Annex V – Recommendations on the use of languages

V-1.   The use of different languages is a barrier for cross acceptance and mutual recognition. However, this issue is not yet solved even on EC level, because the national legal framework prescribes the language to be used.

V-2.   The use of translations is hampered by the following facts:

   a) Risk to introduce mistakes and ambiguities

   b) Lack of technically qualified translators

   c) Cost and cost allocation

   d) Misunderstandings due to individual use of English

   e) Lack of legal value

V-3.   It is therefore recommended to exchange documents as far as possible in their original language.[98]

V-4.   It is recommended to all stakeholders, especially at technical level, to write their original documents in English, as much as possible and conformable to national law.

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[98] *In Italy, the applicant has to deliver all documents of the technical file in Italian language (D.Lgs. 10-8-2007 n. 162, related to 2004/49/CE and 2004/51/CE, article 9)*

Annex VI – Certification of ICs

Stage A: Conformity assessment of interoperability constituents (on-board and trackside)

This stage is out of scope of this Guideline. It is given here for information to put the vehicle authorisation in a wider context. No specific arrangements for this stage are given in this Guideline.

No.	Preconditions	Responsible
CIC/P1 [99]	TSI to be applied is available and can be applied appropriately, including valid version of test specification (e.g. subset-076 for ETCS on-board)	ERA
CIC/P2	Test lab for the ETCS on-board IC is accredited to perform subset-076 tests	Accreditation body
CIC/P3	Products are available that implement TSI requirements	Manufacturer
	Tasks to be performed	
CIC/T1	All relevant conformity tests and verifications applicable to the constituent or group thereof[100]	Applicant
CIC/T2	Assessment of conformity according to Decision 2012/88/EU and Regulation 2016/919/EU ch. 6.2 (table 6.1) and the selected module according to ch. 6.2.2	NoBo
	Documents	
CIC/D1	'EC' certificates of conformity (CoC) of interoperability constituents (IC, or groups of IC) in the on-board/trackside CCS subsystem according to Decision 2012/88/EU and Regulation 2016/919/EU ch. 5	NoBo
CIC/D2	'EC' declarations of conformity (DoC) according to Annex IV of Directive 2008/57/EC

Note: According to the European process, 'EC' declaration of conformity shall be made without conditions and limitations contradicting/conflicting with mandatory requirements[101] | Manufacturer |
| | | |

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[99] *CIC=Conformity of Interoperability Constituent (for unambiguous reference)*

[100] *For ETCS on-board IC: conformity tests using the test cases of subset-076 in an accredited test lab*

[101] *However, real life certificates are still "full of non-conformities", because of the immaturity of the standard and of the products.*

Annex VII – Authorisation of trackside subsystems
Stage B: 'EC' verification of the trackside CCS subsystem

	Preconditions	**Responsible**
VTR/P1 [102]	'EC' certificates of conformity (CoC) for all constituents	NoBos (for ICs)
VTR/P2	'EC' declarations of conformity (DoC)	Applicant
VTR/P3	An ETCS vehicle allowing verification[103] of the trackside CCS subsystem	Applicant
VTR/P4	Engineering rules and operational guide[104] for the relevant trackside	Applicant
VTR/P5	The trackside CCS subsystem has been configured for this specific project	Applicant
VTR/P6	National verification of components not underlying TSI rules (Class B systems, cables, …) and safety assessment of these parts[105]	Applicant
	Tasks to be performed	**Responsible**
VTR/T1	'EC' verification of the subsystem according to TSI CCS ch. 6.3 with table 6.3 ("what to assess"), the chosen module according to TSI CCS ch. 6.3.2, and Directive 2008/57/EC Annex VI ("verification procedure for subsystems")[106]	NoBo (for subsystem)
VTR/T2	If National Rules (NR) for trackside exist, verification of conformity with NRs according to Directive 2008/57/EC art. 17[107]	DeBo
VTR/T3	Unless other evidence can be provided, TTSV testing can be used to validate that the trackside can operate with certified CCS on-boards. If a problem occurs, the analysis according to paragraph 7.4.4 shall take place.[108]	Applicant
VTR/T4	Perform risk assessment according to CENELEC 50126/50128/50129[109]	Applicant
VTR/T5	In case of significant change: independent assessment according to CSM Regulation 402/2013/EU	CSM Assessment Body
VTR/T6	Compile the technical file for 'EC' verification of the CCS subsystem	Applicant
	Documents	**Responsible**

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[102] *VTR=(EC) Verification Trackside (for unambiguous reference)*

[103] *This on-board may be available in lab only. 'EC' verification can mainly be executed in lab.*

[104] *The network operator should have a document which explains the operational rules under ETCS. E.g. at L1 the distance a vehicle have to stop in front of a signal without getting an influence from the first balise*

[105] *Usually following the relevant CENELEC standards*

[106] *This assessment includes the check of configuration data (line engineering) (see TSI table 6.3, aspect 5), or the verification that the checks have been correctly performed (for ETCS baseline 3 see subset-091, v3.2.0, ch. 9.2 "Integrity Requirements for Trackside Data Preparation", for baseline 2 see ss-91 v2.5.0 ch. 9.2 and 9.3)*

[107] *On the management of National Rules, see decision 2011/155/EC and ERA's Application Guide (Part 1 of the Reference Document envisaged by Article 27 of the Railway Interoperability Directive)*

[108] *The applicant is responsible to arrange the necessary TTSV tests and assessments to ensure technical compatibility with existing vehicles authorised on its infrastructure.*

[109] *This is in line with the application of the CSM Regulation 402/2013/EU*

VTR/D1	'EC' certificate of verification (CoV), indicating any restrictions and conditions of use and including the underlying assessment report Note: this 'EC' certificate may be based on 'EC' ISV(s) for parts or stages of the subsystem; in this case the relevant checks need not to be repeated	NoBo
VTR/D2	If applicable, a certificate of NR verification, indicating any restrictions and conditions of use and including the underlying assessment report	DeBo
VTR/D3	'EC' declaration of verification (DoV) according to Directive 2008/57/EC Annex V, based on the NoBo's and DeBo's assessments Any restriction and condition of use shall be stated in the declaration in such a way that the details are easy to find for the NSA	Applicant
VTR/D4	An assessment report regarding the safe integration in relation to the design operating state of the CCS subsystem – based on the risk assessment VTR/T4	Applicant
VTR/D5	In case of significant change: the declaration of the proposer as stated in Art. 16 of Regulation 402/2013/EU[110] – based on the safety assessment report of the CSM assessment body	Applicant/ Proposer
VTR/D6	The technical file for the CCS trackside subsystem	Applicant

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[110] *Optional until Regulation 402/2013/EU comes into force*

Stage C: APS of the trackside CCS subsystem

	Preconditions	**Responsible**
ATR/P1 [111]	The deliveries from stage B, i.e. the documents VTR/D1…VTR/D6.	Applicant
ATR/P2	The trackside CCS subsystem has been integrated in a specific route	Applicant
ATR/P3	Application for authorisation of the trackside CCS subsystem	Applicant
	Tasks to be performed	**Responsible**
ATR/T1	Compile the documents to be submitted for APS	Applicant
ATR/T2	Declare that all essential requirements are met and submit all documents for authorisation including the required declarations	Applicant
ATR/T3	Check of completeness, relevance and consistency of the documents provided by the applicant	NSA
ATR/T4	The NSA checks if the process required by the national legal framework has been correctly applied	NSA
ATR/T5	Information shall be shared[112] on issues that might be relevant for the authorisation process, such as: • known issues/problems from the subsystem under authorisation or parts of it (accidents, incidents, …) • known issues/problems with the involved bodies (accreditation, safety authorisation, safety certificate, complaints, …) known issues/problems with the application of the process required by the national legal framework by the involved bodies	Applicant, NSA
ATR/T6	The NSA shall satisfy itself that the applicant has taken into account these above mentioned issues	NSA
ATR/T7	The NSA shall verify that restrictions and conditions of use are given by the applicant in the technical file	NSA
	Documents	**Responsible**
ATR/D1	Authorisation for placing in service (APS) of the trackside CCS subsystem, including restrictions and conditions of use	NSA

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[111] *ATR=Authorisation Trackside (for unambiguous reference)*
[112] *See footnote under 4.2.13*

Annex VIII – Operation

This stage is out of scope of this Guideline. It is given here mainly to make clear what is not part of authorisation.

Stage D: Operation

a) Network access criteria are to be used by the operator to check the compatibility with a route to be operated (max axle load, systems installed, etc.).

b) The process steps after APS (ascertaining train-route compatibility, as described in Recommendation 2014/897/EU, No.16 and 46) are not in the scope of this Guideline.

c) However, to support this, it is necessary to make available to the RU the restrictions and conditions of use which have been considered within the construction and authorisation of the vehicle and which have to be checked by the RU before operation.

d) The correct use of this information and of the information taken from the RINF is to be ensured by the SMS of the RU. As long as RINF is not yet available, network statements or other type of supporting documentation shall be used.

No.	Preconditions	Responsible
OPV/P1 [113]	APS for the relevant network, including technical file containing the parameters to be checked before operation	NSA
OPV/P2	Track characteristics (basic parameters: track gauge, electrification, axle load, ETCS level …) of the relevant routes	IM
OPV/P3	Vehicle types are registered in ERATV (European Register of Authorised Types of Vehicles)	Applicant, NSA
	Tasks to be performed	**Responsible**
OPV/T1	Register individual vehicles in NVR (National Vehicle Register)[114]	Keeper
OPV/T2	Check technical compatibility of the authorised vehicle with the basic parameters of the routes to be operated as stated in RINF and network statement[115] (see Figure 13)	RU
OPV/T3	The SMS of the RU has to ensure that the vehicle is operated only on routes that belong to the network for which the APS was granted	RU
OPV/T4	Confirm/support	IM
	Documents	**Responsible**
OPV/D1	Conclusion inside the RU that the train can be operated on the envisaged routes	RU
OPV/D2	Registration in NVR completed	Keeper/RU

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[113] *OP=Operation of Vehicle (for unambiguous reference)*

[114] *Not a precondition for authorisation, however some Corridor MSs require registration as a precondition*

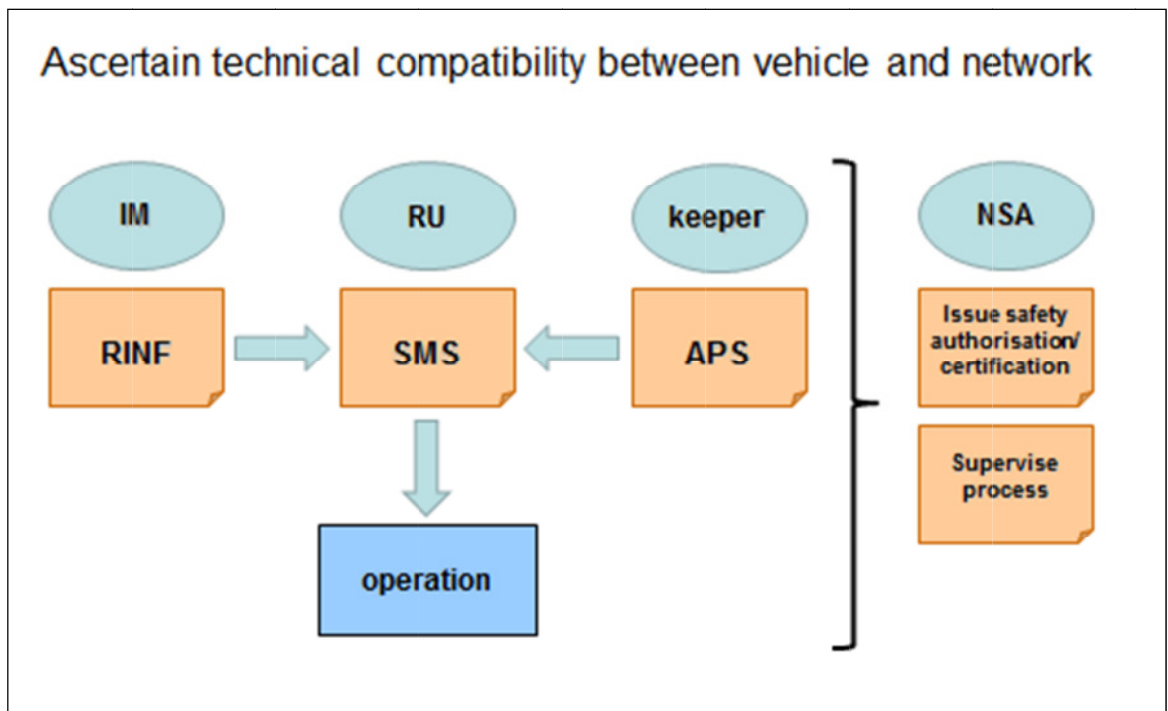[115] *No tests shall be needed after APS, see ch. 4.2.11*

Figure 13: Ascertain technical compatibility between vehicle and network