ERTMS in the railways network: assessment and compliancy to CCS TSI

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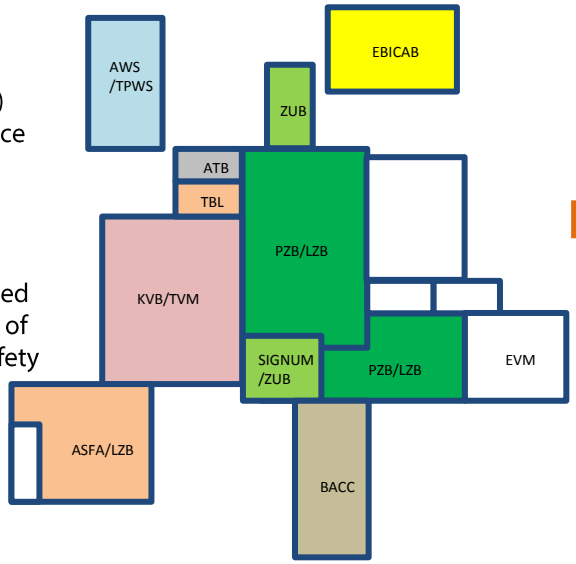
Content

- Principles on CCS TSI :
  - consideration of subsystems and ICs
  - specific focus on GSM-R
- General information on Certification and Authorisation
- Compliancy to TSIs and derogations

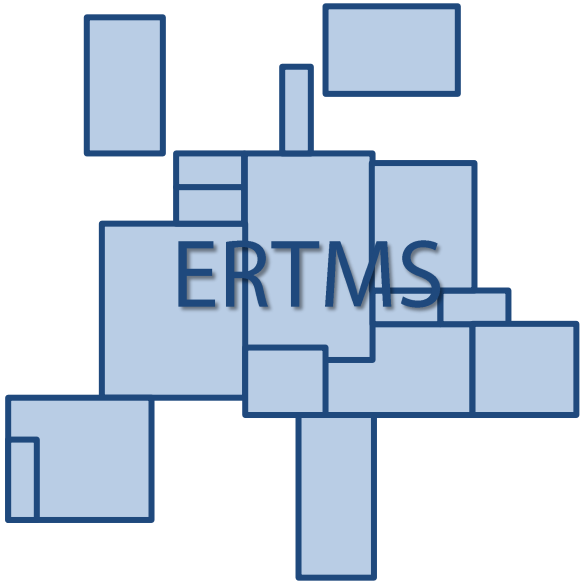
ERTMS - Migration

Fragmented national railway systems

- National supplier oligopolies (captive)
  - obsolescence
- Cross-border:
  - change of locomotive
  - multiple systems fitted
- Limitations in terms of functionality and safety



Single European Railway Area



Clarity on goals is needed

"Seamless train operation without borders (caused by signalling) at best economic conditions"

Need to define the **target state** and intermediate states

Principles on CCS TSI(I)

- In the section 1.1 of the CCS TSI [(EU)2016/919] Annex, the scope of the TSI is defined for both Track-side and On-board Subsystems:

This TSI concerns the Control Command and Signalling On-board Subsystem and the Control-Command and Signalling Track-side Subsystem.

- In the section 2.1 of the CCS TSI [(EU)2016/919] Annex, a definition of what is a subsystem can be found.

The Control-Command and Signalling Subsystems are defined in Annex II of Directive 2008/57/EC as 'all the equipment required to ensure safety and to command and control movements of trains authorised to travel on the network'.

- In the section 2.2 of the CCS TSI [(EU)2016/919] Annex, the different parts of the Subsystems are defined.

The Control-Command and Signalling Subsystems include the following parts:

1. train protection;

2. Voice radio communication;

3. Data radio communication;

4. train detection.

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Principles on CCS TSI(II)

- The Class A train protection system is ETCS whilst the Class A radio system is GSM-R.
- The legacy systems are referred to as Class B
- There is no obligation to retrofit existing systems. BUT if there is a new installation, upgrade or renewal of a Subsystem, implementation of Class A (ETCS and/or GSM-R) is mandatory.
- The implementation rules can be found in chapter 7 of CCS TSI [(EU)2016/919] Annex.
- The installation of Class B systems is only allowed in the cases defined in chapter 7 (in a trackside with Class A, if there are vehicles not equipped with Class A running in the line; in a vehicle, if it has to run in lines not equipped with Class A): during migration period

Objective: towards a Single European Railway Area (SERA)

Definition of ICs and Subsystems in CCS TSI

- In the CCS TSI, the following is described:

SUBSYSTEM	Parts	Interoperability Constituents
ONBOARD	Voice Radio Communication	GSM-R voice Cab radio; GSM-R SIM card;
	Data Radio Communication	GSM-R EDOR; GSM-R SIM card
	Train protection	ETCS onboard; odometry equipment; internal or external STM;
TRACKSIDE	Voice and Data Radio Communication	No ICs described
	Train protection	RBC; radio infill unit; Eurobalise; Euroloop; LEU Eurobalise; LEU Euroloop;
	Train detection	No ICs described

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Implementation of one or more parts of a Subsystem

- TSI defined parts of a subsystem can be implemented separately, according to the point 7.2.1 in the CCS TSI [(EU)2016/919] Annex.

The different parts of the Control-Command and Signalling Subsystems may therefore be upgraded or renewed separately, if interoperability is not jeopardised.

- TSI defined parts of a subsystem can be assessed separately, according to the point 6.4.1 in the CCS TSI [(EU)2016/919] Annex.

6.4.1. Assessment of parts of control-command and Signalling Subsystems

A certificate of verification may be issued for each part specified in this TSI; the notified body only checks if that particular part fulfils the TSI requirements.

Regardless of which module is chosen, the notified body shall check that:

(1) the TSI requirements for the part in question have been fulfilled; and

(2) the TSI requirements already assessed for other parts of the same subsystem are still fulfilled.

- This allows flexibility for the projects to implement each part (radio communication, train protection, train detection) independently and to start their operation independently.

- When no other parts of the Subsystem are present, the Subsystem is composed of only 1 part. An example could be a Trackside Subsystem that only implements the radio voice communication part.

GSM-R network assessment

- The GSM-R network is considered as a whole in the CCS TSI. This means: no separate concept of BSS and NSS.
  - The assessment of the network is NOT done separately for BSS and NSS
  - All the elements installed in the network(transmission system between BTS and BSC, backbone, BSCs, BTSs, MSCs, Authentication center…) should be present as they are part of the subsystem. The assessment of the essential requirements (in TSI) is done to the complete real network, when it is fully configured.
  - The details of the specific engineering (single/dual coverage, redundancy of BSCs, redundancy of MSCs, etc) are assessed while verifying the essential requirement for Reliability/Availability, and the relevant points in the TSI.
  - There is no specific architecture required in order to fulfil the requirements.
  - The coverage and network availability are specified in GSM-R SRS mandatory for interoperability requirements.

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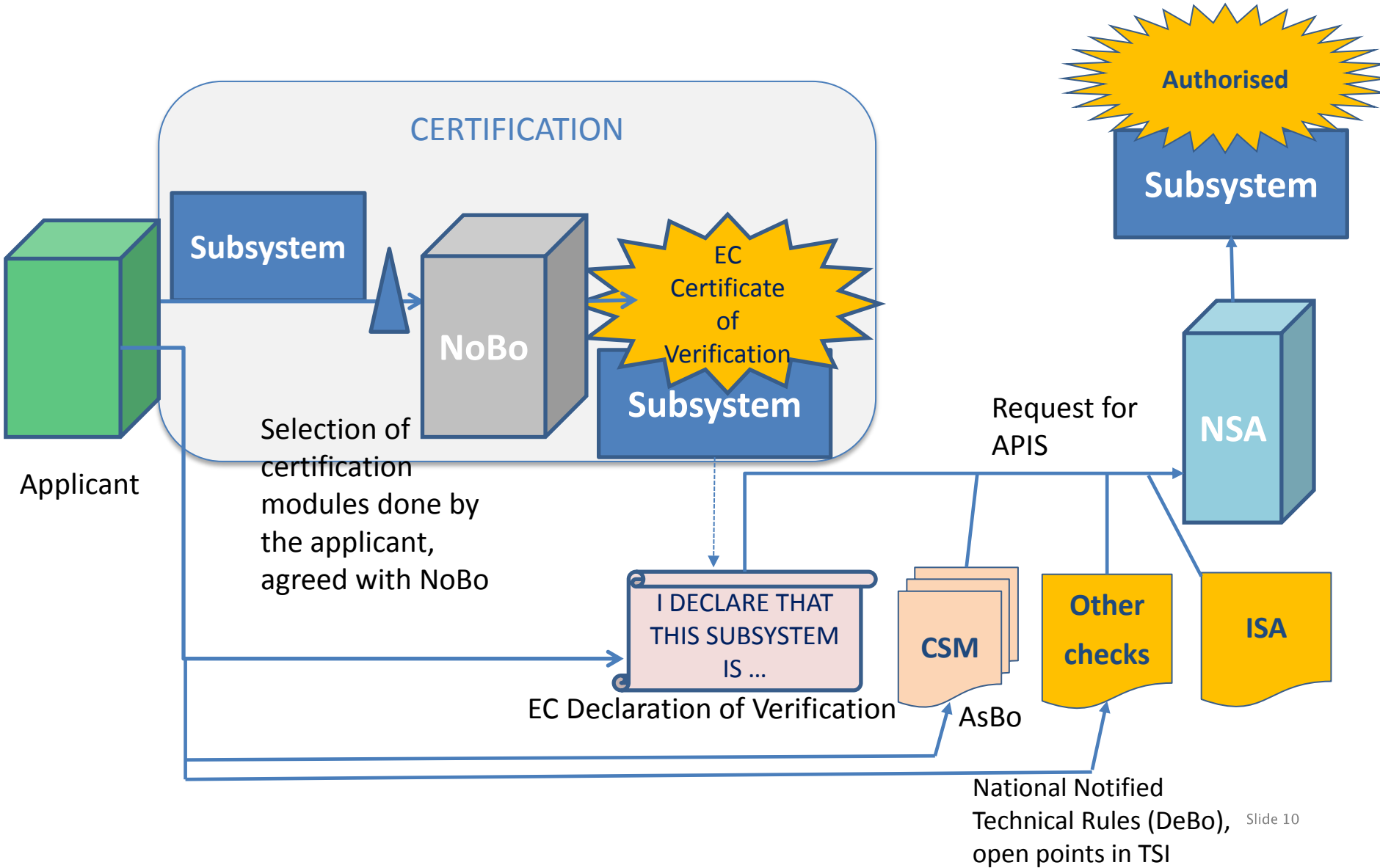
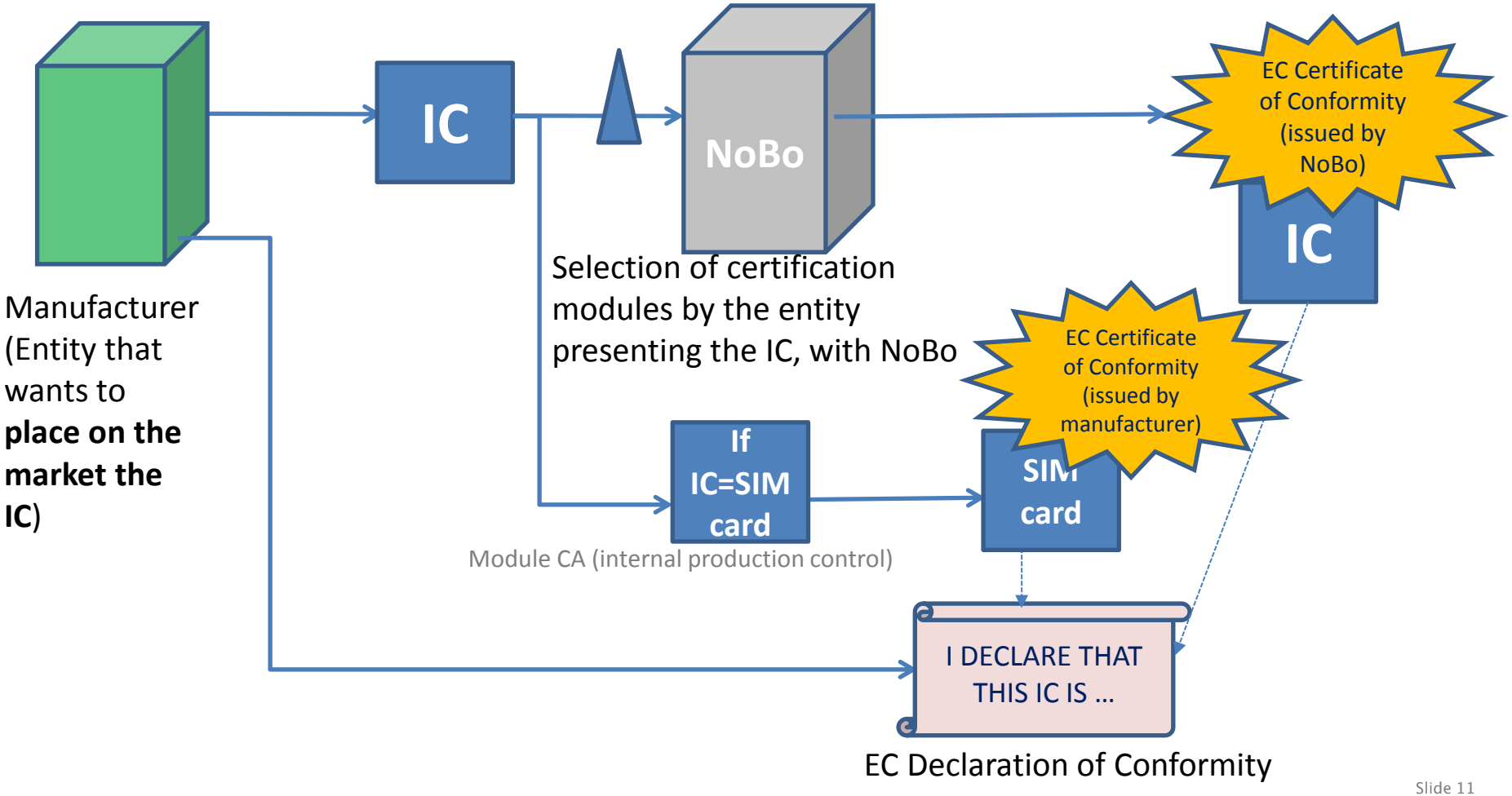
Why is authorisation needed for a Subsystem?

- In order to issue the Authorisation for placing in service (APIS) a subsystem within the scope of the TSI, the Member State shall check that it complies with the relevant TSI provisions on operations and maintenance.
  - Art. 15 to 18 of Interoperability Directive (2008/57/EC) state this obligation
  - Member States have to use the assessment and verification procedures described in the CCS TSI
  - The entity requesting the placing in service is responsible of presenting the “EC declaration of Verification” (verifying that all the TSIs involved are fulfilled) & CSM (Common Safety Methods), together with other information (as specified in the TSI and he Directive) to the NSA.
- Process described in Chapter 6.3 of CCS TSI [(EU)2016/919] Annex and Interoperability Directive:
  - An entity takes the subsystem for assessment to a NoBo, and receives the “EC Certificate of Verification” (the applicant)
  - The applicant should then write the “EC Declaration of Verification” and present it to the NSA in the request for APIS together with other documents: CSM RA done by AsBo, ISA report, DeBo checks, other additional information.

Overview of Authorisation and Subsystem Certification

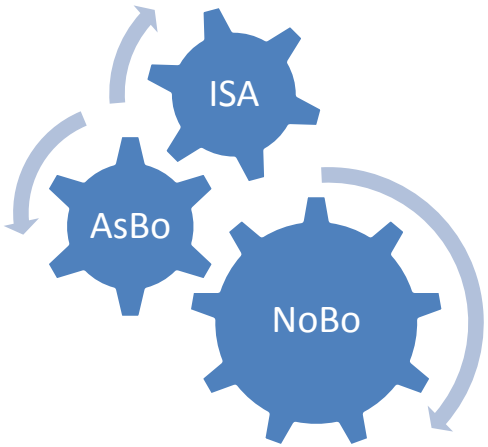


Overview of IC certification process



Different actors in authorisation and certification

- **NoBo** = Notified Body, checks if the requirements in a TSI are fulfilled by the IC or Subsystem . Issues Certificates.
- **DeBo** = Designated Body, checks if the requirements in Notified National Technical Rules are fulfilled.
- **AsBo**= Assesment Body, checks the correct application of Common Safety Methods (CSM) for Risk Asessment
- **ISA** = Independent Safety Assessor
- **NSA** = issues APIS



- **Applicant** = entity that intends to authorise a subsystem to be used in an area. *The applicant may be the contracting entity or the manufacturer, or their authorised representative within the Community.* A contract may state that a specific company has the responsibility of assessing the subsystem.

The Applicant or authorised representative issues EC Declaration of Verification of the Subsystem.

- **Manufacturer** or his authorised representative= the entity that presents the IC in order to be able to place on the market the IC. A contract may state that a specific company has the responsibility of assessing the IC.

The Manufacturer of authorised representative issues the EC Declaration of conformity of the IC.

NOTE: EC Declarations state the fulfilment of the requirements in the TSIs for which the Subsystem has a certificate AND ALSO compliancy to all other applicable regulations.

Flexibility to define strategy of certification

Example: extension of a GSM-R network already authorised

a) Consider that the extension is part of the Subsystem already authorised: the subsystem is modified (the scope of the subsystem is changed: new tracks)

- The NoBo will indicate the additional checks to be performed in order to update the certificate (to cover the new scope)

- The NSA will indicate if the resulting subsystem has to be reauthorized or not.

b) Consider that the extension is a new Subsystem

- The NoBo will perform the certification of the Subsystem (full assessment)

- The applicant will request the APIS for the Subsystem to the NSA

c) Assess the core GSM-R network (ISV, intermediate stage of verification) and then, define each extension as a new Trackside Subsystem "ISV + radio access in the specific section"

- The NoBo will perform the certification of each Subsystem (scope: core & trackside installation along the specific section)

- The applicant will request the APIS for each Subsystem to the NSA

Remember: The scope of a trackside subsystem can be a section of a line (from km A to km B), a complete line, a subset of lines or all the lines of the whole country…

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Compliancy to TSIs

- In general, a Subsystem has to comply with the TSIs in force when APIS is requested to an NSA.
- In some cases, this is not possible:
  - Contract signed when a different TSI was in force ("project at an advanced stage of development")
  - there are technical restrictions when integrating the Subsystem in the network where it will operate
  - There are safety issues found that cannot be overcome otherwise
  - The application of the TSI would compromise the economic viability of the project
  - …
- In those cases, a request to be exempted from the application of a specific TSI (the whole TSI or some sections) has to be formalised: **request of Derogation**
- The possible reasons to request a Derogation are described in Art 9.1 of Railways Interoperability Directive 2008/57/EC.
- In those cases where TSIs in force may not be applied, an Applicant has to send the request for Derogation to the Member State (Ministry of Transport).

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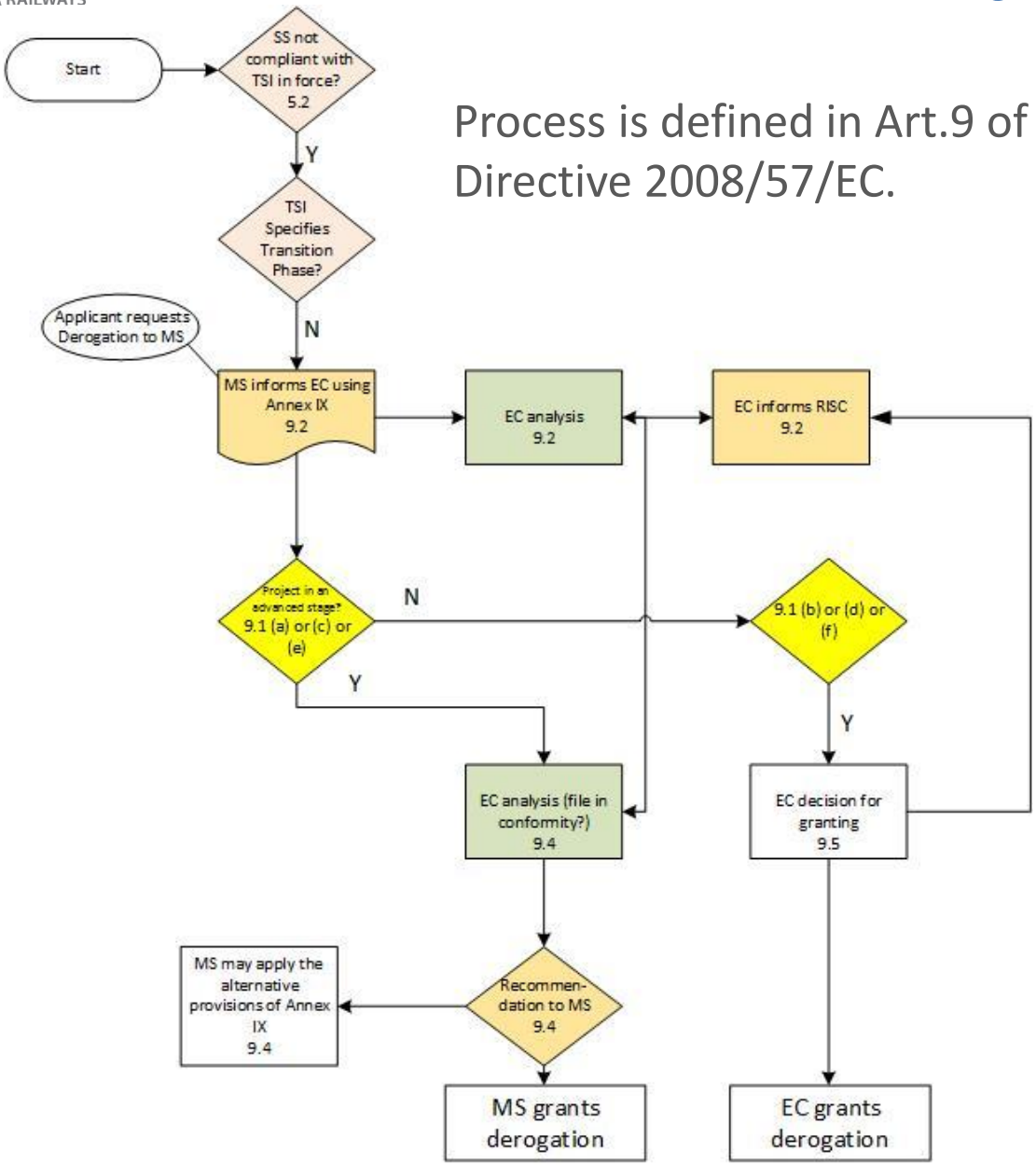
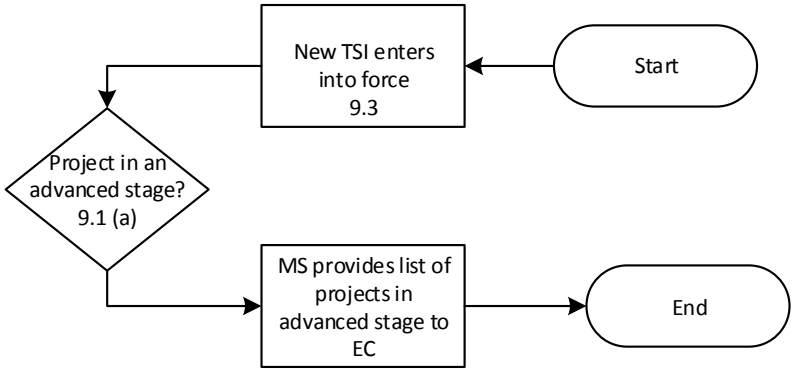
Process of granting of a Derogation

Process is defined in Art.9 of Railways Interoperability Directive 2008/57/EC.



Other remarks regarding Derogations

- Another process exists:



- Derogation HAS TO BE REQUESTED for any non compliancy with the TSI in force, unless otherwise specifically stated in the TSI.
- Derogation HAS TO BE REQUESTED for all projects in an advanced stage, unless otherwise specifically stated in the TSI.
- EC does not grant the derogation for projects in an advanced stage of development: Derogation granted by MS.
- Derogations are not only for CCS TSI: same conditions apply for other TSIs.

EXAMPLE: TSI Safety in Railway Tunnels states :

4.2.1.8. Emergency communication

This specification applies to all tunnels of more than 1 km in length.

(a) Radio communication between the train and the infrastructure manager control centre shall be provided in each tunnel with GSM-R.

(b) Radio continuity shall be provided for permitting the emergency response services to communicate with their on-site command facilities. The system shall allow the emergency response services to use their own communication equipment.

May request derogation not to fulfil this point, indicating the reason (art 9.1) and explain the alternatives planned

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