Certification and Authorisation for Placing in Service of Control-Command and Signalling Subsystems in Bulgaria

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Abstract – **The purpose of this article is to review the state-of-play of the verification, assessment and authorisation processes and procedures for the railway structural subsystems CCS (ERTMS) in Bulgaria. Based on a study, the most important issues and discrepancies are highlighted, discussed and provided as outcomes of this review.**

Keywords – **Railway system, CCS, TSI, Authorisation for Placing in Service.**

I. Introduction

The European Railway Traffic Management System (ERTMS) is emerging as a global standard for railway signalling regarding train control. It aims at replacing the different national train control and command systems in Europe. ERTMS comprises of the European Train Control System (ETCS), the Global System for Mobile communications - Railway (GSM-R), Traffic Management Systems and operating rules. The technical specifications for ETCS and GSM-R are published in the Control Command and Signalling (CCS) Technical Specification for Interoperability (TSI) [4]. GSM-R provides voice communication for the railways and provides data communication for ETCS.

The specifications for ERTMS at the time being are stable. The European Union Agency for Railways (EUAR or 'the Agency') operates an ERTMS Change Control Management of the ERTMS technical requirements to ensure the stability of the specification. It should be noted that testing, certification and authorisation remains a top issue for the smooth deployment of ERTMS.

The term used for Authorisation for Placing in Service (APIS) of a railway structural subsystem changes across the different railway legislation within the European Union (EU). The last definition in force is given by [2] and Table I below.

Looking into the EU legislation (before and following the adoption of the 4th railway package and including TSI CCS [4]) on interoperability and safety and into the EU related recommendations, the following assessment and authorisation entities can be identified:

1) Notified Body (NoBo)
2) Designated Body (DeBo)
3) In-house accredited body
4) Assessment Body, also stated as Risk Assessment Body (RasBo)
5) Independent Safety Assessor (ISA) (only for CCS subsystems)
6) Assessment bodies required by the other EU rules relevant for a subsystem to be placed into service (or into the market)
7) Accredited laboratories
8) National Safety Authority (NSA)

TABLE I
AUTHORISATION IN ACCORDANCE WITH THE EU RAILWAY LEGISLATION

Source of legislation	Term	Definition from the source of legislation
Directive 2016/797/EU	Authorisation for placing in service of fixed subsystems	*Placing in service means all the operations by which a subsystem is put into its operational service*
	Authorisation for placing on the market of mobile subsystems	*Placing on the market means the first making available on the Union's market of an interoperability constituent, subsystem or vehicle ready to function in its design operating state*
	Vehicle authorisation for placing on the market	

Here, a role is also taken by the EUAR in the context of the pre-authorisation of ERTMS track-side projects. In particular, according to the Article 19 of the Directive 2016/797/EU [2], the Agency performs some checks to ensure that the technical solutions envisaged are fully compliant with the relevant TSIs and are therefore fully interoperable. The scope of the aforementioned checks with regards to NoBo tasks is not defined and the risk to have a double check cannot be avoided in full.

II. Overview of the APIS Process within the European Countries

This study shows that the APIS process varies across European countries. Expansion of the study process included Italy, Denmark, France, Poland and Bulgaria.

One common identified issue is the lack of unequivocal definition for new/upgraded/renewed subsystems with clear criteria. A related problem is the identification of the body which decides on the type of the subsystem (new, upgraded or renewed). Italy indicates that this is the Applicant for APIS. In Denmark this could be the NSA, the infrastructure manager and the railway operator but the decision for starting a new APIS procedure is made by the NSA. In Poland the infrastructure manager and the Applicant for APIS are the responsible bodies.

There are no applicable national rules for placing in service of CCS subsystem in Poland and Bulgaria while in Denmark and Italy these exist. This necessitates unification of rules.

There are differences in testing procedures with respect to the role of the NSA. In Bulgaria the NSA participates in the

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process as a control body involved in the organisation of the process while in the other countries the NSAs do not play a part.

The other common issue is how to proceed with testing a new CCS trackside (Baseline 3) if a certified/authorised vehicle (or at least an on-board CCS, Baseline 3) is not available.

In particular, NoBos have underlined the following priorities:

- Necessity to harmonise the verification/assessment processes put in practice for interoperability assessment developing a common understanding of such processes by the NoBos;
- Not all functions from the System Requirements Specification [6] are implemented and the impact on the integration into a subsystem and also train to track integration is not specified, thus leading NoBos to misunderstandings during assessments;
- Identification of the scope and roles for the different conformity assessment bodies involved in an authorisation process for subsystems, avoiding duplication of work among them;
- Management of specific issues related to an EC verification and conformity assessment like: 1) Management of Subset-076 results from the accredited laboratories (in particular in connection with their approval within the certification process and management of deviations); 2) Management of deviations, restrictions or conditions for use during the assessment/verification tasks and within an authorisation; 3) Practical use of the Recommendations For Use (RFU) to improve their legal validity in order to have common and standardised format for NoBo deliverables.
- The definition of agreed and harmonised approaches to the assessment, especially in case of railway corridors is required.

As feedback from NSAs, the three main problematic areas are:

- *Heritage from the past:* Some NSAs are confronted with the complexities of managing situations created in the past.
- *Work in progress:* Some NSAs, when applying correctly the process specified in Directive 2008/57/EC, encounter problems related to the quality of products (not fully compliant with the TSIs) because of several instances of non-conformity of products.
- *Planning for the future:* Principally, NSAs want to be deeply involved in the whole process leading to authorisation. In some cases NSAs also offer on a 'voluntary basis', at the choice of the applicant, a solution whereby the NSA is more involved during the project, with the delivery of intermediate 'authorisations' at certain steps of the development/installation.

III. Overview of the Verification and Assessment Framework within an APIS Process and Related Procedure in Bulgaria

The APIS process and all related procedures are regulated in [3], which transposes [1] into the Bulgarian legislation.

Assignment of Different Bodies in Bulgaria

In Bulgaria verification and assessment of a subsystem is usually assigned to the relevant body in two ways, depending on the Contracting Authority (CA):

- In case of the CA is a state structure the assignment is going through a tender procedure, which sets out the technical parameters of the assessment;
- In case of the CA is the subsystem's manufacturer, the assignment is going through direct selection of an assessment body.

The practice in Bulgaria with infrastructure projects for upgrading or renewal of the railway network shows that NoBo, DeBo and RasBo is most frequently selected and appointed at the beginning of the project.

There was a case where the NoBo was appointed at the end of the project to assess according to inappropriate module, making verification impossible (e.g. module SH1 where the manufacturer, subject to an audit, is no longer available).

Verification/Assessment Process within an Authorisation Framework

Verification and assessment procedures together with relevant roles that comply with Bulgarian legislation are present in the figure below and include the following stages:

Stage 1: Appointment of a conformity assessment body for a specific task

Stage 2: Definition of the assessment scope

Stage 3: Collecting the evidences for the assessment

Stage 4: Execution of the assessment

Stage 5: Conclusions and issue of the deliverables of the assessment.

Stage 1: Appointment of a conformity assessment body for a specific task

Activities on verification and assessment of a specific rail project, assigned to a NoBo and/or DeBo and/or RasBo, usually cover the geographical scope of the project's subsystems, following the scope of the construction/upgrading/renewal. Often, different manufacturers of subsystems construct different parts of a project with common geographical scope and each producer should choose its own assessment body.

Actually, some issues found at the assigning the Conformity Assessment Bodies:

- There is no coordination in assigning the assessment – it is possible different assessment bodies to be appointed by various entities for the same subsystem with a different timetable;

- There is no available instructions on who, when and how assigns the assessment of a specific rail system;

- Assessment of a railway subsystem is often required to be made under the last TSI instead of under the TSI in force during the subsystem design and construction;

- In the most cases, the Applicant is not aware of the assessment and verification process and the modules he has to choose. That's why the NoBo makes some recommendations/clarifications beforehand for the modules to be chosen in every particular case/project.

Stage 2: Definition of the assessment scope

In case of construction and placing in service of a **new subsystem**, [3] specifies clearly full achievement of the interoperability for the subsystem.

In case of **upgrading/renewal of a subsystem**, defining the scope of conformity assessment is the most difficult stage before starting the verification process.

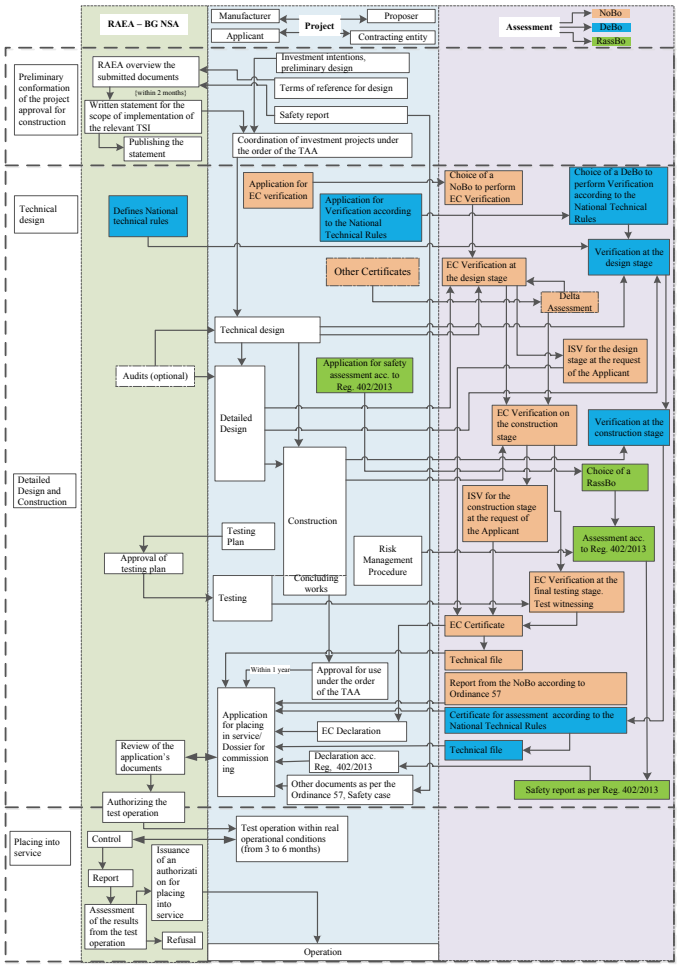

Fig. 1. Certification and authorisation process in Bulgaria

- ***New structural subsystems***

Article 446 of [3] requires the Applicant for APIS to prepare *a Safety Report* and *Terms of Reference for Design* to define the subsystem's technical and functional specifications. These documents are subject to revision by NSA and a *Statement,* defining degree of implementation of the relevant TSI, is to be published within two months on the NSA's web site.

- ***Upgraded/renewal structural subsystems***

Article 45 of [3] requires the Applicant for APIS to prepare *a Dossier* to define the TSI characteristics intended to be implemented within the project. The NSA's statement on *the Dossier* is the fundamental document for the degree of implementation of the TSI for the subsystem and defines the scope of the verification and assessment.

Logically, the process of creation and approval of the *Safety Report, Terms of Reference* and *the Dossier* should be done at the beginning of the project. In practice, such documents are submitted to the NSA at the end of the project, just before applying for placing in service. Thus, the scope of the assessment is not clear to that moment and achieving interoperability becomes very difficult and remains too vague by the end of the verification and assessment process.

The other general problem is that the Applicant does not define properly the scope of the project, respectively the scope of the assessment and is not interested in providing any evidences, especially when it costs more resources and is not in its obligation.

Stage 3: Collecting the evidences for the assessment

During the evaluation, the assessment body collects evidences by means of obtaining design and construction documents, test results, etc., as well as by lists of open points, exchanged between parties, if necessary.

Stage 4: Execution of the assessment

For the implementation of verification and assessment process of Track-side CCS (TS-CCS) and (On-board) OB-CCS subsystems, a procedure which strictly follows the applicable for the project characteristics of CCS TSI, Sections 4, 5, 6 and all specifications/Subsets in Annex A [4], by means of Traceability Matrices is used. The CCS subsystem verification and assessment procedures are based on Tables 6.2 & 6.3 [4].

Depending on the module used for the EC verification and assessment and the contractual provisions the NoBo uses the laboratory results produced by the Applicant or makes own tests. In case the laboratory is accredited, the results are accepted. In case the laboratory is not accredited, the NoBo uses its own procedure to check the laboratory.

Often a project for modernisation of CCS subsystem lasts long and during the verification process a new TSI comes in force. The Contracting Authority could not foresee this, thus such situation leads to confusion and the CA brought requirements to the NoBo to assess the subsystem according to the new or to the old TSI without being aware of the process of placing the subsystem in service. That is a problem for the NoBo due to a new reassessment and the results could fail.

Stage 5: Deliverables of the assessment

The NoBo in Bulgaria issued in the most cases Intermediate Statements of Verification (ISVs) due to the fact that the CCS subsystems under assessment are often subject to modernisation or renewal covering part of a subsystem rather than a whole subsystem.

Where ISV has been issued under an old TSI by another NoBo, the current NoBo, responsible for the verification of the subsystem, takes this ISV into account, and, before issuing the certificate of verification,

1) verifies if the ISV covers the relevant requirements of the new TSI(s),
2) checks all aspects that are not covered by the ISV or do not meet the requirements of the new TSI, and
3) checks the final testing of the subsystem as a whole.

Technical file

All the assessment results are included in the NoBo's Technical file, which follows strictly the content and the name of paragraphs of those given in RFU STR-011 [8] provide all collected evidences for the project.

Certificate

The content of the Certificate is also according to the RFU-STR-001 [7]. The Certificate follows the recommendations given in the RFU as regards to the content and the layout. The Annex of the certificate refers to the Technical file.

IV. Technical Issues Regarding the Track-side and On-board Authorisation

In the following Table a list of issues as outcomes of the analysis carried out and related to the CCS subsystems authorisation process is given.

TABLE II
LIST OF TECHNICAL ISSUES

ON-BOARD AND TRACK-SIDE CCS AUTHORISATION PROCESS	
No. of the issue	**Description**
1.	For a TS-CCS or OB-CCS subsystem an authorisation cannot cover the class A part only as a stand-alone part of the subsystem even if provided with its own certificate of verification (as granted in the TSI CCS).
2.	An authorisation for an OB-CCS subsystem cannot be considered as stand-alone but only integrated within a vehicle authorisation.
3.	If an OB-CCS already authorised is modified, update of the vehicle authorisation is expected as well.
4.	The use of operational test scenarios for testing during an authorisation process not still applied and understood as expected.
5.	Difficulties in obtaining track access for performing the aforementioned testing runs or on-track tests.
6.	Dedicated testing procedures and involvement of specific conformity assessment bodies during the testing phase within the authorisation process are expected and required
7.	The application of risk assessment framework is sometimes required during a testing phase but its use within such a phase often not well understood.
8.	For the Class A OB-CCS (especially the European Vital Computer (EVC)) a laboratory testing framework has been defined only for the ETCS on board (as interoperability constituents). The same is not available for Class A track-side part.
9.	Difficulties to use/recognise mutual recognition/cross – acceptance arguments to authorise a whole TS-CCS considering also the signalling (interlocking part). To be investigated the applicability on the class A part.
10.	In cross-border projects railway network or geographical specificities may affect the authorisation for track-side/on-board CCS or both subsystems.
11.	The compliance to national rules during the testing phase is sometimes demanding and not often well understood by the Applicants.
12.	Sometimes network specificities or national provisions and processes during the management of the testing phase are to be taken into account
13.	The 4th Railway package appoints the Agency as system authority regarding track-side ERTMS project involving ETCS or GSM – R equipment for ensuring the harmonised implementation of ERTMS in the Union. The issue is related to the decision of the Agency as part of the authorisation for the placing in service where changes/modifications to the ERTMS track-side project may happen following the tender stage.

V. Conclusion

The present article described the state-of-play of the CCS authorisation process and related procedures in two steps: 1) A general overview of the authorisation as explained by the EU legislation for railway; 2) The specific authorisation process in Bulgaria, according to the national legislation.

At the end of the study, a set of findings and issues related to the authorisation process was addressed and will be used as a foundation to adopt common principles and harmonised approach within authorisation.

Acknowledgement

The analysis is part of the "ERTMS Harmonised and International Procedures for Placing into Operation of Products and Subsystems" project, number 2014-EU-TM-0128-S, which is co-funded under Connecting Europe Facilities (CEF) 2014-2020 and is contributed by Rina Services.

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