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| Technical support  for the interoperability Issues Log Book |
|  |
| Implementation & Deployment Plan update  (Working document on issue Follow-up) |

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Zoetermeer, 1 February 2022

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# Introduction

## Introduction to the project

The Technical Operational Issues Log Book (ILB) is a Commission initiative to accelerate progress on interoperability by focussing on a limited number of priorities and by streamlining the work done at European, corridor and national level by public authorities (European Union Agency for Railways, European Commission, national authorities), infrastructure managers including Rail Freight Corridors, railway undertakings and rail sector associations. Through the Issues Log Book, major hindrances to cross-border rail traffic have been identified “bottom-up” by the sector. These hindrances are related to safety or are of a technical and operational nature.

The objective of this project, carried out by the Panteia Consortium, is to support and accelerate the achievement of rail breakthroughs as defined in the Technical and Operational Issues Log Book by providing to the Commission technical assistance and by alleviating resource and expertise constraints of public authorities and rail sector stakeholders. The main objective is to support the Commission and ERA to work with infrastructure managers and railway undertakings, public authorities, namely Ministries of Transport and National Safety Authorities, as well as the Rail Freight Corridors in removing operational, technical and administrative barriers to rail interoperability in cooperation with the European Union Agency for Railways.

Work carried out by the consortium during the first phase of the project included an update of the ILB structure and its information (available on the DG MOVE website). Also, a prioritization was identified of issues that qualify for technical assistance (support activities). Issues assigned low or medium priority are provided with administrative and/or technical assistance based on specific requests; this also goes for support activities under ILB Priority 1 (braking). Issues assigned high priority were further analysed and actively considered in order to initiate solution processes. These are found in the table below:

| **Project** | **Related Issue(s)** | **Activity description** | **Time frame for activity** | **Priority for technical assistance** |
| --- | --- | --- | --- | --- |
| 1 | 5 (Train Composition - Working handbrake last wagon) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |
| 6 (Train Composition - No push 6 axles wagons) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |
| 7 (Train Composition – Buffer wagons) | Investigate geographical scope; work with ERA to develop specific TOs (in addition to TO for RO, BG) | Sept-Dec 2020 (first results) | High |
| 11 (New train number) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |
| 2 | 13 (2 people cabin crew) | Base analysis, geographical mapping; where rules requested, explore by whom, reasons. Explore existing solutions and propose solutions | Sept-Dec 2020 (first results) | High |
| 3 | 3 (Tail lights vs. plates) | Analysis of MSs study on the use of reflective plates | Jan-Feb 2021 | High |
| 4 | 14 (Equipment of border stations with commutable electric power supply) | Analysis of the situation referring equipment of border stations with commutable electric power supply | Jan-Jun 2021 | High |

In this working document, the results of the support activities captured in the table above are described. Based on these activities – with different time frames – further support actions are expected to be defined later on.

## Methodology of the project

This report sets forth the results from the Panteia Consortium’s inquiries in follow-up of the first update of the Issues Log Book (July 2020). For prioritized issues where no external projects or activities apply, the Consortium performs projects itself, as required by the Commission and included in the table above.

The Consortium based the analyses on information previously acquired through initial desk research, interviews and stakeholder survey, as well as the study of additional documents and information from a series of in-depth interviews.

## Methodology for implementation and deployment of solutions

This chapter refers to “Methodology for pilot projects implementation / deployment of solutions” and “Methodology for applying the solutions at corridor & European level”.

According to the initial project approach, the implementation and deployment of solution refers to pilot projects as well as to corridor and European level.

The actual ILB technical assistance activities have focussed on selected projects and related ILB issues (as requested by DG MOVE; see also overview above):

* Project 1 (Issues 5, 6, 7, 11)
* Project 2 (Issue 13)
* Project 3 (Issue 3)
* Project 4 (Issue 14)

In an iterative process, the projects have been performed by analysing the issue, supporting the development of solutions, drafting proposals for the implementation of solutions and monitoring the status of implementation. In the following chapters of this implementation and deployment plan, each covered issue is documented according to the following structure:

* Introduction / Description of the Issue
* Occurrence and legal background
* Problem drivers / Reasons
* Impacts
* Conclusion / Solutions

As a result of the analyses, most issues occur in single countries and at specific country-country borders rather than affecting entire corridors or the European network. Consequently, the finding and implementation of solutions focussed on the areas concerned. The following table provides an overview on the tackled issues, their occurrence as well as suggested solutions and status (solved, unsolved).

| **Project** | **Issue(s)** | **Occurrence** | **Solution, status** |
| --- | --- | --- | --- |
| 1 | 5 (Train Composition - Working handbrake last wagon) | PT, RO | Cleaning up related national rules (PO / General Safety Regulations, Basic Principles: Chapter 4 (39.5); RO / Regulation of traction and braking No 006/2005); unsolved |
| 6 (Train Composition - No push 6 axles wagons) | RO | Cleaning up related national rules (Regulation for trains and shunting no. 005, Art 99 and 100; Instructions N° 250 regarding the technical overhaul and maintenance of wagons in operation); unsolved |
| 7 (Train Composition – Buffer wagons) | BG, HU, RO | Application of RID; solved during the project (cleaning up rules in BG, HU, RO) |
| 11 (New train number) | HU, RO | Cleaning up related rules (HU / MÁV Operational Rule Book, RO / Instruction N° 250); unsolved |
| 2 | 13 (2 people cabin crew) | IT, RO, BG, (ES) | RO & BG: removal of national rules, IT: change interpretation of national law (‘rule n° 81’); unsolved |
| 3 | 3 (Tail lights vs. plates) | BE, FR, IT, PT, ES, (UK) | Application of new OPE TSI, chapter 4.2.2.1.3.2; solved (implementation until 1/2026) |
| 4 | 14 (Equipment of border stations with commutable electric power supply) | Everywhere where power supply system changes | Solution out of ILB scope; as a step forward, the sector shall develop best practises for the design of power supply change. |

# Project 1 – Issues 5, 6, 7, 11

| **Project** | **Related Issue(s)** | **Activity description** | **Time frame for activity** | **Priority for technical assistance** |
| --- | --- | --- | --- | --- |
| 1 | 5 (Train Composition - Working handbrake last wagon) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |
| 6 (Train Composition - No push 6 axles wagons) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |
| 7 (Train Composition - Buffer wagons) | Investigate geographical scope; work with ERA to develop specific TOs (in addition to TO for RO, BG) | Sept-Dec 2020 (first results) | High |
| 11 (New train number) | Base analysis, identification of stakeholders, further investigations, proposal for possible solutions | Sept-Dec 2020 (first results) | High |

## Issue 5: Train Composition - Working handbrake last wagon

### Introduction / Description of the Issue

In principle, all trains must have a continuous air pressure brake for all wagons, which must always be ready for operation during the train run and which guarantees the required braking performance of the train (brake weight, brake positions, see Issues 1 and 2).

Issue 5 however deals with preventing parked trains from unwanted movements. For this purpose, different technologies are available, being installed either on the wagon or on the track (mostly parking/hand brakes, brake shoes, track locks/derailers). The specific conditions for securing a parked train are specified in the respective national regulations.

A particular problem arises, if the national rule demands the last wagon(s) of a train to be equipped with a working hand brake. This leads to additional shunting operation at the border station, if the last wagon(s) of an international train that enters a country or network with such regulation does not fulfil this requirement.

### Occurrence / Legal background

Different countries have been identified (Italy, Portugal, Romania, Serbia) where the issue potentially exist; according to the current findings only Portugal and Romania are affected by the Issue. In contrast, a working handbrake at the last wagon is not mandatory in Northern, Western and Middle Europe. Therefore, the Issue does not occur there. Issue 5 has also not been mentioned as a problem in the Xrail working groups.

The national rules and relevant parts for the considered issue for Portugal and Romania are listed in Table 1.

Table 1: Relevant national rules in (Issue 5; Romania and Portugal)

|  |  |  |
| --- | --- | --- |
| N° | National rule | Relevant parts, explanation |
| 1 | **Portugal:**  General Safety Regulations, Basic Principles  (PT: Regulamento Geral de Segurança, Principios fundamentais) | Chapter 4 - Circulation notions  39.5 Brake distribution  [...] In any train it is mandatory   * that the first and the last vehicle of the composition are equipped with Automatic Brake, in good working condition * that one of the three tail vehicles is equipped with a parking brake, in good working order. [...] |
| 2 | **Romania:** Regulation of traction and braking No 006/2005 of national law, MoT order No 1815/2005 on traction and braking rules | Chapter V – “Braking of trains”, Section 6, page 48, article 37, point 1, corroborate with the definition of “active brake” which is defined in the same regulation and the same Chapter V, at Section 1, page 30, article 21, point 1, letter b. |

According to information from ERA (30.09.2021), there are no rules that have been notified in the Single Rules Database (SRD) in relation to this issue.

The situation in Portugal and Romania can be summarised as follows:

* **Portugal:** According to the stakeholder survey, performed by the ILB consortium in May 2020, Issue 5 affects the Portuguese borders of RFC 4 and RFC 6. According to national regulations[[1]](#footnote-2) (see also Table 1), all trains must have an active handbrake at one of the last three wagons.
* **Romania:** As the stakeholder interviews show, Issue 5 particularly affects the Romanian borders of RFC 7 and RFC 9. According to national regulations[[2]](#footnote-3) (see also Table 1), all trains in Romania must have an active handbrake at the last wagon. Moreover, the hand-braking performance of parked trains must be at least 10%; depending on the train weight this means that potentially more than one wagon has to be equipped with a handbrake. Explicitly mentioned was especially the HU/RO border in Curtici: in many cases, the last wagon of an international train arriving at Curtici is not equipped with a handbrake; in such cases shunting is required to position a wagon with a handbrake to the end of the train. Similar problems were reported for the RO/BG border in Ruse.

In addition, similar problems have been reported for the following countries, not directly associated with issue 5. These are documented for reasons of completeness:

* **Serbia** requires a minimum number/percentage of wagons with handbrake that causes additional shunting operations at the BG/RS border in Dimitrovgrad ZS.
* **Italy:** In Italy, the problem does not occur despite being named in the survey. Even though it is recommended to have a working handbrake at the last wagon, it is not mandatory. Securing parked wagons can be performed by using brake shoes. The exact number of required brake shoes depends on the train composition (number of wagons, train length/weight, share of wagons with a hand brake) and on the number/positioning of empty wagons (empty wagons in a group / or mixed with loaded wagons). The brake shoes are stored on the locomotive. Some locomotives (like Vectron) have storage boxes outside the driver cabin. In other locomotives types, the brake shoes have to be stored in the driver cabin; this might lead to some inconvenience regarding storage space on the locomotive. Moreover, the brake shoes need to be handed over in case of locomotive change. However, these problems were reported to be of minor nature and therefore manageable.

Another topic, mentioned in the stakeholder interviews by Xrail, is the number and type of brake shoes to be used. Requirements are currently described in national rules, however harmonisation has been considered as beneficial for international freight train operations.

### Problem drivers / Reasons

The consultants found no evidence that such national rules – as implemented in Portugal and Romania – are required. The strong inclines on some of the Romanian corridor sections are no reason for demanding a parking brake, since wagons are parked in stations, for which the permitted gradient is considerably smaller than on the lines.

### Impacts

The potential impacts from this Issue can be shown exemplarily for a service Schwandorf-Craiova. This train runs 2-3 times per week and is planned to be increased to a frequency of 4-5 trains per week. Some 50% of the trains entering Romania are affected with the problem that the last wagon is not equipped with a handbrake. As explained above, this means that shunting is required. Model calculations for such operations (assuming that one wagon with handbrake will be repositioned from the middle to the end of the train) show that such activity takes at least 30-45 minutes per train of pure shunting time. In practice, shunting operations can last even longer (e.g. according stakeholder interviews shunting at BG/RS border station Dimitrovgrad ZS takes about 2 hours).

In Curtici, this time loss is considerably extended in many cases, because the RU must engage an external shunting operator. If there is no shunting locomotive available, or the owner is not willing to provide it, typical waiting times for an available shunting locomotive take up to 12 hours, causing delays and significant costs to bring the locomotive to the border station. Moreover, such shunting service is generally not available during night shifts, which might cause further waiting time of 4-12 hours. Additionally, such shunting operations lead to capacity constraints at Curtici, where only a limited number of tracks are equipped with the HU safety system allowing operations between Lököshaza and Curtici.

In some cases, none of the wagons has a working handbrake (e.g. Schwandorf train). In that case, wagons without handbrake (e.g. 5 out of 25 wagons) have to be exchanged against wagons with handbrake; the discarded wagons have to be transported with another train that provides sufficient capacity for these additional wagons. Alternatively, a wagon with a handbrake needs to be attached; due to limitations of the train length in Romania, one wagon may have to be left at the border station. The stakeholders reported cases, where containers from such sorted out wagons had to be transported by truck to the customers, with respective extra planning efforts and costs.

### Conclusion / Solutions

According to TSI-OPE Appendix I, train composition (incl. rules regarding handbrakes) is not an area for national rules; according to information from ERA, none of the listed rules in Portugal and Romania have been notified in the Single Rules Database (SRD). Train composition principles are listed in TSI-OPE point 4.2.2.5.2; but it is up to the RUs to define how to implement these principles in their own Safety Management System (SMS) by applying appropriate risk assessment methods.

To solve the issue it would be necessary, cleaning up related National Rules in relation to working handbrakes in freight trains:

* Portugal (General Safety Regulations, Basic Principles: Chapter 4 Circulation notion, 39.5 Brake distribution);
* Romania (Regulation of traction and braking No 006/2005 of national law, MoT order No 1815/2005 on traction and braking rules, Chapter V – “Braking of trains”, Section 6).

As intermediate and supporting steps for improving the situation, the following actions could be implemented:

* Railway Undertakings could already implement in their Safety Management System alternative ways to mitigate the risk of putting a train at standstill, by implementing TSI-OPE and not the national rule.
* A potential workaround could be established, using brake shoes instead of handbrakes within a field research with dedicated, limited scope (selected stations, operators, wagon types). The outcome of this test operation could serve as basis for risk evaluation of applying rules like Italy in regular operation.
* Additionally, it is recommended to follow the revision process for UIC IRS 40454 on handbrakes that is intended to harmonise both the requirements regarding number and position of handbrakes as well as number, type and position of brake shoes.

According to UIC, International Railway Solutions (IRSs) are the outcome of independent work conducted by the railway operators in order to harmonise the railways in an efficient and realistic way, progressively replacing the UIC Leaflets.

## Issue 6: Train Composition - No push 6 axles wagons

### Introduction / Description of the Issue

One of the issues which occurs in just one country but has a Europe wide impact, nonetheless, is the prohibition to push 6-axle wagons. This is the case in Romania. Despite wagon manufacturer’s specifications, the infrastructure manager does not allow the use of a pushing locomotive for trains which have 6-axle wagons at a certain position.

The determination of the position where 6-axle wagons can or cannot be used in a train with a pushing locomotive is complex and includes train length, train weight and the distribution of weight within the train. Basically, the last 300t gross weight of the train must be without 6-axle wagon. Thus, the correct position for 6-axle wagons needs to be calculated for each individual train. For trains with a low share of 6-axle wagons, which is often the case in single wagon load, this is not a problem. It is comparably easy to compose the train to that the 6-axle wagon will not be affected by the issue. For trains with a high share of 6-axle wagons, such as intermodal trains, the issue is more important, as they will often have to change the composition of the train temporarily in order to conform to the IM’s rules.

Operational measures to comply to the rules causing this issue include changing the train composition, splitting the train in two parts, or adding a second traction locomotive, instead of a pushing locomotive, or adding buffer wagons at the end of the train to adhere to the rules.

### Occurrence / Legal Background

As stated above, the issue only occurs in Romania. Within Romania, there are certain lines and areas which are affected, as the use of pushing locomotives is not necessary on all lines. The most important line sections and areas which are affected are Predeal – Brasov, Fetesti – Cernavoda, Drobeta-Turnu Severin – Balota, and Vintu de Jos – Coslariu. The issue is especially relevant for transit traffic from/to Turkey, as this traffic predominantly consists of intermodal trains. Following the input received from several stakeholders during interviews, there are no other European countries where this issue occurs.

The national rules and relevant parts for the considered issue are listed in Table 1.

Table 2: Relevant national rules in Romania for issue 6

|  |  |  |
| --- | --- | --- |
| N° | National rule | Relevant parts, explanation |
| 1 | Regulation for trains and shunting no. 005 Regulamentul pentru circulaţia trenurilor şi manevra vehiculelor feroviare - nr. 005, aprobat prin Ordinul ministrului transporturilor, construcţiilor şi turismului nr. 1.816/2005 | Art. 99 and Art. 100, prescriptive orders for train composition of trains carrying hazardous goods |
| 2 | INSTRUCTIONS of October 26, 2005 regarding the technical overhaul and maintenance of wagons in operation no. 250, approved by MoT Order no. 1817 of October 26, 2005 | Section 3, art 37 and Section 4 art 38 (Technical conditions imposed on the last wagon on the train) Art 9 - Technical checks and mandatory check of wagons Art.10 - Technical revision of transit trains |
| 3 | ORDER no. 340 of April 29, 2021 regarding the abrogation of art. 99 and 100 of the Regulation for train traffic and maneuvering of railway vehicles - no. 005, approved by Order of the Minister of Transport, Construction and Tourism no. 1,816 / 2010 | Removal from the legislation of articles 99 and 100 prescriptive orders for train composition of trains carrying hazardous goods |

According to information from ERA (30.09.2021), there are no rules that have been notified via NOTIF-IT in relation to this issue. The issue is only related to National Rules in Romania. Cooperation and bi-lateral discussions between ERA and the Romanian Ministry of Transport are ongoing. The preliminary result is that ERA requests the removal of the applicable national rules and the issue will thus be solved.

### Problem drivers / Reasons

The drivers behind this issue are National Rules which should be removed. It is related to so-called rule no. 250 stating that 6-axle wagons are to be considered as exceptional transport in Romania, which leads to the fact that these wagons cannot be pushed on above-named lines (see also Table 2). This is not related to the definition of exceptional transport which is given in the TSI OPE. As mentioned in the introduction, the rule includes train length, train weight and the distribution of weight within the train, which makes it complex for railway undertakings to correctly form the train.

Historically, the rule had been implemented as reaction to accidents in the past. However, the exact date and circumstances of these accidents were not known by the interview partners. Thus, the issue has a rather historical background and not a technical one. Nevertheless, the partially bad condition of infrastructure is most likely part of the reason why the rule is being kept today.

The stakeholders involved in this issue are the infrastructure manager CFR Infra, the Romanian Railway Agency and the Romanian Ministry of Transport.

### Impacts

Despite the limited geographical scope of this issue, the scope of its impact is a lot greater. The impacts can be grouped together into direct impacts and indirect impacts of the issue. The direct impacts are time loss, cost for additional (shunting) services, additional energy costs and increased cost for overhead planning. RUs have developed different operational measures to achieve compliance to the national rules, modifying the train composition for the affected line sections, when the original train configuration would not be allowed on those sections (e.g. intermodal trains with 6-axle wagons only). The operational measures to achieve compliance differ in their impact. The possible operational measures put in place by RU in order to comply with the national rules and their impacts are summarised in the table below.

Table 3: Operational measures currently taken by RUs to comply to national rules for issue 6 and their impacts

|  |  |
| --- | --- |
| Operational Measure | Impact |
| Splitting the train in two parts  By splitting the train, the train weight reduces, and no pushing locomotive is required | Time loss (low – medium)  Additional shunting costs (low)  Additional costs for loco rent or parking |
| Second traction loco instead of pushing loco  A second traction locomotive can be attached instead of using a pushing locomotive. Additional time is required to attach and detach the locomotive. | Time loss (low – medium)  Additional costs for loco rent or parking |
| Re-position 6-axle wagon in train  If a sufficient number of non-6-axle wagons is in the train, the wagons can be re-arranged to comply to the national rules. | Time loss (medium – high)  Additional shunting costs (medium – high)  New wagon list must be prepared (overhead) |
| Adding buffer wagons  If no non-6-axle wagons are in the train, it can be a solution to add buffer wagons so that no 6-axle wagons are in the last 300t gross weight of the train. | Time loss (low – medium)  Additional shunting costs (low – medium)  Additional costs for wagon rent or parking  Additional dead weight, increased energy costs |

Small railway companies are usually more affected by the issue, because it is less economical for them to take measures for compliance, such as additional traction locomotives, available at the respective stations. Thus, they heavily rely on external shunting services which increases the cost and makes them dependant on the shunting operator’s availability.

The indirect impact of this and other issues located in Romania is the rerouting of trains. Especially for intermodal trains, this rule often makes it unprofitable to run those trains through Romania. The increased running time as well as the potentially necessary reduction of train weight are the main factors influencing RU’s decisions. Especially intermodal trains to/from Turkey will often be rerouted via Serbia. This impact can already be observed today.

It is not known how many trains are affected by this issue. For a leading RU, 3 trains per day (to/from Turkey) are negatively affected. It is especially complex to estimate the share of trains which are being rerouted because of this, as multiple factors and issues influence the route choice.

### Conclusion / Solutions

Route compatibility and train composition principles are listed in TSI OPE point 4.2.2.5. The safe usage of 6-axle wagons in a train is related to Safety Management System (SMS) processes of the RUs or other processes defined by EU legal framework. According to TSI-OPE Appendix I, train composition and route compatibility are not areas for national rules. Further, the number of axles per wagon is not mentioned in Appendix D1, which lists the aspects which need to be checked by RUs for route compatibility. According to information from ERA, none of the listed Romanian rules have been notified in the Single Rules Database (SRD). Train composition principles are listed in TSI-OPE point 4.2.2.5.2; but it is up to the RUs to define how to implement these principles in their own SMS by applying appropriate risk assessment methods. Thus, it is the responsibility of the RU to accommodate for any risks which might be related to the pushing of 6-axle wagons.

The following solutions are suggested:

* National Rules in relation to this issue shall be removed by Romania. RUs shall be in charge choosing the best way to handle 6-axle wagons safely.
* Railway undertakings shall, together with the infrastructure manager, perform a risk assessment for a safe transition from national rules to the safety management by the RUs.

The importance of this issue is clear, as Romania is positioned in the center of the corridor, so each bottleneck which can be removed there is fostering the smooth run of trains on the corridor. The situation has to be seen in a positive manner as the market potential is high. Thus, administrative bottlenecks have to be eliminated, in order to reach efficiency. 798.7 Million Euro (6 projects on rail) are currently invested in the development of infrastructure in Romania via the Connecting Europe Facility[[3]](#footnote-4). The market need has to be taken into consideration and the infrastructure development must be accompanied by a change of operational rules in order to unfold the full potential of the infrastructure upgrades and not to lose the traffic to alternative routes. Otherwise, the expensive infrastructure would not prove to be efficiently used.

### Obstacles to the solution of removing national rule

In order to solve this issue by removing this national rule, workshops were organised with ERA, the Ministry of Transport and CFR Infra in March 2019 and October 2020. In these occasions, ERA identified all outdated national rules and the rules of Romania that were considered not justified and need to be eliminated. Of course, the low level of quality of infrastructure in Romania, as well the low quality of the rolling stock makes those rules more relevant in Romania than in other countries. The authorities lack a market-oriented attitude and are not necessarily committed to change the rules.

An effective solution would require strong political support, as in the past two years and despite all evaluations (including the waiting times reduction proposed measures) a solution of the issue was not taken into consideration. Mr. Mathieu Grosch - Coordinator of the Orient/ East–Med Corridor has also made a number of recommendations in the last published Work Plan and supports the RFC7 in their initiatives to reach the goals of reducing waiting times at border.

Support of ERA and Mr. Grosch together with bilateral meetings/communication initiatives of RFC7 are still not sufficient. A lot of letters were sent to the Romanian MoT and to the high level of management of the IM, but due to the frequent change of the management, continuation of actions is not met, and initiatives are restarted over and over again.

## Issue 7: Train Composition - Buffer wagons

### Introduction / Description of the Issue

The number of buffer wagons required between the locomotive and wagons carrying dangerous goods is different in certain Member States. This is a cause for unnecessary shunting and therefore additional costs, time loss and dead weight. Also, buffer wagons that are not needed have to be parked, unnecessarily using infrastructure capacity and increasing costs. Finally, buffer wagons may lead to exceeding the permissible train limit values (length, gross weight). The consequent decrease of economic efficiency constitutes a limitation on rail freight’s competitive position.

From a regulatory perspective, the only mandatory rule is found in RID par. 7.5.3: *(a) at least 18 m, or (b) occupied by two 2-axle wagons or a wagon with 4 or more axles.* Thus, MSs should clean-up any additional national rules in the process of implementing the Fourth Railway Package. On this subject, ERA has published specific TOs.

After a decision regarding an implementing act by the European Commission, and request thereof to the authorities in Romania and Bulgaria, these Member States reported in May 2021 that their relevant national rules were successfully removed. Thereby, issue 7 can be regarded as solved.

### Occurrence

The stakeholder survey indicated that the issue occur in: BG, HU, RO, DE, AT, and IT, as well as RS (Serbia). Especially, the Ruse, Curtici and Dimitrovgrad border crossings were mentioned.

From follow-up inquiries, the following insights were obtained:

* HU has cleaned up national rules as per August 2020. This has led to positive experiences
* BG requires only 1 buffer wagon (not specified). National rule successfully removed in May 2021.
* RO requires a minimum of 12 axles, or between 2 and 6 wagons. For complete petrol trains, no buffer wagons are required. National rule successfully removed in May 2021.
* RS also requires no buffer wagons for complete petrol trains
* AT applies RID; no issues were found

### Problem drivers / Reasons

For some of the MS where the issue occurs, implementation of the Fourth Railway Package was still to be completed. Especially for Romania, however, hesitance on the side of the MS, its infrastructure manager and safety authority appeared to be inspired by the relatively poor state of the infrastructure. For the Netherlands, the aforementioned covenant between the MS, IM and the sector is not a national rule as such, but is seen as a working procedure.

### Impacts

Overall, the issue must be seen as a cause for unnecessary shunting and therefore additional costs, time loss and dead weight. Also, buffer wagons that are not needed have to be parked, unnecessarily using infrastructure capacity and increasing costs. Finally, buffer wagons may lead to exceeding the permissible train limit values (length, gross weight). The consequent decrease of economic efficiency constitutes a limitation on rail freight’s competitive position.

### Solutions

It is highlighted that the Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) do not foresee any buffer wagons in this configuration. The only mandatory rule is found in RID par. 7.5.3:

*Protective distance. Every wagon, large container, portable tank or road vehicle containing substances or articles of Class 1 and bearing a placard conforming to models Nos. 1, 1.5 or 1.6, shall be separated on the same train from wagons, large containers, portable tanks, tank-containers, MEGCs or road vehicles bearing a placard conforming to models Nos. 2.1, 3, 4.1, 4.2, 4.3, 5.1 or 5.2 or road vehicles for which the transport document indicates that they are containing packages bearing a label conforming to models Nos. 2.1, 3, 4.1, 4.2, 4.3, 5.1 or 5.2 by a protective distance. The requirement for this protective distance is met if the space between the buffer head of a wagon or the end wall of a large container, portable tank or road vehicle and the buffer head of another wagon or the end wall of another large container, portable tank, tank-container, MEGC or road vehicle is: (a) at least 18 m, or (b) occupied by two 2-axle wagons or a wagon with 4 or more axles.*

In an ERA analysis of national rules in BG, HU and RO with reference to required buffer wagons, it is established that TSI-OPE Appendix I lists the areas where national rules are allowed. Appendix I comes into effect in 2021; also, MSs should clean-up national rules in the process of implementing the Fourth Railway Package. When considering Appendix I, train composition is not an area for national rules. Therefore, national rules in excess of the RID should be cleaned-up as per the railway safety directive that defines the migration strategy from a rule based approach to a risk based one.

## Issue 11: (Processes due to) New train number

### Introduction / Description of the Issue

As Issue 15 (“Real-time train running information”), Issue 11 also depends on the change of the train number. In contrast to Issue 15, Issue 11 concerns operational procedures that have to be performed, only due to assigning a new train number in cross-border operation. In these cases, the train is considered as a new train and thus subject to (all) train preparation procedures (such as full technical wagon check and brake test), although the train composition has not changed. This would be a time consuming process involving unnecessary costs, and therefore be potentially harmful to rail freight’s competitive position.

### Occurrence / Legal background

In the narrow sense of the definition (see chapter 1.4.1), the Issue occurs only in Hungary when the international train number changes to national train number at border station e.g. in case of delays. According to MÁV rule book, pre-arranged train paths (PaPs) expire after 24h delay. In this case, a new train number is assigned, and complete train preparation procedures have to be performed.

Also, in Romania it has been investigated that train checks have to be performed due to pure formal reasons. This is not due to the change of the train number, but affects all freight trains passing a Romanian border station regardless if the train composition has changed or not.

In contrast, Issue 11 does not appear in Northern, Western and Middle Europe; it has also not been mentioned as a problem in the Xrail working groups.

The related rules and relevant parts for the considered Issue for Hungary and Romania are listed in Table 4.

Table 4: Relevant rules (Issue 11; Hungary and Romania)

|  |  |  |
| --- | --- | --- |
| N° | National rule | Relevant parts, explanation |
| 1 | **Hungary:**  MÁV Operational Rule Book | Pre-arranged train paths (PaPs) expire after 24h delay. In this case, a new train number is assigned, and complete train preparation procedures have to be performed. |
| 2 | **Romania:** Instruction on technical overhaul and maintenance of wagons in operation no. 250 of 26.10.2005, MoT order No 1817/2005 on traction and braking rules, amended by Order 462/2007; Order 385/2010; Order 1359/2012; Order 1466/2014 | SECTION 1 Technical revision of the train composition  Art. 6. - (1) The technical revision of the trains composition is performed in the following situations:  a) in the train composition stations with the exception provided in art. 5, para. (6) of these instructions, on the lines provided in the technical plan of operation of the station - hereinafter referred to as PTE;  b) in the stations on route to the wagons which are introduced or attached to the trains in transit;  c) in state border stations, for freight trains |

### Problem drivers / Reasons

The situation in Hungary and Romania can be summarised as follows:

* **Hungary:** The RFC 7 provided the following explanation: “In Hungary, the delay threshold is +/- 24h before the train path expires; thus a train number has to be changed as well. When a corridor train runs on the corridor (on a PaP) and for some reasons it has to be blocked (e.g. due to technical/operational problems, change of the staff, miss-management of the related resources, or there is a huge traffic congestion, etc.) and it reaches 24 hours delay, the train number expires. The train PaP is cancelled, and a new number is assigned, so the train can continue its run based on a so-called “operational train PaP”, a national path which does not have the same service level any more as a train which run on the corridor PaP. We call it in most of the cases ”ad-hoc“ trains, and they have to wait until the national traffic management is able to put the train again into the traffic flow (re-integrate). All concerned measures are defined and described in the National Network Statement, so RUs have to follow these instructions. Certainly, it takes time and money. Therefore, a train number change has a negative effect on the smooth run, because it generates additional delays of the delivery of the same goods from point “A” to point “B”. (Same train, same goods, but totally different PaP parameters.) Each country has different national rules for this delay’s rate, so along the corridor RUs might meet very different measures when the train number has to be changed.” The main problem is, that trains with changing train numbers are considered as a new train, requiring additional checking procedures.
* **Romania:** Technical wagon checks have to be performed for all international freight trains in the respective border station for entering Romania. This concerns both trains where the composition or other technical configurations change (e.g. locomotive change, change of braking positions) as well as trains where nothing changes. Currently, this is is not a huge problem, as most trains have waiting times at the border stations anyway due to traction change (Electric – Diesel). In case that no traction change is required, this could be a problem as it would extend the necessary stopping time.

### Impacts

Impacts arising from Issue 11 are twofold:

1. If the PaP is changed from “corridor” to “operational train” level, this means waiting time until the train receives a new train path for the national rail network. Moreover, the train will lose priorities assigned to corridor trains, which might lead to additional time loss in case of conflicts with other trains.
2. Additional technical train checks mean further time loss and costs for the operational staff. A model calculation based on experience values for a 600m train, consisting of 30 four-axle-wagons would require 2 hours for one wagon inspector to perform a complete wagon check and complete brake test. This waiting time may further exceed, if the operational staff is not available when needed.

### Conclusion / Solutions

Train checks must be performed due to safety reasons / operational needs (change of train configuration, potential standing time, …), not to pure formal reasons (only change of train number, all freight trains in border station). According to TSI-OPE 4.2.3.3.1. “Checks and tests before departure”, the RUs are in charge of defining the checks and tests to ensure that any departure is undertaken safely.

To solve the issue it would be necessary, cleaning up related rules:

* Hungary (MÁV Operational Rule Book);
* Romania (Instruction on technical overhaul and maintenance of wagons in operation no. 250 of 26.10.2005, MoT order No 1817/2005).

As intermediate and supporting steps for improving the situation in Hungary, the following actions could be implemented:

* Reducing train delays at border stations will lead to less re-numbering of trains and less “operational train PaPs” - even under the current regulatory framework.
* Optimising information exchange (train numbers, ETA) and border handling processes (issue 8). In order to harmonise the information across borders and to support international train management, Rail Net Europe (RNE) has developed the Train Information System (TIS) over the last years. The matching of train running information from different national IM systems is a challenging topic, because trains often change their number during the origin-destination run (e.g. at border crossings). RNE currently runs the “Digital Train” project within the Issues Log Book framework, ensuring a better linking of train numbers based on the train composition. In more detail, the data sets of different train numbers are compared in relation to the train composition (wagon numbers, train length). The level of consistency determines if the two train numbers are related to the same train.
* Ensuring consistent train numbers, preventing trains being considered as a “new” train - see also Issue 15 and related solutions (“Train ID”). The Train ID is already defined in the TAF TSI framework and shall be allocated by the RU after ordering of train paths. It is expected that first implementations of the Train ID will be performed in the next 2-3 years.

# Project 2 – Issue 13: 2-people cabin crew

| **Project** | **Related Issue(s)** | **Activity description** | **Time frame for activity** | **Priority for technical assistance** |
| --- | --- | --- | --- | --- |
| 2 | 13 (2 people cabin crew) | Base analysis, geographical mapping; where rules requested, explore by whom, reasons. Explore existing solutions and propose solutions | Sept 2020-Dec 2021 (first results) | High |

## Introduction / Description of the Issue

This issue relates to the number of **train drivers operating locomotives and trains** and **other crew members** performing safety-related tasks on the locomotive, which is in the certain countries higher than in the majority of European countries. More specifically, the number of drivers / size of cabin crew is required to be 2 in some cases and in some Member States, irrespectively of the condition of the infrastructure, rolling stock operated or safety systems installed. In some cases, 2 drivers are required, in other cases 1 driver plus 1 additional staff are required.

## Occurrence / Legal background

In the stakeholder survey and the subsequent interviews, the geographical spread of this issue could be limited to **Bulgaria, Romania, and Italy**. The issue differs slightly in the three affected countries and will be described separately for each country. The relevant national rules are listed in Table 5.

Table 5: Relevant national rules for issue 13 (Bulgaria, Romania, and Italy)

|  |  |  |
| --- | --- | --- |
| N° | National rule | Relevant parts, explanation |
| 1 | **Bulgaria:**  Ordinance no. 58 of 2.08.2006 on the rules for technical operation, train movement and signalling in rail transport, issued by the Ministry of Transport;  Rules for train traffic and shunting operations in railway transport - the SE NRIC is responsible for the creation and publication of these rules; | Section III of the Ordinance no. 58/2006 regarding Train service: Art. 219. (amend. – SG 68/14, in force from 15.08.2014) specifies that trains shall be serviced by a train crew which includes personnel performing the task of train management (drivers) and additional crew member (train master), which shall compulsorily service all trains carrying passengers and freight trains, the movement of which requires special conditions depending on the different categories of trains and the sections of traffic. |
| 2 | **Romania:**  Railway technical operation regulation no. 002 (approved by Order 1186/2001)  Towing and braking regulations no. 006, (approved by Order no. 1.815 /2005)\_\_  Regulation for train running and manoeuvring of vehicles railway - no. 005 ((approved by Order no. 1.816 /2005)\_\_  MoT Order no. 1684/2012 for the management and service of direct freight trains in a simplified system  Order no. 1853/2018 on the approval of the new norms for train service | Article 157 of technical operation rule no 002, defines that any train has to be serviced by at least two agents.  The number of active or inactive motor railway vehicles that perform the train traction, driven and serviced in a simplified system, is established according to the Towing and Braking Regulation no. 006, and operation rules are set by Regulation 005.  MoT Order no. 1684/2012 establishes the technical, organizational and personnel requirements with non-discriminatory nature for all rail freight operators for  direct freight trains in a simplified system, without being used in the service of the train of and additional locomotive driver, but with the support of additional personnel as train master.  Order no 1853/2018 defines additional Specific Norms for the service of freight trains by a single agent - the locomotive driver, partially modifying the regulations 002, 005 and 006. |
| 3 | **Italy:**  Legislative decree 9 April 2008, no. 81 - Implementation of Article 1 of Law no. 123, concerning the protection of health and safety in the workplace | Art. 12 and Art. 20 are interpreted in such a way that the worker’s safety must be ensured at the maximum level and cannot be decreased. |

**Bulgaria**

In Bulgaria, it is required to operate locomotives on railway lines with two qualified drivers. This is the case for some lines on the network, depending on the different category of train running those lines. These lines should be specified in the network statement and should be updated regularly for public use. For these circumstances, the complete train crew should be formed, according to the Ordinance 58/2006 of a train driver, a deputy train driver and/or train master. Exceptions are made for trains with two locomotives, including either pushing locomotives at the end of a train or a second locomotive in double traction. The additional locomotive can be operated by only one driver. In these cases, 3 drivers are required in total: two drivers for the leading locomotive and one driver for the second locomotive (either in double traction or pushing at the end of the train). The operation of a single locomotive can also be done with only one driver.

**Romania**

For Romania, the issue is very similar to the issue in Bulgaria. A two-people cabin crew is required in some specific cases. Unlike in Bulgaria, the second person in the cabin does not necessarily need to be a driver but must be able to stop the train. Nevertheless, a second driver is often preferred by the RUs, in order to utilise the second person for shunting and other tasks. The regulations requiring a second person in the cabin are given in Regulation no. 006, issued by the Ministry of Transport, Construction and Tourism. This regulation was amended in 2019 by Order no. 1853/2018 on the approval of the specific Norms for the service of freight trains by a single agent - the locomotive driver, when some of the conditions for the trains which must be serviced by at least two agents (driver and e.g. assistant driver) were eliminated if certain requirements regarding the type of train and the safety and vigilance equipment can be met. In those cases, trains can also be operated by only one driver without additional staff. Specific rules for the service of freight trains by only one locomotive driver establishes a series of specific provisions for the circulation of these trains only on certain traffic sections, with complementary application to the national safety norms in force and it is not applicable for trains transporting dangerous goods.

**Italy**

The case of Italy differs slightly from Bulgaria and Romania. All three countries have in common that two people on one locomotive are only required on certain lines or line sections. The reason for this, however, is not part of the Italian railway regulations but rather part of the health & safety regulations. The second person should assist the driver in his tasks and must be able to intervene in case of unexpected events, including health issues of the driver. It is argued that the second person is e.g. necessary to provide first aid to the driver in case of emergency. In practice, the second person is not necessary in most cases. According to national railway safety authority ANSF, single agent operations are possible since 2013. However, the interpretation of art. 20 of the legislative decree nr. 81/2008 prevents this in most cases. In some regions (e.g. Turin), the health authorities even demand that a second driver must be used.

Historically, a second driver was needed. Until 2000, there was no signalling system and no active train protection system installed on the network. A second driver was needed for safe train operations. After 2000, an active train protection system (SCMT) has been deployed. A second person, not necessarily a driver, was needed to make emergency calls in case of the illness of the driver. The installation of cab radios and the GSM-R radio coverage in 2008/2009 made the second person technically obsolete. The National Agency for Railway Safety ANSF recognized this and stated in 2013 that a second person is no longer necessary from the point of view of the railway regulations. Nevertheless, the workers trade unions and local health authorities insist on two agent operation up to this day, citing the above named legislative decree nr. 81/2008 and the Decreto Interministeriale DM 19/2011, the railway application of Art. 45 “Primo soccorso” of legislative decree 81/2008.

**Other countries**

Similar issues exist in other European countries as well. Since they relate to passenger services and not to freight services, they are less relevant for this analysis. The countries where a two-people cabin crew is necessary in some cases include Poland, France, and Spain. This is mostly the case for trains operating on high speeds with low level of protection from train protection systems, such as on lines without ERTMS. As there is no influence on rail freight transport

## Problem drivers/Reasons

Historically, a second person on the locomotive was needed for double vigilance, as previous signalling and trains protection systems provided a lower level of safety as they do today. And before driver’s vigilance devices were in place, a second person was frequently used to ensure the driver’s vigilance. However, with modern signalling systems and the requirement for driver’s vigilance systems on all trains, there is no need for such rules today. As mentioned in the previous chapter, the rules regulating this issue differ between the countries. Whereas they are related to train control & signalling systems in Bulgaria and Romania (responsibility of the national railway safety authorities), they are related to worker’s health & safety in Italy (responsibility of health & safety authorities).

## Impacts

The impacts and consequences are the same in all three countries, though the number of trains affected is different. Additional staff implies greater planning effort, additional resources (personnel, training, certification, transport, equipment etc.) followed by increased cost for operations (personnel, admin). Remuneration of the drivers in the western countries is different than the ones in the Eastern European countries. There are also certain differences in the approach to training; for example, the balance between classroom training and on-the-job training is different from country to country, with more on-the-job training in Italy, Romania and Bulgaria.

Taking into consideration the increase of demand for rail transport as well as the increase in the number of companies operating in more than one Member State and to higher demand for drivers sometimes additional staff is hard to accommodate. In the long run, this might lead to increased HR costs for drivers or even to RUs rejecting traffic, as they might not have sufficient numbers of train drivers.

## Conclusion / Solutions

This issue is one that is highly relevant for the safety of train operations. The regulations are in place to allow for safe train operations and avoid accidents which are related to errors in the driver’s behaviour or other incidents. This issue is mostly based on history, as prior to the use of sufficient safety systems, all trains had to be operated with two drivers. However, European legislation sets the frame for safe operations with a single agent. TSI OPE specifies that all trains must be equipped with a driver vigilance system, which can stop the train in case the driver does not react within a certain time. Further, the Directive 2007/59/EC (Certification of drivers) stipulates that all drivers shall have the necessary fitness and qualifications to drive trains (passenger and freight), which makes incidents with a driver’s health highly unlikely during a train run.

**Bulgaria and Romania**

The national rules requiring a second driver should be removed by the Member States, as the European legislation covers all safety relevant aspects. Railway undertakings shall update their SMS and operation plans in force. RUs as well as the administrator / managers whose railway infrastructure shall assess the risks of change made for running operations with only one driver, according to the provisions of the Implementing Regulation (EU) no. Commission Regulation (EC) No 402/2013 of 30 April 2013 on a common safety method for risk assessment and assessment and repealing Regulation (EC) No. 302/2009, with subsequent amendments and completions. For Romania, the process of cleaning up national rules has been started by ERA and is currently ongoing. For Bulgaria, this process has yet to start.

**Italy**

In Italy, this is not an issue related to railway legislation. Legislation on health and safety as well as workers’ trade unions are involved in this issue, by imposing the two-agent operation citing health and safety concerns. The action is argued on terms of self-protection according to art. 20 of the Italian legislative decree nr. 81/2008 (law on workers’ health protection) and the related DM 19/2011. Basically, the legislation states that a worker’s health must be prioritised and safety levels cannot be decreased. Local health authorities interpret this rule to mean that removing the second person would decrease the safety level, as this means longer response times for first aid to the driver in case of an incident. Up until now, the unions have not yet been willing to find a solution for this issue. Any possible solution will require high political support from the area of health and safety in Italy in order to be successful.

Discussions between DG MOVE, representatives of RUs, members of the Ministry of Transport and representatives of the trade unions are ongoing, trying to find solutions. Previously performed simulations of rescue times shall be made available for further analysis. Eventually, the problem can only be solved if Italian health & safety authorities agree to change the interpretation of the law, and/or to change the decree so that “a reasonable” rescue time is considered sufficient instead of it being “as low as possible”. Efforts are made by the Brenner working group to start pilot operations with a single agent on the Brenner corridor. The next steps by the stakeholders towards finding a solution to this issue are:

* Sharing of the previous rescue time simulations and evaluation by the stakeholders
* Collecting and sharing best practices from neighbouring countries, other modes of transport (e.g. road) and alternative technical measures to mitigate remaining risks
* Risk assessment: analysis on the driver’s risks
* Seeking a legal opinion on interpretation of the Italian law

Best practice from other countries were analysed by the consultant and have been composed for the issue (see Table 6) from the following documents:

1. Essay on single locomotive driver in Italy
2. FerCargo Association - Via Vicenza n. 26 - 00185 - ROME (Subject: n.2 requests on the application of the legislation on safety at work under Article. 12 paragraph 2 Legislative Decree 9 April 2008 n.81)
3. Canadian Department of Transport - Medical Service Bern
4. Izba Gospodarcza Transportu Lądowego (Land Transport Economic Chamber) (IGTL), Warsaw Poland

Table 6: Arguments for allowing single agent train operations

|  |  |
| --- | --- |
| **Safety concerns for requiring 2nd Driver** | **Argument for a 2nd driver is not necessary** |
| Second crew member is needed in case of sudden illness of the train driver | * Studies by SBB say that there has been no sudden illness of driver that led to a sudden inability to act during the train’s run. * German Railways Agency, EBA (Eisenbahnbundesamt), German branch of SBB Cargo, and French SNCF say there have never been any case of trains being stopped on the network as a result of the driver's sudden illness. * Health conditions of train drivers are covered by DIRECTIVE (EU) 2016/798 Article 7 paragraph 4, Article 16 and 18; DIRECTIVE 2007/59/EC Article 11 and TSI OPE 4.2.3.6 |
| Second driver is needed for double vigilance | * An accident in Poland in 2012 revealed that the single driver reacted 20 seconds faster than the train with two crew members * Concentration level is sometimes reduced with the presence of a second crew member. * Significant improvement in safety and communication systems like the SCMT in Italy are able to monitor and ensure driver vigilance and compliance to movement authority * TSI OPE 4.2.2.9 also cover for driver vigilance monitoring |
| Second driver is needed to assist the driver in case of emergency | * Specialist analyses and assessments of the Railway Undertakings' Risk Assessment Document with regard to rescue times and methodologies have been done. Validated by an independent body - Altra Imprese. * Also supported by CIMA Research Foundation which is recognized as a Centre of Competence at national level by a Decree of the Presidency of the Council of Ministers. * Assessment always takes into consideration the topographical characterizations of railway lines and probabilistic analysis of the occurrence of driver sickness on routes with high risk scenarios. * Result shows that the probability of occurrence of such emergency, even in particularly critical conditions of the track, is of the order of 1 event every 1,000 years, in the worst case. * TSI OPE 4.2.3.6 cover for situations such as degraded operations (including contingency arrangements), emergency situations and needed aid by the train crew |
| Second crew member is needed to properly immobilize a train on steep slopes by applying “brake shoes” | * It is necessary to fully immobilize a freight train when it is unattended and this arises mostly in the station/yard which are not designed to have steep slopes and not on open track. * Handbrakes are also being used to achieve this. Even when external brakes shoes are used, the driver is capable of doing this on his own since the existing train pneumatic brakes can keep the train braked while the driver does this. * It makes no difference if the driver or a second person applies the brake shoe or hand brake. * TSI OPE 4.2.2.6 covers Train braking: the RU is responsible for ensuring sufficient braking. |

# Project 3 - Issue 3: Tail lights vs. plates

| **Project** | **Related Issue(s)** | **Activity description** | **Time frame for activity** | **Priority for technical assistance** |
| --- | --- | --- | --- | --- |
| 3 | 3 (Tail lights vs. plates) | Analysis of MSs study on the use of reflective plates | Jan-May 2021 | High |

## Introduction / Description of the Issue

Different kinds of rear end signals in national requirements lead to interruptions at border crossings. E.g. if a train is originally only equipped with plates and is travelling to a country where tail lights are compulsory, that train needs double equipment and has to stop and change the equipment at the border (even if locomotive is ERTMS equipped). Lights are allowed in countries with plates, which means that there is no need to stop at the border when the compliance is done at the start of the train.

The issue may cause the following impacts related to cost burden, time loss and/or quality loss:

* Double equipment (plates + lights) required;
* Border stop required to exchange plates against lights (only applicable if border is not foreseen due to other reasons);
* Additional staff required to replace plates by lights.

The problem is worse for small RUs that do not have the staff to do the equipment change. Sometimes, big RUs do it for the small ones, but this is very expensive (the staff of the big RUs must be paid 24h/day). Both the NSAs and IMs say each the other should do the work.

## Occurrence / Analysis

Provisions regarding rear end signals are already covered in the OPE TSI 773/2019 (4.2.2.1.3.2) and its predecessor TSI 995/2015. However, RUs still have to stop at borders to comply with the different legislations.

Those Member States requiring lamps are not differentiating between differently equipped lines. It would be a great step forward, if they allowed the use of the plate on defined lines (preferably on border stretches), based on a risk analysis confirming that safety levels are not reduced. The issue is also linked to permissive driving and the possibility to have two trains on the same block. At this stage, the last Member States requiring lamps on freight trains are not keen on accepting plates for safety reason. Previous studies on the link between safety, permissive driving and the use of tail plates/lamps were not fully conclusive.

In March 2019, the RFC 1 Rhine-Alpine performed an analysis about the situation on the corridor showing the following results:

* NL/DE border (both directions): Tail plates are required, Tail lights are also accepted.
* BE/DE border
  + BE --> DE: Tail plates are required, Tail lights are also accepted.
  + DE --> BE: Tail plates are only allowed for freight trains during daytime between the loading area and the first station, or in harbour areas and shunting yards. Otherwise, tail lights are required.
* CH/DE border (both directions): Tail plates are required, Tail lights are also accepted.
* CH/IT border:
  + CH --> IT (Chiasso): only Tail lights are accepted.
  + IT --> CH (Chiasso): Tail plates are required, Tail lights are also accepted.
  + CH <--> IT (Luino, Domodossola): On dedicated lines, Tail plates are accepted, otherwise only Tail lights are required

Additionally, the issue has been recognized for the borders between Austria and Italy (due to national regulations in Italy) and between France and Luxembourg.

OPE TSI (4.2.2.1.3.2) mentions Belgium, France, Italy, Portugal, Spain and UK as countries requiring freight trains to be equipped with 2 steady red lights as a condition to run on sections of their network.

## Solutions

As stated above, the OPE TSI 773/2919, adopted in May 2019, already covers the issue of harmonising rules regarding rear end signals. Chapter 4.2.2.1.3.2 of this TSI sets up clear deadlines and procedures for tail lights to be followed by Member States in the transition period until January 2026, as follows:

1. 16 June 2019: the target system = reflective plates + head lights TSI Loc&Pas compliant, with following deadlines:
   1. January 2022 vehicles with plates only are allowed to travel along all Rail Freight Corridors of the Union rail network; Plates & Lights and lights only are accepted everywhere
   2. January 2026 vehicles with plates only are allowed to travel EVERYWHERE in the European Union rail network
2. 31 December 2020 (shifted from 30 September 2020): Member States' concerns deliver a report to COM on use of reflective plates on their network
3. 30 June 2021 (shifted from 31 March 2021): COM review the specification based on ERA report and MS findings, if necessary

The ILB consortium has analysed and summarised the MS reports (provided by the Commission) in a separate working document (“Analysis of MS reports on the use of reflective plates”, May 2021).

# Project 4 – Issue 14: Commutable power supply in border stations

| **Project** | **Activity ID** | **Related Issue(s)** | **Activity description** | **Time frame for activity** | **Priority for technical assistance** | **Responsible ILB Consortium partner** |
| --- | --- | --- | --- | --- | --- | --- |
| 4 | 1401\_GA | 14 (Equipment of border stations with commutable electric power supply) | Analysis of the situation referring equipment of border stations with commutable electric power supply | Jan-Jun 2021 | High | Railistics |

## Introduction / Description of the Issue

At border stations with system separation points, two power systems of 15 kV - 25 kV come together. Due to the different power systems, trains that want to travel from one country to another can only overcome this problem with great difficulty. This often requires shunting movements or the purchase of expensive multi-system locomotives.

The four European electricity systems of the main lines are:

* Direct current 1.5 kV,
* Direct current 3 kV,
* Single phase alternating current 16 2/3 Hz, 15 kV,
* Single phase alternating current 50 Hz, 25 kV.

There are different possibilities to design the change of power supply within the stations. The system separation points can basically be distinguished in two ways:

1. **System separation point is located on the open track**

One option is to change the power supply on the open track between two stations (see Figure 4‑1). This is a cost-effective variant for IMs because both construction cost and operating costs are the lowest among the available options. In this case, it is necessary to use multi-system locomotives, because a locomotive change would hardly be possible. The multi-system locomotives are designed for operation with two or more electricity systems and can seamlessly travel across the separation point without the need to stop. The four-system design is used for all four power systems mentioned above. These allow unrestricted European traffic. There is no necessity for RUs to stop at the border for technical reasons. However, the purchase of new vehicles and the retrofitting of existing vehicles is very costly and the associated downtime is another reason why multi-system locomotives cannot be used everywhere and immediately. Further, some RUs might – due to different reasons – prefer operating strategies with single system locomotives which are made impossible by locating the system separation point at the open track. This can also include operating strategies where single system locomotives are used as back-up for multi-system locomotives in case of disturbances or delays.

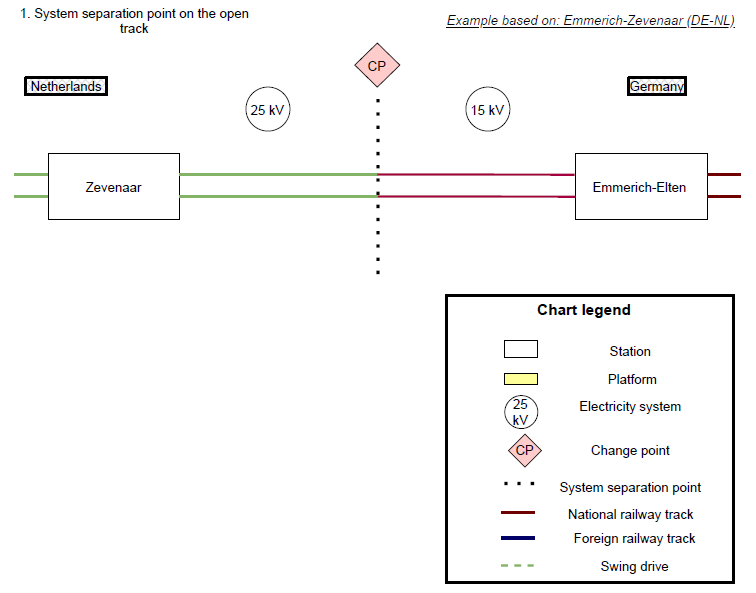


Figure 4‑1: System separation point on the open track

1. **System separation point is located in the station**

Another good practice to switch from one electricity system to another is to move the interface between electricity systems from the open track to border stations. With the interface within a station, the station tracks can either have a switchable power supply (see Figure 4‑2) or a non-switchable power supply (see Figure 4‑3). Usually within a station, some station tracks will be switchable, and some are non-switchable.

* 1. Station tracks with switchable power supply

In such stations the overhead lines on some tracks will be switchable from the national system to the electricity system of the neighbouring country. This makes it possible to change locomotives for cross-border journeys at the border station by switching the necessary current for the locomotive in question. When using single system locomotives, the first locomotive can uncouple from the train and drive into a siding track, using its own power supply only. Then, the power supply of the station tracks is changed, and the second locomotive can drive and attach to the train. No additional shunting locomotives are required with this option, as each locomotive can be operated with its own power supply. This option allows greatest operational flexibility while reducing shunting times to a minimum.

* 1. Station tracks with non-switchable power supply

In the first option, the tracks within the border station are not switchable and there is a single point where the power supply changes on each track. With this option, a diesel shunting locomotive is needed within the station to change the locomotives. This causes additional time losses and costs for operations with single system locomotives.

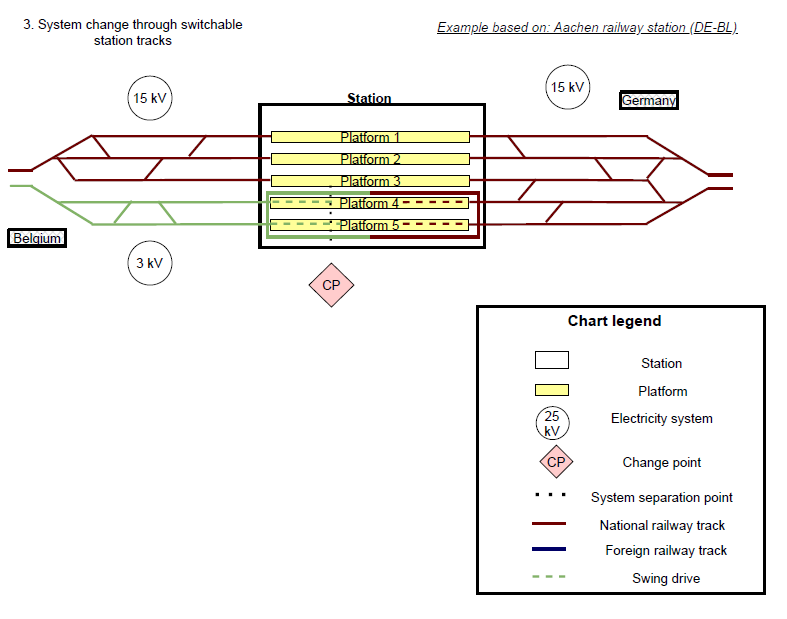


Figure 4‑2: System separation point with switchable station tracks

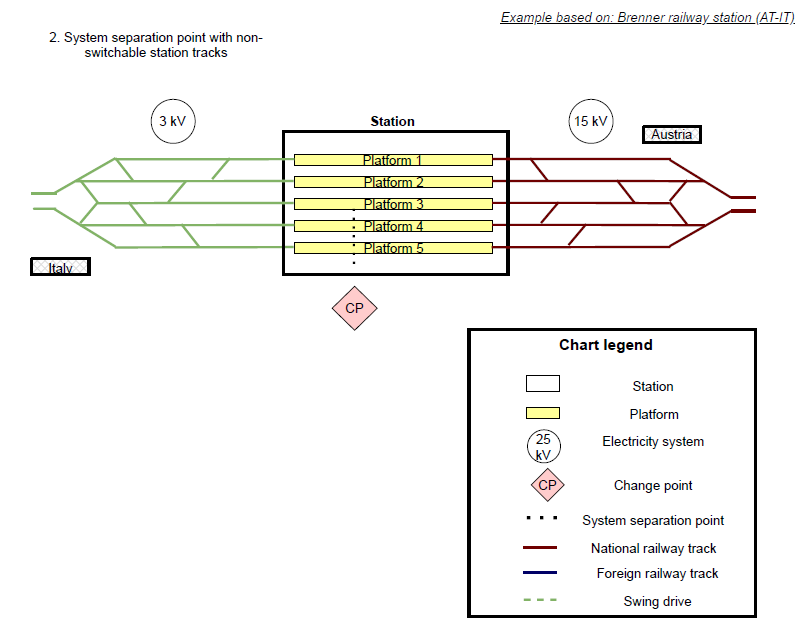


Figure 4‑3: System separation point with non-switchable station tracks

In cross-border freight transport, a voltage change from one electricity system to another is most often and sensibly handled by two or more system locomotives, since freight trains do not usually run only through the neighbouring country, but often through several countries with different electricity systems. However, there are still many RUs which only use single system locomotives and need to change them at the border stations. This leads to capacity consumption within the border station, increased dwelling and thus delivery times for the RU and increased planning effort.

Different railway undertakings with different models of operations and different locomotives will prefer different layout of the system separation points. However, the general opinion is that the smooth operation can be done even if the change is done on the station, allowing for a change of locomotives or attachment of extra wagons. When IMs plan to upgrade their border stations, they should consider the needs of RUs using the stations. Compromises might need to be made between low investment and operating cost for the IMs and operational flexibility and costs for the RUs. If necessary, it might be considered how operating costs of border stations can be split between IMs and RUs in a fair way.

## Occurrence

DB Cargo NL has reported the issue on the Dutch – German borders of Roosendaal-Essen and Oldenzaal – Bad Bentheim in both directions. On RFC 7, the issue happens on the cross-border points with required system change, between Hungary and Slovakia. Potentially, this can cause problems in all European border stations where power supply changes between neighbouring countries.

## Problem drivers/Reasons

The issue drivers are changes in the infrastructure design. Some infrastructure managers upgrade the border stations without considering all operating models and improve the situation only for the use of multi-system locomotives. Moving the separation points from the border stations to the open track has further the advantage for IMs that this option is often cheaper and reduces capacity consumption within the border stations. For RUs, this solution increases costs, as multi-system locomotives are more expensive, both in investment cost and operating cost..

## Impacts

In general, the design and layout of a border station has a direct influence on which operating models are possible (and feasible) for RUs. Some variants of the power supply change make certain operating models technically impossible, like the power change on open track prevents the use of single system locomotives. Other variants may make certain operating models economically unfeasible, due to increased cost and/or efforts in markets with small profit margins. In order to shift as much traffic to rail as possible, the role of the border stations in allowing certain operating models should be considered, whenever a border station is upgraded. Rail can only be competitive on an international level, if all types of freight can be transported, which is important to reach European goals, such as the Green Deal.

With separation points on the open track, complications arise for small railway undertakings which might not be able to use multi-system locomotives. Rerouting or loss of traffic might be the result for them. It might also have an impact on train length and train weight in some cases.

When the separation point is located within the border stations, more staff and time are needed to change from one power supply to the other. With switchable station tracks, the operating costs for IMs increases, while the operating costs for RUs decrease in comparison to non-switchable station tracks, as no additional shunting locomotive is needed to exchange single system locomotives. For RUs using multi-system locomotives, an additional stop within the border station might be necessary as some IMs only allow a transition when the train is standing still. Further, the more trains are operated with a locomotive change at the border station, the more track capacity within the border station is needed, which might cause congestion and increased efforts to manage station capacity.

In addition to the operational impacts for railway undertakings, there are several other impacts which should be considered in an in-depth analysis. A rough multi-criteria analysis has been performed by the consultants. The impacts of the different criteria are shown in Table 7.

Table 7: Multi-criteria analysis of the impacts of different power supply changes

|  |  |  |  |
| --- | --- | --- | --- |
| **Criteria** | **System separation on open track** | **System separation in station, non-switchable tracks** | **System separation in station, switchable station tracks** |
| Investment cost (IM) | Low | Medium | High |
| Maintenance cost (IM) | Low | Low | Medium |
| Operating cost (RU) | High | Medium | Low |
| Environmental impact | Low | Medium | Low |
| Land consumption | Low | Medium | Medium |
| Susceptibility to errors | Medium | Low | Medium |
| User-friendliness (RUs) | Low | Medium | High |
| Qualification of staff (RU) | Medium | Low | Medium |
| Related safety risks | Medium | Low | Medium |

## Solutions

The solution of this issue is not in the scope of the ILB project, as it cannot be solved with ‘soft measures’, such as removing national rules or applying sector best practice. The change of the system separation points would require great investments in infrastructure updates.

The necessity to change the power supply at border stations will remain as technical issue on particular border crossings within Europe, as a complete harmonization of all power supply systems on short term is very unlikely due to the immense cost which would be caused by changing the power supply system of a whole country. Thus, the power supply change at border stations should be designed with respect to both the IMs and the RUs needs. Currently, there are no rules, regulations or sector best practises available on this topic.

A possible solution would be the future development of best practises, which are recognized by both IMs and RUs. These could then be used whenever an IM plans to upgrade a border station. The sector best practises could include descriptions of the available options with their advantages and disadvantages. Further, the decision-making process to identify the ideal option for a specific border station should be described. This might include calculation examples on how many station tracks should have switchable power supply and how many siding tracks are necessary in relation to that.

In addition to best practise examples of infrastructure layout, calculation examples for fair usage fees might be provided as well. It is possible that the operating cost of the IMs will increase, depending on the technical design of the old and upgraded border station. To allocate the cost between RUs and IMs, the local access charges for the use of the border station might be adapted to the new situation. Depending on the actual cost for the IMs, it might be possible to set financial incentives for the use of multi-system locomotives or to increase access charges for switchable station tracks. Calculation examples complying with European legislation should be developed by IMs.

UIC has made a first step in this direction, as their X-border subgroup has developed a draft “Concept for an ideal border section” in April 2020. Currently, the draft is considering the RUs’ standpoint only and covers both legal and technical aspects of border stations in general, including power supply. It is planned to include the IMs’ standpoint as well. In the end, this could lead to a suitable best-practise document, which could be used by all European Infrastructure Managers planning to upgrade their border stations.

On level of the European Union, it might be considered if and how financial incentives can be created, e.g. by providing financing via CEF funds if border stations fulfil certain requirements. These possible financing options should take into account the complete design of the border station, not limited to power supply.

1. General Safety Regulations, Basic Principles (PT: Regulamento Geral de Segurança, Principios fundamentais) [↑](#footnote-ref-2)
2. Regulation of traction and braking No 006/2005 of national law, MoT order No 1815/2005 on traction and braking rules [↑](#footnote-ref-3)
3. CONNECTING EUROPE FACILITY (CEF) – Transport grants 2014-2020 – State of play June 2020 https://ec.europa.eu/inea/sites/inea/files/cefpub/eu\_investment\_in\_transport\_in\_romania.pdf [↑](#footnote-ref-4)