

# Compliant Infrastructure

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# Content

- Braking curve issues
- Compatibility assessment

# Braking curves

- In the past years the railway sector has detected certain shortcomings in the ERTMS specifications on braking curves.
- This topic was identified as the “braking curve game changer” in the ERA list of game changers.
- EUG was assigned the task to investigate and describe these braking curve issues.
- The result is a list of seven individual topics where improvements are proposed to improve the business case of ETCS (e.g. suitable for high performance networks).
- This list was sent to ERA in September 2017.
- Next step is for ERA and the sector to agree on how to proceed with these topics.

# Compatibility assessment

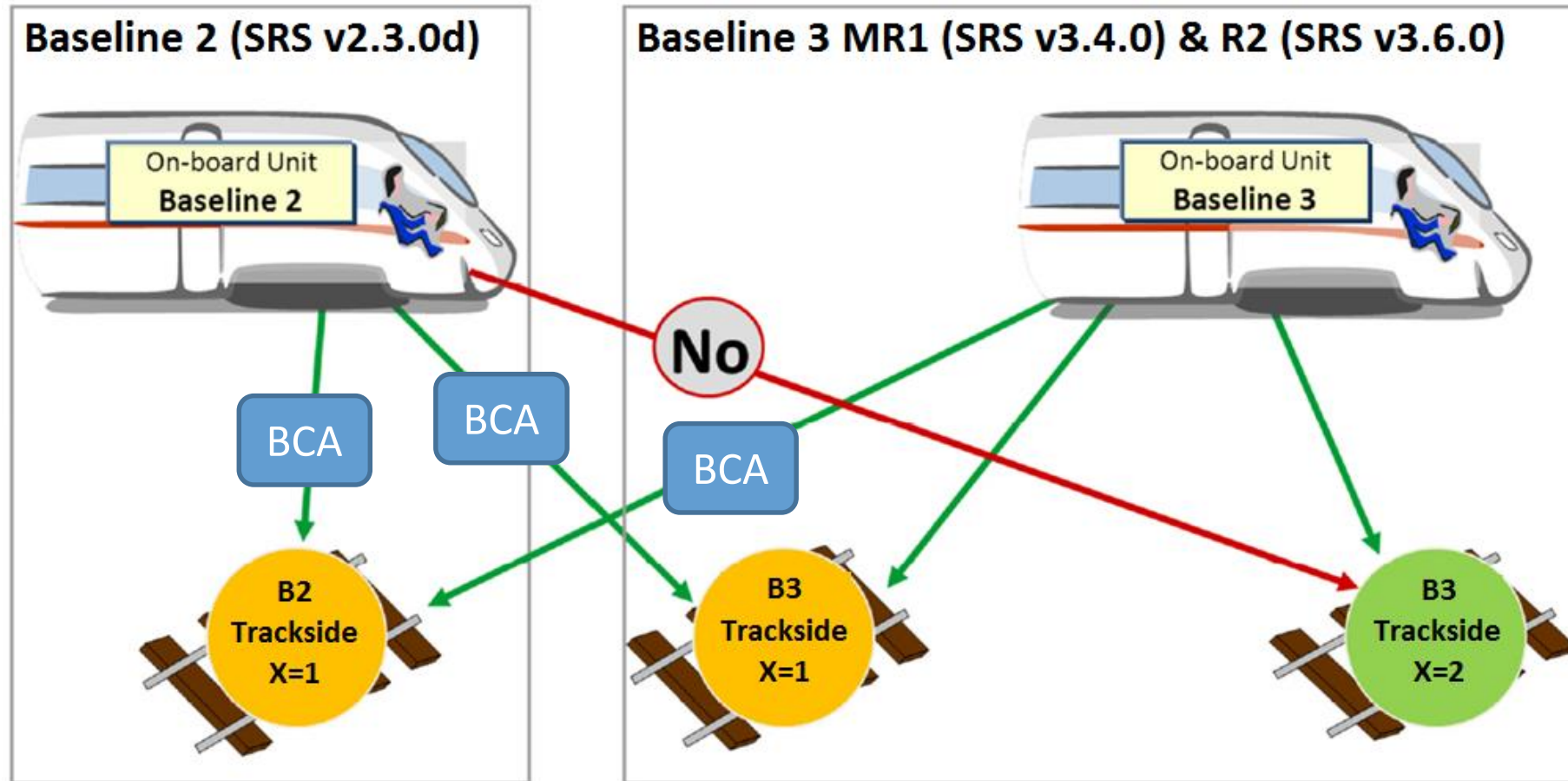
Compliant Infrastructure  
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Compatible Infrastructure

# Background (1)

- With the introduction of baseline 3, MR1 and R2, a total of 491 CRs was solved.
- A Baseline Compatibility Analysis (BCA) was performed for each CR with all versions (B2, B3MR1, B3R2) and on-board and trackside both with/without the CR solution implemented.
- Out of the 491 CRs, only 59 were assessed as potentially leading to compatibility problems.
- For most of these 59 CRs, trackside mitigation measures were defined.

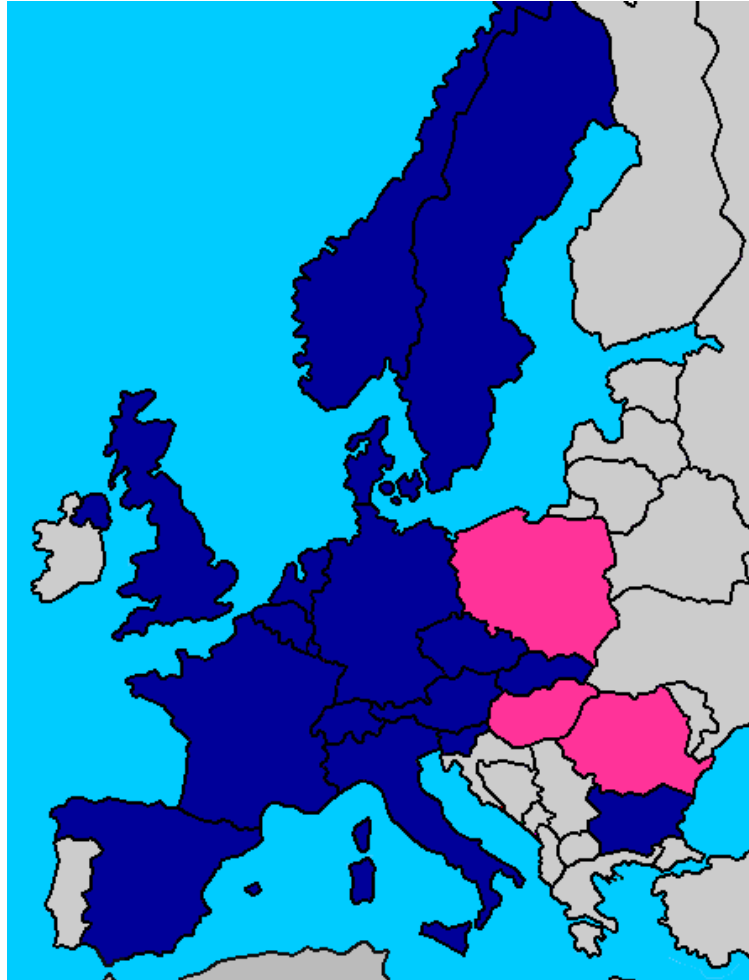
# Background (2)



# Support to the BCA validation

- EU funded project performed by EUG and INECO from September 2015 until end 2017.
- Original scope: Support the validation of the BCA by investigating the practical impact of BCA on existing B2 compliant infrastructure in Europe.
- Note that the analysis of the BCA is made by the Infra Managers themselves. The EU project only provided support and investigated the results.
- Scope was extended with B3 (MR1) infrastructure.
- Errors, which were recently solved in the context of the ERA Technical Opinion, are out of scope (too late for the time frame of this project).

# Overview



- A total of 20 Infra Managers has been addressed
- Feedback received from 17 of them (14 B2, 2 B3MR1 and 1 with B2 and B3MR1)
- No feedback received from 3 of them



# Work methodology (I)

- **1<sup>st</sup> step: Recollection of all the necessary information to validate the BCA report**
  - Deep knowledge of some CRs is required to assess the potential compatibility issues identified in the BCA reports.
  - Use of tailored questionnaires to recollect the information.
- **2<sup>nd</sup> step: Identify the specific CR with theoretical possible impact in a specific network**
  - Classification into 6 categories of impact of the 59 CRs identified in the BCA reports for each network based on the information provided by IMs.

# Work methodology (II)



- Categories A-D: Issues without impact (i.e. function not used, BCA mitigation measure implemented, other mitigation measure implemented or impact not relevant for IM although function is used and not mitigated)
- Category E: Theoretical possible impact only for B2 on-boards
- Category F: Theoretical possible impact for B3 on-board

Issues identified in the BCA reports

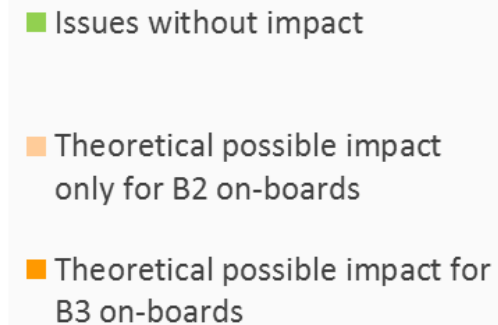
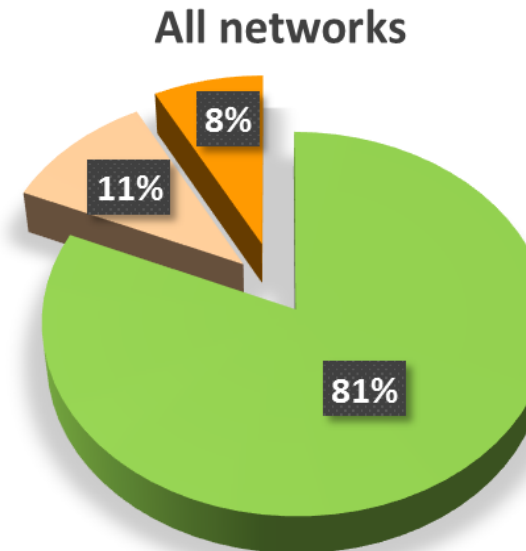
IS-R	IS-R heading	Ref	IssueID	InfLabel	Problem	RI	Network	NEC	OSB	SEA	SNCR	Relevant	SZ	SZSC	Traffic/Power	OS	Implementation	OS	Networks
0240	Position report in case of passing an unmitigated block signal	B	B	A	D	B	A	F	E	E	A	B	B	B					
0303	Parameter used in RV mode	A	A	A	D	A	A	E	A	E	A	A	A	D	A				
0348	Use of NO OPERATIONAL	E	E	B	D	B	B	A	E	B	B	A	B	F	D				
0404	Train stopped in 50 km mode	B	B	B	F	B	B	E	B	E	B	D	T	B					
0410	Changing in STM mode	A	A	A	E	A	C	A	A	C	A	A	F	D	A				
0417	Use of ITB	B	B	B	D	B	B	F	F	E	E	B	B	B	F				
0484	Classification received: Made profile and sets MA	E	A	B	C	A	A	A	E	B	E	K	A	A	A				
0505	Initial communication (Part 3.1.1)	F	B	F	F	F	F	F	B	F	F	B	B	B					
0510	Inconsistency between Subset OS and Subset OSF	A	B	C	D	B	C	E	A	C	B	E	B	B					
0537	Initial Supervision	A	A	B	A	A	A	A	A	D	A	A	A	A	A				
0530	Train movement in L158 without Train Data	A	A	A	A	A	A	A	A	A	A	A	A	A	A				
0597	Usability of REC-REC handover procedure in case of radio network change	A	A	A	B	F	A	A	A	A	A	A	A	F	A	A			
0617	Inconsistency of Etcaps Parameter	B	B	C	A	D	B	B	A	F	B	B	B	A	B	B			
0710	Clarity of received but not yet applicable national topology used by ETCS in IM	B	C	C	F	B	C	F	B	C	B	B	B	C	B	B			
0712	Calculation in packets not transmitted by initial device	A	A	A	A	A	A	A	F	D	A	A	A	A	A	A			
0757	Inefficient use of provisions for management of future ETCS ETCS system versions	A	A	A	A	A	B	A	A	A	A	A	A	A	A	A			
0777	ETCS driver speed supervision in RV mode	D	C	C	D	A	A	A	E	B	A	E	E	C	D	A			
0822	State of conditions internal	B	B	C	B	B	B	B	B	D	B	B	B	B	B				
0800	Conditional level transition order overtake normal level transition order	F	B	E	F	A	B	A	A	B	E	A	B	F	B				
0813	ETCS message for Ack received	C	D	E	F	B	C	A	F	A	B	E	A	B	F	B			
0818	ETCS-STM Header issue	A	A	B	A	A	E	A	A	E	D	D	A	A	A	A			
0819	ETCS-STM Header issue	A	E	E	E	E	B	A	A	E	B	E	A	B	E	A			
0821	ETCS-STM Header issue	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
0843	Message direction (transmission information in RV mode (follow-up 25))	A	A	A	A	A	E	A	E	A	A	A	A	D	A				
0842	Position of approval of safe in IM	C	B	B	E	B	C	A	A	C	C	A	B	C	C				
0843	Message with several non-receivable TMS is discarded	E	A	B	E	A	A	A	A	A	B	A	A	B	A				
0844	Unsupervised train movement supervision after PT or RV (initials is overpassed)	D	C	C	E	C	C	E	C	D	C	C	B	C	C				
0844	Exception 'N' does not apply to suspension of 'L' operation phasing of MA' in table of incident 3.1.1 of the SRS	B	B	B	B	D	C	A	A	E	A	A	A	B	A				
0845	Made transitions (21) vs. (24)	A	E	C	A	A	A	A	A	E	A	A	A	E	D	C			
0846	Entry into Level 2 question	B	D	B	E	B	B	A	B	E	B	A	A	B	B				
0876	Response time for Positive Shunting Follow-up of CR 75	F	F	F	C	F	F	F	F	F	F	C	F	F	F	B			
0895	Unintended extension of the permitted distance to run in Reversing due to filtering of 'N' in 'N'	A	A	A	A	B	A	A	E	A	C	A	A	A	D	A			
0896	Position of the Acknowledgement of Train Data when received in RV mode	A	A	A	A	B	A	A	E	A	A	A	A	A	C	A			
0897	End of train	A	B	D	D	B	A	A	A	A	A	A	A	E	B	B			
0899	Replacement of track destination and taking information	E	A	B	D	B	B	B	F	B	E	B	E	B	E	B			
0907	Handshake brake command in RV mode	A	A	A	A	C	A	C	A	E	A	A	A	A	D	A			
0914	Wrong signal condition	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
0917	Signal of permission disabled	A	A	A	A	D	A	A	A	A	A	A	A	A	A	D			
0919	Production of lot of lot for SM area, error in solution of CR50	A	A	A	D	A	A	A	A	A	F	D	A	A	A	D			
0924	Change for data in case of STM	A	A	A	E	E	A	A	A	A	A	A	A	E	D				
0925	Message transition from IM mode	A	A	B	E	E	A	A	A	D	A	A	A	E	E	A			
0942	Requirement for test signal messages in case of end and end conditions are fulfilled	C	B	C	E	C	B	E	B	B	B	E	B	B	B				
0953	Ambiguous instruction	E	E	E	E	E	E	A	E	E	E	E	E	E	E				
0941	Standardised brake for LS projects	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
0963	Integrity in case of shortening of MA in the current position of the train	A	A	A	B	A	B	B	B	E	B	A	E	A	A	D			
0977	Impact of message preparation time	B	B	C	F	B	B	B	B	B	B	B	D	F	B	D			
3015	Usability of non-response based acknowledgement mechanism	B	A	A	A	E	B	A	A	E	B	A	A	E	A	A	C		
3022	Communication session (data radio connection) setup in radio mode	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A			
3010	Reduced attention area	A	B	A	F	A	A	F	A	A	A	A	A	A	A	A			
3016	Function for reporting ETCS function change of radio system	A	A	A	E	B	A	A	A	A	A	B	A	E	A	A	D		
3016	Range and frame in communication rules to bus	B	A	B	E	C	B	B	E	E	B	E	A	A	A	B			
3048	STM (external) Trip Protection use for ETCS (not described) and Level 2 system	A	A	A	D	E	A	B	A	A	D	A	A	A	C	D	A		
3155	CR712 follows up non-ETCS from IM device	A	A	A	A	A	A	A	E	D	A	A	A	A	A	A			
3183	Header use of telegram header info when a bullet telegram or BG message is received	F	B	A	C	F	A	A	F	F	F	A	F	D	B	B	F		
303	Setting of REC received information	F	B	A	D	F	A	A	F	F	F	A	F	D	B	B	F		
3039	All test messages in IM mode	B	B	B	F	A	B	A	B	B	A	B	F	B	B	F	B	B	
3184	Making requirements for the number of communication sessions an OBU must be capable to handle simultaneously	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
3149	Problem with preparation	A	F	A	F	A	F	F	F	F	A	F	F	A	A	A	D	B	F
3592	Issue related to the format of communication caused by an REC	A	A	A	A	A	A	A	E	A	A	A	A	A	A	A	A	A	A

# Work methodology (III)

- 3<sup>rd</sup> step: Assessment of the possible impact
  - CRs in Category E and F are assessed to identify the possible impacts and when they are applicable in a specific network.
  - These possible impacts are only applicable for specific on-board product implementation, i.e. depending on the on-board behaviour the impact could be relevant or not.
  - Some infra managers have reported that most of these behaviours have not been detected in current on-board subsystems products.

# Results

- The BCA reports identified 59 CRs to be analysed for B2 lines.
- The BCA reports are also relevant for B3 MR1 lines.
- 5 CRs solved from B3MR1 to B3 R2 should be analysed for B3 MR1 lines to assure that B3MR1 and B3 R2 on-boards can run a normal service.
- 92 % of the potential compatibility issues have no impact for B3 on-boards on the lines which were investigated.
- 48 % of the potential compatibility issues are related to functionalities not used.
- 24 % of the potential compatibility issues have been mitigated by implementing the mitigation measure proposed in the BCA reports and only 5% by implementing another mitigation measure.



# Conclusions

- With feedback from 17 IMs the BCA validation has been well performed.
- The BCA reports were useful for IMs to assess compatibility issues on their lines.
- Especially for B3 on-boards there are very few CRs which have to be checked when a new train comes to a certain line.
- BCA is still useful to assess the impact of any error in the specifications which might be detected in future.



Thank you for your attention

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