Building a single European market for railway rolling stock

Janis Vitins
Locomotive Division

Rail Forum Europe

Strasbourg, 5th July 2011

BOMBARDIER

Bombardier – A world leader in rail transportation, business & regional aircraft

Montreal based company with a large footprint in Europe

Workforce of 66,900 people worldwide

Revenues of $19.4 bn US

Revenues in 2010

Transport-ation 52%

Aerospace: 48%

Bombardier Transport-ation GmbH, Headquarters in Berlin, Germany

Bombardier Aerospace, Headquarter is in Montreal, Canada

Bombardier Transportation, global leader in rail equipment

25’000 employees and 65% revenues in Europe

Trains	Locomotives	Propulsion & Controls	Bogies	Services	Rail Control Solutions	Transportation Systems
						
▪ Light rail vehicles ▪ Metros ▪ Commuter trains ▪ Regional trains ▪ Intercity trains ▪ High speed trains	▪ Regional ▪ Intercity ▪ High speed ▪ Freight ▪ Diesel ▪ Electric ▪ Dual-power	▪ Traction converters ▪ Auxiliary converters ▪ Traction motors and gearboxes ▪ Control and communic-ation	▪ Portfolio to match entire range of rail vehicles ▪ Full scope of service over the lifetime of a bogie	▪ Fleet management ▪ Operations & maintenance ▪ Spare parts ▪ Vehicle refurbishment ▪ Component reengineering	▪ Integrated control systems ▪ Automatic train protection and operation ▪ Interlocking systems ▪ Wayside equipment ▪ Services	▪ Monorail systems ▪ APM systems ▪ Light rail systems ▪ ART systems ▪ Metro systems ▪ Intercity systems

Contents

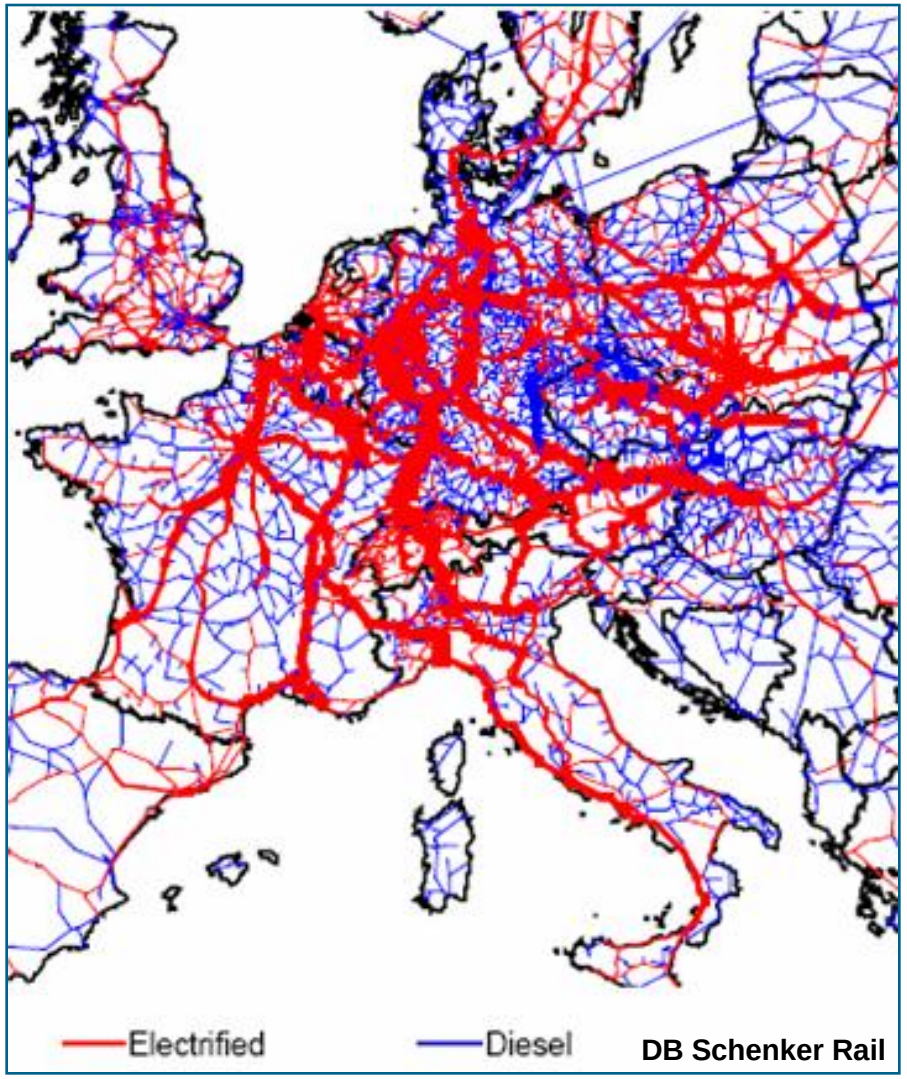
Introduction – a look at freight

Most freight traffic in Europe is **cross-border**

The freight market is growing ...

- **due to rail liberalisation**
  (free access since Jan. 2007)
- **with competition & innovation**
  - leading to peak sales in 2008
- **market recovering in 2010/11**
  - with optimized operations
  - new locomotive purchases

We can expect further growth, particularly in intermodal services



BOMBARDIER

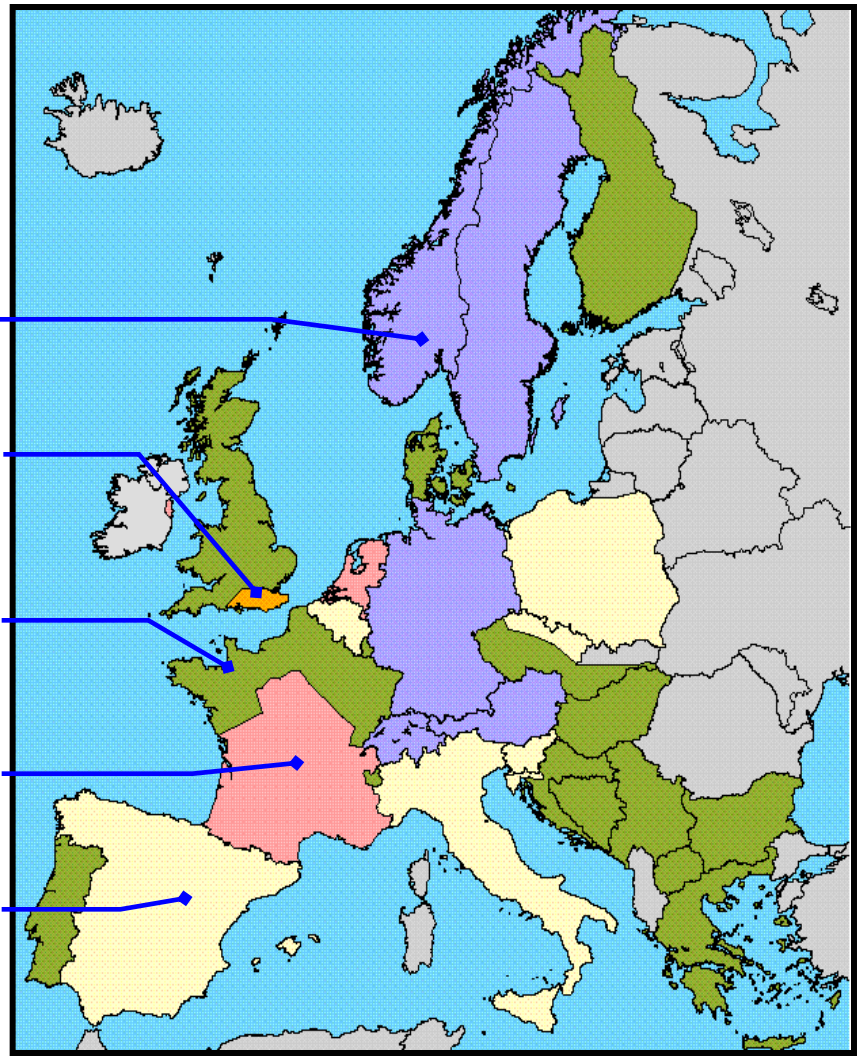
We can live with the 5 different catenary voltages

… which (however) implies more sophisticated traction converters

- **… however a one-fits-all locomotive is too expensive!**

System	Price (approx.)
– 3 kV	100%
– 15/25 kV	103%
– 1.5/3 kV DC 15/25 kV	115%

Traction converter



BOMBARDIER

… but there are many more major challenges

to be mastered for cross-border, interoperable services!

- **Eight different types of pantographs**
  - only four fit on the roof of a locomotive!
- **Four different train radio systems**
  - However, GSM-R is a good example of standardization
- **Five different loading gauges (incl. UK)**
  - Legacy (nationally built) locomotives: typically cannot operate cross-border
  - Cross-order locomotives: must meet the smallest loading gauges of France & Italy
  - UK locomotives: require very specific designs with the smallest loading gauge

… and then come the many national requirements

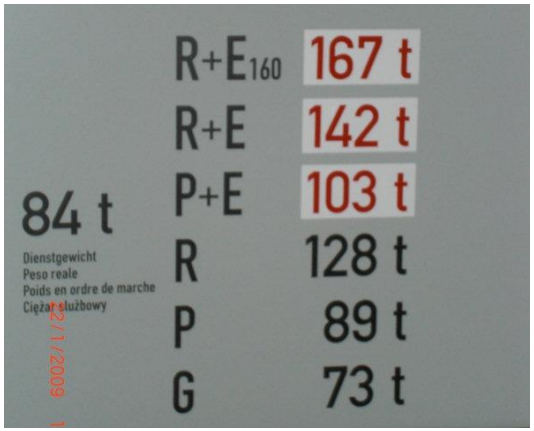
… which in part conflict each other! Some examples:

D – A

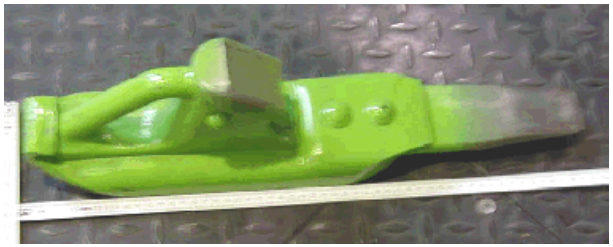
D – A – B – NL

D – B – F

Labeling of brake performance:



Brake shoes

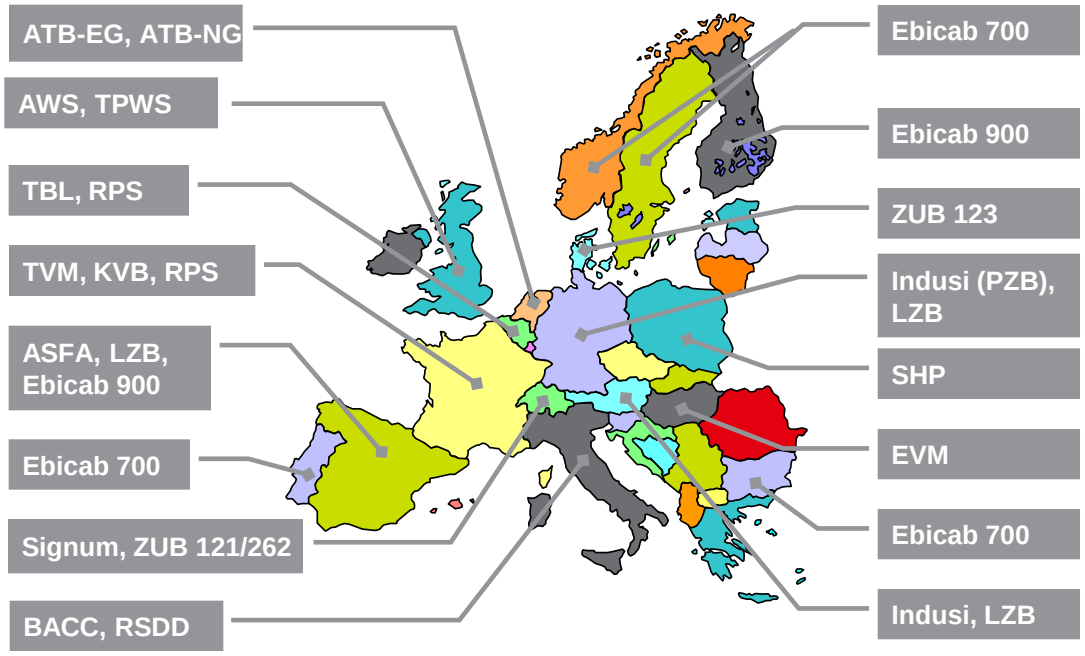


BOMBARDIER

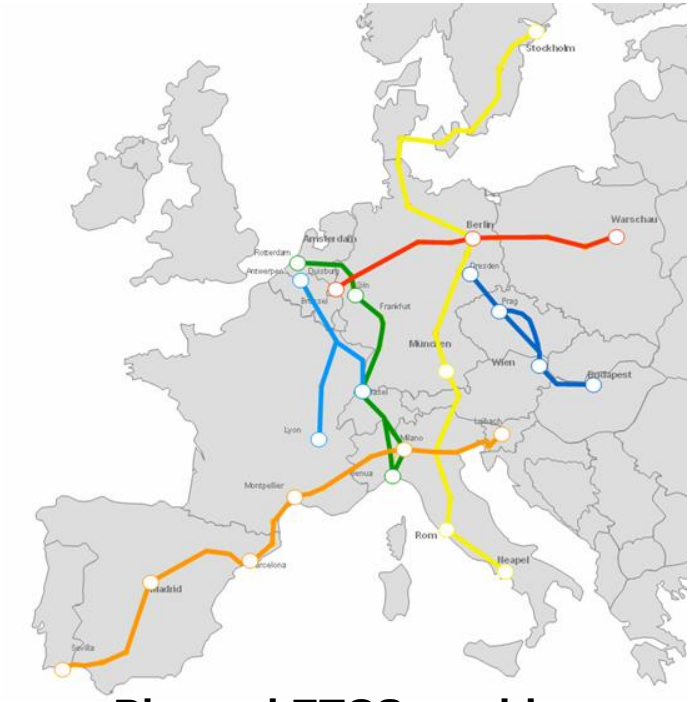
… but the most difficult challenge to interoperability are the Automatic Train Protection (ATP) systems

- Each country has 1 to 3 legacy ATPs!
- ERTMS is added as new system
- ERTMS per loco: Price: +10% (approx.)

LZB ETCS



More than 25 ATP systems!



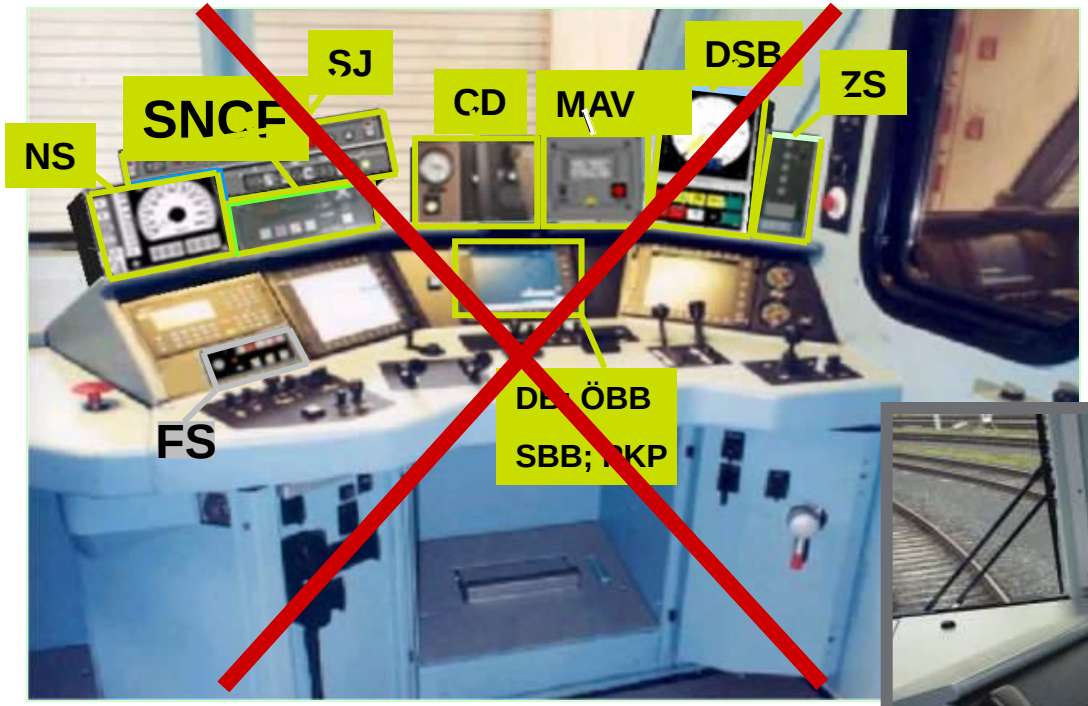
Planned ETCS corridors

ERTMS = European Rail Traffic Management System

BOMBARDIER

An integration of ERTMS with legacy ATPs is needed

This requires new costly developments costing millions of Euros!



☹ **Conventional approach:**

Simply adding ATP systems mostly does not work!

Standard TRAXX driver's desk

☺ **New development:**

Central ERTMS display
→ single interface for driver

ATP = Automatic Train Protection

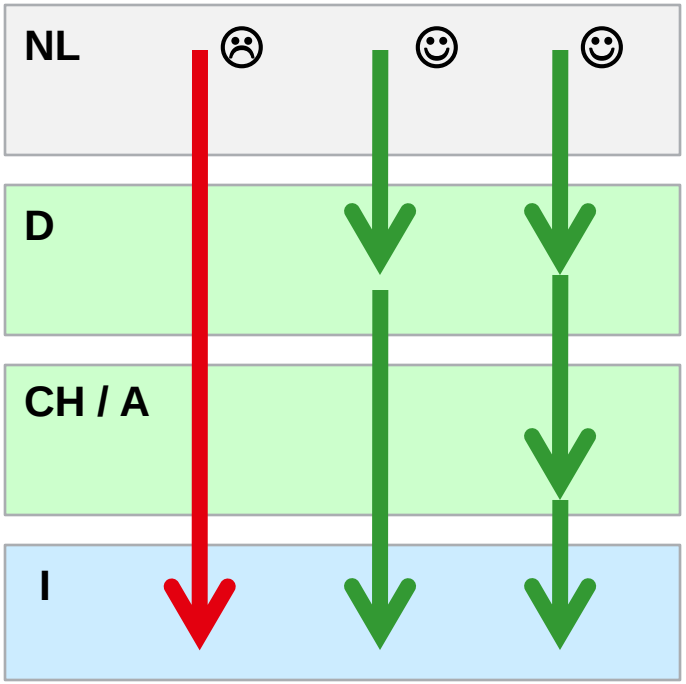
Example: *Corridor A* is too expensive!

The ATPs cost 20 to 25% of the base locomotive price!

Corridor A: NL-D-A-CH-I

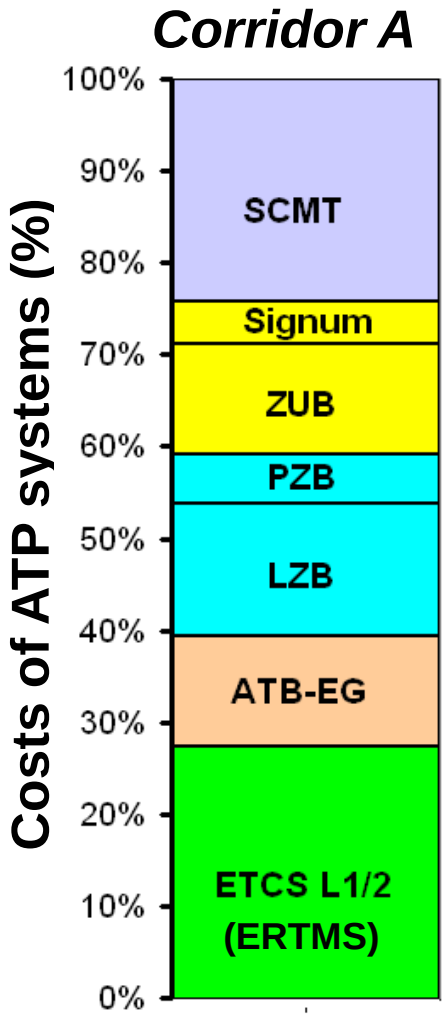
- ATP systems increase the loco price by 20 – 25%
- Consequence: A locomotive running Rotterdam → Milano is in most cases not economical!

→ **Mostly "shorter corridors" are economically viable!**



The mode of operation will depend on …

- Price of locos
- Trains per day
- Operations concept



*) How to equip trains to run cross-border on European corridors, Janis Vitins and Joachim Nordmann. UIC ERTMS World Conference Malaga, 31 March – 2 April 2009

BOMBARDIER

The switching of systems at borders is too complex

... it is often specific to each border crossing!

Harmonizing the switching (transitions) from one ATP system to the other requires major efforts & cooperation of: Infrastructure, Railway, Industry, National Safety Authority, Railway ... and takes years!

Examples:

1. **A – CH:** ***static transition*** PZB (STM) - ZUB
2. **A – I:** ***static transition*** PZB (STM) - SCMT
3. **B – F:** **dynamic transition** Memor (STM) – KVB (STM), based on **ERTMS**; dependent on infrastructure
4. **CH – I:** ***static transition*** ZUB - SCMT
5. **D – A:** **no transition needed** for the train protection system (PZB stays active)
6. **D – B:** **dynamic transition** PZB (STM) - Memor (STM), based on **ERTMS**; dependent on infrastructure
7. **D – CH:** ***static transition*** PZB (STM) - ZUB
8. **D – F:** **dynamic transition** PZB (STM) – KVB (STM), based on **ERTMS**; dependent on infrastructure
9. **D – NL:** **dynamic transition** PZB (STM) - ATB (STM), based on **ERTMS**; transition process **approved verbally**, but no written approval available
10. **D – PL:** ***static transition*** PZB (STM) – SHP
11. **NL – B:** **dynamic transition** ATB (STM) – Memor (STM), based on **ERTMS**
12. **F – CH:** **dynamic transition** KVB (STM) – PZB (STM), based on **ERTMS**; but only in Basel Muttenz

The solution to border transitions = ERTMS!

BOMBARDIER

Contents

The suppliers are building locomotive platforms

Siemens: ***Vectron***, Alstom: ***Prima***, Bombardier: ***TRAXX***

TRAXX AC

15 and 25 kVAC

TRAXX DC

3 kVDC

Italy, Spain, Poland

North-South corridors

TRAXX MS

15/25 kVAC & 1.5/3 kVDC

Benelux, Italy, Poland

TRAXX DE

diesel-electric

Non-electrified lines

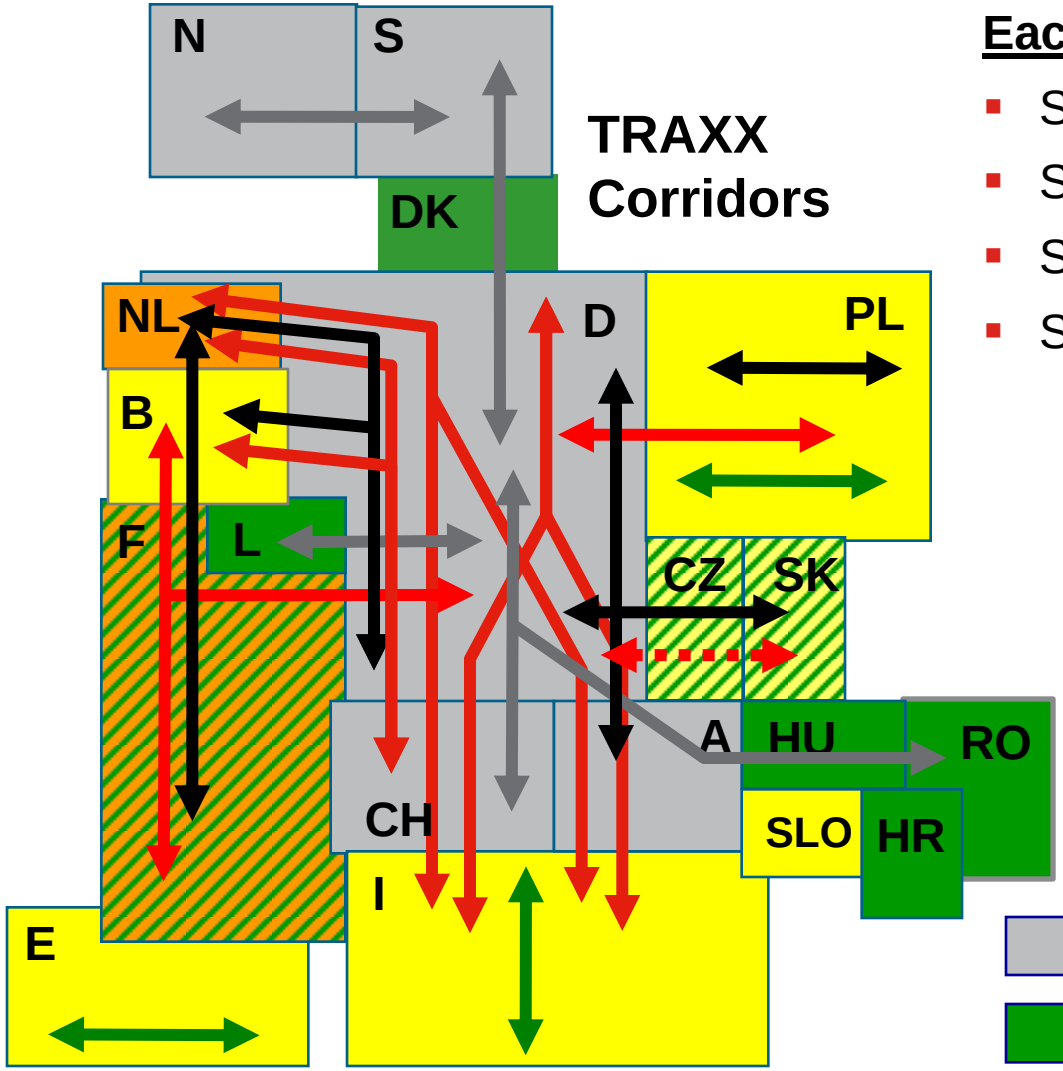
More than 1’500 units sold

More than 1’300 units in service

BOMBARDIER

TRAXX locos cover all major corridors through Europe

→ Country and corridor locomotives



TRAXX Corridors

Each corridor loco has …

- Specific safety systems
- Specific national equipment
- Specific control software
- Specific authorizations

Locomotive types:

- TRAXX AC
- TRAXX MS
- TRAXX DC
- TRAXX DE

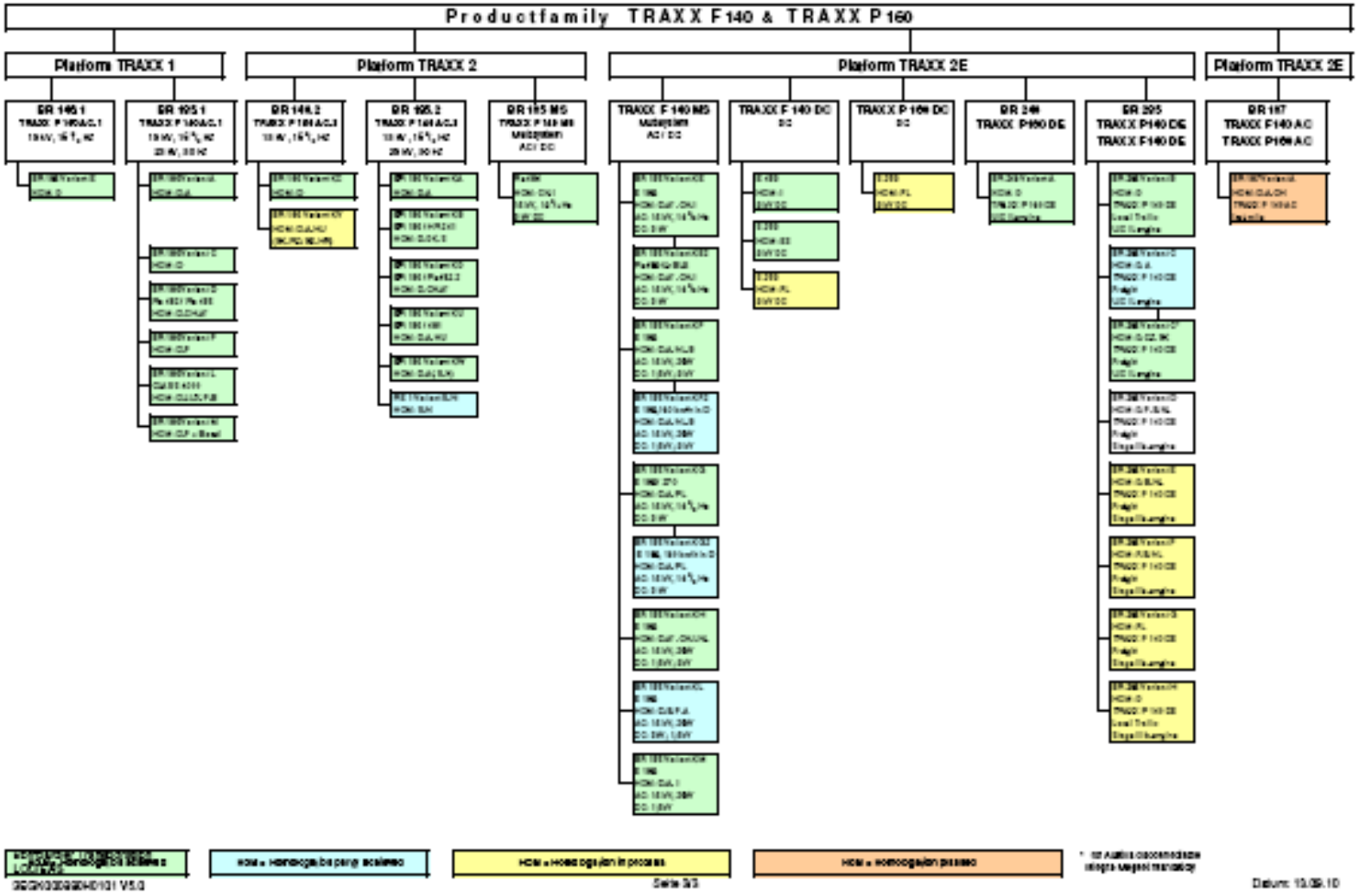
Catenary systems:

- 15 kV AC
- 3 kV DC
- 25 kV AC
- 1.5 kV DC

BOMBARDIER

Changing requirements & standards leads to complexity!

TRAXX: Approx. 40 basic loco types and >100 homologations



BOMBARDIER

Contents

There are 25 Member States with railways

MS (n-1)	Member State (n)	MS (n+1)	MS (n+2)
• … • … • …	• National Safety Authority (NSA) • National requirements • Train operator	• … • … • …	• … • … • …

EU: Directives, TSIs, Standards (EN) — **Europe**

Compliance is required to:

- TSIs, EN standards
- National Requirements

TSI = Technical Specification for Interoperability

BOMBARDIER

Cross Acceptance

... It definitely helps in the interim, but is NOT the solution!

What is Cross Acceptance (CA)?

- It is a bilateral agreement between Member States on the acceptance of items of authorization of one country by another.
  - **Complete CA:** no additional tests, certifications and documents are required
  - **Partial CA:** additional tests are required
  - **No CA:** full procedures are needed, e.g. for infrastructure requirements
  - Example D-F (approx. values): Complete / Partial / No CA = 60% / 25% / 15 %

Where is it applied?

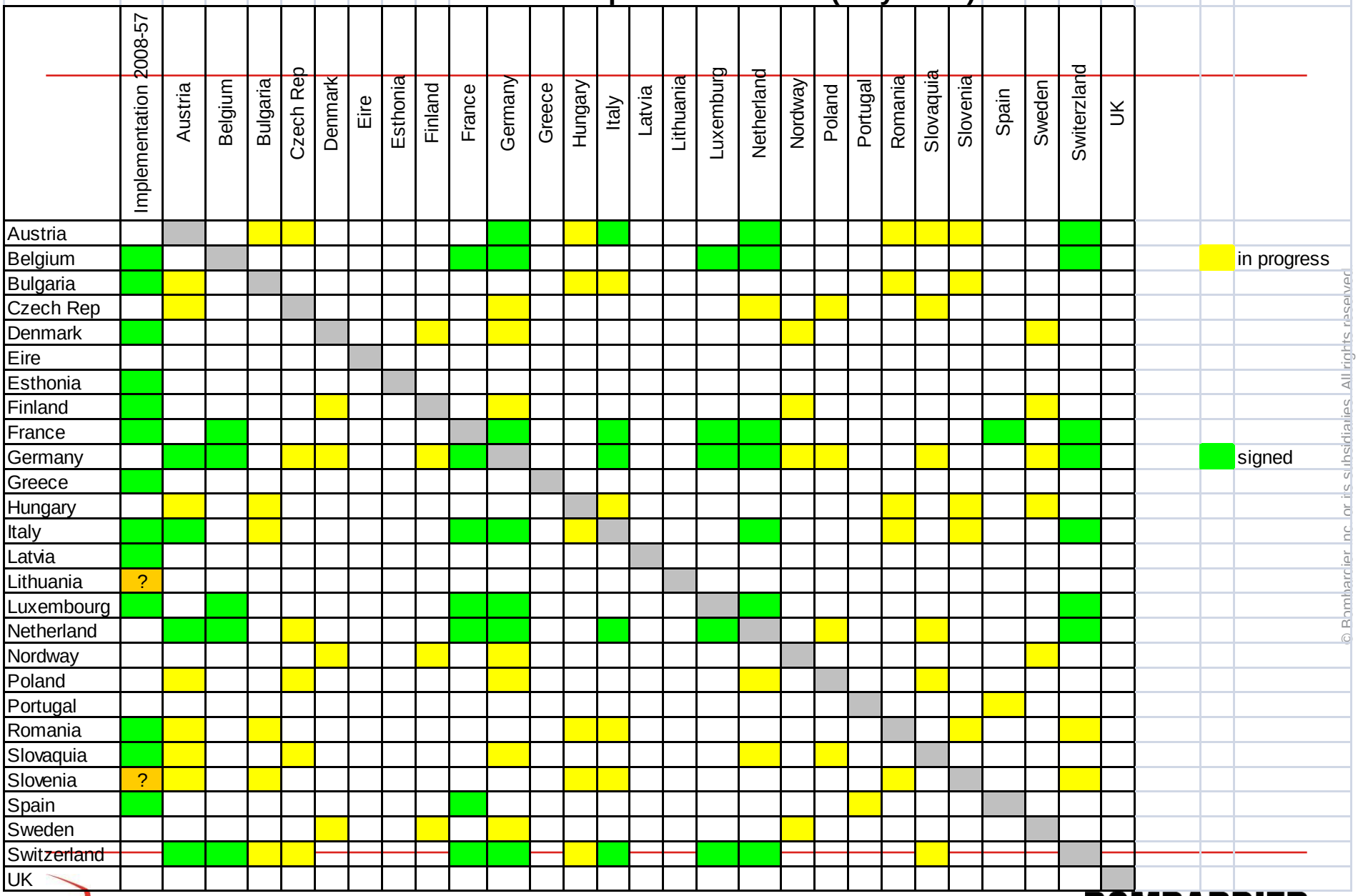
- Official agreements exist (see next slide).
  - A *Task Force Interoperability* (TFI) for Corridor A exists

How can it be improved?

- Ongoing: ERA is collecting all the applicable national rules and their classification → web-based tool *Reference Document Database* (RDD)

ERA = European Railway Agency

Cross-acceptance situation (May 2011)



BOMBARDIER

Urgently needed: A harmonized method for *Proof of Safety*

European Regulation:

- *Common Safety Methods* (CSM) on *Risk Assessment*

Applicable European standards:

- EN 50126 /8 /9

➔ **A harmonized use of the *Common Safety Methods* regulation is urgently needed at the National Safety Authorities (NSA) for the authorization process of vehicles**

Davis Super Low45 intermodal wagon Example #1: Authorization difficulties of new products

- Seven years of development
- TSI approved (December 2010) with UK-specific derogations
- G1 compliant, semi self-steering, track-friendly bogies
- Excellent running performance & low maintenance costs
- Designed to transport ‘Hi-Cube’ (9ft 6in) containers*
- No ‘wasted’ deck space, → 3 to 4 additional containers per train

Objective

- Services between UK – France

Threat

- Approval for operating through the Channel Tunnel and in France due to minor TSI derogations and lack of cross-acceptance for UK-France.

*) Hi-Cube (9ft 6in) are becoming the dominant size for shipping

Further examples of inefficient & negative rulings

Examples #2A, #2B

A. Inefficient use of braking energy for power regeneration

- In Switzerland ≥ 240 kN is used for more than 20 years!
  … and now also in Austria, Sweden, Norway, …
- UIC 544-1 (and EBA complimentary regulation B007) stipulates a much lower value, max ~130 kN (adhesion coefficient of max 0.15).
  → Can lead to 50% reduction of power regeneration!
  → Reduces competitive edge of railways!
- **Problem**: Such regulations/interpretations ≠ best railway practice!

B. ATP systems in Belgium, TBL1+

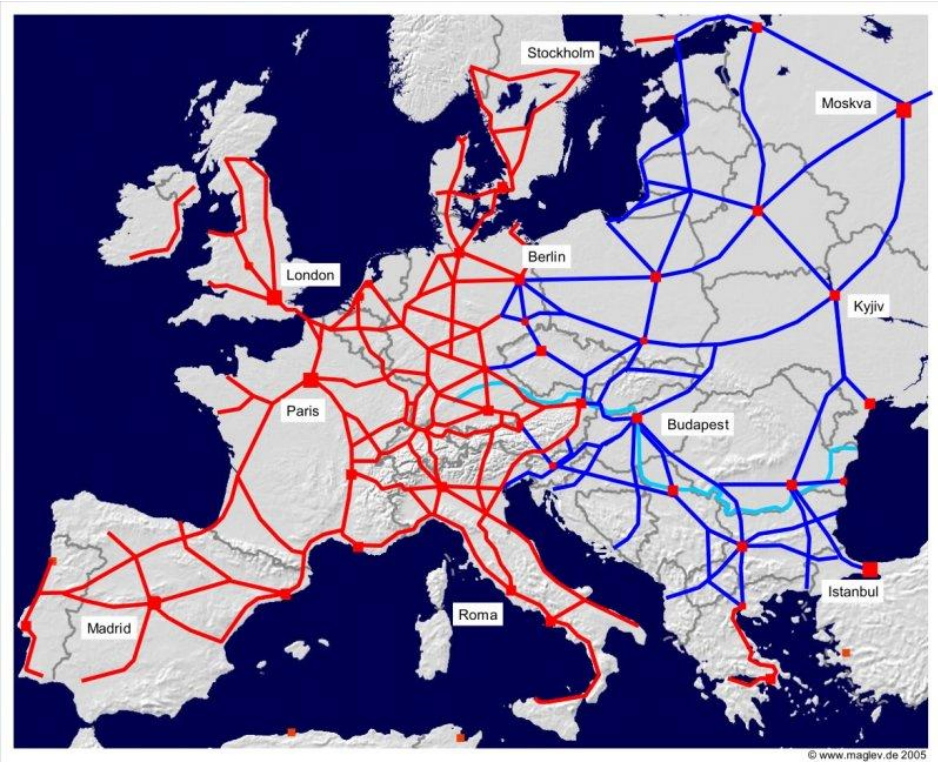
- For general freight lines the present requirement is Memor
- In addition a new ATP system, TBL1+, is being rolled out
- **Problem**: There is a fear that after 2015, vehicles without TBL1+ will have restrictions in operation, although TBL1+ is not (officially) required.
  Conclusion: The future ATP requirements are unclear!

Operation of new locos through the Channel Tunnel

Example #3: Conflict between TSI and National Rules

Situation

- The Channel Tunnel is part of the TEN
- The Safety Rules (e.g. fire) are so far defined by the *Channel Tunnel Intergovernmental Commission* (IGC)



TEN = Trans-European Network Corridors

Conflict

- The Safety Rules of the Channel Tunnel (IGC) do not take the TSI SRT* into account!

Threat

- The IGC safety rules would prohibit the operation an *EU-Locomotive* on the TEN between France and the UK through the Channel Tunnel!

*) TSI SRT = Technical Specification for Interoperability regarding Safety in Railway Tunnels

BOMBARDIER

Contents

Summary

- **A *one-for-all* European locomotive is not viable due to …**
  - High vehicle costs due to all required national systems
  - Complexity of the authorization process (no European Safety Authority!)
  - Solution of industry: Development of *Vehicle Platforms*

- **The complexity of National Standards is causing a multitude of vehicle variants*! → Bottle-neck for Industry and Agencies alike. This leads to …**
  - Immense costs, 1.4 B€ overall expenditure
  - Immense delays for authorization; approx. 600 days average

- **Transition procedures between the networks of the EU Member States must be harmonized**
  - Suggestion: to be put under the lead of the ERA!

    Note: Railway operators are not able to harmonize this.

***) Also due to constantly changing standards**

BOMBARDIER

Summary ERTMS: It has clear future advantages

… however, implementation is difficult and costly

Advantages

- Migration to a single ERTMS system for Europe → **the ultimate target!**
- ERTMS = solution for dynamic transitions at borders ☺

Problems of ERTMS implementation

- Today's implementations have too many different realizations coming from specific (national) requirements.
  Problem: → tests for each ERTMS network section → high costs & long delays!
- We need to avoid an inflation of standards!
  Suggestion: Stick to Baseline 3*!

Also, increasing complexity due to …

- New national systems, e.g. SCMT & SSC (Italy), TBL1+ (B) ≠ ERTMS
  → Additional costs & increased complexity without benefit to the train operator

***) Baseline 3 System Requirement Specification (SRS 3.0.0):** To become the stable version of ERTMS, which will be backward compatible with 2.3.0.d

What can we do better?

Cross Acceptance

- Target: Must be applied to the largest extent possible by all Member States
- Suggestion: Support ERA to generate the *Reference Document Database*

Reduce influence of National Standards

- Suggestion: Implement TSI instead of National & specific standards (e.g. CT*)

Ensure a common interpretation of Standards

- Suggestion: Common understanding by National Safety Authorities on how to apply the *Common Safety Method* for Risk Assessment. **Who should do it?**
- Suggestion: Regulations must contain the **best practice of railways** (e.g. power regeneration) and **not to go for the smallest common denominator of MS**

Avoid non-relevant obstacles

- Target: **Support pragmatic solutions**, e.g. for interpretation and derogations of Standards (e.g. Super Low45 wagon)

***) Channel Tunnel**

BOMBARDIER

In a nut shell….

We need …

- new technical solutions and technologies to build a single European market for railway rolling stock

and …

- a framework of regulations and standards ... which do not hinder creativity and innovations to overcome our borders!

Thank you for your attention!