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Einführung von ERTMS und die Auswirkungen auf das Geschäftsmodell des internationalen SGV

Konferenz „Verkehrsökonomik und -politik“

Technische Universität Berlin

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Agenda

Background and objectives

Methodology

Findings and options

Business case

Conclusio

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The purpose of this study is to review approaches to ETCS in selected European countries

Background and objective

Background

- The approach to ETCS implementation taken in Europe, coordinated by various Infrastructure Manager, will have a significant impact on international freight operators
- The full costs – which are high – of equipping its locomotives to ensure compatibility will fall to freight operators
- Freight operators are looking to understand what approaches are undertaken in other countries which might provide guidance and support their engagement and discussions with Infrastructure Managers and Ministries

Objectives

- Understand the ETCS migration strategies undertaken in different European countries and impact on freight operators
- Identify responsibilities for implementation in different countries, including funding mechanisms and allocation of risk
- Understand cooperation strategies between IMs, operators and suppliers of RS and on-board equipment
- Identify lessons and opportunities from various European countries

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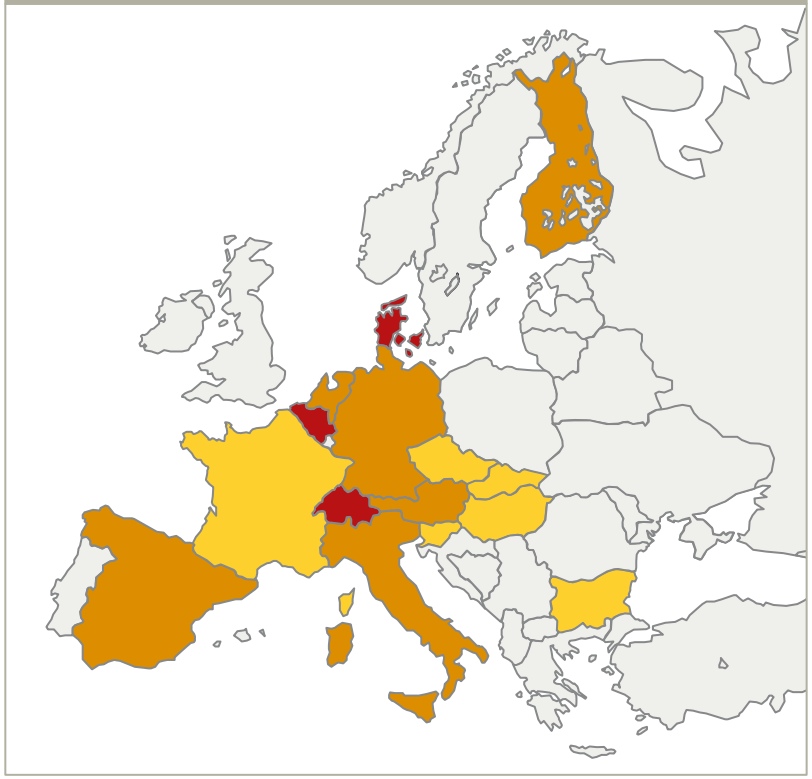
Different plans and strategies across Europe

ETCS plan until 2025

Infrastructure



Country	TEN-T	HSR	Whole network
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TEN-T TEN-T + HSR Whole network

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Different plans and strategies across Europe

ETCS plan until 2025

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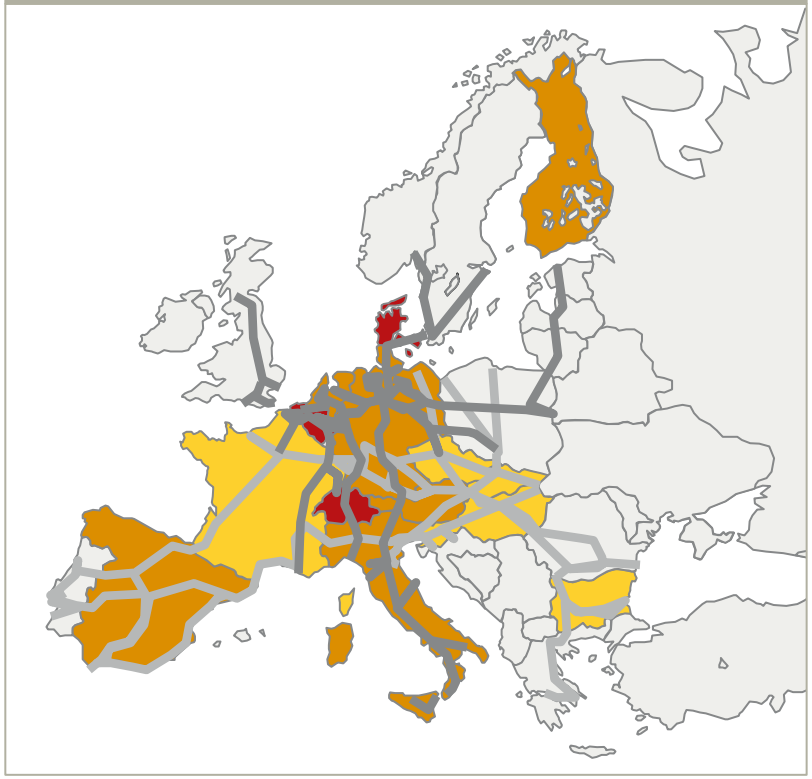

Country	TEN-T	HSR	Whole network
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TEN-T TEN-T + HSR Whole network

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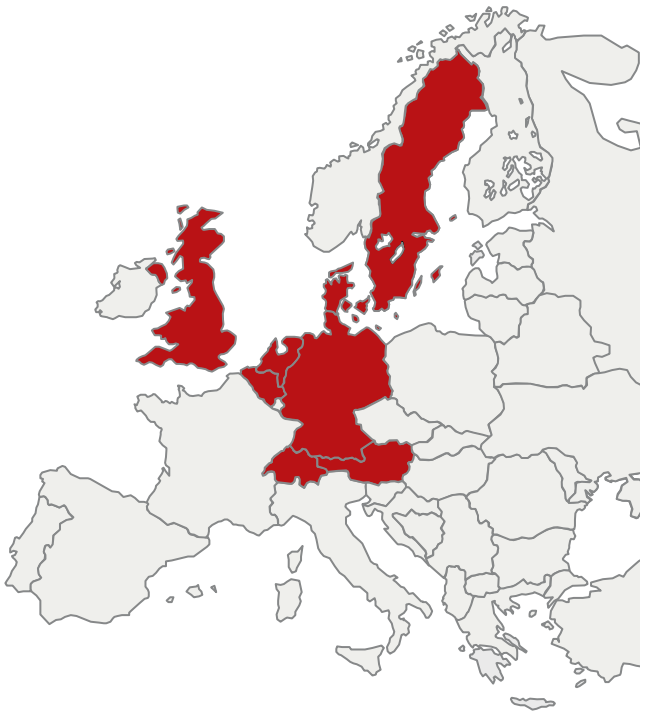
We are reviewing the impact of ETCS implementation on freight operators in eight European countries

Comparator countries



Organisations contacted	
	banedanmark; HECTORRAIL; DB SCHENKER; Transportministeriet; ALSTOM; SIEMENS
	TRAFIKVERKET; HECTORRAIL
	DB SCHENKER; DB NETZE
	ÖBB INFRA; WIENER LOKALBAHNEN CARGO; Schienen Control; TU WIEN TECHNISCHE UNIVERSITÄT WIEN Vienna University of Technology
	SBB CFF FFS; SBB Cargo; Schweizerische Eidgenossenschaft Confédération suisse Confederazione Svizzera Confederaziun svizra
	ProRail;
	Federal Public Service Mobility and Transport; INFRABEL; B Logistics;
	ORR; DB SCHENKER; Network Rail; ALSTOM
	unife THE EUROPEAN RAIL INDUSTRY; uic; ERFA European Rail Freight Association; European Commission Mobility & Transport; European Commission Competition; CCFE-CER-GEB Communauté des Chemins de Fer Européens Community of European Railways Gemeinschaft der Europäischen Bahnen; ertms

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Overview of ETCS implementation in relation to freight operators in selected countries

Initial assessment

Overall integrated Strategy	✓	✓✓	✓	✓✓	✓✓	✓	✗	✓
Clarity of investment programme	✓✓	✓	✓✓	✓	✓✓	✓	✗	✓
Engagement with FOCs	✓	✓✓	✗	✓	✓	✓	~	✓
National funding available	✓	✓✓	✗	?	✗	✗	✗	✗
Commercial risks to FOC	**High**	**Low**	**High**	**Low**	**Medium**	**High**	**High**	**High**
Technical challenges overcome	**In progress**	~	**In progress**	✓	✓	~	~	**In progress**
Overall lessons		✓✓	✓	✓	✓	~	✗	~

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There is no consistency of approach to ETCS implementation in different European countries

Strategy

Findings

- In most countries ETCS is implemented on TEN-corridors, new build (high speed) lines, and cross-border-sections
  - Only in DK[1)], BE[2)] and CH[3)] will the whole network be upgraded
- Most common driver of ETCS is as the best whole life cost solution for replacing old or life-expired signalling systems
- ETCS is the main building block of ERTMS and therefore wider benefits perceived
  - Only comprehensive cost-benefit analysis in the Netherlands
  - Wider analysis of benefits currently being developed in GB
  - Both of these are countries with major capacity challenges on their rail networks
- Fast and comprehensive roll-out in Belgium based on improvement in safety risk
- Implementation in Germany and Austria is focused on transit corridors and cross-border sections

IMPLICATIONS

- Governmental engagement differs among European countries. In most European countries the responsibility for equipping freight locomotives with on-board ETCS equipment, and the associated costs are the responsibility of the individual freight operators.

1) ETCS Level 2; Baseline 3.5.0
2) ETCS Level 1 LS & FS; selected lines equipped with ETCS- Level 2
3) ETCS Level 1 LS; selected lines equipped with ETCS- Level 2

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In most countries the coordination and lead for ETCS implementation is taken by the Infrastructure Manager

Infrastructure

Findings

- In most countries the coordination and lead for ETCS implementation is taken by the Infrastructure Manager
  - In the Netherlands the ERTMS project team reports to the Transport Minister
- However, the degree of integration to align all the elements of a coherent rail system differs widely among the investigated countries
- Great Britain is the only country identified that has a fully integrated approach to the implementation of ETCS – including freight operators
- Most countries will remove the existing signalling technology on a line-by-line basis, as soon as the lineside ETCS equipment is installed (shortly afterwards in Belgium)

IMPLICATIONS

- Speed of roll out in most countries dictated by Infrastructure Manager and dependent on availability of funding, but typically on a corridor by corridor basis

Most countries are leaving freight operators responsibility for equipping their own locomotives – GB is the exception

Freight operators and rolling stock

Findings

- Countries are only at the start of the process of equipping freight locos with ETCS
  - Early fitment based on need e.g. Betuwe line and Swiss transit corridors
- Many countries report difficulties with suppliers
  - Particularly for the internal interface between ETCS on-board unit and existing train control system (relating to software on locos build post-c.1990)
  - Interface between infrastructure and on-board unit mostly well specified
- GB freight operators have established a joint working group to coordinate activities and discuss issues
- Indicative costs from various sources suggest a cost of €0.5m-€1.2m for first-in-class locomotives and €100k-€250k for subsequent locomotives

IMPLICATIONS

- Most countries are leaving freight operators responsibility for equipping their own locomotives – GB is the exception
- The changes to the network as a result of ETCS implementation are being imposed on the freight operators, with very little opportunity for them to influence decisions

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No freight operator has identified a business case for upgrading freight locomotives with ETCS

Funding

Findings

- All countries fund the installation of ETCS lineside equipment and on-board equipment for incumbent/PSO operators
- Freight operators in most countries have to pay to equip their own locomotives
- Some central European funds are available, but are limited and insufficient
- The GB approach is to fund all elements of the ETCS system – fixed infrastructure, passenger operators and freight operators – through Network Rail
  - Denmark only other country to establish fund to contribute to freight operators' costs
- State Aid rules indicate that national governments can only fund freight operators to 50% of cost of on-board equipment
- Ongoing discussions at EC on the reclassification of on-board equipment as 'fixed' infrastructure to remove funding constraint

IMPLICATIONS

- No operator has identified a business case for upgrading freight locomotives with ETCS

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Agenda

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Most of the benefits are on the side of the IM, while the RU side have to bear a significant part of the costs

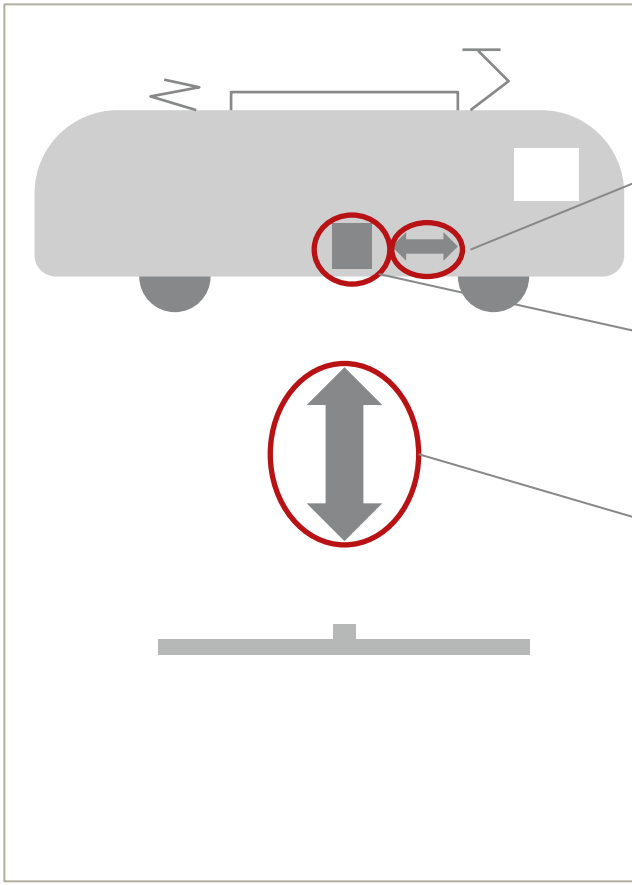
Business Case

Costs and benefits

- Those countries which have developed a full business case for ERTMS and the main building block which is ETCS (i.e. the UK and the Netherlands) have recognised the need for an integrated approach to deliver the overall strategy, cost savings and wider benefits from the system.
- These business cases recognise that the costs and benefits of the new technology are not evenly distributed, and therefore an integrated programme is in the best interest of the end-user customer, the tax payer and overall railway.
- Whilst the implementation of ERTMS is beneficial for the whole railway system – with a combination of **improved safety**, **performance**, **capacity** and **lower maintenance costs**, only minor benefits (e.g. lower energy consumption) accrue to the operator. Most of the **benefits are on the side of the infrastructure manage**r, while the operator side have to bear a significant part of the costs and risks, as significant parts of infrastructure will be integrated into the locomotive.

Costs of retrofitment are highly dependent on class of locomotive and number of countries authorised

Elements and corresponding cost



Integration STM

Specific Transmission Module (STM)

Interface STM - Infrastructure

Authorisation process and homologation

- Costs driven by
  - Fleet size (Economics of Scale)
  - Experience with retrofitment for selected locomotive class
  - Manufacturer and ability to retrofit
- Costs driven by number of countries and NTCs

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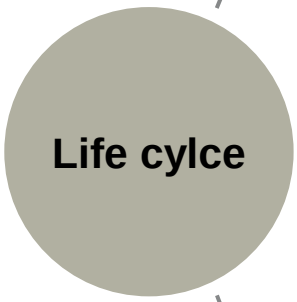
From the perspective of a rolling stock asset manager the investment is not commercial profitable

Business Case



- While the introduction of ETCS for most of the European Infrastructure Managers is a **replacement investment** to replace a legacy system at the end of the life cycle, most of the rail freight **operators' locomotives** are in the **middle of their life cycle**. These locomotives have to be upgraded.
- From the perspective of a rolling stock asset manager further investments are necessary, while the asset is not at the end of life cycle or the asset has **no further capabilities**. Therefore the **investment is not commercial profitable**.
- Even the most important benefit, to have one common control system is not currently being achieved, with each country using different sets of specifications and different homologation processes. This is a particular issue at this time of transition, with each country's railway network and the overall European network a **patchwork of different technologies.**

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Agenda

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Need for a system-wide business case

Conclusio

- We agree that there is a business case and associated benefits for the replacement of the national signalling system, however this should be considered at a ‘system-level’.
- The benefits and cost savings accruing to the Infrastructure Manager, through the removal of trackside infrastructure will be significantly larger than the additional costs of equipping the small number of freight locomotives on the rail network; therefore there is a strong overall business case if these savings and costs are considered together.
- However the cost of equipping the freight locomotives, without taking account of the savings elsewhere, makes these costs prohibitively expensive for the rail freight operators.

Quelle: civity Management Consultants

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All first mover countries have to deal with software and hardware which is not proved under daily routine

Risks from early deployment

- ETCS is a highly innovative technology. All first mover countries have to deal with software and hardware which is not proved under daily routine of operations for many years.
- Therefore countries like Switzerland have decided to implement 2.3.0d to avoid initial difficulties.
- For Germany 2.3.0d is a fixed standard for upgraded cargo corridors and new build high speed lines until the beginning of the 2020s.
- European rail industry has already several years of experience with baseline 2 on new build high speed lines (e.g. ES, AT, CH) and dedicates rail freight lines (NL). Therefore baseline 3 will be primal mandatory in Switzerland after 2023. Many experts argues that at least 5 years of experience from daily routine after implementation are necessary to guarantee stable operations.

Quelle: civity Management Consultants

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The reluctance and a lack of ability of the supplier industry for on-board equipment leads to delays

New and complex technology

- However even in countries with many years of research and development, testing and the selection of a proven baseline, such as Switzerland, a successful start of operations is not guaranteed.
- The reluctance and a lack of ability of the supplier industry for on-board equipment leads to delays and threatened the implementation of ETCS in many European countries.
- Many freight companies have had significant problems and expect delays to their locomotives. For example, the situation exists in many countries (Austria, Belgium, Switzerland, Denmark) where one particular supplier lacks the ability or the inclination to retrofit their own locomotives with ETCS. Even in countries with large fleets of freight locomotives the willingness is low.
- The difficulties are so substantial that in Belgium, the requirement for all freight locomotives to be fitted with either ETCS or the Belgian ATP system by the end of 2015 has been postponed for 12 months, as it is unachievable.

Quelle: civity Management Consultants

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Slides per country – Great Britain

Findings on Great Britain – 1

Results	Details
ERTMS strategy	• GB ERTMS is based on a whole life cost case for signalling renewals from c. 2007 (Red Diamond Review) • Full system business case (including operators) is currently being developed as part of ‚The Digital Railway' project, and expected early 2016
IM implementation	• ERTMS implementation, including operators' on-board equipment managed by Network Rail for whole GB railway industry • Initial implementation on East Coast Mainline (c. 150km) by December 2020 with ETCS L2 (without trackside signals)
FOC implementation	• Centralised procurement of onboard equipment – two contracts currently out to tender, covering all GB FOC locomotives • Each ‚first-in-class' locomotive will have a FOC to lead ETCS introduction and homologation with suppliers and regulators • Analysis ongoing to determine number of locomotives requiring fitment for use on first section of ETCS enabled infrastructure

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Slides per country – Great Britain

Findings on Great Britain – 2

Results	Details
Funding	• Funding for all ERTMS works, including FOCs, by government, but in 5 year commitments (Network Rail control periods) • £93m (€130m) committed for 2014-2019 (CP5) for freight locos
Risks	• Funding may not be sufficient in CP5 for all locomotives required • Uncertainty of funding level post-2019 • Will two contracts deliver a competitive price from suppliers? • Are there any ‚State Aid' issues?
Technical issues	• Funding may not be sufficient in CP5 for all locomotives required • Uncertainty of funding level post-2019 • Will two contracts deliver a competitive price from suppliers?

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Slides per country – Great Britain

Lessons from Great Britain

Results

Lessons for DK

Details

- Overall national benefit to centrally fund all elements of ETCS system – fixed infrastructure, passenger and freight operators
- Small proportion of savings to IM from reduction in fixed infrastructure costs can offset cost to freight operators
- Remit to Network Rail is to manage ERTMS for the country and all industry parties, not just the IM function
- Are there lessons from GB on how to avoid ‚State Aid' issue?
- GB cost analysis supports Banedanmark strategy to remove existing signalling technology on a line-by-line basis, as soon as the lineside ETCS equipment is installed
- Working together with other freight operators to strengthen position vis-a-vis infrastructure manager
- Integrated engagement with supply industry – benefits assumed, but yet to be realised

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Slides per country – Belgium

Findings on Belgium – 1

Results	Details
ERTMS strategy	• No overall national strategy for ERTMS/ETCS, except Corridor C freight route and high speed lines • ETCS Masterplan for Belgium developed by Infrabel and approved by parliament in 2011 • Justification for change based on improvement in safety risk
IM implementation	• ETCS rolled out across whole network by 2022 (combination of L1, L2 and L1 Limited Supervision) • All operators will need ETCS installed by 2025, as legacy systems will then be removed
FOC implementation	• Responsibility for upgrading locomotives is with freight operators • Very little consultation by Infrabel or SNCB on strategy • Some operators have started upgrading locomotives, others are “waiting to see” what happens next, as Masterplan is very ambitious

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Slides per country – Belgium

Findings on Belgium – 2

Results	Details
Funding	• Freight operators will be required to fund on-board equipment • No funds available from Belgian government • Explicit decision to use Infrabel's savings to reduce its costs
Risks	• Full commercial risk sits with freight operators • Lack of integration, and un-engaged approach by Infrabel increases risk to freight operators in Belgium
Technical issues	• Freight operator Crossrail has major issues with Bombardier over delays and problems in the installation of ETCS L2 on 10 Class 66 locomotives • This work had received €500k of EC funding but now not clear if this work will proceed due to delays

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Slides per country – the Netherlands

Findings on the Netherlands – 1

Results	Details
ERTMS strategy	• Cost-benefit analysis developed to justify ERTMS programme • Leadership and programme office with Transport Ministry • Programme delayed for political reasons (Fyra enquiry)
IM implementation	• ETCS currently on four existing lines: Betuweroute (freight only), HSL-Zuid, Hanzelijn and Amsterdam-Utrecht • Overall strategy to roll out ETCS Level 2 on primary network from 2018 • Dual fitment of ETCS and ATB from 2018 to 2021, and then only ETCS after 2021
FOC implementation	• All operators – including freight - will be required to equip locomotives with ETCS on-board between 2016 and 2021 • This is not a major issue as most NL locomotives are already fitted with ETCS for use on Betuweroute

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Slides per country – the Netherlands

Findings on the Netherlands – 2

Results	Details
Funding	• Currently deciding on final approach to funding on-board ETCS equipment for freight locomotives • Precedent of 50% funding for locomotives on Betuwe line
Risks	• As a result of the central coordination by the Transport Ministry's ERTMS scheme, and the precedent and lessons from the Betuwe line, risks are reduced • Some uncertainty on timescales due to Fyra
Technical issues	• [Currently investigating lessons from retrofitting of locomotives for use on the Betuweroute in 2005-2007]

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Slides per country – Switzerland

Findings on Switzerland – 1

Results	Details
ERTMS strategy	• Low budget ETCS-Solution for the whole network until January 1st 2017 • Coordination and lead for ETCS implementation is taken by SBB Infrastruktur
IM implementation	• ETCS Level 1 Limited Supervision (whole network) from January 2017 • ETCS Level 2 for main trans-alpine corridors and all Lines with speed above 160 km/h • ETCS Level 2 for whole network until 2025
FOC implementation	• ETCS will replace two former class-b systems (ZUB-121 and Signum); In the long-run positive business case because one train control system instead of two • No public funding for rail freight companies (incl. SBB Cargo) • Independent procurement of on-board equipment – one contract for each FOC-locomotive fleet

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Slides per country – Switzerland

Findings on Switzerland – 2

Results	Details
Funding	• Funding for all ERTMS line-side works, including international and national TOCs, by government • No funding for freight operator • Volume 300 mn. CHF
Risks	• One single system authority: SBB Infrastruktur (on behalf of BAV) • Close cooperation between Thales, Siemens, Bombardier and Alstom: common laboratory for interface: Infrastructure – ETCS on-board unit
Technical issues	• Cost for Rolling Stock are higher; Focus on upgrading investment on locomotives instead of infrastructure • Overall Business Case more profitable from industry perspective • SBB Cargo and freight operators have major issues with Bombardier over delays and problems in the installation of ETCS

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Slides per country – Germany

Findings on Germany – 1

Results	Details
ERTMS strategy	• In Germany ETCS will be implemented on TEN-corridors, new high speed lines, and cross-border-sections • Key driver for implementation is interoperability
IM implementation	• In the short term for new and expansion projects of the TENs • In the medium term, to enable a technically harmonised operating on selected routes / cross-border-sections • In the long term ETCS will be replace the existing continuous train controls system LZB
FOC implementation	• No necessity to equip locomotives until 2020 • Many freight locomotives have to be equipped post 2023 with opening a new tunnel between Karlsruhe and Basel

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Slides per country – Germany

Findings on Germany – 2

Results	Details
Funding	• No national funding program for rail freight companies • Direct funding for Infrastructure and indirect funding for PSO-Railways • FOCs have applied quite successful for EU-funding
Risks	• Freight operators have responsibility for equipping their own locomotives • German rail freight companies are only at the start of the process of equipping freight locos with ETCS. Early experience from international cargo services to Netherlands, Switzerland and Austria
Technical issues	• Small scale experience mainly from international car train services and passenger trains

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Slides per country – Austria

Findings on Austria – 1

Results	Details
ERTMS strategy	• In Austria ETCS will be implemented on TEN-corridors respectively on new/upgrades high performance lines (Hochleistungsbahnen) • Key driver for implementation is interoperability (e.g. TSI)
IM implementation	• Coordination and lead for ETCS implementation is taken by ÖBB Infrastruktur • New build(e.g. tunnels) and upgraded sections of high performance lines will be equipped with ETCS Level 2
FOC implementation	• Responsibility for retrofitting locomotives is with freight operators • To use main corridors, ETCS retrofitment is neccessary • Austrian FOC benefits from international ETCS Corridor Vienna-Budapest

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Slides per country – Austria

Findings on Austria – 2

Results	Details
Funding	• Direct funding for Infrastructure and indirect funding for PSO-Railways • Minor private freight operators have applied successful for EU-funding
Risks	• Freight operators have responsibility for equipping their own locomotives • Most rail operators uses Siemens Eurosprinter locomotives (Taurus) for all kind of services where retrofitment is well approved
Technical issues	• Several years of experience with retrofitting • First ETCS stretch since 2 years in operation

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