

Legend

- North Sea - Baltic
- Rhine - Alpine
- North Sea - Mediterranean



Ministry of Infrastructure and Water Management

ERTMS National Implementation Plan  
**The Netherlands, 2020**



# Index

1. Introduction
2. Preceding actions
3. Overview of the Dutch rail network
4. Dutch roll-out plans in EU-perspective
5. Migration strategy and planning
6. Expected benefits in 2030
7. Costs and funding of the ERTMS roll out





# 1. Introduction

## **Motivation:** Why ERTMS?

- › Need for replacement: current class-B system dates from 1950-60s
- › Need for renewal to accommodate capacity growth
- › Need for digitalisation
- › European regulation

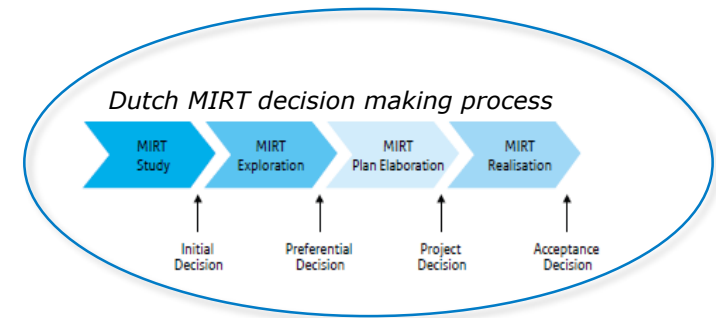
## **Core:** Replacement of nationwide current class B system 'Automatische TreinBeïnvloeding' (short: ATB) by ERTMS

- › The ERTMS-program is designed as a sector-wide change assignment.
- › First stage to 2030: base investment plus first few track sections executed by the ERTMS-program.
- › Latest 2050 full nationwide replacement completed.





## 2. Preceding actions



- › 2012 – [Parliamentary study](#) into rail maintenance and innovation.
- › 2012 – ERTMS-program incorporated in the [Dutch Multi-annual Program for Infrastructure, Spatial Planning and Transport \(MIRT\)](#).
- › 2013 - [Initial Decision](#) for Exploration phase.
- › 2014 – [Preferential Decision](#) by Cabinet based on [social cost benefit analysis](#). Start of plan elaboration phase.
- › 2014 – Corporation agreement between the ministry of Infrastructure and Water Management, ProRail and NS to implement ERTMS.
- › 2016 - First version of the Dutch National Implementation Plan was issued.
- › 2019 - [Program Decision](#) by Cabinet; entering realisation phase.
- › 2020 – Publication of tenders for the ERTMS Central Safety System and first batch of rolling stock.
  
- › 2030 - **Acceptance Decision** planned (decharge).









# 3. Overview of the Dutch rail network

- 3.3 Million annual train runs
- 1.1 Million daily passenger journeys
- 135 Million weekly loading tonne-kilometres
- 7,114 Kilometre track
- 6,795 Switches
- 399 Stations throughout the Netherlands
- 2,316 Level Crossings
- 11,751 Signals





# Dutch class B systems

Class-B system	Type of supervision	Type of system intervention
<b>ATB EG</b> Eerste Generatie (First Generation)	Only speed supervision, 40/60/80/130/140 km/h	Brings the train to a complete standstill if the train driver does not brake according to preset minimum braking requirement (braking criteria).
<b>ATB vv</b> Verbeterde versie (Improved Version)	Braking curve supervision (only installed at high-risk ATB-EG signals)	Brings the train to a complete standstill if the train driver does not adhere to the predefined braking curve.
<b>ATB NG</b> Nieuwe Generatie (New Generation)	Braking curve supervision	Brings the train to a complete standstill if the train driver does not stay within the braking curve of the train.

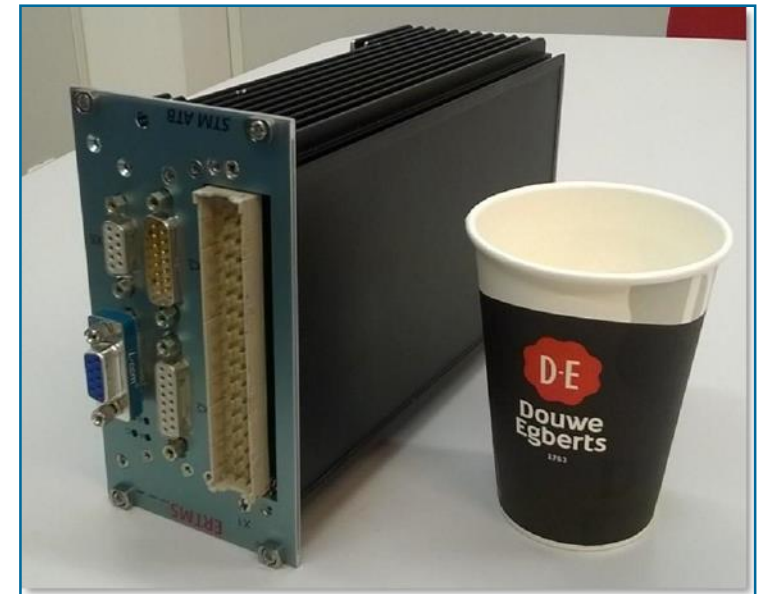




## Two STMs-ATB needed for baseline 3

In 2020, after 5 years of developing, a project team of the ERTMS-program delivered a fully functional STM-ATB EG-Vv for ETCS Baseline 3.

- ✓ Open access: everyone can request to buy the 'blueprint' (the STM-ATB design) by visiting the Dutch [ERTMS-website](https://ertms.nl).
- ✓ Everyone who acquires the STM-ATB blueprint must sign a licensing agreement. Costs: € 30k (excl. VAT) per license.
- ✓ Fully compliant to TSIs and Dutch regulation (RIS).
- ✓ Small in size compared to other STMs for ATB.
- ✓ No calibration needed (= low maintenance costs).
- ✓ The ERTMS-program is securing the availability of a STM ATB NG for the near future.







# Facts and figures for planned ERTMS implementation

## Base-investment foresees in changes for:

- 60+ primary user processes
- 15,000+ users of ERTMS
- 1,300+ units of rolling stock
  - $\pm 690$  units to be retrofitted
  - $\pm 360$  units to be upgraded (from baseline 2 to 3)
  - $\pm 317$  units to be updated (from baseline 3.4.0 to 3.6.0)
- Test track at Hanze line and railway yard Lelystad

## Infrastructure changes:

- ERTMS only, level 2, on 345 km
- ERTMS baseline 3, release 2
- Preparation for (hybrid) level 3



## GSM-R in relation to FRMCS

GSM-R has been rolled-out throughout the country and has been operational since 2004.

All trains have been equipped with a GSM-R on-board radio since 2006.

Baseline 3, release 2 (with GPRS) will be installed in both trains and infrastructure as part of the ERTMS-program.

The ERTMS-Program welcomes the development of a successor of GSM-R. However:

- › No formal decision has been taken about migration towards FRMCS (FRMCS is not included in the current TSI CCS);
- › Studies about the implementation of FRMCS are ongoing;
- › Planning and budget are still to be determined;
- › GSM-R is the only formally approved system for communication between wayside and trains/ locomotives;
- › Until FRMCS systems become available, new trains will be equipped with GSM-R (GPRS).





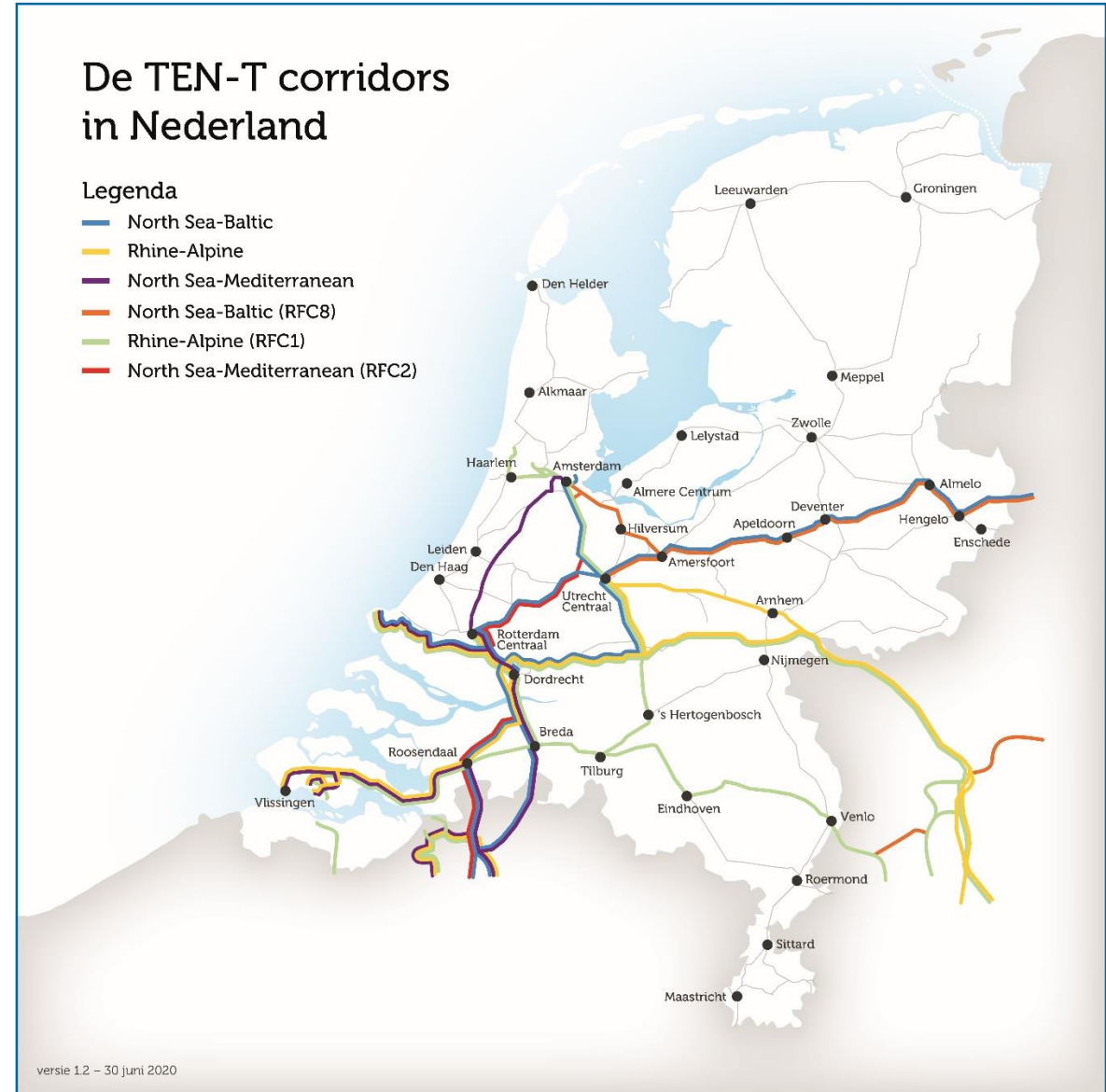




# 4. Dutch roll-out plans in EU-perspective

Three TEN-T corridors start / end in The Netherlands:

Corridor	Main route of the international freight corridor	Main route in the Netherlands
Rhine – Alpine	Zeebrugge – Antwerp / Amsterdam / Vlissingen / Rotterdam – Duisburg – [Basel] – Milan – Genoa	Maasvlakte – Kijfhoek / Amsterdam Westhaven / Amsterdam Houtrakpolder / Vlissingen Sloe > Meteren – Zevenaar (border)
North Sea – Mediterranean	London / Dunkirk / Rijsel / Liege / Paris / Amsterdam – Rotterdam – Zeebrugge / Antwerp – Luxembourg – Metz – Dijon – Lyon / Basel – Marseille	Maasvlakte – Kijfhoek – Roosendaal (border)
North Sea – Baltic	Wilhelmshaven / Bremerhaven / Hamburg / Amsterdam / Rotterdam / Antwerp – Aachen / Prague / Berlin – Warsaw – Terespol (Polish – Belarusian border) / Kaunas	Maasvlakte – Kijfhoek – Meteren – Zevenaar (border) / Amsterdam Westhaven / Amsterdam Houtrakpolder > Amersfoort – Oldenzaal (border)







# Current and planned roll-out

## Already equipped (blue lines)

1. Betuwe Route
2. HSL-South
3. Harbour rail line
4. Amsterdam-Utrecht
5. Hanze Line

## Equipped by 2030 (yellow lines)

6. Kijfhoek – Roosendaal - Belgian border
7. Lelystad – Almere – Schiphol (OV SAAL East)
8. Hoofddorp - Schiphol – Duivendrecht (OV SAAL West)
9. Utrecht – Meteren
10. Roosendaal – Den Bosch ('s Hertogenbosch)
11. Meteren – Eindhoven
12. Eindhoven - Venlo - German border











## 5. Migration strategy and planning

### **Principles of the migration strategy:**

- › Focus on the user
- › Migration from the class B system ATB to ERTMS in ten steps
- › Program and operation both control the migration steps
- › Objective: To minimize and control the effect on the performance
- › Foundation is laid out for nationwide implementation

### **Masterplanning:**

- › 2020 – 2025: Investment in management processes and systems, rolling stock and staff
- › 2026: Testing
- › 2026-2030: Investment in track sections 6 to 12 on slide 13.
- › 2030-2050: Nationwide replacement



# From ATB to ERTMS-only in ten migration steps

## Management processes and systems

### 1. Chain management is ready for operation

New hardware and software are added to the rail system with ERTMS (both in infrastructure and in rolling stock). An incident or problem can occur in many places in the chain. Monitoring the performance of the entire business process chain, resolving incidents and problems and implementing changes is called chain management. Chain management must be adapted to the introduction of ERTMS. Chain management is carried out in an integrated manner over the entire chain for existing ERTMS operations, anticipating further ERTMS expansions.

### 2. Logistics chain is ready for operation

Personnel and systems are prepared on time so they can deal with ERTMS specific planning and adjustment aspects.





# From ATB to ERTMS-only in ten migration steps

## Conversion of Rolling Stock

### **3. Passenger trains converted to ERTMS; start of commercial deployment with STM ATB**

ERTMS functionality is built into the various types of passenger rolling stock. These are then deployed again in operational service and initially run with ATB.

### **4. Freight trains converted to ERTMS; start of commercial deployment with STM ATB**

ERTMS functionality is built into various types of freight trains and other rolling stock that are used exclusively on Dutch rail infrastructure. The rolling stock is then used again in operational services.

### **7. Start of commercial deployment of upgraded international trains in operation**

Trains deployed on both domestic and international rail infrastructure which already have an ERTMS configuration are upgraded to the correct version. Also freight trains and passenger trains used for international traffic and trains used internationally by contractors are upgraded.



# From ATB to ERTMS-only in ten migration steps

## Trained staff gains operational experience with driving with ERTMS

- 5. Start staff training on harmonized line Hanze line to gain ERTMS experience**
- 6. Start staff training on harmonized line Amsterdam - Utrecht to gain ERTMS experience**

Trained personnel will operate rolling stock suitable for ERTMS on harmonized ERTMS track sections during the regular timetable. With this, operational experience is gained driving with ERTMS.

- 8. Start of commercial operation on test track Hanze line and railway yard Lelystad with ERTMS level 2, baseline 3**

This is the first time that trains operate under ERTMS Level 2 Baseline 3 with passengers during commercial operation. This way, both train drivers and traffic controllers/dispatchers get experienced in train operation under ERTMS. As soon as all trains run under ERTMS, the train service managers will also gain experience with the new user processes. The use of the test track section must last long enough to gain sufficient experience with the implementation of the changed business processes (for example shunting).



# From ATB to ERTMS-only in ten migration steps

## Driving with ERTMS level 2 only

- 9. Start of commercial operation on track section Kijfhoek – Roosendaal - Belgian border with ERTMS Level 2 only**
- 10. Start of commercial operation on track section OV SAAL East with ERTMS Level 2 only**

In the previous steps, processes and systems have been adjusted, equipment has been converted and staff has gained experience with driving with ERTMS. This final step is taken towards a safe and reliable operational transport system with ERTMS Level 2 only. Specific track sections have been converted to ERTMS, all technical systems function properly, skilled personnel is able to drive the trains and the organisation has been prepared to carry out its tasks.

**The rollout of the other track sections will follow after migration step 10.**





# Planning

Milestones	Events
2021-2021	Migration step 01: Chain management is ready for operation
2024-2024	Migration step 02: Logistics chain is ready for operation
2022-2023	Migration step 03: Passenger trains converted to ERTMS; start of commercial deployment with STM ATB
2022-2023	Migration step 04: Freight trains converted to ERTMS; start of commercial deployment with STM ATB
2022-2023	Migration step 05: Start staff training on harmonized line Hanze line to gain ERTMS experience
2022-2023	Migration step 06: Start staff training on harmonized line Amsterdam-Utrecht to gain ERTMS experience
2022-2023	Migration step 07: Start of commercial deployment of upgraded international trains in operation
2026-2026	Migration step 08: Start of commercial operation on test track Hanze line and railway yard Lelystad with ERTMS level 2, baseline 3
2026-2028	Migration step 09: Start of commercial operation on track section Kijfhoek – Roosendaal - Belgian border with ERTMS Level 2 only
2027-2029	Migration step 10: Start of commercial operation on track section OV-SAAL east with ERTMS Level 2 only
2028-2029	Start of commercial operation on track section Hoofddorp - Schiphol – Duivendrecht with ERTMS Level 2 only
2028-2029	Start of commercial operation on track section Utrecht – Meteren with ERTMS Level 2 only
2028-2030	Start of commercial operation on track section Roosendaal – Den Bosch with ERTMS Level 2 only
2029-2031	Start of commercial operation on track section Eindhoven - Venlo - German border with ERTMS Level 2 only
2030-2031	Start of commercial operation on track section Meteren – Eindhoven with ERTMS Level 2 only
2030-2050	Further Nationwide implementation









## 6. Expected benefits in 2030 (2019)

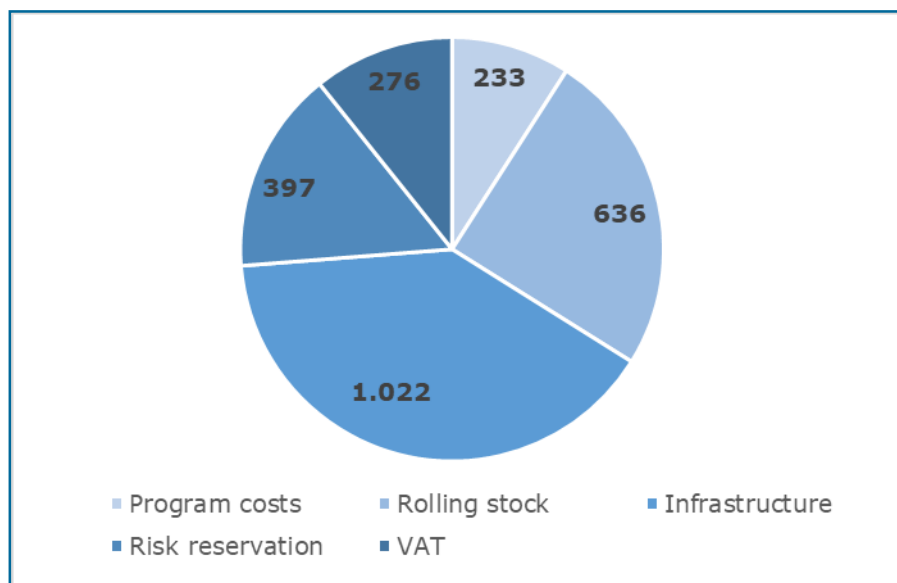
Improvement in:	System Indicators	Indication of social impact
<b>Interoperability</b>	Train kilometres under ERTMS on Dutch network: 34% in 2030.	The interoperability of cross-border freight transport increases from 65% to 93% due to the ERTMS program. The interoperability of international passenger transport increases from 10% to 31%. Given the autonomous development estimated in 2019, this contributes to 21% more passenger kilometers and 13% more tonne-kilometres with ERTMS on the Dutch network than in the situation without ERTMS.
<b>Safety</b>	Decrease in signals passed at danger (SPAD): 72% in 2030.	Implementation of ERTMS is expected to reduce the number of fatalities (0.15 per year) and seriously injured persons (0.64 per year) resulting from accidents on the rail infrastructure and level crossings.
<b>Capacity and speed</b>	Driving time reduction per train, on average: 1.7% in 2030. Interval time reduction between two trains in the same direction: 25% in 2030. Interval time reduction between two trains in opposite direction: 15% in 2030.	1 million passengers use the Dutch railway system every day. All travelers are expected to save 2.3 million hours of travel time on an annually basis.
<b>Reliability</b>	Reduction of train delay time of rail system due to malfunctions: 0% in 2030.	Given the autonomous development estimated in 2019, the expected number of passenger lost hours is 0.2 million hours lower in 2030 than in the situation without ERTMS.





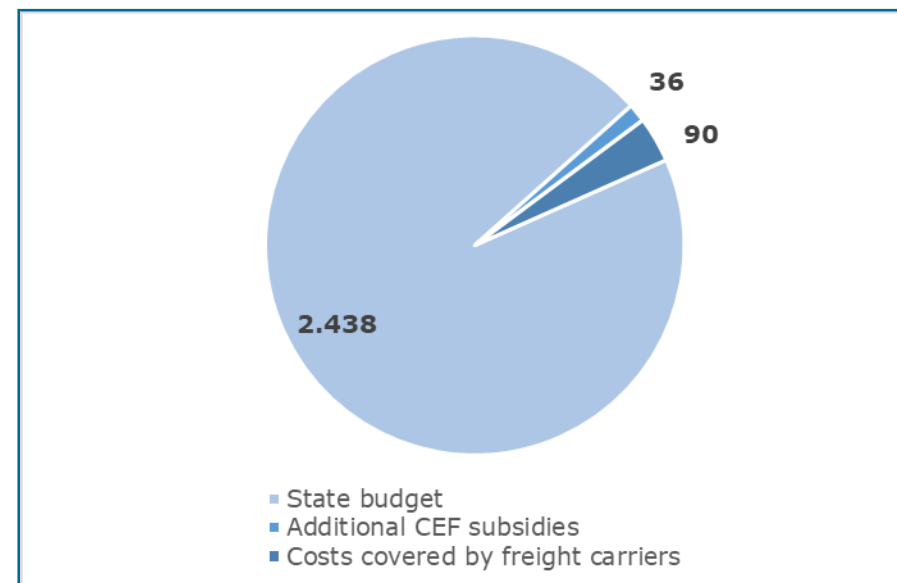
## 7. Costs and funding of the ERTMS-program (until 2030)

ESTIMATED COSTS (X € 1 MILLION)



Price level 2017

FUNDING (X € 1 MILLION)



Price level 2017



## Estimated budget for nationwide roll out (after 2030)

- › The current ERTMS-program ends at 2030.
- › For the nationwide replacement of ATB by ERTMS the cabinet reserved another € 100 million (incl. VAT) a year during 2031-2050 on top of the current budget for train control, adding up to a total of € 6,5 - 7 billion between 2020 and 2050, including maintenance.
- › The exact amount needed will depend on factors like the speed with which the safety system is rolled out, technological possibilities (e.g. the transition to ERTMS level 3) and on the development of market prices for ERTMS components. Possible savings through synergy benefits or expected innovations are closely monitored.