

ERTMS NATIONAL IMPLEMENTATION PLAN

September 2007

EXECUTIVE SUMMARY

This National Implementation Plan (the Plan) is submitted to the European Commission to meet the requirements of the High Speed Control Command & Signalling TSI [2006/860/EC adopted 07 November 2006] and the Conventional Control Command & Signalling TSI [2006/679/EC - adopted 28 March 2006 & Annex A updated by 2006/860/EC].

The scope includes the specified High Speed and Conventional Trans-European Railway Network (TEN) routes within the UK. The Plan is focussed upon implementation of GSM-R and ETCS in support of the introduction of ERTMS Level 2 without lineside signals and has been developed as a delivery plan that aligns with expected re-signalling dates and rolling stock replacement dates wherever possible to produce the most economic outcome.

When aligned with signalling renewals, implementation of ERTMS on the infrastructure, within the scope of the Plan is complete in 2038. It should be noted that this Plan covers 72% of the infrastructure in the UK national network and encompasses the entire UK TENs network.

The Plan has been developed in consultation with industry stakeholders and represents the best view of the UK rail industry, based upon information available.

Full GSM-R voice deployment on infrastructure and rolling stock will be completed by 2014, in time for the first deployment of ETCS on the infrastructure in 2015, as outlined in the Plan. This will provide GSM-R quality of service for data on the High Speed lines (except CTRL) and quality of service for voice across the rest of the network. Upgrade of the quality of service from voice to data to support operation of ETCS across the appropriate sections of the network will be aligned with ETCS implementation.

The following table is provided as a summary of the rolling stock and infrastructure ETCS implementation dates on the High Speed and Conventional routes. Further detail is provided in the implementation maps at the end of this document.

Route Type	Route	Rolling Stock Fitment	Infrastructure Fitment
High Speed	Great Western Main Line	From 2013 to 2018	from 2017 to 2035 (majority complete by 2025)
	East Coast Main Line	From 2013 to 2022	from 2018 to 2035 (majority complete by 2025)
	West Coast Main Line	From 2014 to 2027	from 2027 to 2030
	Channel Tunnel Rail Link	From 2025 to 2030	from 2038 to 2042
Conventional	Brighton Main Line	From 2011 to 2022	from 2021 to 2025
	South West Main Line	From 2014 to 2025	from 2017 to 2034
	Midland Main Line	From 2015 to 2027	from 2021 to 2023
	Great Eastern	From 2015 to 2023	from 2027 to 2029

Future updates are anticipated in light of revised demand forecasts; challenges to test the underlying assumptions; changes in investment priorities of major infrastructure, rolling stock renewal and network enhancement programmes; technical developments; capabilities of a global supply market and operational experience gained by all ERTMS operators.

1. PLAN DEVELOPMENT

The Plan has been developed by the UK cross-industry ERTMS Programme Team and is based on optimisation of existing assets; therefore the renewal dates of the signalling assets and the fitment dates for rolling stock are based on life expiration dates. The rolling stock is fitted generally before trackside equipment, and because of the divergent asset age of rolling stock and signalling infrastructure, more than 50% of the trains require retro-installation.

The Plan assumes that there would be a period of migration and ramping up of industry capability before a major main line implementation is undertaken. For this reason, the ERTMS plan from 2009-10 until 2013-14 is predominantly like for like renewal of conventional signalling, together with a couple of ERTMS migration schemes. The first major implementation commences in 2017 over Great Western. When aligned with signalling renewals, implementation of ERTMS on the infrastructure, within the National Implementation Plan is complete in 2038. The Plan also covers 72% of the infrastructure in the UK national network.

The data to develop the Plan was collected and consolidated through a series of consultation with experts from Network Rail Signal Engineering, the Association for Train Operating Companies, Department for Transport and HSBC Rail, a rolling stock leasing company (ROSCO). The interlockings and the rolling stock were mapped onto the current scope of the High Speed and Conventional lines.

2. ASSUMPTIONS

The following assumptions have been made in developing the Plan. If any of these should prove invalid, or change, especially those with a cost impact, the economic viability will need to be reviewed and updates to the plan made.

- The ERTMS solution is Level 2 without lineside signals (*This has been demonstrated to be the preferred solution for the UK through the Strategic Rail Authority report 2004, Department for Transport report 2005 and work undertaken by the ERTMS Programme Team during 2006. Continued evaluation will continue in support of more detailed route and project based plans*)
- The supply chain will be capable and adequate for supporting the proposed national roll out, and will meet the cost targets agreed with the National ERTMS Programme
- A 50% increase in re-signalling volumes can be delivered with ERTMS. (*An analysis is taking place by the ERTMS Programme to support this assumption and will be delivered in time for Network Rail's Strategic Business Plan submission in October 2007*)
- In order to meet the cost assumptions, ERTMS products will be developed and available by 2011 that address the current error corrections and open points whilst also providing the following functionality (*UK Rail industry parties are working with the ERTMS suppliers, ERTMS Users Group and the European Railway Agency through their respective trade organisations*):
 - Level Crossing Functionality
 - Cold Movement Detector
 - Door Control supervision
 - Enhanced data capacity of the communication bearer for high density areas – GPRS (or similar) is developed by 2016.
- The current implementation plan assumes that ERTMS is available off the shelf, as a reliable product in a commercially mature supplier market with no major concerns on technical capabilities
- Any necessary Specific Transmission Modules (STMs) have been developed
- GSM-R voice is available across the routes for deployment (*GSM-R voice implementation plan later on shows good progress to achieving this*)
- Rolling stock is generally fitted before infrastructure to avoid dual fitment of infrastructure

- Migration objectives are fulfilled through the Cambrian Early Deployment Scheme and migration projects
- ERTMS dates are closely aligned to signalling asset renewal dates with a flexibility of 5 years
- Rolling stock and infrastructure equipment has a 35 year asset life
- Retro-installation of an existing train requires it to be out of service for 10 days
- New rolling stock will be ordered ERTMS fitted or capable of ERTMS installation within a planned normal maintenance and overhaul regime.

3. RISKS

The key risks and challenges to the delivery of the implementation plan are the implementation capability of the industry, delivering on the cost assumptions, European specification development, product development and maturity, engineering and operational integration into the current railway and commitment across multiple control periods and franchises.

4. INTERDEPENDENCIES

In the development of the plan, a number of major project and programme interdependencies have been investigated. A brief description of these is provided below:

Channel Tunnel Rail Link

The dates for the Channel Tunnel Rail Link are based upon our analysis communicated to the European Commission in early 2006. The indicated timescales are consistent with the baseline option within this report and remain dependent upon the French ERTMS implementation plans for LGV lines, the replacement plans for the Eurostar trains and availability of TVM-ETCS Bi-standard equipment. The Department for Transport remains in discussion with the French Transport Ministry.

Crossrail

The proposed Crossrail Programme will link Maidenhead and Heathrow in the west with Shenfield and Abbey Wood in the east, through new tunnels under central London. A Bill is currently going through Parliament in order to obtain the powers to build Crossrail. The assumption is that Crossrail trains will be fitted with ERTMS from new so that they do not constrain ERTMS rollout on the Great Western or Great Eastern infrastructure. Use of ERTMS in the core section is under consideration.

Thameslink

The proposed Thameslink Programme will significantly increase capacity on the over-ground railway to and through London, via King's Cross St. Pancras in the north and Blackfriars and London Bridge in the south and is expected to deliver increased services across the Thameslink routes. The assumption is that new Thameslink trains will be fitted with ERTMS in manufacture so that they do not constrain ERTMS rollout on the Midland Mainline, East Coast Mainline or Southern infrastructure. Use of ERTMS in the core section is under consideration.

Intercity Express Programme

The current fleets of High Speed Trains (HST) and several other long distance trains have been operating on a number of long distance routes since the introduction of the HST, almost 30 years ago and the trains are being life extended for service up to around 2016. Whilst these trains are capable of further continued operation, there are increased costs in so doing. The Department for Transport has initiated the procurement of a fleet of between 500 and 2,000 vehicles. These will be provided for under an availability and reliability agreement to future passenger rail franchises. These trains will be called 'Intercity Express Programme' (IEP) trains.

The introduction of the new rolling stock will require enabling works on the infrastructure which is likely to include:

- Lengthening of platforms
- Minor signalling works to facilitate the above
- Gauge clearance works
- Upgrade of power systems
- Upgrade of track quality

The assumption made by the IEP team is that the new trains should be fitted with ERTMS from new. The interaction between ERTMS rollout as a replacement for BR-ATP on GWML and IEP deployment is complex. Currently the IEP team has assumed that dual fitting of IEP trains to run on GWML should be provided for.

Electrification

In assessing the unit costs of electrification, an appraisal would recognise that there is a cost associated with work to:

- Move signals to ensure they are not unacceptably obscured by the overhead line equipment when viewed from driving cabs
- Ensure that signaling equipment is immune to electromagnetic interference from the overhead line equipment, distribution equipment and electric trains

Should the route to be electrified have been ready-equipped with ERTMS (with no line-side signals) and the opportunity taken to provide immunisation, then moving signals and further immunisation works can be excluded from the cost of the electrification project.

The assumption being made in DfT is that any major electrification scheme would follow ERTMS deployment on the route in question.

European Specification and Product Developments

The Cambrian Early Deployment Scheme has been tendered to be compliant with SRS v2.3.0 and it is envisaged that subsequent Migration Schemes will also be tendered to be compliant with SRS v2.3.0. The need for future specification evolution is leading to the development of the next major version of the SRS, currently termed SRS v3.0.0. It is expected that future ERTMS applications will be tendered to further versions of the SRS.

It is noted that the ERA plan that the content for the next specification baseline will be finalised by the end of 2007. The target for delivery of working systems to this baseline is 2010/11. However, there remains serious doubt that the whole process of developing SRS v3.0.0 and the creation of its associated supporting documents will be achieved to meet these timescales. The specific obstacles to these timescales are:

- There is no formal, approved plan in place to achieve this
- The funding mechanism for the SRS 3.0.0 work is still not resolved

The way the system version evolution is managed is not yet formally agreed. Delivery of system version management with SRS v3.0.0 will be key to addressing future compatibility risks between versions.

From an engineering and commercial point of view it would be advantageous to be able to tender to a more mature specification baseline as this would negate necessary applications engineering in order to achieve certain functional gaps (i.e. level crossing functionality, cold movement detection, selective door control, communication bearer capacity) in the current specification baseline.

GSM-R

Network Rail's target for completion of GSM-R voice rollout is 2012, to meet commitments to release the NRN channels for digital TV broadcasting. ERTMS assumes that full GSM-R voice deployment on infrastructure and rolling stock will be completed by 2014, in time for the first deployment of ERTMS on the infrastructure in 2015. If there are any delays to the GSM-R voice rollout this will impact the ERTMS Baseline Plan.

5. ERTMS IMPLEMENTATION PLAN – GRAPHIC OUTPUTS

In this final section are a series of graphical representations of ERTMS infrastructure and rolling stock implementation, in initial 5 year steps (4 maps; 2009, 2014, 2019 and 2024) then 10 year steps (2 maps; 2034 and 2044). The progression of ERTMS/ETCS implementation is highlighted through the use of the Signalling Equivalent Unit (SEU), as a metric for infrastructure renewal, and rolling stock fitment indicators.

On each map, figures 1-6, the incremental increases on each of the indicators are highlighted by the red blocks i.e. volume of ERTMS fitment which has occurred within the timeframe of the previous graphic and that in the current graphic. ERTMS fitment volumes completed in previous periods is indicated by the blue blocks. The grey blocks represent the SEUs, passenger vehicles, freight vehicles and on-track plant volumes across the entire UK network.

By 2044 it can be seen that the blue blocks which highlight the volume of fitment in the Plan, do not extend to the highest level of the scales. This is because the Plan does not cover the UK National network in its entirety. These graphics only reflect the elements of the network which are included in the Plan (TEN routes and Sub National). The Plan covers 72% of the UK national network infrastructure.

Figure	Comment
1 (By 2009)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS No ERTMS Migration Projects will have been completed No rolling stock outside the Cambrian Scheme will be fitted with ERTMS No other infrastructure (expressed in terms of SEUs) in the Plan will be fitted with ERTMS
2 (By 2014)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS ERTMS Migration Projects completed and operating with ERTMS Installation on rolling stock (all types of vehicle) in the Plan will have commenced No other infrastructure in the Plan will be fitted with ERTMS
3 (By 2019)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS ERTMS Migration Projects completed and operating with ERTMS Most freight, on-track plant and a substantial proportion of the passenger vehicles in the Plan will be fitted with ERTMS Infrastructure fitment in the Plan will have progressed
4 (By 2024)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS ERTMS Migration Projects completed and operating with ERTMS Nearly all passenger, freight and on-track plant vehicles in the Plan will be fitted with ERTMS Infrastructure fitment will have progressed further
5 (By 2034)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS ERTMS Migration Projects will completed and operating with ERTMS All passenger, freight and on-track plant vehicles in the Plan will be fitted with ERTMS by 2034 Infrastructure fitment will have nearly been completed across the network
6 (By 2044)	<ul style="list-style-type: none"> The Cambrian Early Deployment Scheme will be operating with ERTMS ERTMS Migration Projects completed and operating with ERTMS All passenger, freight and on-track plant vehicles in the Plan will be fitted with ERTMS by 2034 Infrastructure fitment will have been completed across the network Channel Tunnel Rail Link operating under ERTMS
7 (By 2014)	<ul style="list-style-type: none"> Extended trial of GSM-R voice in Strathclyde area completed in 2009 GSM-R infrastructure rollout completed in 2009 GSM-R voice deployment in all rolling stock and fully operational by 2012 GSM-R voice quality of service across whole network with data Quality of Service on the HS lines (except CTRL).

Figure 1 – ERTMS Implementation by 2009

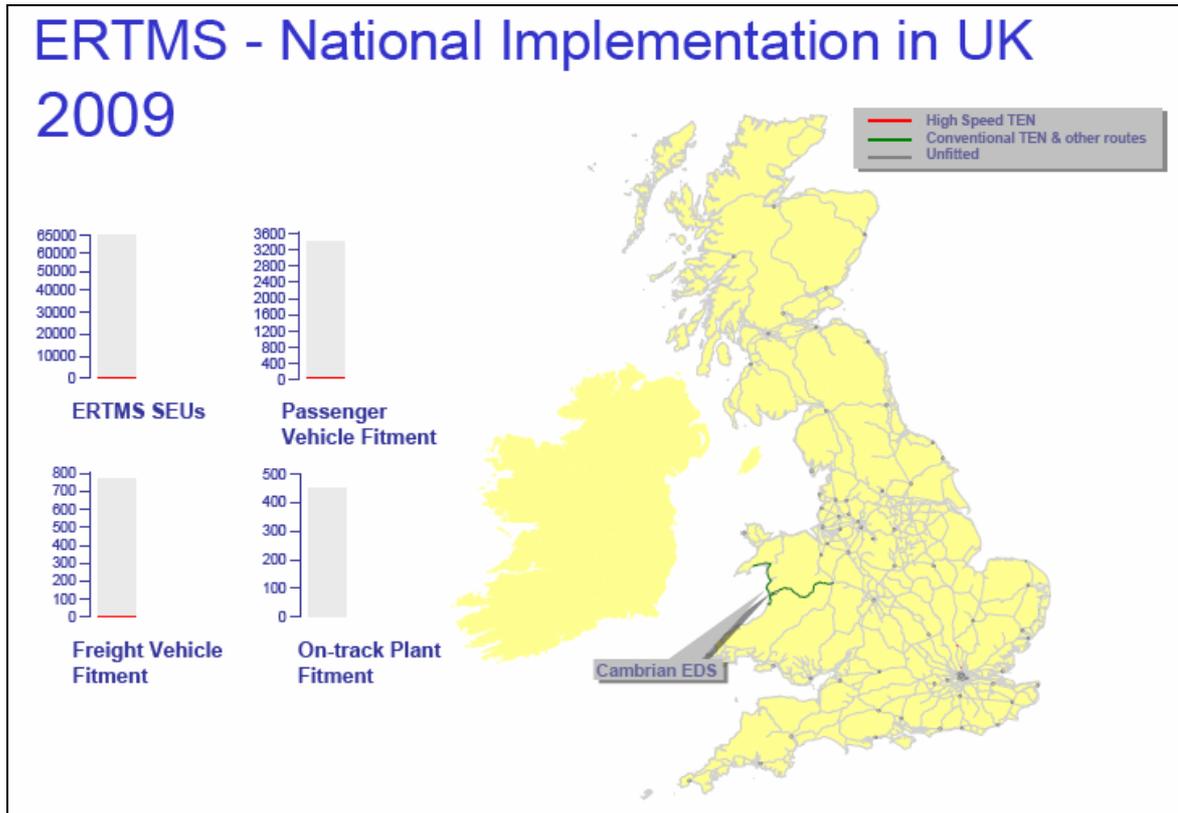


Figure 2 – ERTMS Implementation by 2014

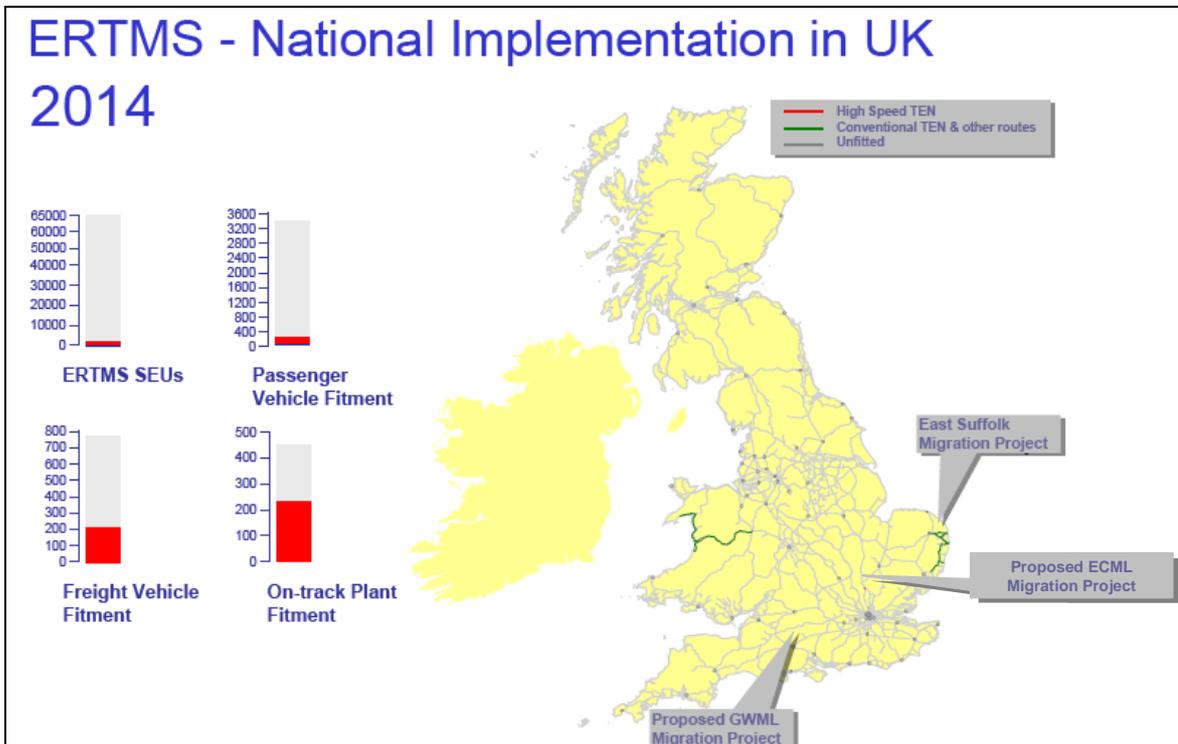


Figure 3 – ERTMS Implementation by 2019

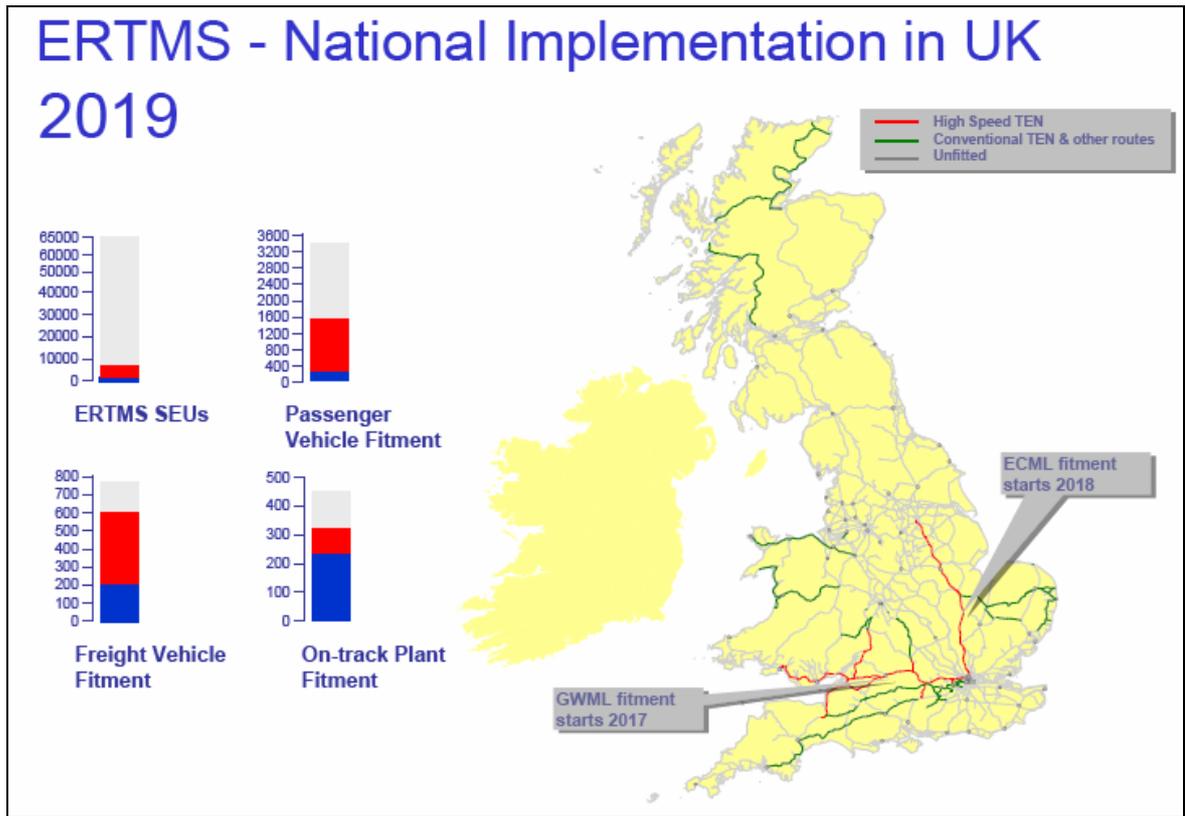


Figure 4 – ERTMS Implementation by 2024

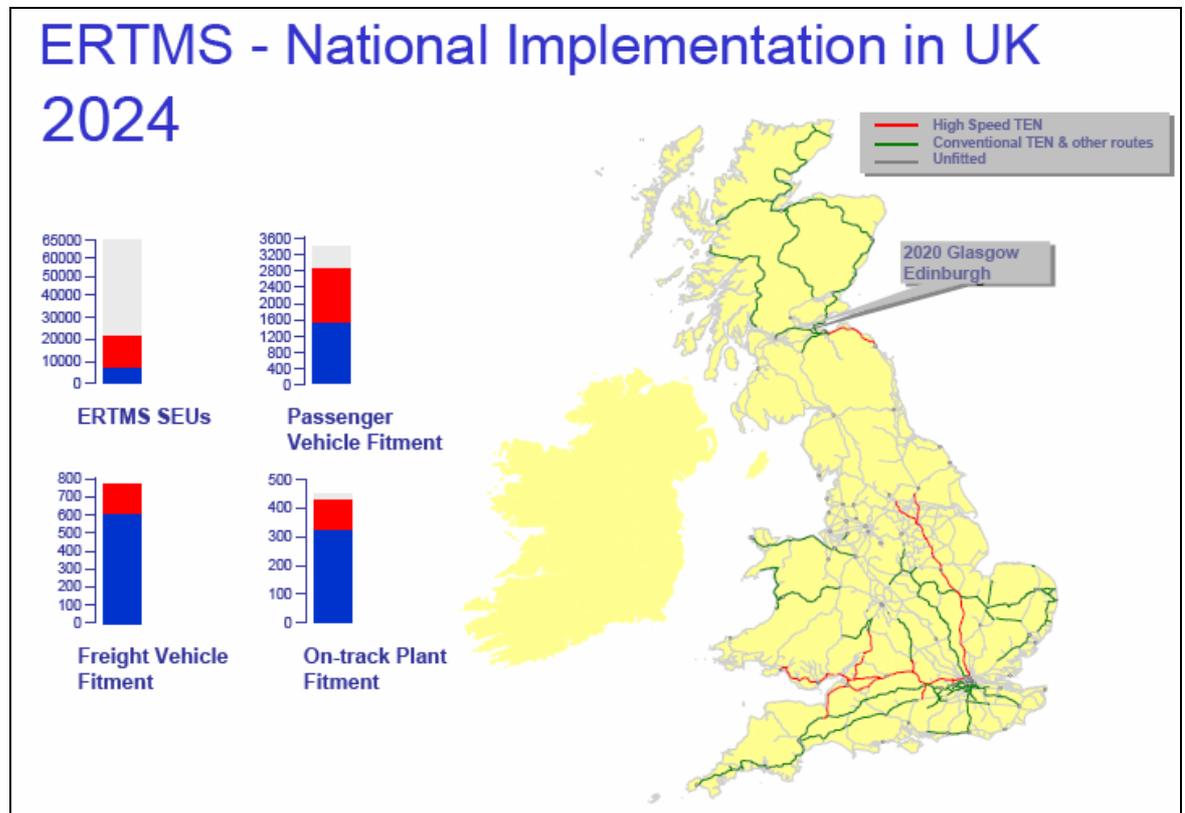


Figure 5 – ERTMS Implementation by 2034

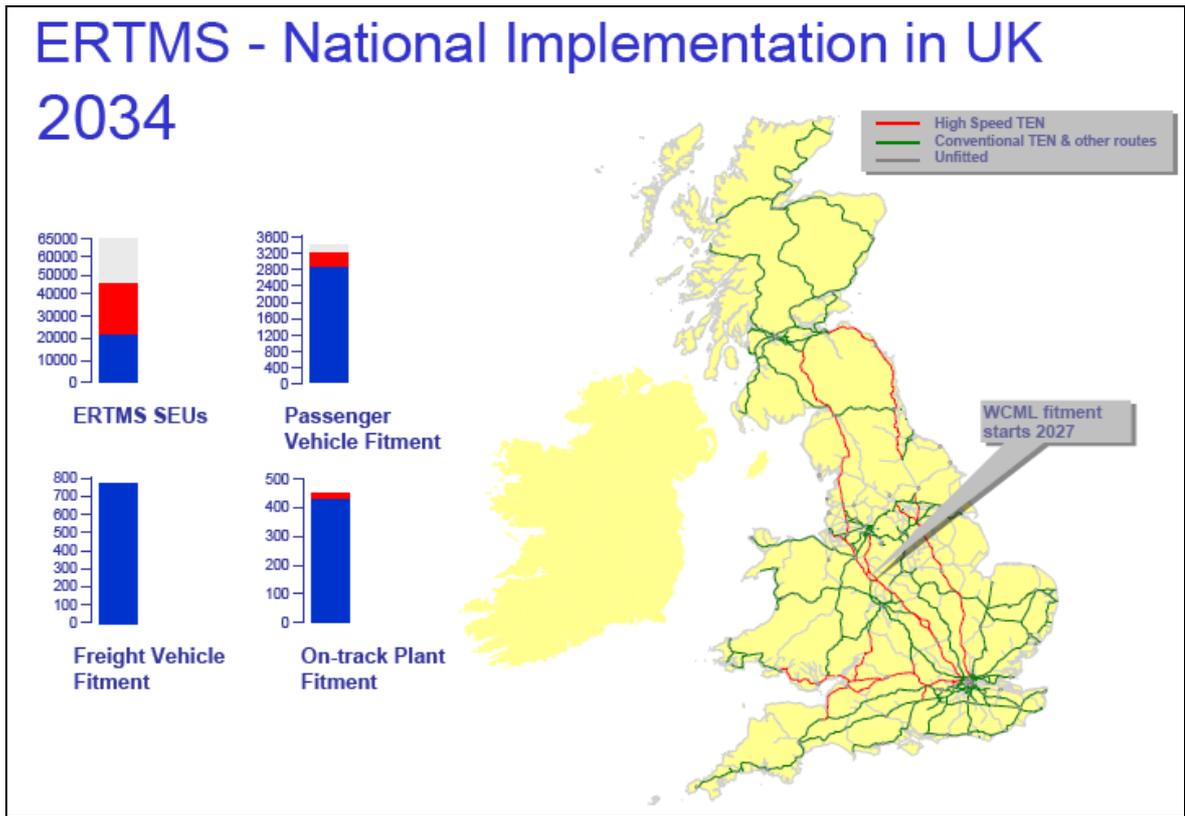


Figure 6 – ERTMS Implementation by 2044

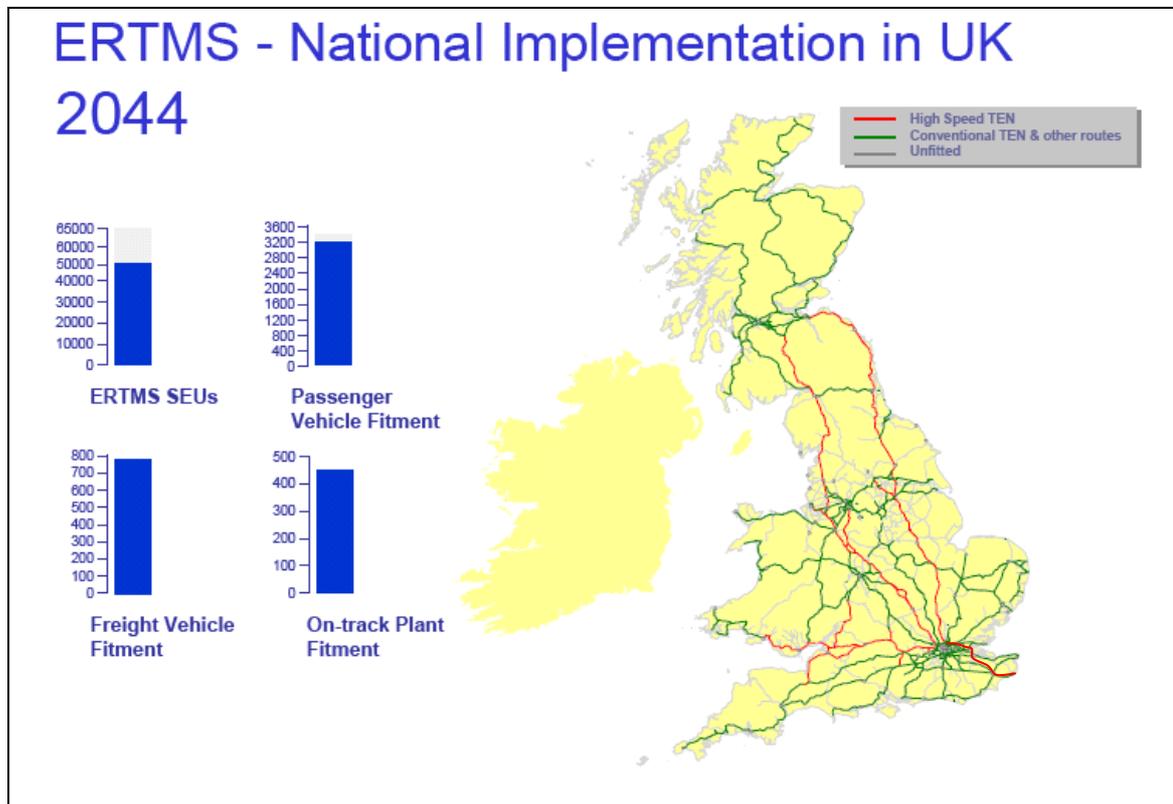


Figure 7 – GSM-R Voice Implementation by 2014

