

UK Implementation Plan for Technical Specification for Interoperability (TSI) Control, Command and Signalling (CCS)

Moving Britain Ahead

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Contents

1. General context description on Great British Rail Network	4
2. Technical Migration Strategy	
3. Open Market for GB Class B Systems	
4. Benefit Cost Analysis of ETCS	5
5.Planning	
6. Committed ETCS Projects up to 2019	
7. Targeted ETCS Projects in development 2019 – 2026	
8. High Speed Two – 2026 onwards	6
9. 2027 onwards (Control Period 7)	
10. Cross Border Vehicles	
11. Annex A: Signalling Statistics	7
12. Annex B: Cost Benefit Analysis	8

General context description on Great British Rail Network

- 1 GB Rail Network consists of 13,076 route kms and 26,914 track kms, with 58% of this electrified. In 2016/17 it has transported 1.731bn passenger journey, an increase of 152% since 1985/86, and 17.2 billion tonne kilometres were moved by freight.
- 2 Facts and figures can be found in Annex A.

Technical Migration Strategy

- 3 The technologies under consideration are European Train Control Systems (ETCS), Traffic Management Systems (TMS), Connected Driver Advisory System (C-DAS) and Automatic Train Operation (ATO), and the withdrawal of the GB class B systems Automatic Warning System (AWS) and Train Protection & Warning System (TPWS).
- 4 The technical migration strategy shall be to deploy these technologies on a business led basis but with defined functionality which migrates to coherent final states.
- 5 The coherent final states are defined as integrated TM with either ATO or C-DAS as appropriate and ETCS without signals, initially at Level 2 but migrating to Level 3 as technology readiness allows.
- 6 With the exception of replacing life expired Automatic Train Protection (ATP) on Great Western Main Line and Chilterns Railway, the replacement of class B systems does not have a strong business case on safety grounds alone. Therefore the deployment strategy for ETCS will be predicated with an emphasis on reducing cost, improving capabilities in performance and capacity.
- 7 TMS enables better utilisation of available capacity and can be implemented either independently or with other technologies. It is anticipated that at many sites, TMS will be deployed ahead of other technologies and integrated with ETCS and C-DAS/ATO when the business case for the latter is positive.

Open market for GB Class B systems

- 8 GB Class B systems consist of TPWS and AWS. Both systems are supported by an industry wide interface specification. This specification defines all the required functionality and performance in a way which does not constrain the market to any particular supplier.
- 9 There are currently multiple suppliers for most elements of these Class B systems but as demand for digital systems increases, the market for TPWS and AWS will gradually decrease and suppliers will prepare to adapt for this business change. It is anticipated that the removal of lineside signals will enable the recovery of equipment which can be recycled to sustain the network.

Benefit Cost Analysis of ETCS

- 10 The Benefit Cost Analysis (BCA) for ETCS has been done on a case by case basis rather than as a whole, following current UK strategy. The analysis can be found in Annex B.

Planning

- 11 As announced in the UK's Digital Railway strategy, digital signalling systems will form a key part in transforming how trains are run in the UK. The UK supports the development and delivery of ETCS to enable the increasing number of trains running in a faster, safer and more reliable manner.
- 12 The GB planning horizon for infrastructure investments are structured within 5 year control periods. The ERTMS implementation plan is therefore divided within these control periods.¹

Committed ETCS Projects up to 2019 (Control Period 5)

- 13 Our committed deployments are summarised as below:

- The retro-fitment of ETCS Level 2 on the Cambrian line was completed in 2011, from Shrewsbury to Aberystwyth and Pwllheli.
- ETCS Level 2/ATO is operational through the central London Thameslink Core Area and was completed in March 2018.
- Crossrail will have ETCS Level 2 from London Paddington to Heathrow Airport Junction. This was planned to be completed by late 2019 and the programme is currently under review.
- First in class fitments of in-cab digital signalling will be installed in around 200 trains by the end of 2018.

- 14 The above committed schemes have enabled us to improve future deployments, where future decision and delivery options will incorporate best practises from previous projects from the UK and abroad.

Targeted ETCS Projects in development 2019 – 2026 (Control Period 6)

- 15 The strategy for ETCS deployment is based on business need and ETCS schemes will continue to be identified and prioritised with the most compelling business cases, based on a set of principles using an integrated and targeted approach.
- 16 Through the Business Case procedures, projects that are considered to have the most benefit to proceed with further development, will have taken into account of passenger benefit, alongside the alignment of asset and rolling stock renewal dates, capacity, performance and safety advances.
- 17 £450m has been committed towards the development and delivery of innovative new digital signalling technology for these selected schemes. This funding was announced through the UK 2016 Autumn Budget as a part of the National

¹ When the UK leaves the EU we will have the flexibility to shape our domestic railway legislative framework, including where necessary on standards applicable to train control, to meet the needs of passengers and freight shippers

Productivity Investment Fund (NPIF). The NPIF programme will be a key enabler in accelerating the deployment of a selection of targeted digital schemes.

High Speed Two – 2026 onwards

18 High Speed Two (HS2) will deliver the UK's new high speed rail network, running from London to the West Midlands and the North of England. The HS2 rail network will operate under ETCS level 2 with the use of TMS and ATO. The first phase of HS2 is due to open in late 2026, with trains to travel at high speed between London and Birmingham before continuing on the existing West Coast Main Line. Further phases of the high speed rail network will be introduced thereafter.

2027 onwards (Control Period 7)

19 Schemes will be phased in such a way that they maximise synergies with signalling renewals, franchise competitions and planned fleet upgrades. As the development of digital technologies and processes matures and experience is gained from deployments, the costs for digital signalling, smart infrastructure and train control are expected to reduce. Therefore, it is anticipated that renewing Command, Control & Signalling assets with digital technologies will become 'business as usual' across the network in the longer term. The longer term plan will be regularly revisited to consider and integrate with other factors such as demand, franchising and technology developments.

Cross Border vehicles

20 There are currently no dates for existing cross-border vehicles to operate with 'ETCS only equipped on-board' on the cross-border high-speed network.

Annex A: Signalling Statistics

Asset Renewals Volumes	Renewal Type	Signal Equivalent Units (SEUs)	2016/17 Forecast
Network-wide	Full Conventional re-signalling	SEUs	584
Network-wide	ERTMS re-signalling	SEUs	0
Network-wide	Partial Conventional re-signalling	SEUs	379
Network-wide	Targeted Component renewal	SEUs	27
Network-wide	Modular re-signalling	SEUs	38
Network-wide	Level Crossing Renewals	No.	20

Safety	Measure		2016/17 Actual
England & Wales	Signals Passed At Danger	No.	253
Scotland	Signals Passed At Danger	No.	21
Network-wide	Signals Passed At Danger	No.	274

Asset Condition	Measure	Signalling Type	Total Years
Network-wide	Signalling Condition Index (SICA Remaining Life)	Total	15.50
Network-wide	Signalling Condition Index (SICA Remaining Life)	Mechanical	10.64
Network-wide	Signalling Condition Index (SICA Remaining Life)	Relay	12.92
Network-wide	Signalling Condition Index (SICA Remaining Life)	Electronic	18.94

Annex B: Cost-Benefit Analysis

Scope of CBA

We have examined a targeted selection of schemes due to their costs, revenues, monetised benefits and subsequent value for money. This process contributes to the success criteria for preferred schemes to be further developed, along with affordability and strategic fit.

Note that the selected options on ECML and SE & ELL have been broken into the following constituent parts for the purposes of the economic analysis. Each of these constituent parts can be delivered as a standalone scheme.

- ECML: Welwyn area only; Moorgate area only.
- SE & ELL: Kent area only; Sussex area only; Battersea Park to Crystal Palace only; Clapham Junction to Crystal Palace only.

Methodology

The benefits which have been assessed are:

- Journey time improvement from user benefit time savings and reduced road congestion
- Reduction in delays and reactionary delays.
- Crowding / performance benefit. This is only relevant for TfL services where they are also trying to improve the current peak time crowding issues.

Changes in revenue from more rail journeys and passengers

For the ETCS options a 60 year appraisal period has been used in line with standard appraisal methodology.

Economic Analysis for selected ETCS schemes

The below economic analysis shows that the ETCS Moorgate scheme has journey time benefits, reduced crowding benefits and non-user benefits from road decongestion. Most of the benefits are from reduced crowding.

The ETCS Welwyn scheme has monetised benefits for rail user reliability, non-user benefits from road decongestion and some environmental and accident benefits. The majority of the benefits are from improvements to rail user reliability.

Baselines

The following table sets out the baseline against which each scheme has been compared.

Table 1: Baselines for economic analysis of shortlisted schemes

Shortlisted scheme	Baseline
East Coast Main Line South (London to Grantham)	Increased East Coast frequency from 2021, with full peak suburban service, results in reduced performance of 1.5% PPM (uncommitted) Conventional signalling renewals CP6 and CP7 Kings Cross to Peterborough.
East Coast Main Line – Moorgate Branch	

Results of economic analysis

The table below presents the results from the economic analysis. As Comparative analysis of shortlisted schemes

Table 2: Comparative economic analysis of shortlisted schemes. 2010 prices and values (Model values converted in 2010 price base year using GDP deflator over whole appraisal period. Market prices. (Standard methodology)

Shortlisted scheme	PV of Costs (£m)	PV of Revenue (£m)	PV of Monetised benefits (£m)	Net of PV (£m)	BCR and VfM category
East Coast Main Line South (London to Grantham)	335	282	534	481	10 Very High
East Coast Main Line – Moorgate Branch	46	10	102	66	2.8 High

* Sensitivities

Three key sensitivities include; background passenger growth, cost assumptions and appraisal period. Sensitivity tests were used as a way to indicate the possible impact these assumptions have on the economic case results. The table below presents the sensitivity tests and impacts to the result.

Table 3: Sensitivities of the economic analysis of shortlisted ETCS schemes. Figures presented in 2010 prices and values

Shortlisted scheme	Central BCR	Low performance benefit	Sensitivity 2 Market Study growth forecasts	Sensitivity 3 30% increase in costs	With HS2
East Coast Main Line South (London to Grantham)	NPV 481 Very high	164 Medium	569 Very high	330 High	96 Medium

Shortlisted scheme	Central BCR	Sensitivity 1 Half NMF growth	Sensitivity 2 Market Study growth forecasts	Sensitivity 3 30% increase in costs	Sensitivity 4 – halving the benefits
East Coast Main Line – Moorgate Branch	2.8 High	Not assessed	4.4 Very high value for money	30% cost increase – remains high value for money, BCR 2.2	Not assessed

The central BCRs and sensitivities in this analysis are normally based on NMF.