



# Towards the Digital Railway

16<sup>th</sup> November 2017

*Working together for a better railway:*



The problem we're addressing in GB





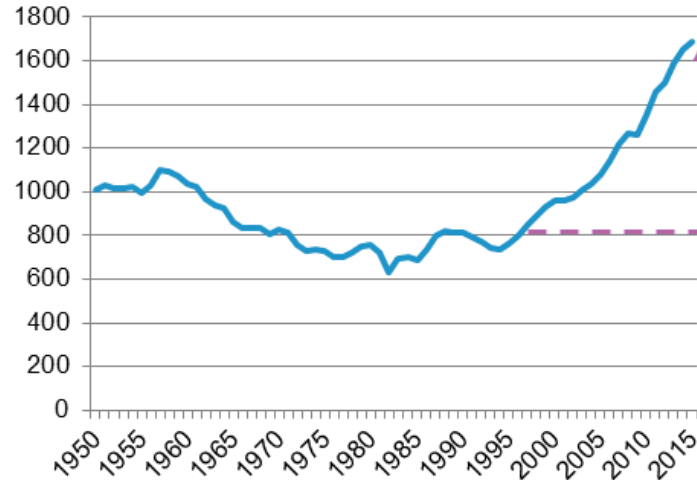




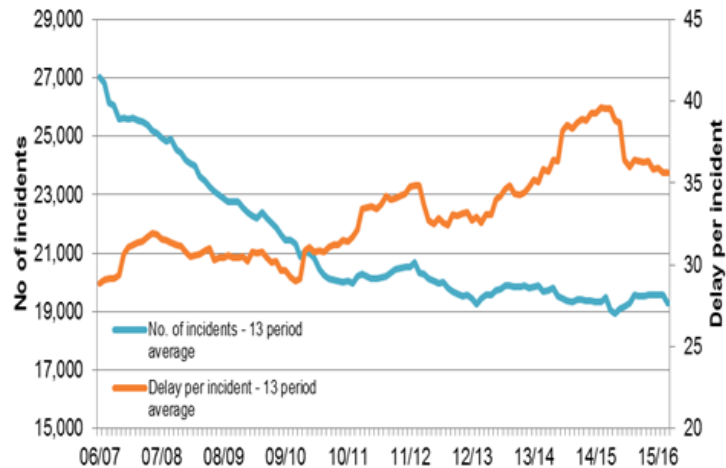
# Britain's railways are booming but are facing a capacity crunch

Passenger numbers have doubled since 1996 and are set to double again over the next 25 years.

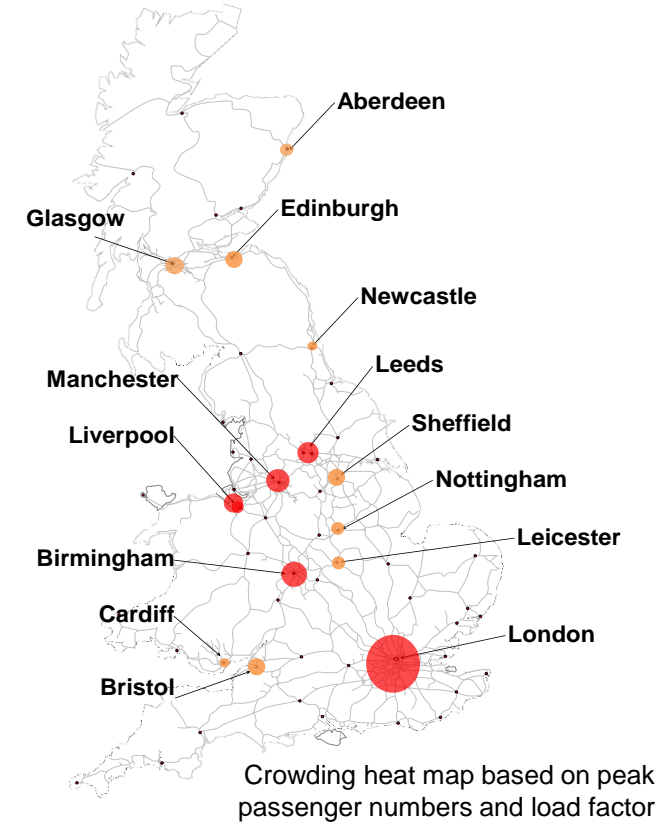
Total passenger journeys (millions per annum)



No of incidents vs Delay per incident



Number of incidents has decreased but the delay per incident has increased.

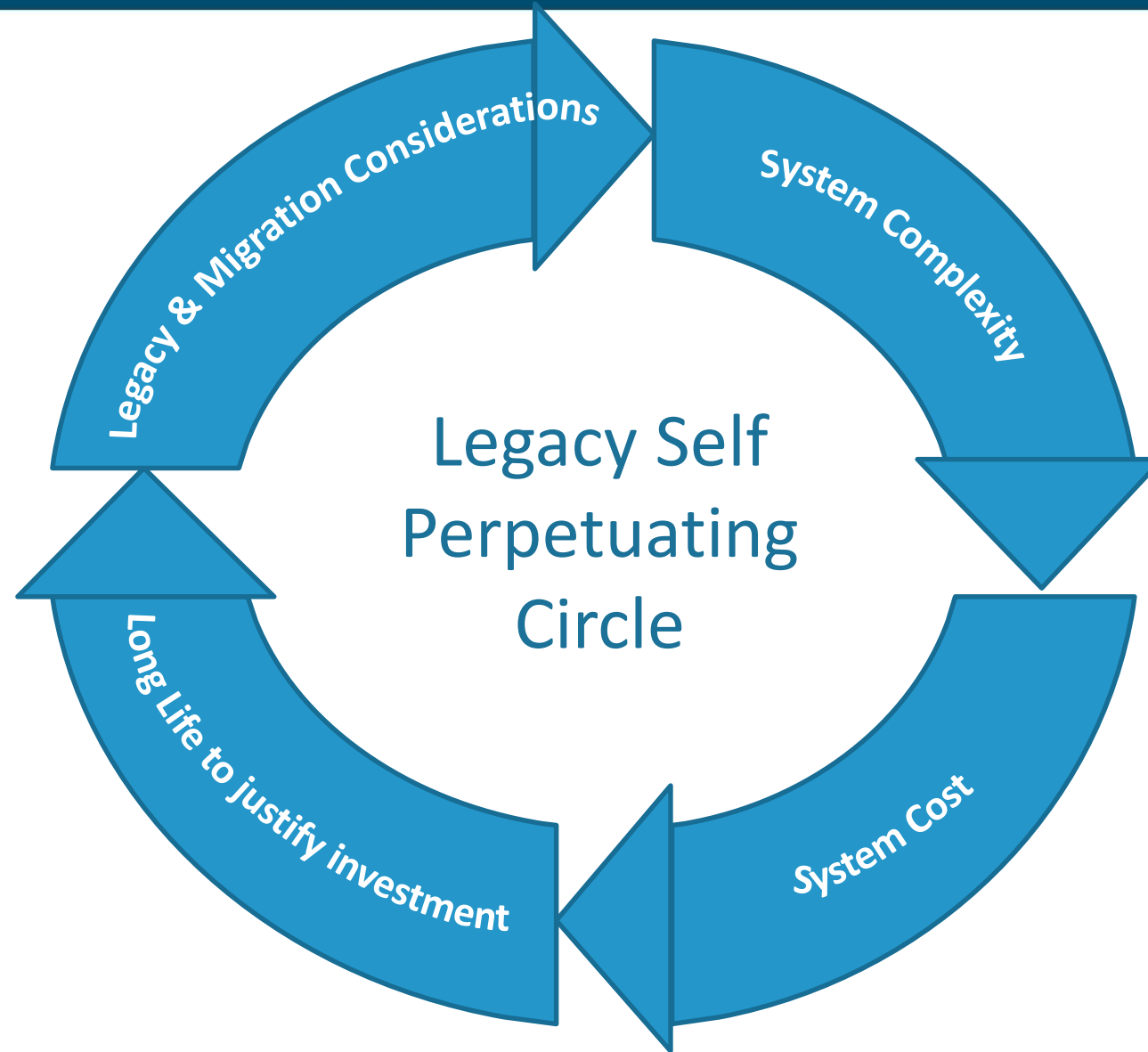


Major stations already full at peak times



The challenges we also need to consider?

- ◆ Car Sharing
  - ◆ Autonomous Vehicles
  - ◆ Road Trains
  - ◆ Budget Airlines
- 
- ◆ Costs to enhance/sustain railway in this competitive market





- ◆ Competitor transport modes have little or no legacy challenges and/or have designed them out
- ◆ What could CCS systems look like without legacy considerations?
- ◆ Can we design a migration path without legacy considerations?

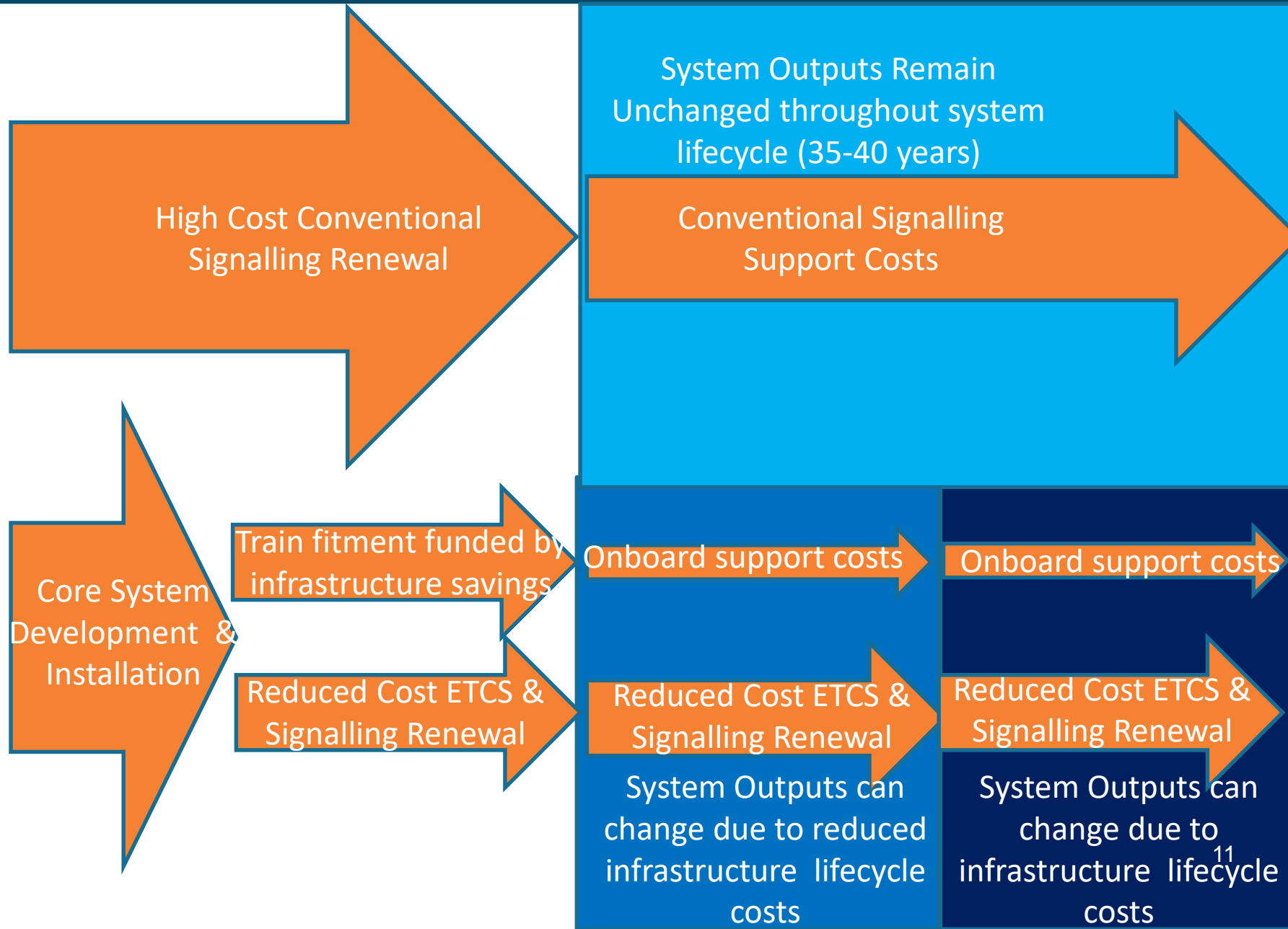
What can we do to address the challenges?

## Opportunities derived from ETCS Level 2 without Lineside signals

- With ETCS and Signalling considered as a single system
  - Signalling Principles can be simplified
  - Signalling Principles can be harmonised between Member States
  - Operating rules can be harmonised between Member States based on harmonised Signalling Principles
  - Consistent System Architecture and System Interfaces
- With a harmonised approach between Member States
  - System development costs can be applied across a greater market size
  - Existing / New Market Entrance able to invest:
    - Automated design and assurance tools for signalling/ETCS data production
    - System Platforms
- The above opportunities can lead to a significant reduction in Infrastructure Costs



# Transformational ETCS Delivery Model ?



- ♦ All trains need to be fitted with ETCS
  - ♦ Significant reduction in Infrastructure Costs could allow Railway Undertakings to be compensated (Legal/Commercial Challenges?)
- ♦ High Cost of Train fitments
  - ♦ Simplified and harmonised infrastructure can reduce legacy complexity of onboard systems and authorisation costs (technical and operational challenge?)
- ♦ Harmonisation and simplification of signalling principles and operational rules
  - ♦ Agreement required on key elements
    - ♦ Reliability, Availability, Maintainability & Safety Targets
    - ♦ Degraded Mode operations including degraded mode speeds
    - ♦ System Architecture (including safety integrity levels to support normal and degrade mode operations)

# A digital railway transformation enables a more efficient and sustainable railway in the longer term

	Current	Digital Railway Transformation
Renewals	Signalling Renewals (resignalling)	Renewal with DR technology
Cost	c. £800m p.a.	Challenge to be 10%-20% of conventional systems?
Technology	Conventional technology	Digital / faster to develop technology?
Equipment	Significant volumes of lineside equipment	Less lineside equipment with train systems funded from infrastructure cost reductions?
Maintenance	Large manual interventions	Digitally enabled asset maintenance?
	High maintenance investment	Less maintenance / subsidy?
	Capacity and performance <b>limited</b> System Sustainability <b>Challenging within current funding limits</b>	Capacity and performance <b>Uplift?</b> System Sustainability <b>Achievable within current funding limits?</b>



# ETCS is the foundation to harmonisation and full digitisation of CCS Systems



## Industry Readiness

The successful implementation of digital technologies is reliant on industry readiness to accept, understand and embed their usage and maximise the benefits of the overall systems.

## Industry Skills, Capabilities and Transformation

*Builds capacity and capability and develops expertise. Enables the workforce and industry to adopt new technologies and ways of working, build digital capabilities and maximise the benefits of the overall systems.*

## European Train Control System (ETCS) & Signalling

*allows trains to run closer together and to travel at their best speeds whilst maintaining safe braking distances.  
Can provide the catalyst for simplified/harmonised signalling principles/ operating rules leading to significant cost reduction for Infrastructure CCS Systems?*

## Connected Driver Advisory Systems (CDAS) + Automatic Train Operation (ATO)

*provides decision support to drivers in the cab so that they have the information they need at the right time to boost performance and safety.*

## Traffic Management (TM)

*maximises performance as trains flow across the network, maximising the throughput that existing track can support and adapting in real-time as network conditions change to aid rapid recovery.*

## Core systems - Telecoms + Data

*will underpin and connect all these systems through Fixed Telephone Network (FTN) and Global System for Mobile – Railway (GSM-R). and/or Future Rail ways Mobile Communications System (FRMCS)*



# The benefits of a Digital Railway will impact both business and society





# Conclusion

- 1 Railways are facing a number of challenges such as capacity, increased competition and sustainability of existing CCS systems
- 2 A migration approach that facilitates migration from today's legacy systems but also allows simplified and harmonised signalling principles and operational procedures should be able to significantly reduce CCS system costs
- 3 ETCS in conjunction with signalling system simplification provides the foundation for such an approach - further focused developments through S2R and EULYNX to provide a consistent system architecture and CCS implementation to deliver the efficiencies are required .
- 4 A harmonised approach will provide economy of scale for developing systems to achieve an efficient CCS system based on ETCS. Previous attempts at harmonisation have had limited success due to constraints imposed by compatibility with existing (and different) legacy systems.
- 5 With the foundations in place through ETCS, are the challenges sufficient to provide the impetus for railways to truly consider a transformational approach to the implementation of standard CCS systems with harmonised operating rules?

## Digital Railway



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**Rail Delivery Group**

