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# ***Best Practices in Intercity Rail An Infrastructure Manager's Perspective***

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# *Network Rail in Context*



# Overview of Network Rail



- ▶ We own, run, maintain and develop 20,000 miles of track, 40,000 bridges, 48,000 signals and 700 tunnels
- ▶ We own 2,500 stations and operate 17 major stations
- ▶ We carry 20,000 train movements every day
- ▶ We own and operate the second busiest in Europe, and the fifth busiest railway network in the world
- ▶ We operate and maintain the UK's high speed rail infrastructure
- ▶ We are a £6bn business with 35,000 staff

# Track Access Agreements

- ▶ Rail services on Network Rail's infrastructure are provided by 29 operators under regulated access contracts. These track access contracts capture:
  - ▶ Number, frequency and other characteristics of the operator's services
  - ▶ Routes covered by the contract
  - ▶ Restrictions of use, e.g. related to Engineering Access
  - ▶ Track charges
  - ▶ Performance regime
- ▶ Network Rail is legally required to reimburse train operators in case of unavailability of the infrastructure
  - ▶ Schedule 4: service variations by Network Rail
  - ▶ Schedule 8: performance regime

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# *Britain's Classic High Speed Intercity Network*



# Principal Long Distance Operator Routes



— Electrified Routes (25kV, 50Hz AC)  
 - - - Non-Electrified Routes

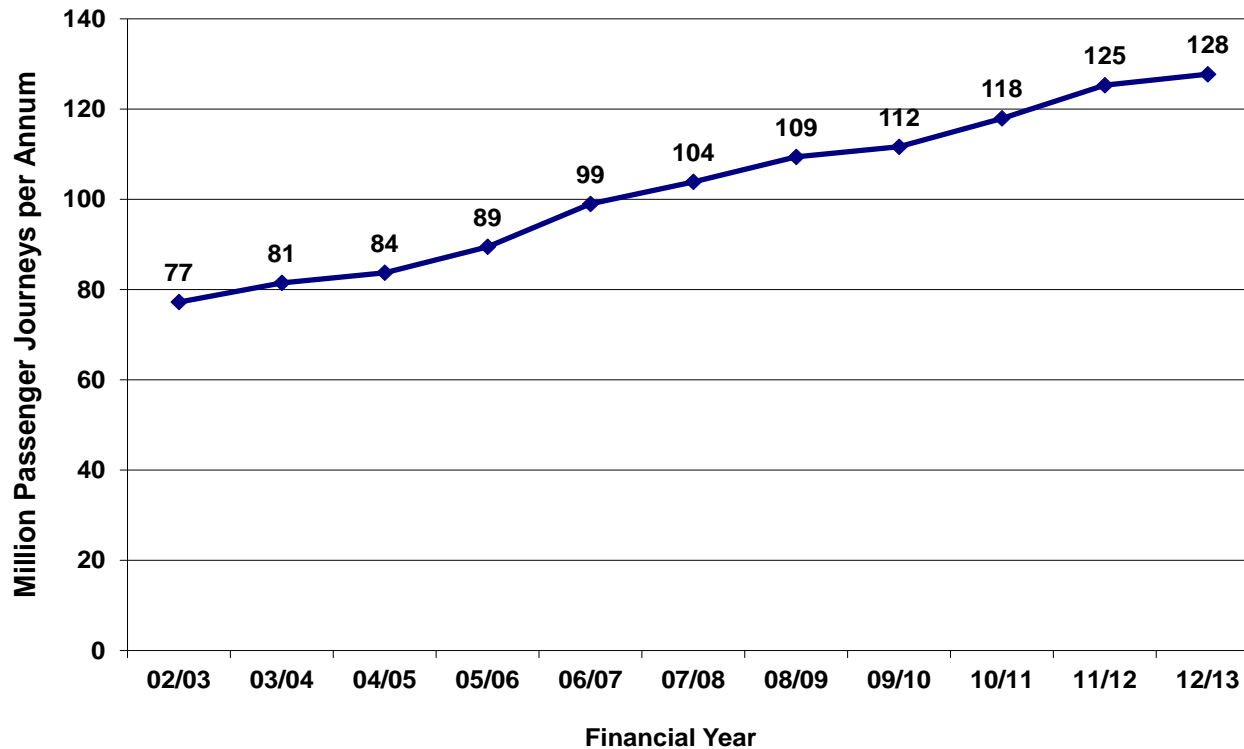
— East Coast Mainline  
 - - - Midland Mainline  
 - - - West Coast Mainline  
 — Great Western Mainline

All routes: 2-4 tracks, max speed 125 mph



	Distance (miles)	Quickest Journey Time	Quickest Avg Speed (mph)	Weekday Departure
London - Birmingham	115	1hr 13m	95	48
London - Manchester	184	2hr 00m	92	46
London - Glasgow	401	4hr 08m	97	15
London - Edinburgh	393	4hr 00m	98	19
London - Leeds	185	1hr 59m	93	33
London - Bristol	117	1hr 37m	72	33
London - Sheffield	165	2hr 00m	83	29

# Growth in Passenger Journeys 2003-2013



- ▶ 128 million long distance rail journeys were made in the UK in 2012/13 - this is broadly four times the number of passengers AMTRAK carries



# Investments to Accommodate Growth

Annual average network growth of 5.2% over last 10 years and 2.5% over next 20 years  
 £8bn invested over the last 5 years and £12bn of planned over the next 5 years

## Stations:



London Bridge: £500m



London Kings Cross: £550m



Birmingham: £600m



Reading Area: £850m



Edinburgh: £100m



London Thameslink KO1: £2bn

## Track and Signalling:



Crossrail connections: £2.3bn



Great Western Electrification: £5bn



Manchester (NH): £560m



Trans-Pennine Electrification £100m



Newport Area signalling: £157m



London Thameslink KO2: £4bn

# Improving Performance and Reducing Costs

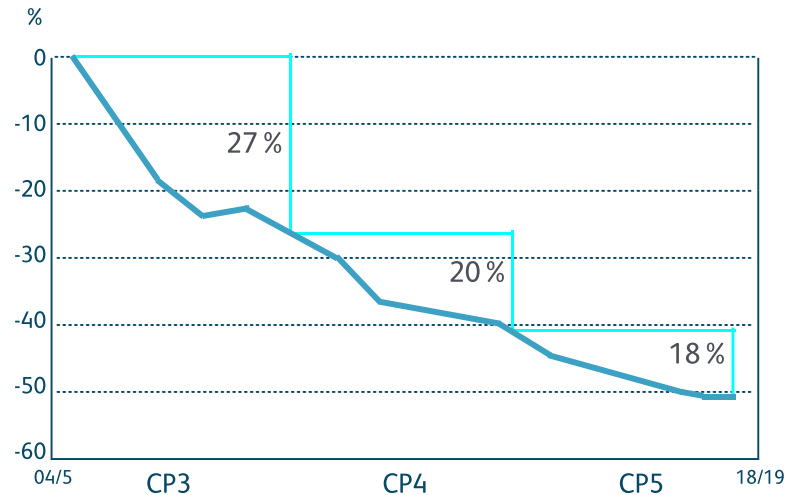


# The Efficiency Challenge

Network Rail has a number of initiatives to improve performance and reduce operating costs:

- ▶ An operating strategy for 21st century
- ▶ Improved asset information
- ▶ Improved maintenance and renewals techniques

Network Rail Efficiency



# An Operating Strategy for 21<sup>st</sup> Century

£1.8bn over the next 15 years with benefits of £2.5bn over the next 60 years

Key components are:

- ▶ 12 new Rail Operating Centres (ROCs) replacing 500+ mechanical signal boxes
- ▶ Co-location of signalling, control and electrical control roles and NR & and Train Operating Company staff
- ▶ Traffic management technology that will increase capacity and improve reliability through:
  - ▶ Real-time planning/prediction; and provide
  - ▶ Real time information for passengers



# ORBIS – Offering Rail Better Information Services

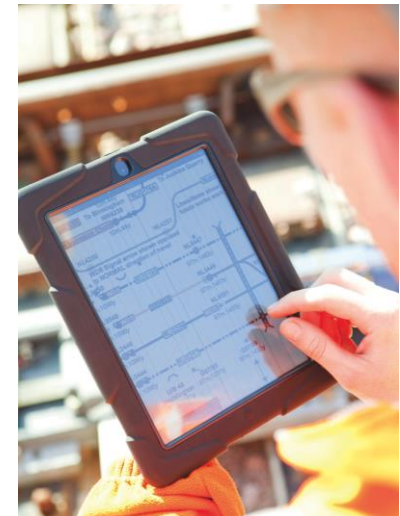
## Three principal objectives:

- 1 Establish a sustainable and trusted information base
- 2 Align information to business process
- 3 Maintain the linkage between fixed, topological, document & vehicle information types

Investment of £327m, with benefits of circa £270m over the next 5 years and circa £100m pa thereafter

## Key outcomes

- ▶ Easier data capture and safer working
- ▶ Asset management policy optimisation
- ▶ Improved investment planning
- ▶ Legislative compliance and industry-wide data sharing
- ▶ Improved operational performance



# Plain Line Pattern Recognition

- ▶ New technology developed to detect defects in track and fixings, fitted to a measurement train
- ▶ System uses 7 line scan cameras to scan the track:
  - ▶ Data is decoded using machine vision software
  - ▶ Data is synchronised with real time positioning system and geometry data
  - ▶ Reports are dispatched to teams on the ground
- ▶ Faults can be accurately located meaning staff can focus on fixing problems rather than walk along a 125 mph railway
- ▶ System allows targeted maintenance of assets that need dealing with instead of blanket renewals



# Remote Condition Monitoring

- ▶ To-date more than 12,000 assets are live on the Intelligent Infrastructure system, including points, track circuits and signal power supplies
- ▶ So far 153,000 delay minutes have been avoided, saving £4.7 million
- ▶ A further 23,000 assets including track circuits and points heating fitments will be added, with benefits expected to rise to £14m per annum



# High Output Track Renewals

- ▶ We increasingly carry out work at night to reduce disruption
- ▶ Significant investment in high-tech track renewals technology and automation to speed up track renewals
- ▶ Our high-output systems can replace between 400-600 metres of track and ballast within eight hours (overnight)
- ▶ Four high output ballast cleaning and track renewal systems in operation on our network





# Modular S&C Installations

- ▶ Standard designs that can be built in factories
- ▶ Tilting wagons allow built-up switches (26.5 m long, 3.7 metre bearers) to be carried at 60 degrees angle within the current loading gauge
- ▶ Modular S&C installations have significantly reduced the time taken to complete renewals, allowing replacements within overnight possession windows
- ▶ In addition mobile maintenance workshops are used for component replacement (preparation & follow-up work to core renewals)



# Conclusions

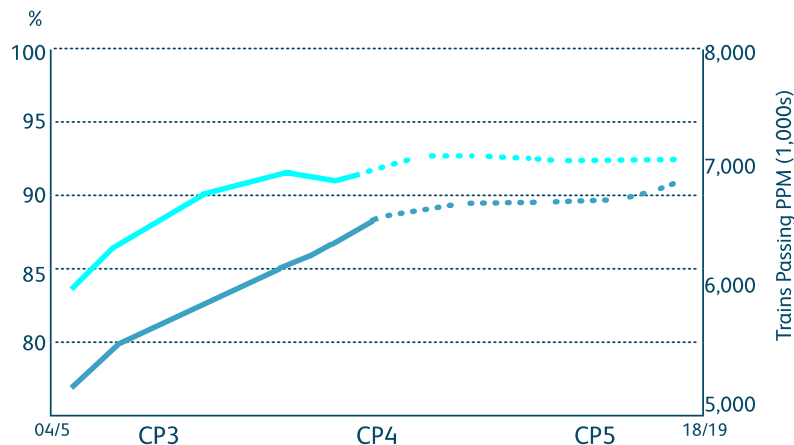


# Conclusions

- ▶ Significant improvements in performance and operating costs over last 10 years have been achieved
- ▶ However, Network Rail is on a journey of continuous improvement

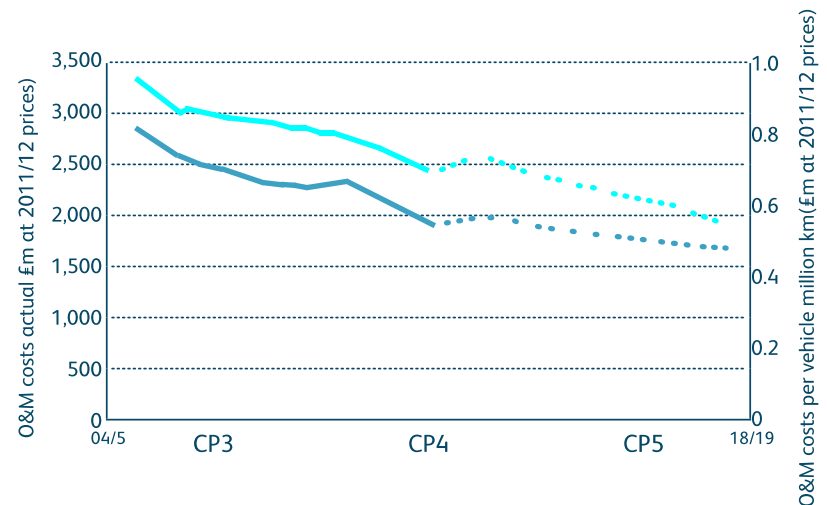
## Punctuality

— PPM Actual      — Trains within PPM(1,000s) Actual  
⋯ PPM Forecast      ⋯ Trains within PPM(1,000s) Forecast



## Operating and Maintenance Unit Costs

— O&M Costs Actual      — O&M per Vehicle km Actual  
⋯ O&M Costs Forecast      ⋯ O&M per Vehicle km Forecast



**Thank you**

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