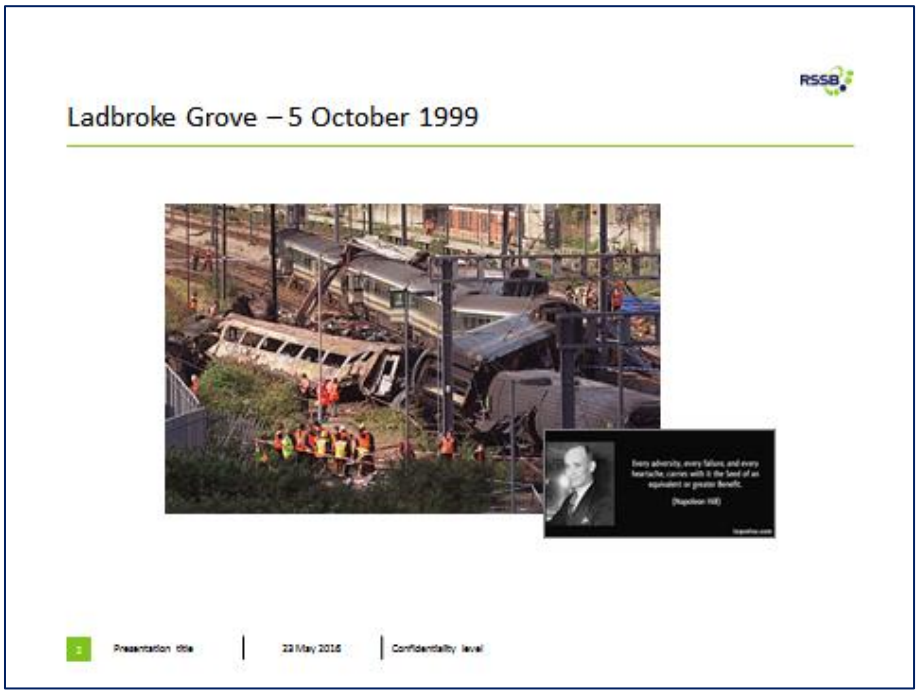
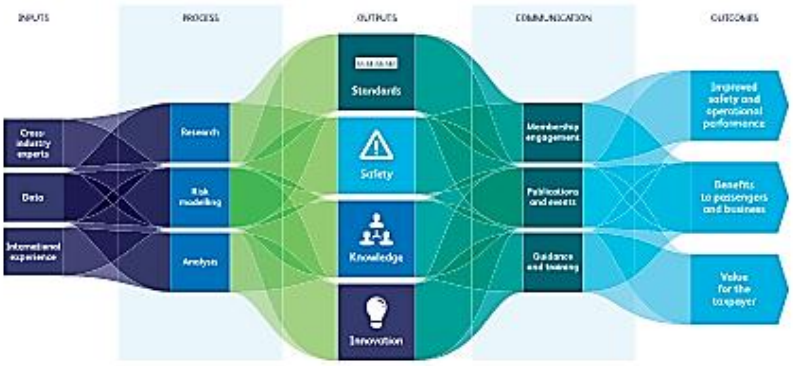
附件

簡報資料摘錄

(一) Presented by Chris Fenton and John Abbott RSSB

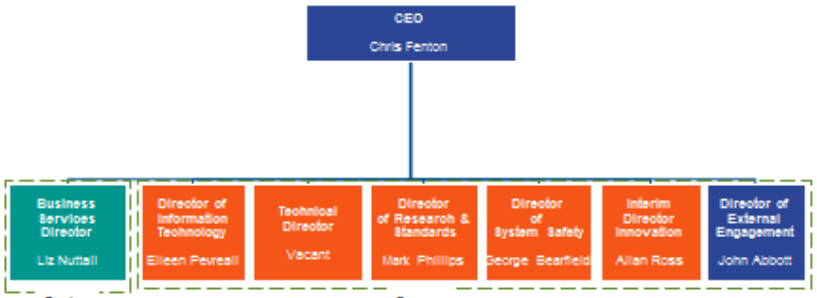


RSSB

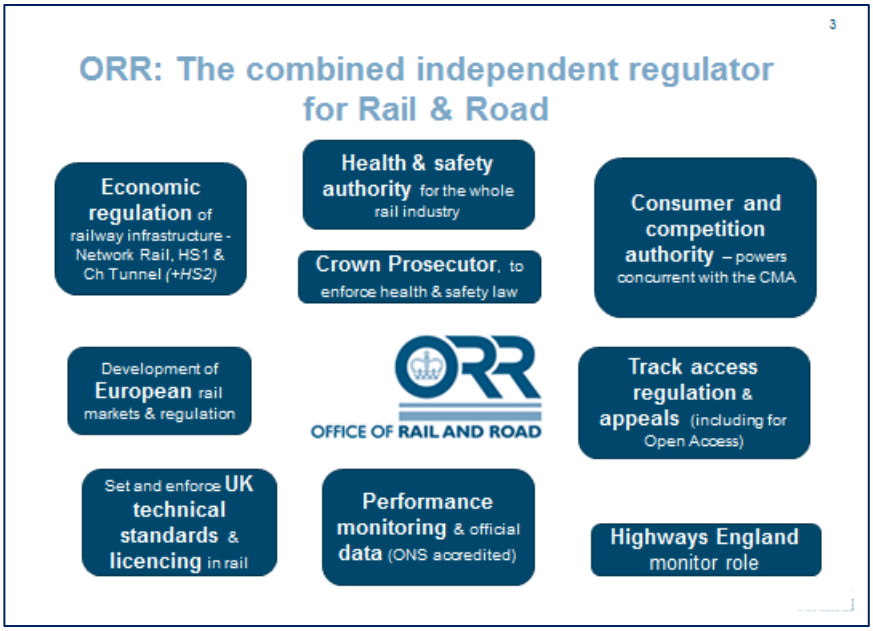


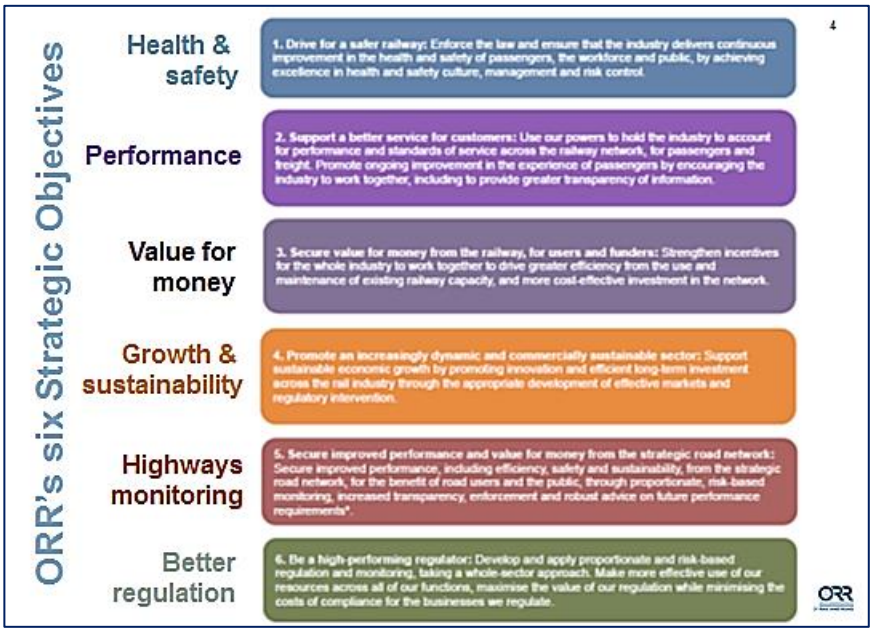
Framework

Senior Leadership Team



(二) Rail regulation in Great Britain ORR





6

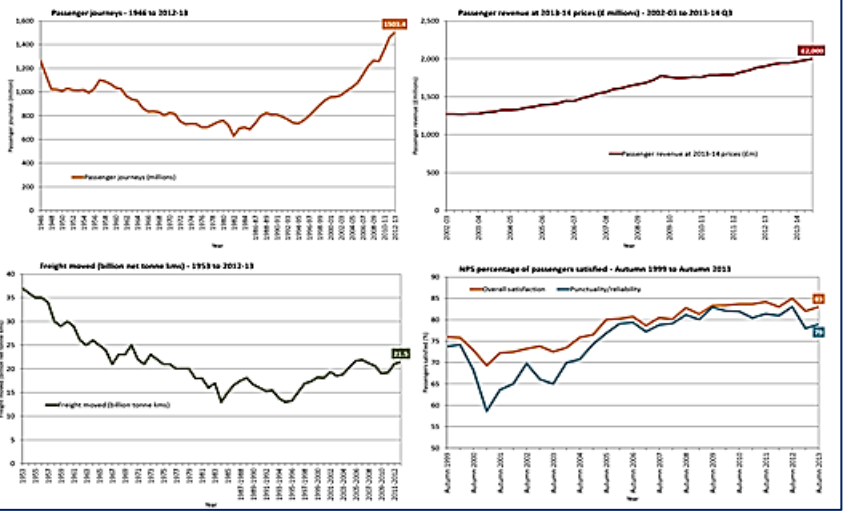
Railways in Great Britain: Key Stats

- 16,000 route km, one-third electrified
- 2,500 stations
- 130,000 staff (30,000 in Network Rail)
- 9,000 level crossings, 40,000 bridges and tunnels
- Over 23,000 trains daily (mostly passenger but over 1000 freight trains)
- Over 3 million passengers each week day, heavily focused on London where rail has a very strong market position
- 60 million tonne kilometres of freight moved every day, mostly coal and containers. But overall rail share of freight market about 8%
- £5 billion per annum subsidy focused on the passenger railway

ORR

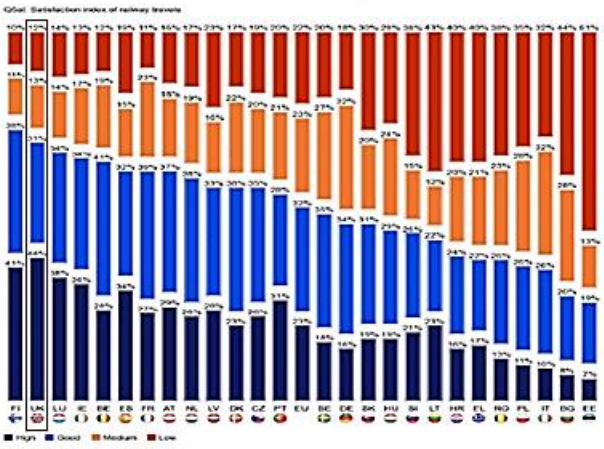
7

Significant growth in GB rail since 1990s



8

High levels of passenger satisfaction: Eurobarometer comparison index

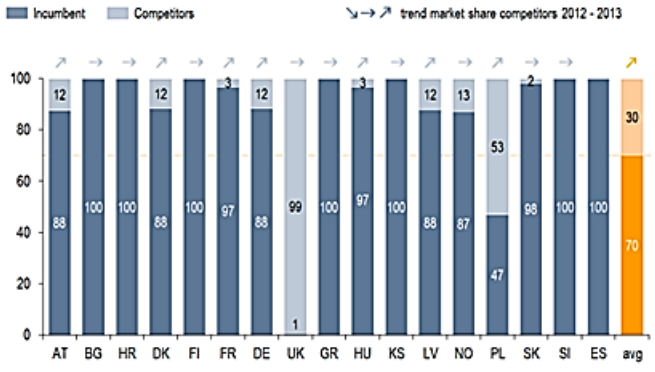


Source: EU Commission Eurobarometer survey, Dec 2013

9

Rail: Private vs State Ownership in Europe

Market shares comparison between European countries, 2012-13

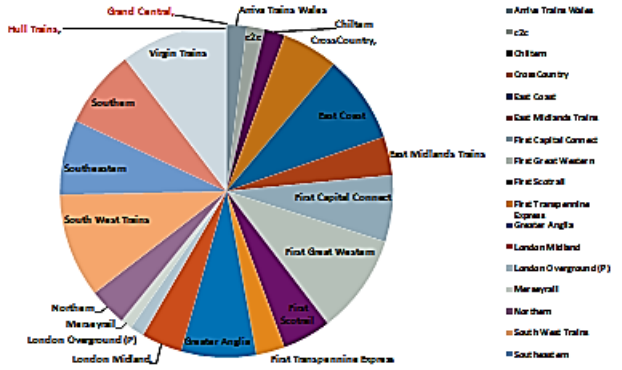


Source: IRG-Rail monitoring report, Commission RMMS report

10

A diversified market

Franchised & open access operators. Shares of passenger kilometres, 2013-14



ORR

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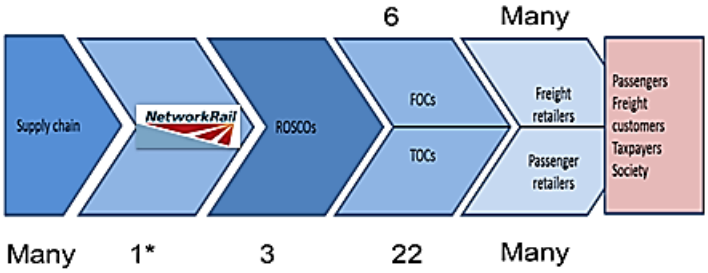
The UK rail industry value chain



* Plus High Speed 1 and others

Source: Office of Rail Regulation

ORR

13

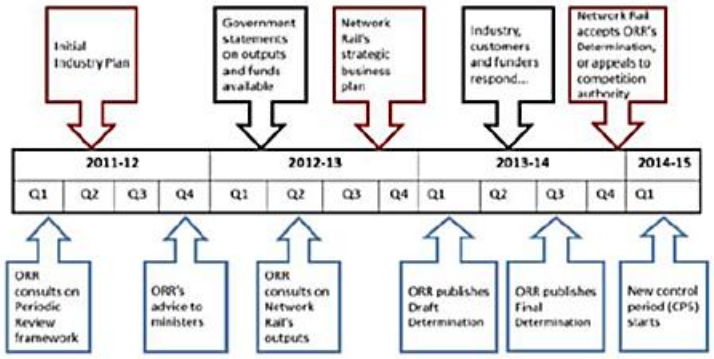
Monitoring and enforcing delivery

- Network Rail is the monopoly infrastructure manager. It operates under a licence enforced by ORR.
- ORR uses that licence to monitor Network Rail delivery against outputs set by periodic reviews and other requirements.
- If Network Rail fails to achieve these outputs, or is likely to fail, we can require it to take remedial action and/or levy penalties.
- We can change the licence by agreement or by referral to the Competition Commission if Network Rail do not agree.
- This provides assurance to government about what it is getting for the money; it complements the contracts individual train companies have with Network Rail.
- Wide range of powers (financial penalties, orders, investigation)

ORR

14

Periodic review process in the UK

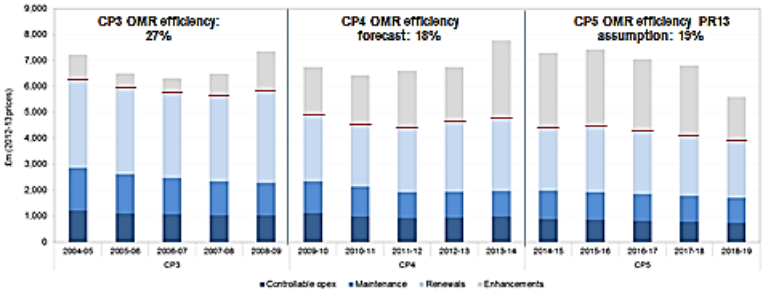


Source: Office of Rail Regulation

ORR

1

Shift from maintaining the network to enhancing it



1

ORR

16

Moving towards a more regional approach to regulation of infrastrucrure

Today

Limited concession (PPP) for HS1
South West Alliance
Limited devolution outside England
Metropolitan transport authorities

Future?

Further route alliances?
Full devolution to Scotland?
Mainline route concessions or sale?
Local public partnerships?
HS2 – concession for infrastructure?

ORR

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Conclusions

- A growing railway (passenger and freight). But growing passenger/freight use of network poses real future challenges
- Improved performance and safety, record levels of passenger satisfaction.
- Innovative and competitive supply market
- Costs are reducing but scope to go further. Government is determined to get more value for money from railways, and has asked for more infrastructure devolution and 'alignment of incentives'.
- With clear government and regulatory support

ORR

(三) ORR　strategy and approach to health and safety regulation Johnny Schute

22 February 2016

What Excellence is…

It is about	It is not about
trust	gold plating
people and behaviours	harming workers
legal compliance	having dissatisfied stakeholders
transparent reporting	blame
two-way communication	lots of paper
having a strong continuous improving learning culture	tick box audit
managing risks	inappropriate standards and procedures
doing things right the first time	paying less attention to contractor safety
making the most of everyone's capabilities	endless debate or complex processes

4

OFFICE OF RAIL AND ROAD

Our law is European and home-grown…

- European Railway Safety Directive 2004/09;
- Domestic Health & Safety at Work etc Act 1974;
  - ROGS Regulations;
  - We grant permission to each business on the basis that they control risks using their management system:
    - We re-do this at least every 5 years; and
    - We check that their system is up to a common European standard;
  - We check control of risks by management in each business through our risk based plans for inspections and investigations .

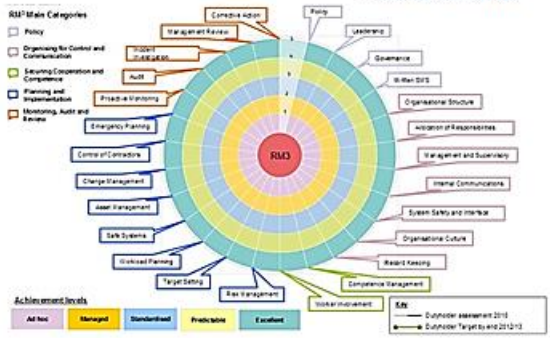
5

OFFICE OF RAIL AND ROAD

The Railway management Model RM3

What excellence looks like:

- Governance, Policy and Leadership
- Organising for delivery of control and communication
- Co-operation, competence and development of employees at all levels
- Planning and implementing risk controls
- Monitoring, review and audit



OFFICE OF RAIL AND ROAD

ORR's priorities

Risk Areas & their work programmes
Level Crossings
Train control / protection technologies
Infrastructure
Rolling Stock
Interface system safety
Workforce Safety
Workforce occupational health
Europe

Enablers & their work programmes
Long term H&S vision
Leadership and Culture
Safety by design
H&S management systems
Management of change
Competence

7

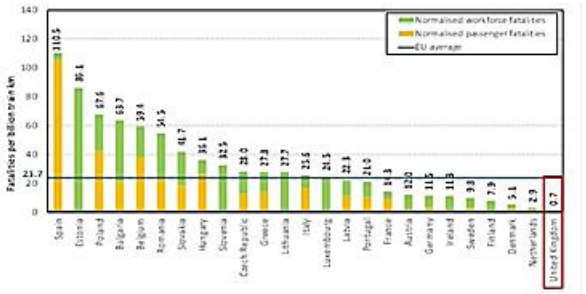
OFFICE OF RAIL AND ROAD

Our RM3 – R Analysis

10

OFFICE OF RAIL AND ROAD

Passenger and workforce fatality rates across the European Union's railways, 2009-13



11

OFFICE OF RAIL AND ROAD

Key messages in the Chief Inspector's report 2015

- The on–going challenges of managing growth and change;
- Maintaining and renewing a safe, suitable mainline infrastructure;
- Continuously improving health and safety culture, with a particular emphasis on health (as well as safety) and we are still some way from achieving excellence; and
- Safety by design.

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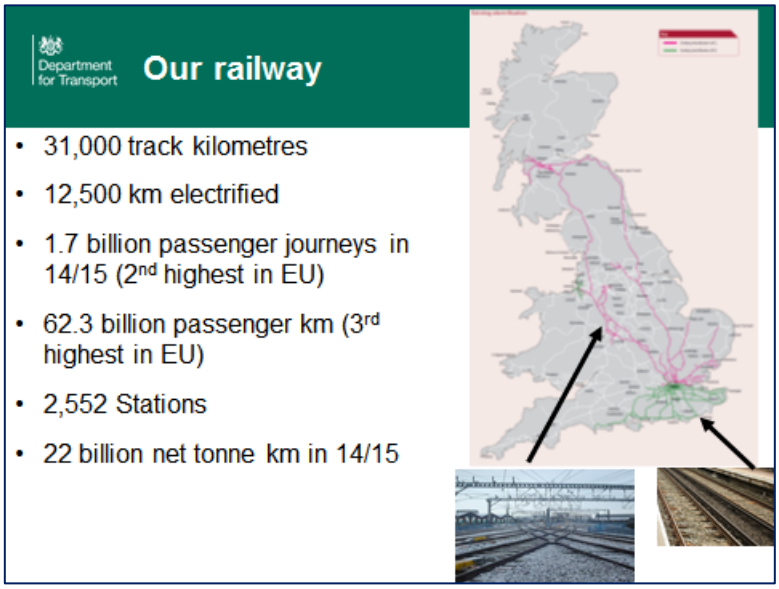
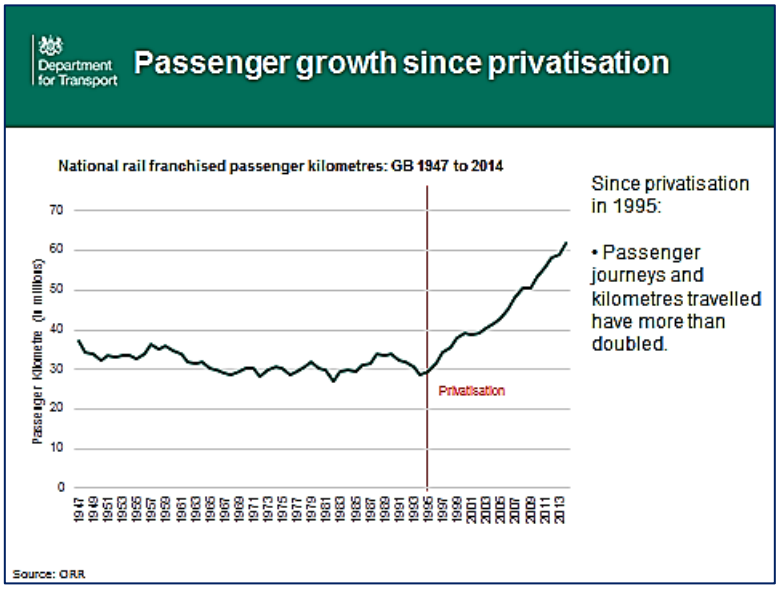
ORR
OFFICE OF RAIL AND ROAD

(四) Presentation on UK Rail/ Monday 22 February 2016 Robin GROTH

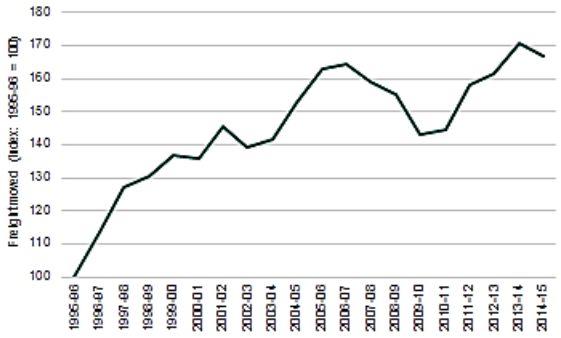
Rail Technical International and Safety





Rail freight growth since privatisation

Total freight moved: GB 1995-96 to 2014-15



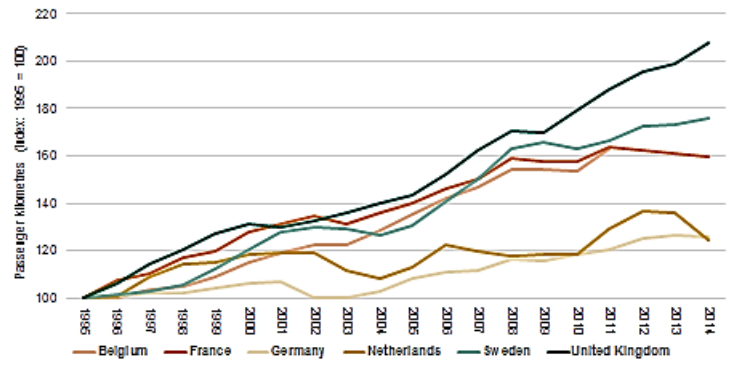
Since privatisation in 1995:

- Volume of rail freight moved has increased by over 65%.

Source: ORR

European comparisons

Passenger kilometres travelled: 1995 to 2014

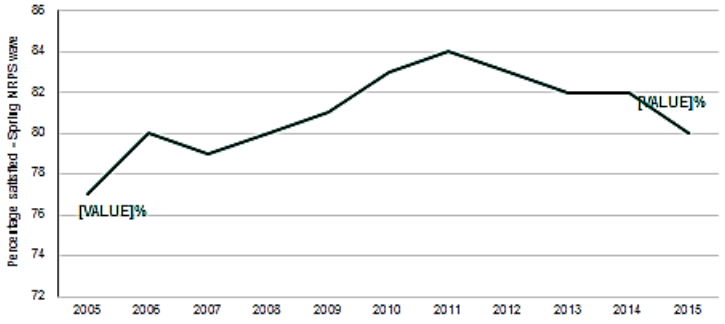


Source: OECD

Department for Transport

Passenger satisfaction has improved

Percentage of passengers satisfied with their journey overall, NRPS Spring waves only, 2005-2015

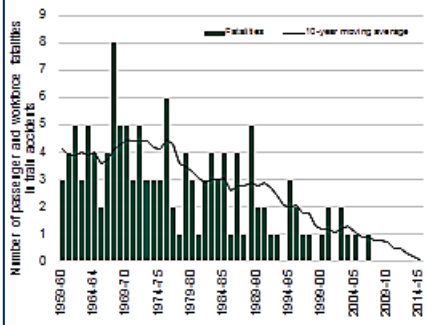


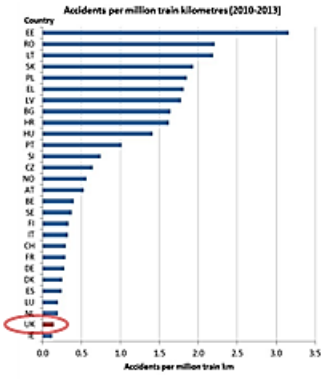
Source: Passenger Focus

Department for Transport

Safety

Train accidents with passenger or workforce fatalities: 1959-60 to 2013-14





Source: ORR

Department for Transport

Infrastructure

Network Rail owns and operates the National Rail network.

High Speed One owns and operates the high speed line from London to the Channel Tunnel

Eurotunnel owns and operates the Channel Tunnel

Department for Transport

Infrastructure - Network Rail

- Network Rail owns and manages the rail network
- ORR regulates Network Rail, safety, and capacity allocation

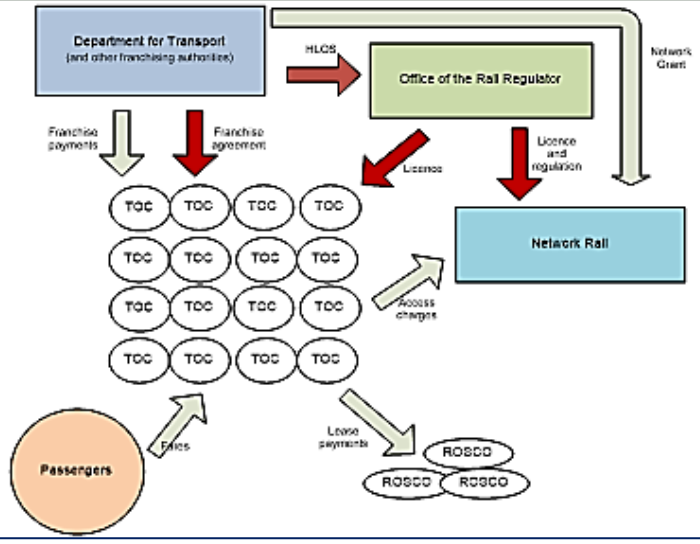
Department for Transport

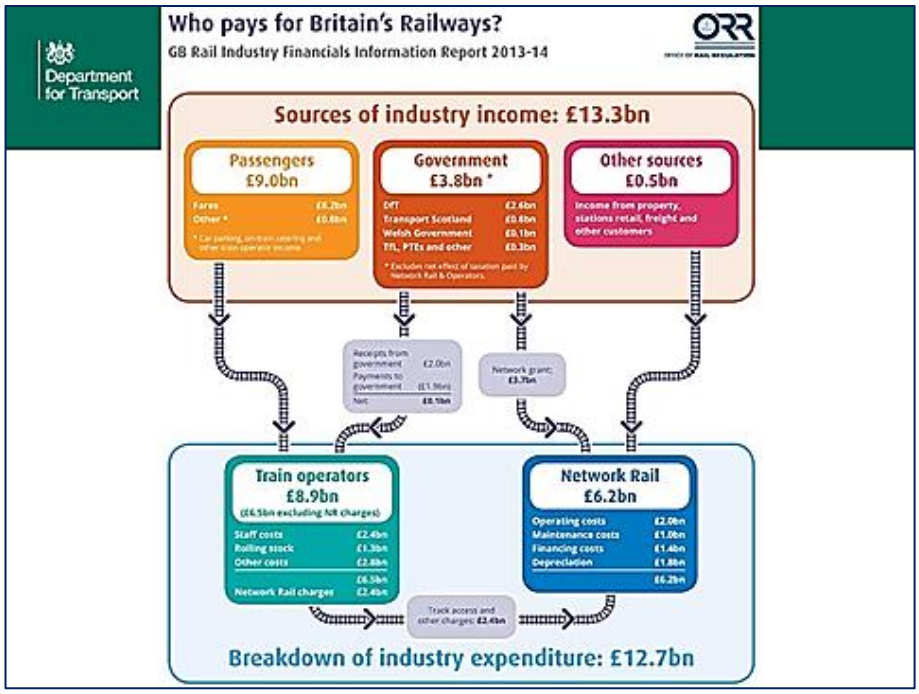
Train operators

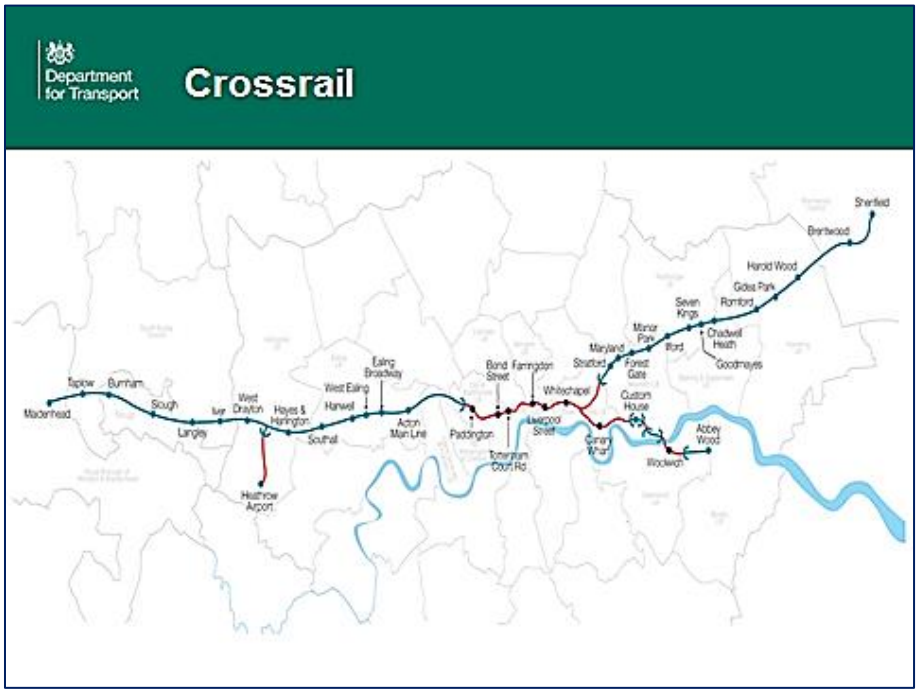
- Most passenger services operated by private companies under contract to public authorities ("franchises")
- Some "open access" passenger operations
- Private rail freight operators
- Most passenger rolling stock is owned by leasing companies
- Rail passenger franchises are awarded and managed by public authorities

Department for Transport

Industry Structure



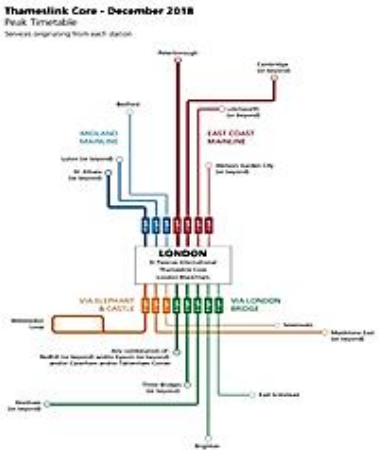

Department for Transport
Who pays for Britain's Railways?
GB Rail Industry Financials Information Report 2013-14
ORR
Sources of industry income: £13.3bn
Passengers
£9.0bn
Fares £8.2bn
Other * £0.8bn
Government
£3.8bn *
DfT £2.6bn
Transport Scotland £0.8bn
Welsh Government £0.1bn
TfL, PTEs and other £0.3bn
Other sources
£0.5bn
Income from property, stations retail, freight and other customers
Train operators
£8.9bn
(£6.5bn excluding NR charges)
Staff costs £2.4bn
Rolling stock £1.3bn
Other costs £2.8bn
£6.5bn
Network Rail charges £2.4bn
Network Rail
£6.2bn
Operating costs £2.0bn
Maintenance costs £1.0bn
Financing costs £1.4bn
Depreciation £1.8bn
£6.2bn
Breakdown of industry expenditure: £12.7bn

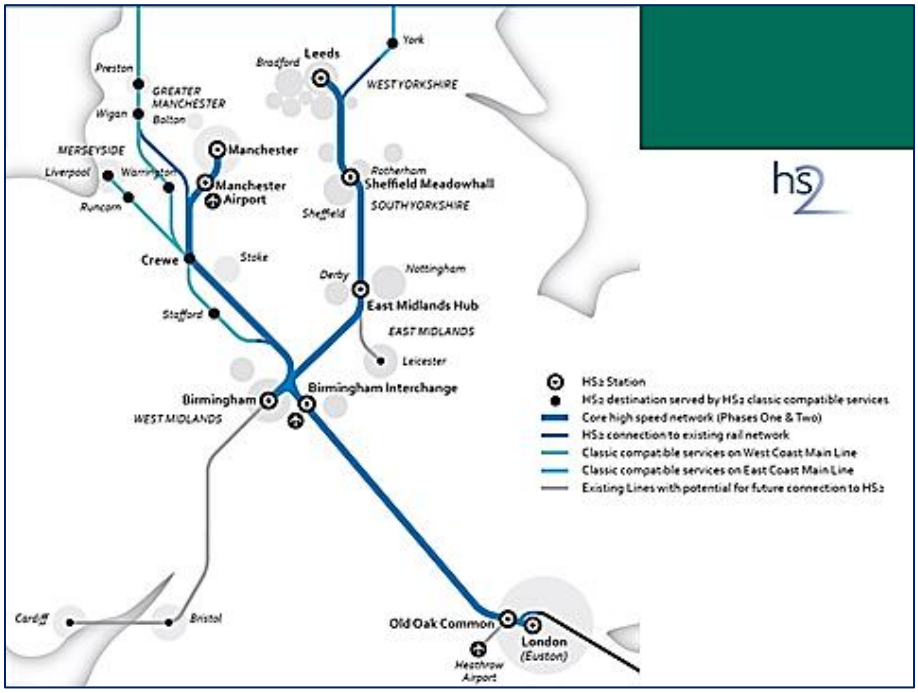

Department for Transport
Crossrail
Shenfield
Brentwood
Harold Wood
Gidea Park
Romford
Seven Kings
Ilford
Manor Park
Chadwell Heath
Goodmayes
Maryland
Stratford
Forest Gate
Bond Street
Farringdon
Whitechapel
Custom House
Liverpool Street
Canary Wharf
Abbey Wood
Woolwich
Tottenham Court Rd
Paddington
Ealing Broadway
West Ealing
Hanwell
Acton Main Line
Southall
West Drayton
Hayes & Harlington
Heathrow Airport
Taplow
Burnham
Slough
Iver
Langley
Maidenhead

Department for Transport

Thameslink Project

- 24 trains per hour, 12 carriage trains





(五) Exporting to Taiwan Whole Life Cycle Cost February 2016/LPA

LPA in Taiwan

Long Life Reliability
does not cost the earth

1986 EMU200 11x3 car sets delivered to TRA with LPA Connectors manufactured under licence. In service for around twenty years with excellent reliability

TRA recognised the inherent reliability of pin and tube connectors and called for this technology on EMU700. LPA, with our Taiwanese partner Union Group supplied the connectors and umbilicals for EMU700.

LPA and Union have subsequently supplied connectors and umbilicals for EMU800, EMU800x1 and Taiwan Tilting Train 2

Proposed New LED Lighting Systems design and manufacturing facility

Long Life Reliability
does not cost the earth

Commercial in Confidence

Electro-Mechanical Connection Systems Design and manufacturing

Long Life Reliability
does not cost the earth

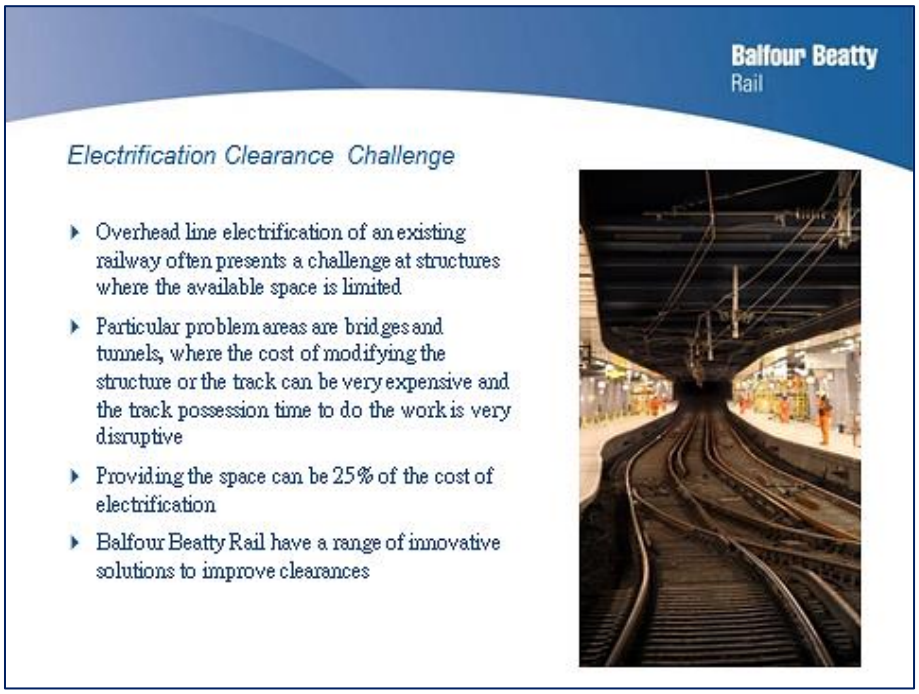
Commercial in Confidence

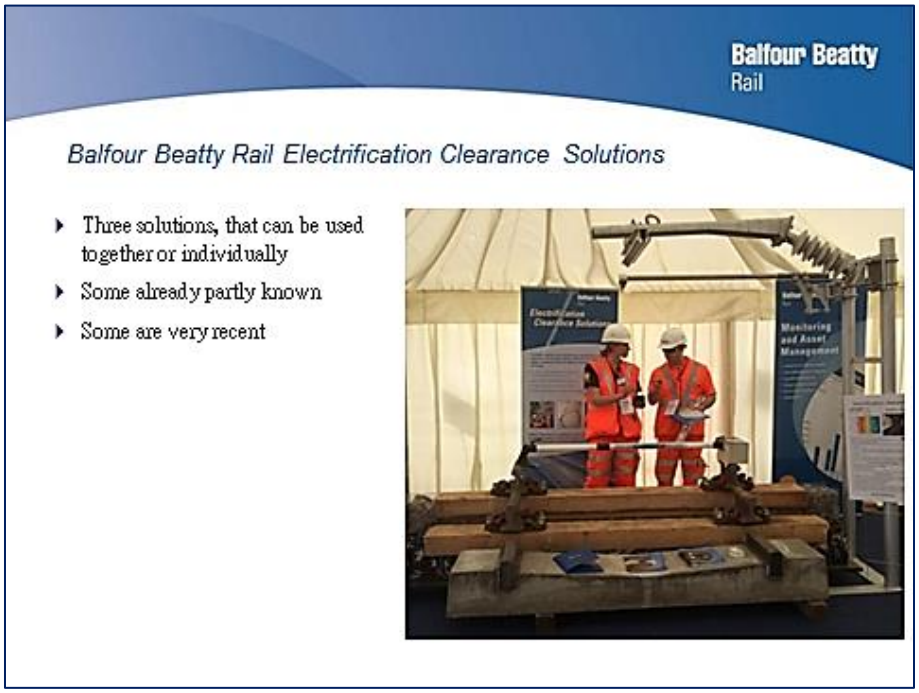
LPA Lighting Systems
LED Lighting Experts

Long Life Reliability
does not cost the earth

(六) *Balfour Beatty Rail/ Engineering and Technology Solutions*

'Delivering the benefits of technology to infrastructure asset management'





Balfour Beatty
Rail

Electrification Clearance Solutions

- Cost effective track lowering and fixity improvement
- Reduced depth conductor beams
- More accurate measurement and analysis of clearance requirements
- Combined they can provide up to 400mm of clearance

Balfour Beatty
Rail

XiTRACK Examples of Use

Heavy Haul / High Speed / Light Rail / Metro

No Ballast Maintenance Required

No Tamping of S&C

Track Support at Transitions

Maintaining Structure Clearance / Track Geometry

Lateral End Restraint for S&C/Curves

Ideal for High Speed with Crossing Traffic

Control of ballast on embankments and reducing dynamic loads on

Balfour Beatty Rail

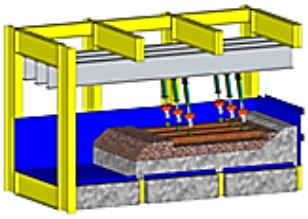
Our Most Challenging Application Toadmoor Tunnel (Opened 1840)

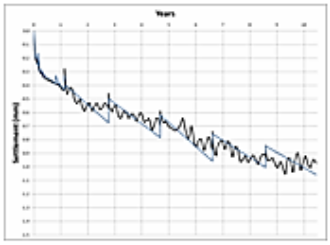
- Line speed improvement
  - From 60 mph to 80 mph
  - 22.5 tonne axle loads
  - 1200m curve
- Problem definition
  - Tight clearances
  - High maintenance input already, increasing line speed may make impossible
  - Tamping not possible due to shallow (and differential) ballast depths
  - Drainage concerns
  - Little time for work, midweek nights to be used
- Other options
  - Concrete Slab Track not an option in available time or budget

Balfour Beatty Rail

Solution Design and Testing

- We built the worst case scenario full size at Heriot-Watt University in Edinburgh and tested 10 years of accelerated fatigue loading
- Quantitative evidence
  - Allowing reduced ballast depth
  - Proving longevity, maintainability and fixity
  - 1mm of settlement after 10 year simulation
  - Stresses managed
  - Ballast migration prevented
  - Fixity demonstrated in the medium-high range
  - Confidence to raise the line speed
- Successfully installed Summer 2014





Balfour Beatty Rail

XiTRACK benefits for electrification clearance improvement

- Work has proved a solution for any reduced ballast layer requirement including for electrification track lowers
- Confidence that 100mm of XiTRACK ballast can be used, **freeing 200mm of space**
  - Without needing to touch the formation
  - Without any risk to drainage
  - Minimising risk to tunnel wall support (Penmanshiel)

- Track fixity standards allow further clearance improvement
  - 25mm laterally and 15mm vertically by moving track from low to high fixity

Balfour Beatty Rail

XiTRACK benefits for electrification clearance improvement

- Work can be done in **one third of the time** and for **half of the cost**
  - Fewer possessions
  - Fewer engineering trains
  - Much less disruption
- Additional benefits in
  - Reduced track maintenance
  - Potential to increase line speeds
  - Increased support over soft formation

Balfour Beatty
Rail

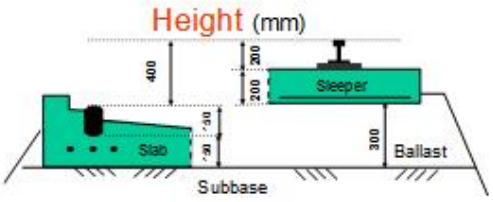
Embedded Rail System

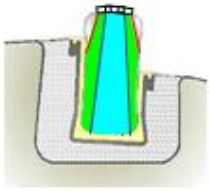
Further clearance improvement
- saving another 200mm

Life Cycle Cost benefits

Fail Safe
- fully ultrasonically inspectable
- no rail foot for defects to hide
- rail break would be benign

Reduced complexity





Balfour Beatty
Rail

Reduced depth conductor beams

- Developed by Balfour Beatty Rail and proven on Thameslink,
- Can provide up to **100mm of additional clearance**
- Robust, easily constructed, 'production line' solution where space is at a premium
- Hollow extruded aluminium sections, cut to length and joined with bolted splice plates
- Un-tensioned conventional contact wire
- Using un-tensioned wire :
  - Eliminates bulky tensioning devices
  - Reduces loading on surrounding infrastructure
  - Eliminates use of tunnel niches for tension weight assemblies

Balfour Beatty
Rail

Reduced depth conductor beams - maintenance benefits

- Maintenance is minimal with barely any moving parts
- As the contact wire is un-tensioned the wear allowance can be safely increased, **extending life by around 10%**
- Wear on the pantograph carbon strip is also improved as the conductor beam is installed laterally in a true sinusoidal wave rather than staggered

Balfour Beatty
Rail

Low height conductor beams - performance benefits

- Significantly reduces the chance of de-wirement:
  - non-tensioned
  - absence of haul spots
  - improved pantograph / contact wire dynamics
- Increased electrical short circuit rating
- More robust electrical sectioning
  - air gap between two sections of beam,
  - Improvement over traditional high maintenance section insulators

Balfour Beatty
Rail

Structure Gauge Measurement

- Any required platform
- High accuracy integration with track geometry data
- Output information compatible with industry standard CAD packages and in-house databases and clearance analysis
- Supporting the UK's leading approach to clearance gauging, giving more space for vehicle operation than any other method

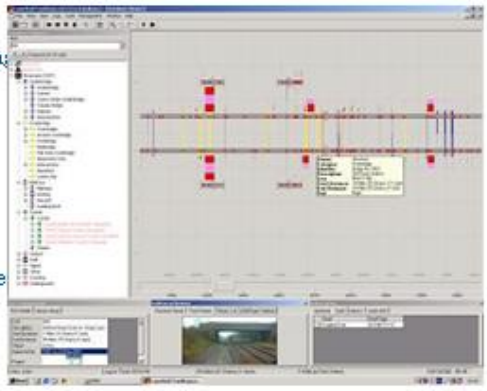
References

- LaserFlex - high speed train based measurement for Network Rail, TTC, PATH
- LGV - RRV based measurement services for Network Rail
- LaserSweep - manual measurement equipment sales, hire and services

Balfour Beatty
Rail

TrackRoute™
3D Infrastructure Database

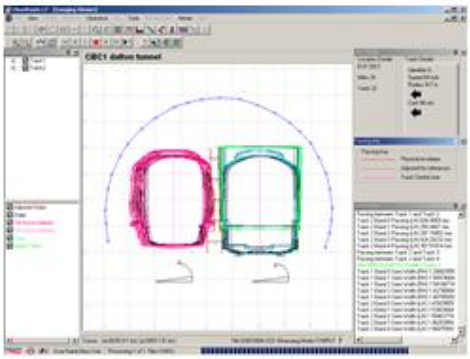
- Used to manage all Network Rail gauging measurements
- Developed and hosted by BBR
- Links various fields such as profile, location, speed & track geometry
- Direct output to ClearRoute for clearance analysis
- Supported by BBR for over 15 years



Balfour Beatty
Rail

ClearRoute™
Clearance Assessment

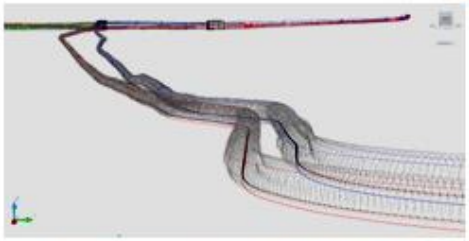
- Clearances between infrastructure and vehicle and between vehicles
- Static gauging and dynamic gauging with vehicle models
- UIC kinematic gauging
- Platform stepping calculations
- Allows complete route assessment
- Compliant with all relevant standards

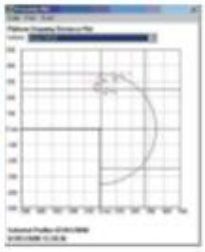


Balfour Beatty
Rail

Gauging Services
Specialist Gauging Consultancy

- The consultants' consultant
- Advanced toolbox
  - ClearRoute+ and HyperRoute
- Specialist knowledge
- Proactive project involvement
- Full service - measurement through to certification
- Involved in all new trains for the UK since privatisation

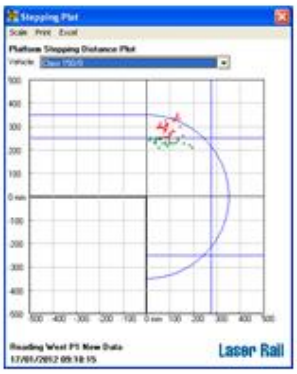


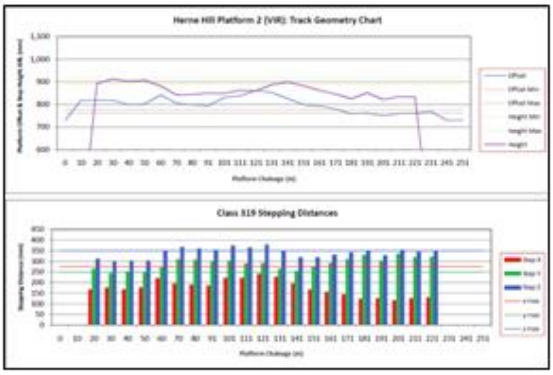


Balfour Beatty
Rail

Absolute Gauging Analysis of Platform Clearances

- Absolute Gauging includes an assessment of platform stepping distances
- Used to assess compliance to the UK Disability Discrimination Act
- Helps provide the most cost effective mitigation measures

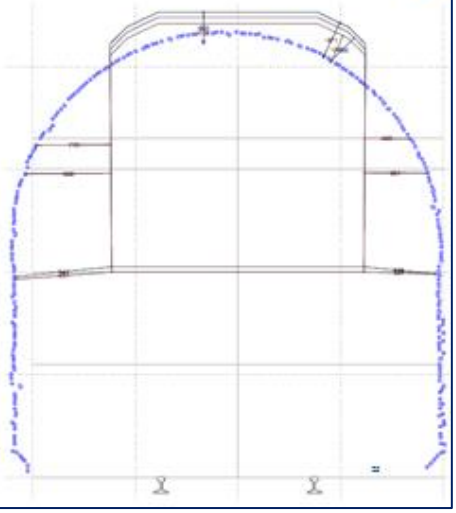




Balfour Beatty
Rail

Gauging of OLE

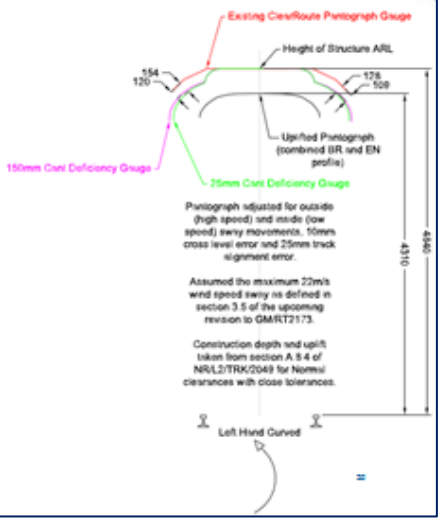
- ClearRoute™ OLE Gauges
- Used to rough estimate OLE tight spots
- Used in all current UK electrification feasibility studies
- Can study any OLE design
- Will currently allow modelling of conductor beams and track lowers
- But uses a static model, so conservative



Balfour Beatty Rail

New Dynamic OLE Gauges

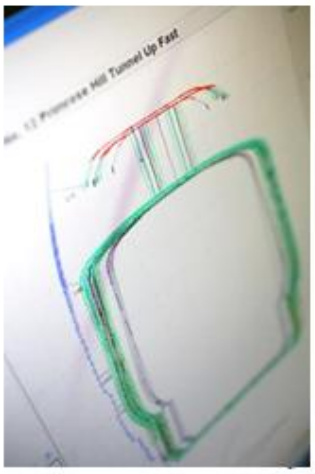
- New dynamic gauges in development (Future Railway)
- Adjusts with track geometry and line speed
- More accurate clearances for arched structures
- Releases over 100mm of space in areas shown



Balfour Beatty Rail

Business benefits and availability

- Preliminary analysis for the MML suggested two structures requiring modification could be unchanged using this assessment
- Available in 3 months as a prototype, following which we can use for consultancy
- Available as an add on module in ClearRoute in 6 to 9 months for clients to use
- Plans for second stage to incorporate cost modelling

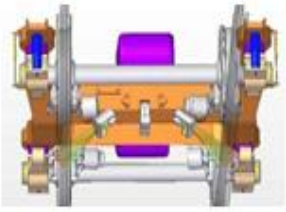


Crossrail West Outer Electrification



References for Measurement Systems

- Network Rail, UK – almost all measurements now made by new BBR systems
- London Underground – provided fully equipped Asset Inspection Train
- Queensland Rail, Australia – road-rail vehicle with a wide range of systems
- MTR, Hong Kong – order late 2012 for a new measurement vehicle
- Hitachi, Japan – recent order for UTGMS for the IEP fleet for the UK



Asset Inspection Train for London Underground

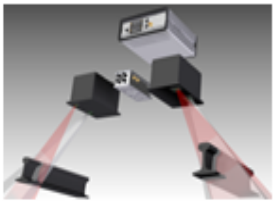
- Key Systems:
  - Inertial Track Geometry
  - Multi Channel Digital Video
  - Running Rail Profile
  - Corrugation
  - RFID/GPS based location
  - Thermal Imaging
  - Ride Quality
  - Noise
  - Synchronized data display

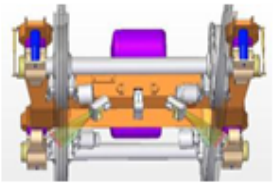
Measurement Car for MTRC, Hong Kong

- Key Features:
  - Contract awarded 2012
  - Scope of work comprises:
  - TrueTrak TGMS
  - Non-contacting OHL measurement (including wear)
  - Rail profile (DMA)
  - Ultrasonic rail testing (RTI)
  - DataMap
  - Balfour Beatty are Project Manager and systems integrator

Unattended Track Geometry Measurement

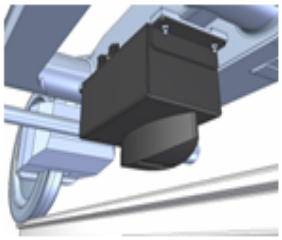
- New track geometry measurement equipment compact and automated to fit to a passenger train
  - Dramatically reduced cost
  - Much more frequent measurement
- Frequent measurement provides an early indication of developing faults and understanding of deterioration rates
- This allows the right maintenance to be carried out at the optimum time
  - At an early stage where it can be seen to be cost effective
  - Where safe, as late as possible to minimise intervention costs or when other work is planned
- Mandated for all new UK fleets by the DfT





UTGMS for Hitachi for IEP

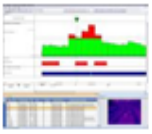
- UK Department for Transport mandating UTGMS as part of all new train fleets
  - IEP, Crossrail, Thameslink
- A small percentage of vehicles need be fitted
- Following extensive evaluation BBR were recently awarded the contract
- System designed into the vehicle from build
- Initial fitment and commissioning in Japan
- Remaining vehicles built in the UK



DataMap™ - The Synchronised View

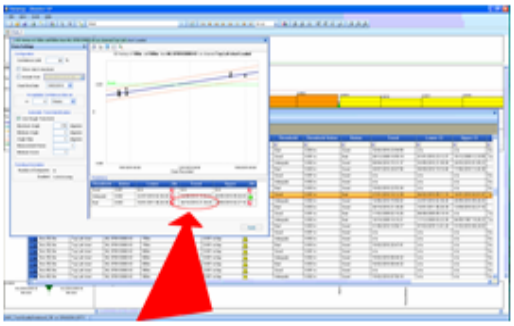
Predictive Maintenance

Infrastructure Improvements



Fire-fighting now under control, move to proactive maintenance planning for remedial action by plant equipment

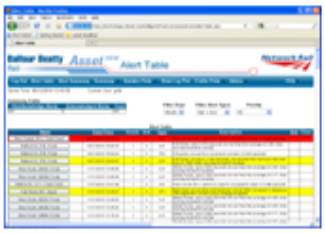
More efficient use of plant leads to cost reductions over time



Examine the growth rate of the statistical quality index values to see when each will breach the maintenance level and schedule plant cost-effectively with pre-warned information.

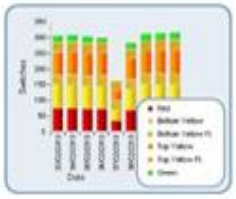
Signalling Monitoring

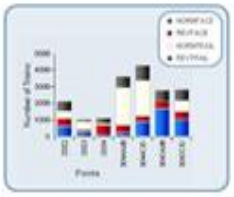
- AssetView is an event monitoring and analysis system that automatically analyses the results from analogue and digital event recorders, including data driven systems such as Solid State Interlocking
- Embedded signalling engineer 'know-how'
- Diagnostic and prognostic
- Now covers around 40% of the UK network
- Business case driven, primarily by delay minute reduction



Intelligent Analysis

- AssetView processes data from a range of sources to provide meaningful information on the performance of the asset.
  - Point machine operating statistics
  - Signal lamp / LED burn times and operations
  - Graphical replay for incident replay and route cause identification
  - Operational performance statistics – e.g: aspect shown to approaching trains, direction of trains over switches
  - Predictive and reactive failure alerts – e.g: SPAD, Change of Aspect and asset failure alerts





Delivering Benefits

- At a key London station the system provided circa 10,000 minutes (£600,000) delay savings over 18 months by:
- Identifying the root cause of a Change of Aspect fault without testing
- Early detection of slowing points at a key Junction
- Identifying point detection flicking under passing train – preventing a potential Change of Aspect fault
- Diagnosing the root cause of a Signal Passed at Danger at a key location

Structure Gauge Measurement

- Structure Gauge Measurement
  - Any required platform
  - High accuracy integration with track geometry data
- References
  - LaserFlex - high speed train based measurement for Network Rail, TTC, PATH
  - LGV - RRV based measurement services for Network Rail
  - LaserSweep - manual measurement equipment sales, hire and services

XiTRACK Examples of Use

- No tamping of S&C

- Track Support at Transitions

- Maintaining Structure Clearance / Track Geometry

- Lateral End Restraint for S&C/Curves
- Ideal for High Speed with Crossing Traffic

- Control of ballast and reducing dynamic loads on embankments

Electrification Design

- Total power and electrification design capability for all types of new railway projects, including upgrades and converting existing systems
- Projects range from Overhead Lines, AC and DC Power Supply to Conductor Rail systems
- Unrivalled in-house design capability, including feasibility studies, basic design, installation design and detailed final documentation
- Innovative solutions using unique software tools able to interpret the demanding requirements of modern railway systems
- Offices in the UK and Malaysia

Solutions for Electrification Clearance

- Overhead line electrification of an existing railway often presents a challenge at structures where the available space is limited
- Particular problem areas are bridges and tunnels, where the cost of modifying the structure or the track can be very expensive and the track possession time to do the work is very disruptive
- Providing the space can be 25% of the cost of electrification
- Balfour Beatty Rail have a range of innovative solutions to improve clearances

Solutions for Electrification Clearance

- Cost effective track lowering and fixity improvement
- Reduced depth conductor beams
- More accurate measurement and analysis of clearance requirements
- Combined they can provide up to 400mm of clearance

Electrification Supplies

- As a result of major electrification Projects worldwide, BBR has developed a wide range of Overhead Catenary and Traction Power Supply Equipment
- We supply all forms of equipment for mainline, light rail transit, metro and mass transit systems
- We supply fully traceable new materials and spares to maintenance organisations, contractors and direct to clients in the UK and throughout Europe, Scandinavia, Asia, Africa, The Americas and Australasia
- Specialist products include high speed neutral sections and rigid conductor beams
- We can develop consignment stock proposals in conjunction with our clients to meet the urgent demands for both maintenance and project works

Asset Management and Maintenance Consultancy

- Maintenance and asset management planning
- Benchmarking of current performance
- Efficiency and performance improvement
- Establishing new and improved processes
- Introducing new technology
- Introducing new skills and competencies to meet changing demands – including formal and informal training
- Improved asset management and maintenance regimes
- More efficient operation and reduced costs