

Network Rail

Rail Infrastructure Cost Benchmarking

Brief LICB-gap analysis and cost driver assessment

Final Report

Hamburg/London, April 1st, 2008

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Content

- **Objectives**
- Revised LICB-Basis
- Gap-Determination
- Activity-Level Analysis
 - Maintenance
 - Renewal
- Efficiency-Gap Analysis
 - Maintenance
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- Conclusions and Outlook

Network Rail and the Office of Rail Regulation discuss the significant gaps in infrastructure expenditures compared to European peers

- The UIC Lasting Infrastructure Cost Benchmarking (LICB) forms the basis for the analysis
- Significant gaps to European average exist for maintenance, more pronounced even for renewal
- Network Rail's Strategic Business Plan envisages improvement initiatives and commits to cost reduction objectives in both areas
- ORR has stated its own expectations about cost reductions, partly based on similar benchmarking studies
- Further consultation and emerging conclusions are crucial for the forthcoming budget period (CP4)

The BSL gap-analysis undertakes a broad assessment of cost-drivers to help explain causes and screen further improvement opportunities

- The scope of the analysis covers maintenance costs and renewal expenditures
- For purposes of good methodological practice, the analysis distinguishes between activity level differences and efficiency gaps
- Beyond InfraCost and LICB (which BSL are the principal authors of) the analysis draws on more in-depth work for a number of Infrastructure Managers and Contractors internationally
- To the extent possible, qualitative information was complemented by quantitative estimates; so far all estimates given are broad indications and should not be misread as precise calculations
- It has to be acknowledged that peers are tackling their cost base as well ("*moving target*"), despite different individual "*track-records*" the European average for maintenance however has hardly changed (< 1% p.a.) over the past 10 years
- The EWS-study on LICB for the ORR was discussed with the author, it takes a modified approach to normalisation of data but broadly comes to the same range of gaps in costs and expenditures
- A distinction of cost-gap-drivers is discussed, reflecting whether they are in Network Rail's control or beyond
- BSL estimates are based on "*conservative*" assumptions regarding improvement targets in order to avoid the risk of double-counting and "*cherry-picking*"

Content

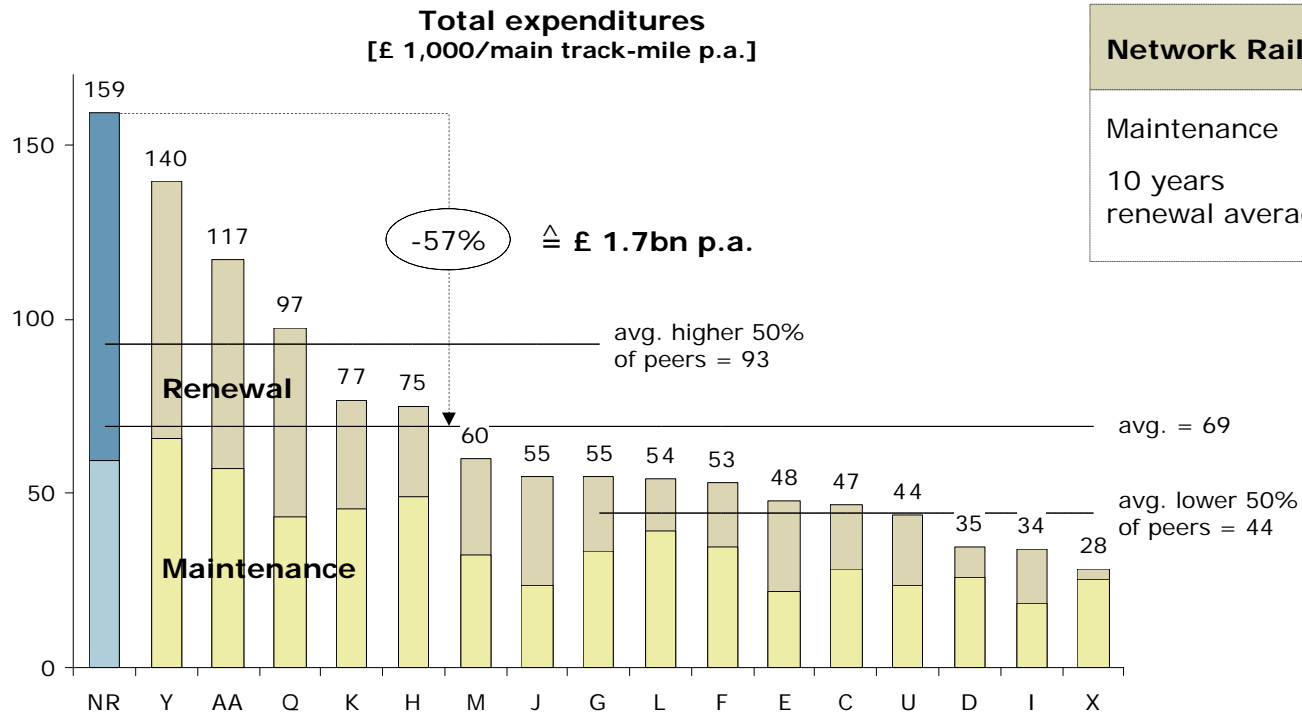
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As a basis for this analysis, the LICB data-set was revised and extended

- In addition to European peers the Amtrak North-East Corridor (NEC) was integrated, based on similar analysis (2007) by BSL
- The ORR had an exchange with Amtrak in 2007 as well, as a part of its "World Tour"
- Where necessary and identified, original peer data for LICB were corrected
- In a similar way some expenditure figures for Network Rail's input to LICB were adjusted
- The UIC normalisation method was applied for
 - Comparative price levels
 - Network complexity
 - Network utilisationfor transparency-purposes, there is **no** additional labour cost normalisation
- Renewal figures represent "10-year" averages for the period 1996-2006
- For clarity reasons this modified basis, as used for the analysis, is termed R-LICB

R-LICB identifies a face value gap of £ 1.7bn to the peer group's average

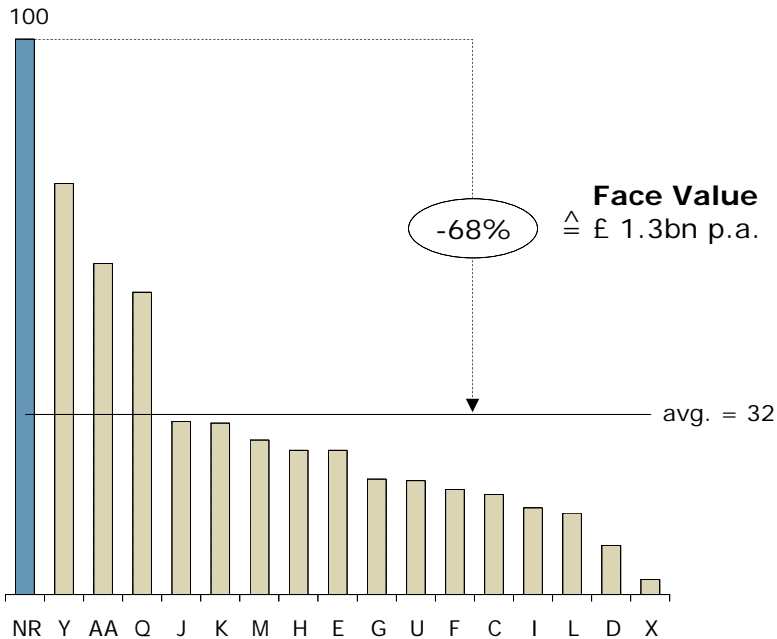
Normalised annual maintenance cost and renewal expenditures



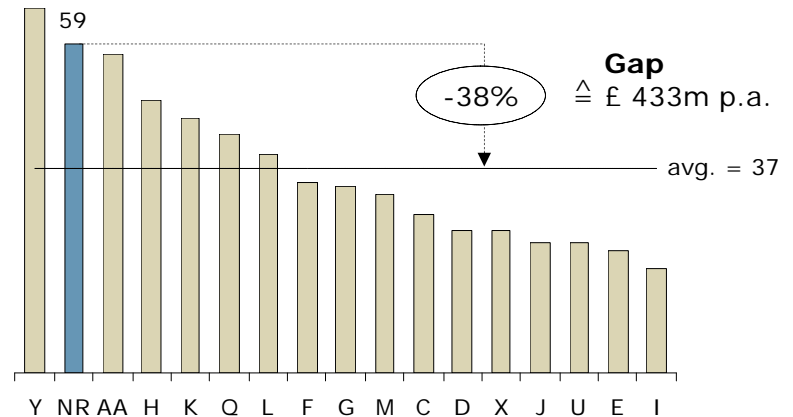
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Renewals account for £ 1.3bn of the gap, maintenance for £ 433m

Normalised Renewal¹⁾ Expenditures
[£ 1,000/main track-mile p.a.]



Normalised Maintenance²⁾ Costs
[£ 1,000/main track-mile p.a.]



- 1) Annual average 1996-2006
- 2) Most recent available data; prevailing 2006

2008\0136005\Charts\0136005_InfraCost_update.xls\Comparison

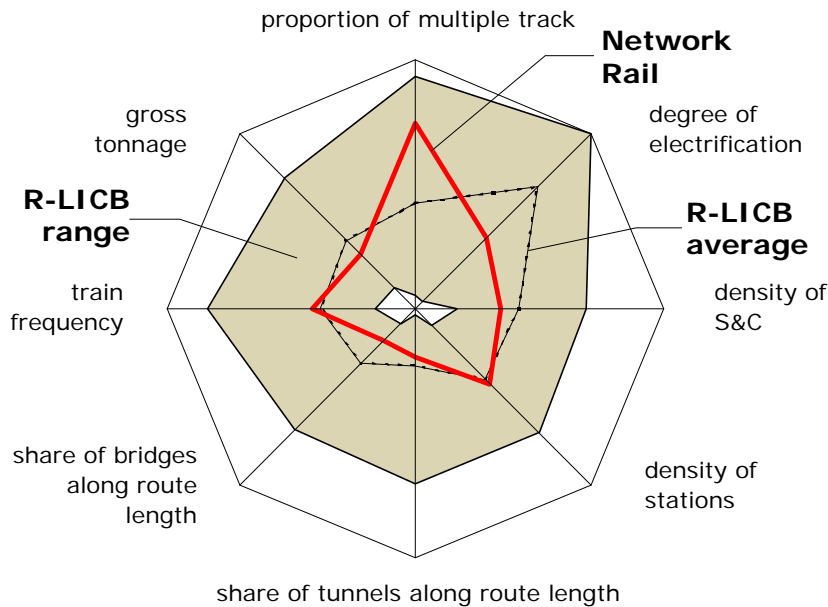
Source: UIC LICB/BSL Management Consultants

R-LICB data reflect both, efficiency and activity levels

- As described, all LICB data show annual maintenance and (mid-term) renewal expenditures
- Expenditures are determined by work activity volumes and corresponding unit cost
- Therefore, a period of increased renewal expenditures (e.g. to catch up an investment backlog) does not necessarily reflect inefficiency in unit costs
- Vice versa an infrastructure manager with low expenditure levels in the R-LICB comparison might just invest less in its network and consequently build up an investment backlog
- To get a realistic picture of the efficiency gap (being the key objective), comparisons need to be based on steady-state activity levels
- The R-LICB comparison and recent BSL experience reveal that "*lessons to learn*" can especially be found at infrastructure managers and contractors in Sweden, Germany, Denmark, Austria, Switzerland, The Netherlands and Spain
- In addition and as agreed with Network Rail, BSL have undertaken specific interviews with contractors about their view of the situation in the UK as compared to continental Europe

Network Rail's overall infrastructure and operational characteristics are close¹⁾ to the R-LICB average

Network Rail's characteristics compared to peer railways

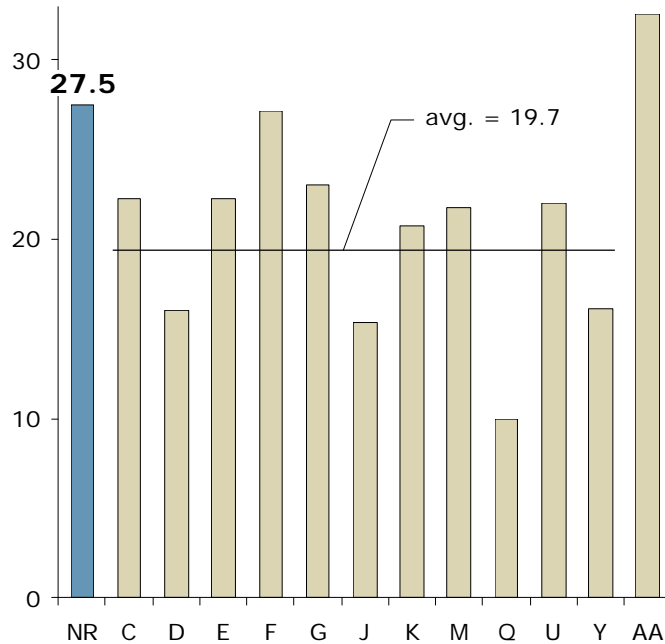


Network characteristics and utilisation	NR	Average excl. NR
proportion of multiple track on total route length [%]	75	43
degree of electrified main track [%]	40	70
density of S&Cs in main track [units/main track-mile]	1.03	1.25
density of passenger stations [stations/route-mile]	0.26	0.24
share of tunnels on total route length [%]	2.3	2.7
share of bridges on total route length [%]	1.2	2.1
total train frequency [1.000 train-miles/main track-mile]	16.7	15.2
gross tonnage total [million gross ton-miles/main track-mile]	4.72	5.88

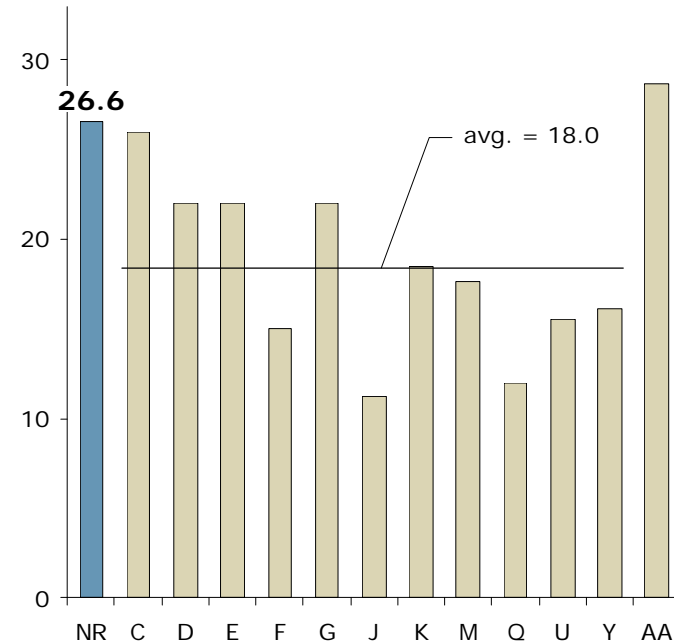
1) Except for high proportion of multiple track and low degree of electrification

Network Rail's infrastructure appears to still have an investment backlog compared to other European infra-managers

Average age of rails
[years]



Average age of S&C
[years]



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For a cost driver analysis, Network Rail's maintenance and renewal processes were allocated to key assets (1)

Process allocation to assets - Maintenance

Rail

- Manual ultrasonic inspection of rail
- Rail changing
- Arc weld repair of effective rail
- Installation of pre-fabricated IJR's
- Thermitite welding

Ballast

- Plain line tamping
- Stoneblowing
- Mechanical reprofiling of ballast
- Manual correction of plain line track geometry
- Manual reprofiling of ballast

Sleepers

- Manual spot re-sleepering
- Mechanical spot re-sleepering

Subgrade

- Manual wet bed removal
- Mechanical wet bed removal

Switches

- S&C tamping
- S&C unit renewal
- Replacement of S&C bearers
- S&C arc weld repairs

Track

- Lv1 patrolling track inspections
- Mechanised visual track inspection
- Other permanent way

Signalling

- Point end routine maintenance
- Signal end routine maintenance
- Track circuit routine maintenance
- Other S&T

Electrification

- E&P

Overhead

- Indirect / overhead costs

Miscellaneous

- Leaf fall & vegetation
- Weedkilling
- Graffiti removal
- Litter clearance
- Other offtrack

For a cost driver analysis, Network Rail's maintenance and renewal processes were allocated to key assets (2)

Process allocation to assets - Renewal

Track

- Plain line
- Other track

Switches

- Switches and crossings

Signalling

- Small signal box concentrator
- Re-signalling
- Interlocking renewal
- LX ABCL
- LX MCB
- LX AHBC
- Other telecoms
- Other signalling
- IT

Structures

- Overbridges
- Underbridges
- Overbridges - Bridgeguard 3
- Footbridges
- Tunnels
- Culverts
- Retaining walls
- Earthworks
- Coastal/estuary defence
- Other structures

Electrification

- Electrification

Overhead

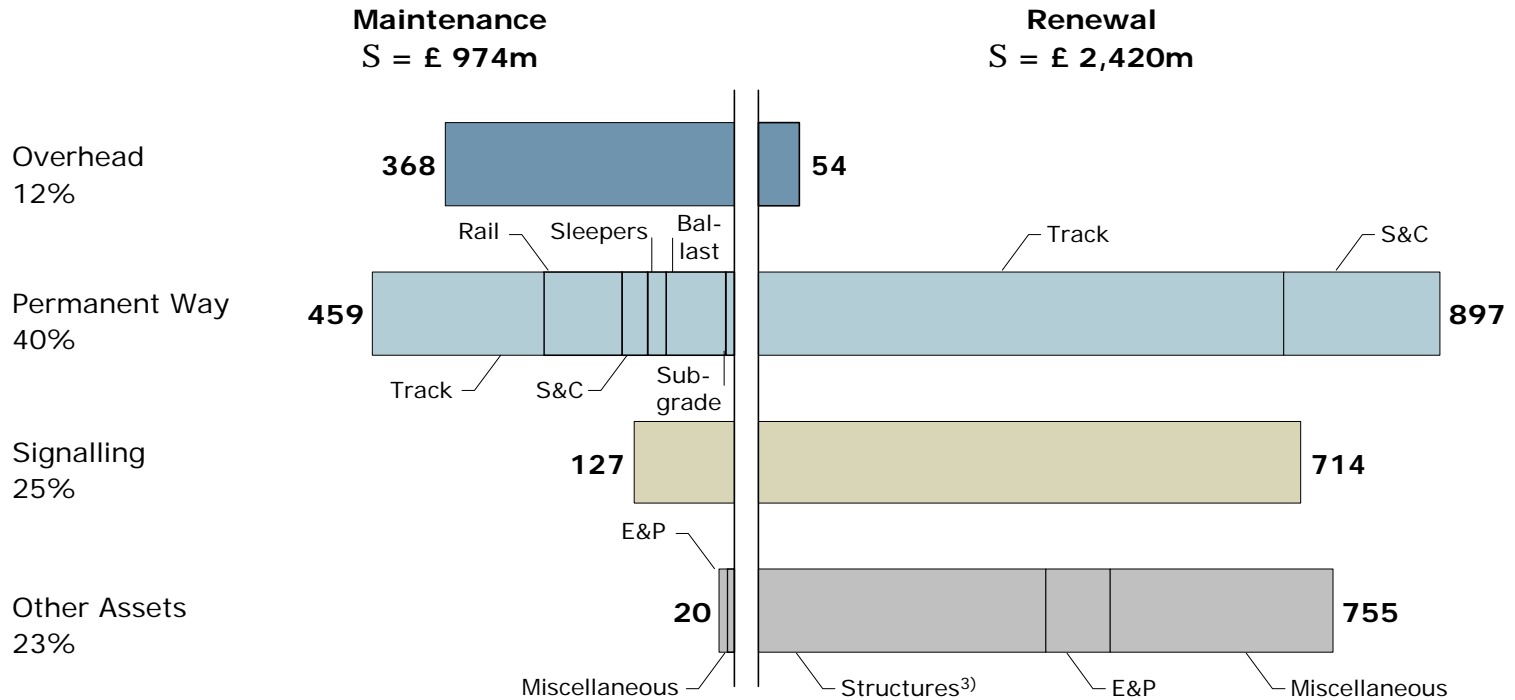
- Indirect/overhead costs

Miscellaneous

- Plant & machinery
- Operational property

Permanent Way and Signalling represent 65% of Network Rail's current maintenance and renewal

Breakdown of annual maintenance cost¹⁾ and renewal expenditures²⁾



- 1) Based on 2007/08 year-to-date figures (9 periods of data); scaled up by 13/9 to meet an annual figure
- 2) 2006/07 annual totals; WCRM figures are currently not included
- 3) Including maintenance expenditures for structures

2008\0136005\Charts\0136005_CostAnalysis.xls\Maintenance - Renewal

Source: Network Rail 14

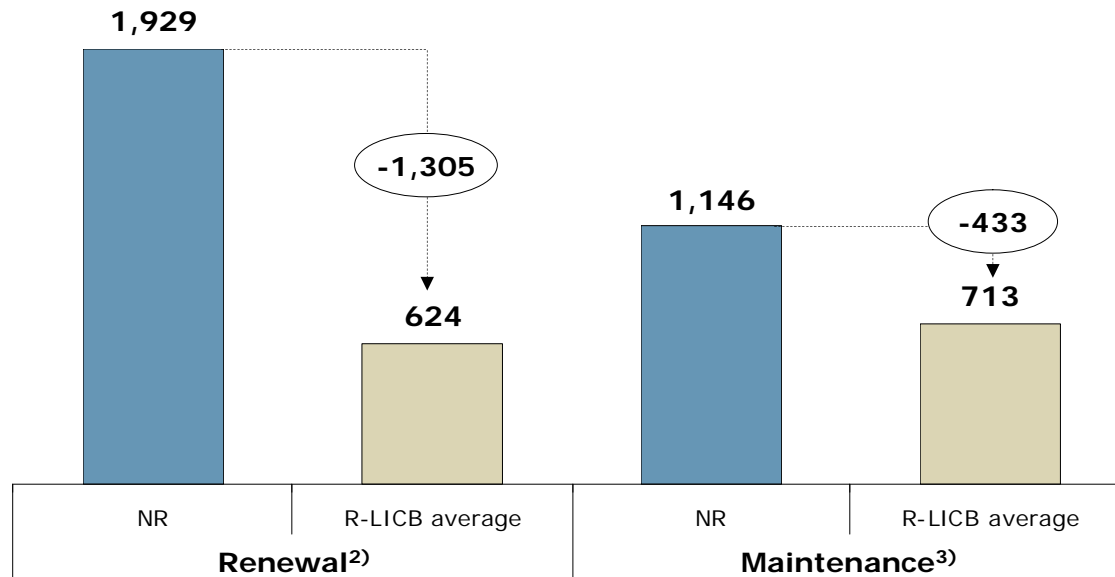
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There is a gap of £ 1,305m face value for renewal and £ 433m for maintenance

Normalised annual expenditures¹⁾

Network Rail gap to R-LICB
[£ m]



- 1) Assuming the comparators to operate under similar conditions as Network Rail; 2006 price-level
- 2) Annual average 1996-2006
- 3) Most recent available data; prevailing 2006

2008\0136005\Charts\0136005_InfraCost_update.xls\Gap

Source: UIC LICB/BSL Management Consultants 16

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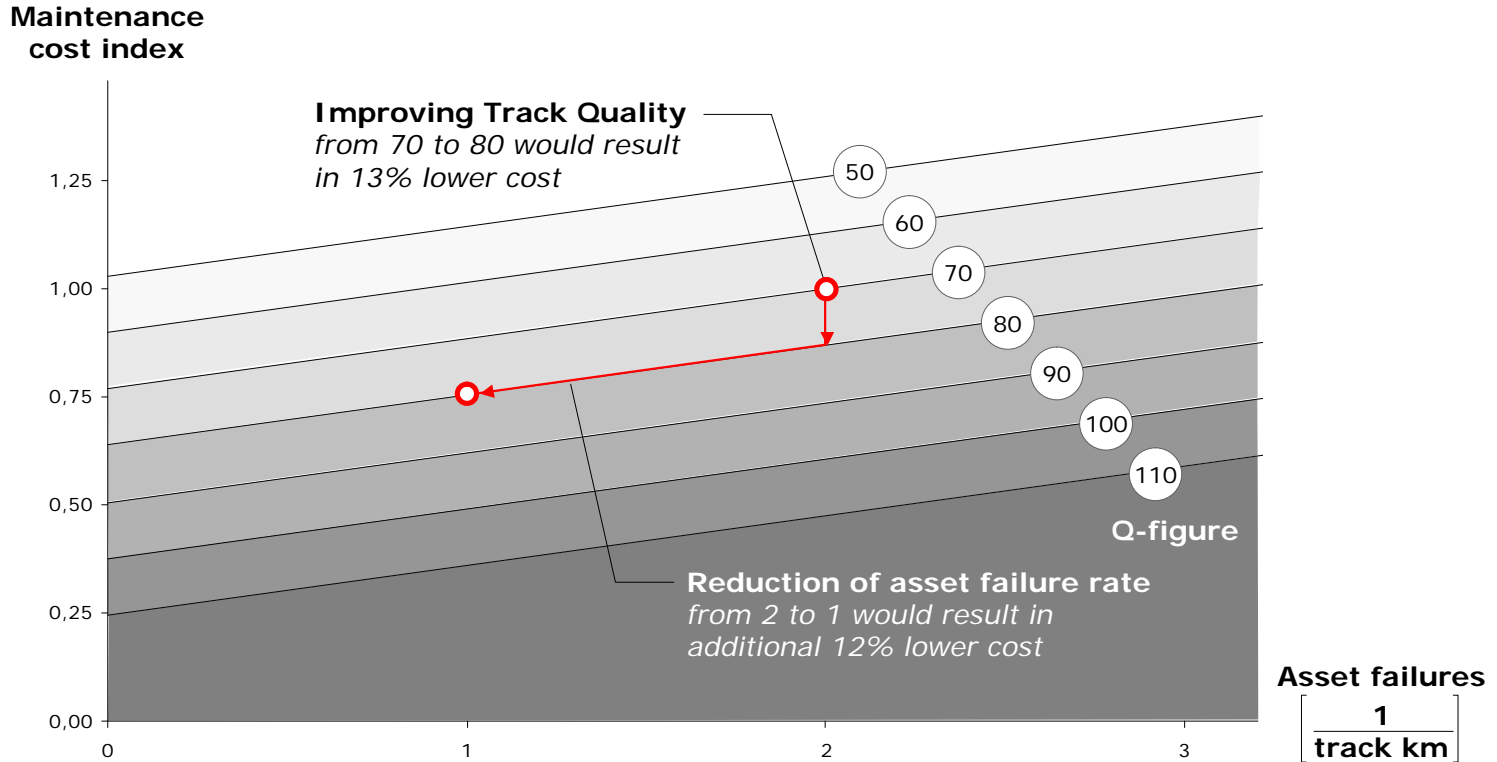
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Based on current condition and peer experience Network Rail is expected to require higher levels of maintenance activity

- Statistical analyses, e.g. from Banverket (the Swedish Infrastructure Manager), show that total maintenance cost are influenced by (geometrical) track quality and asset failure rates, which are usually driven by the signalling and train control system
- Permanent way and signalling represent about 60% of Network Rail's current maintenance cost, which are approx. £ 690m of the R-LICB input
- The Swedish evidence (see next page) was used as a template for Network Rail; it demonstrates an empirical quantification of geometrical track quality and asset failure rates on maintenance cost
- The average track quality of Network Rail is assumed to be "moderate" (Q-figure of 70); data from the Infrastructure Condition Report show an average rate of approximately two train delaying infrastructure incidents per track kilometre and year
- An improvement of the average track quality from 70 to 80 (as also illustrated in the example on the next page) would result in about 13% lower maintenance cost, equal to approx. £ 90m of the gap
- Based on performance levels of other infrastructure managers, a reduction of train delaying infrastructure incidents by about 50% would represent European average; this would result in additional 12% lower maintenance cost, equal to approx. £ 80m of the gap

An empirical regression analysis demonstrates the impact of failures and quality on maintenance cost

Example from Sweden



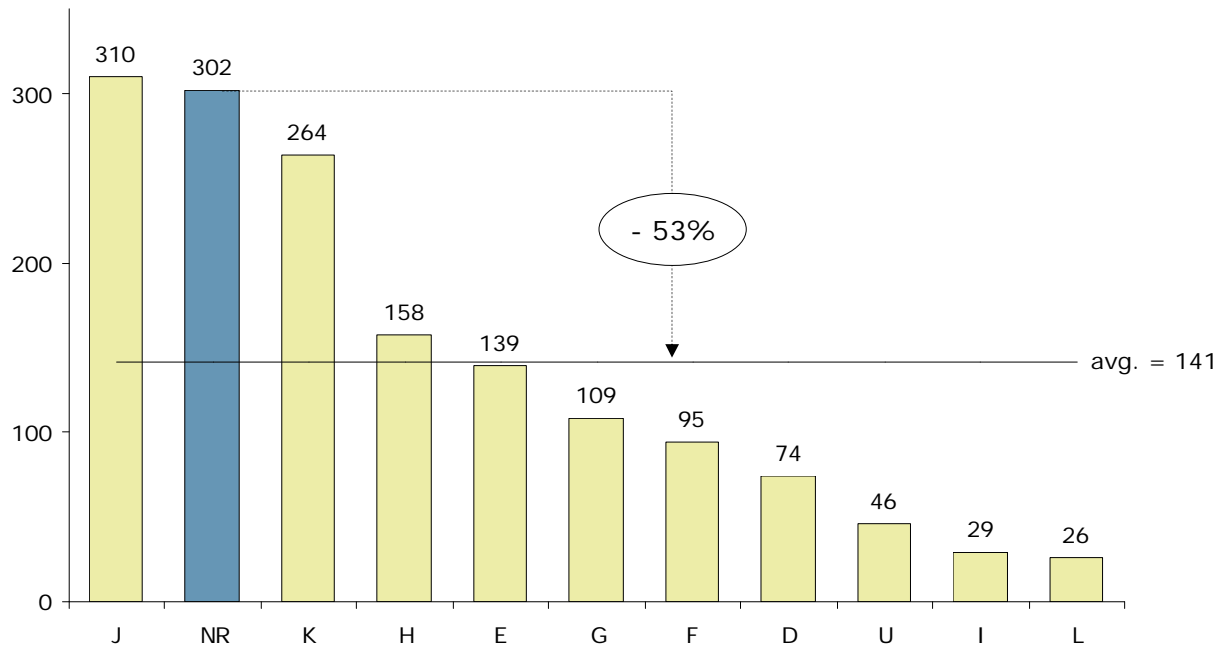
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Available comparisons show Network Rail's relatively high number of train-delaying infrastructure incidents

Enhanced level of corrective maintenance a consequence

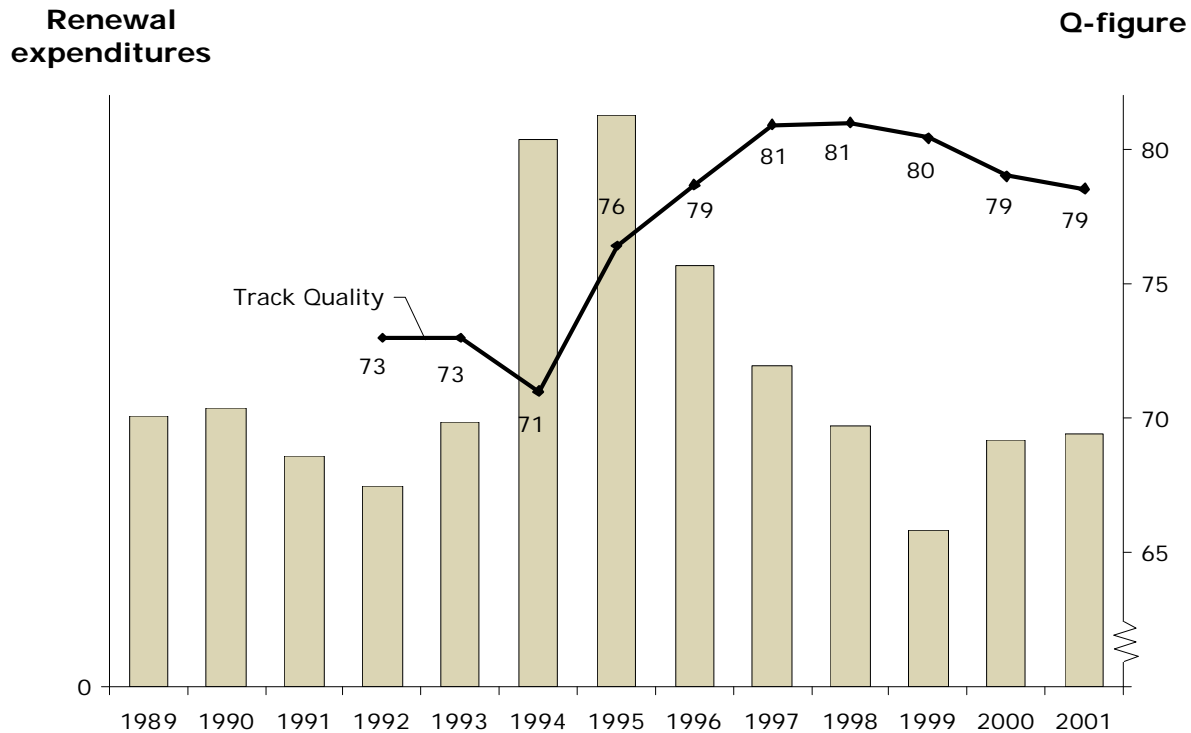
Number of annual train delaying infrastructure incidents

[1/100 main track-miles]



Quality improvement upon enhanced renewal activity is evident

Example for development of renewal expenditures and track quality in Sweden



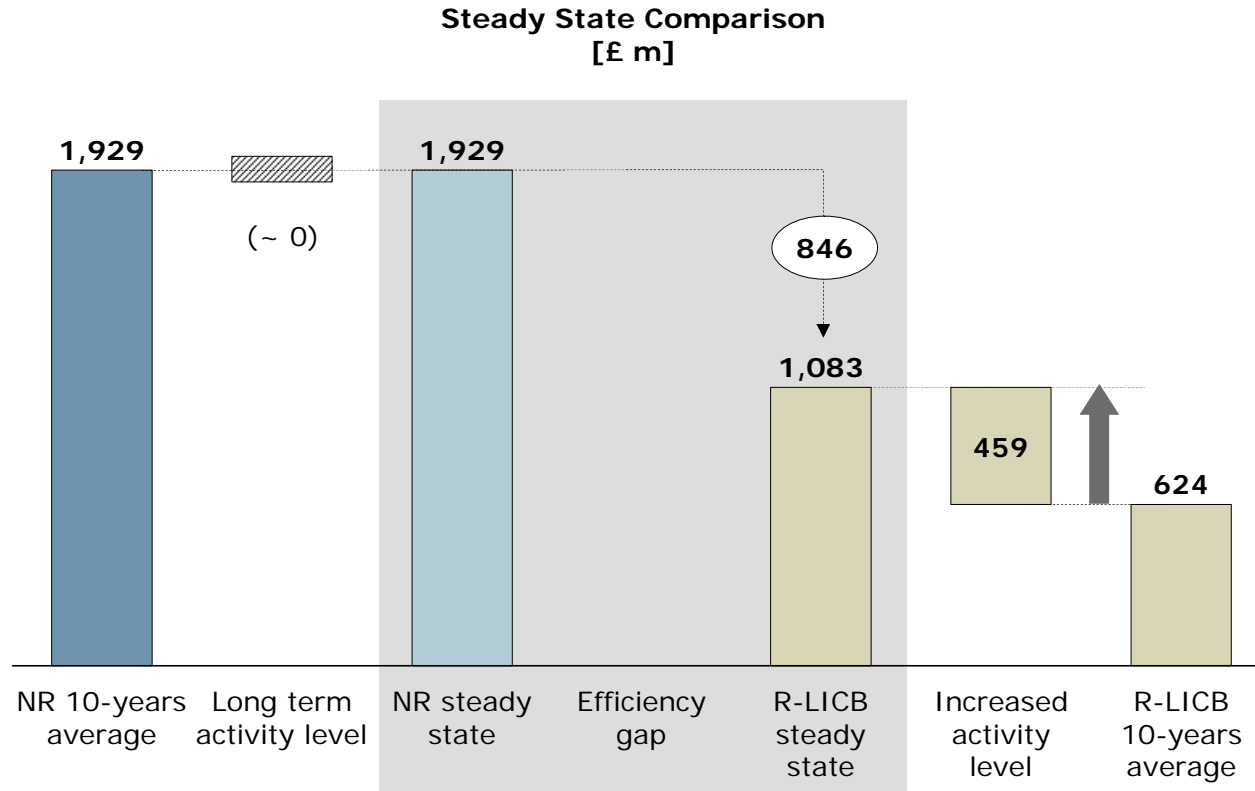
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The gap between Network Rail's 10-year asset regeneration and an equivalent steady state for peers amounts to £ 850m

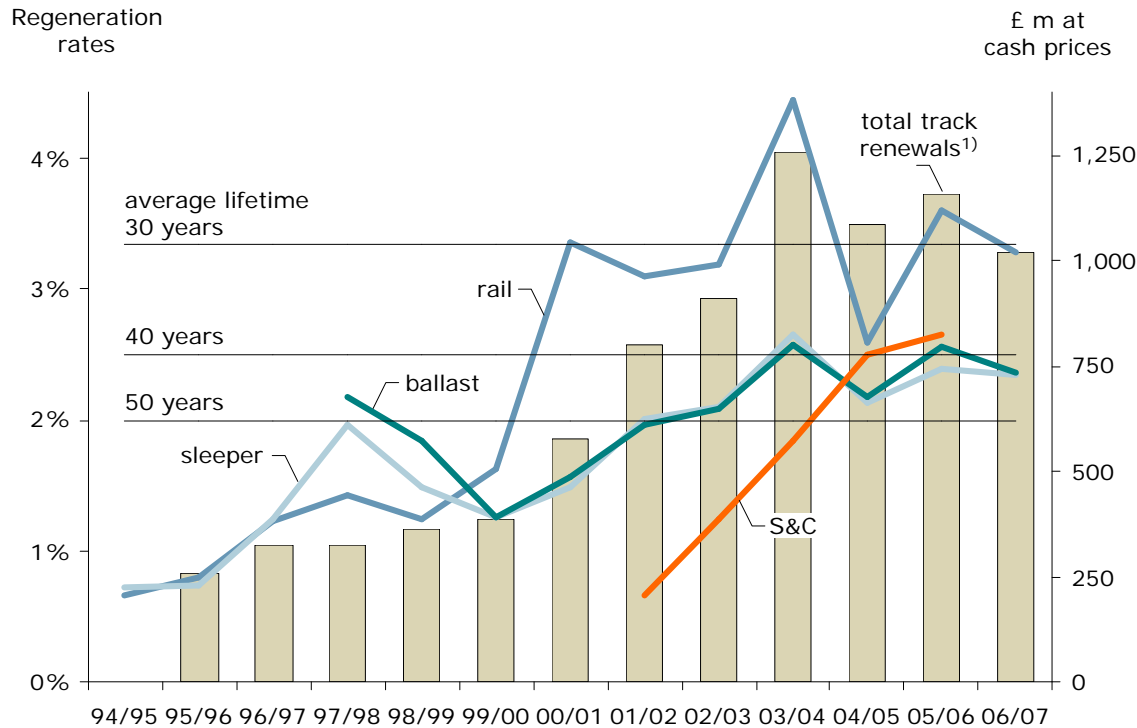
Normalised annual renewal expenditures



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Network Rail's current renewal volumes do not reflect the past 10 years average regeneration levels

Track renewal history



Network Rail's 10 years average regeneration rates (~ R-LICB-input)	
rail	2.6%
sleeper	1.9%
ballast	2.1%
S&C	1.8%
"... broadly equal to steady state levels"	

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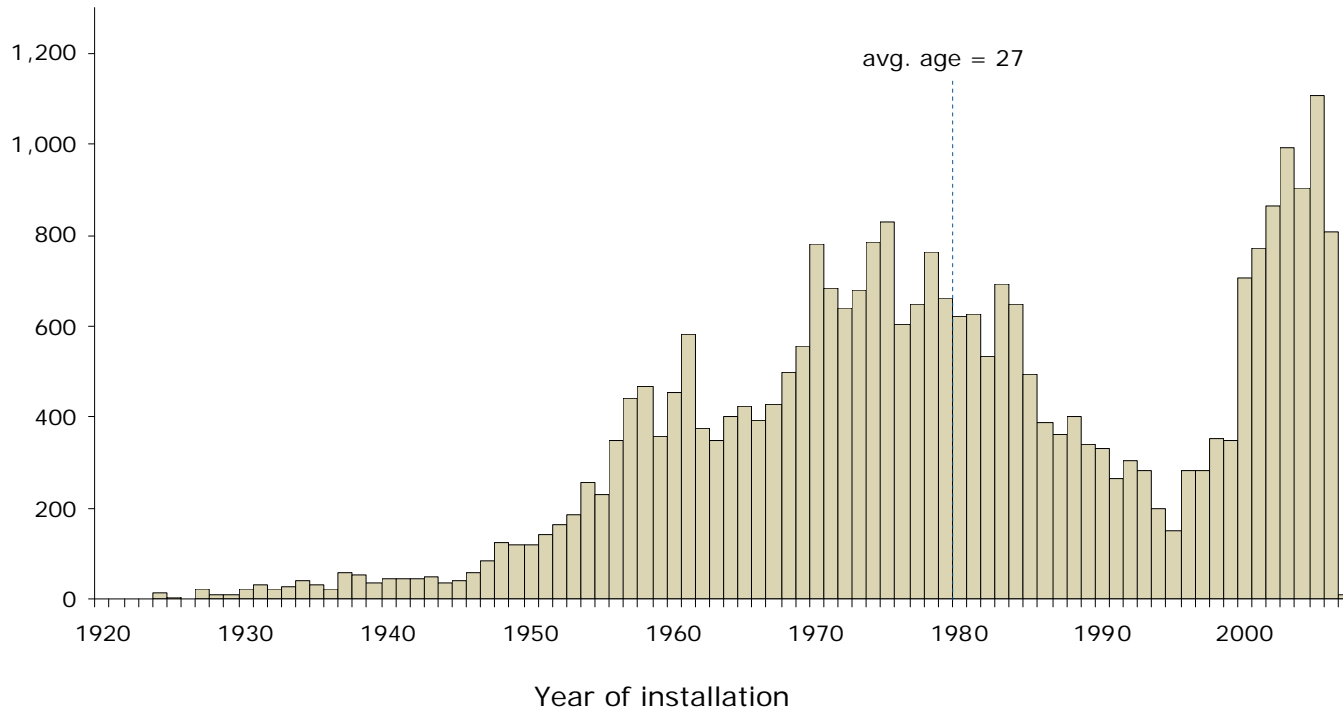
1) Incl. West Coast Route Modernisation; incl. National Recovery Plan



Despite the more recent ratcheting-up of investment, the average rail age is still 27 years

Age distribution of rail¹⁾

[Main track-km]

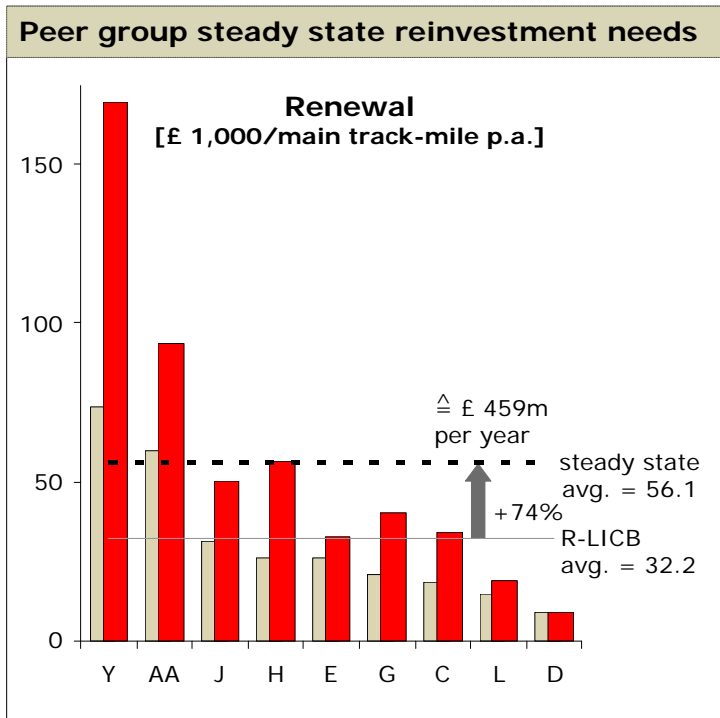


1) As per February 2007

2008\0136005\Charts\0136005_Asset_age.xls/average age: rail total

Some European countries have recently underspent compared to steady state regeneration rates

Normalised annual renewal expenditures



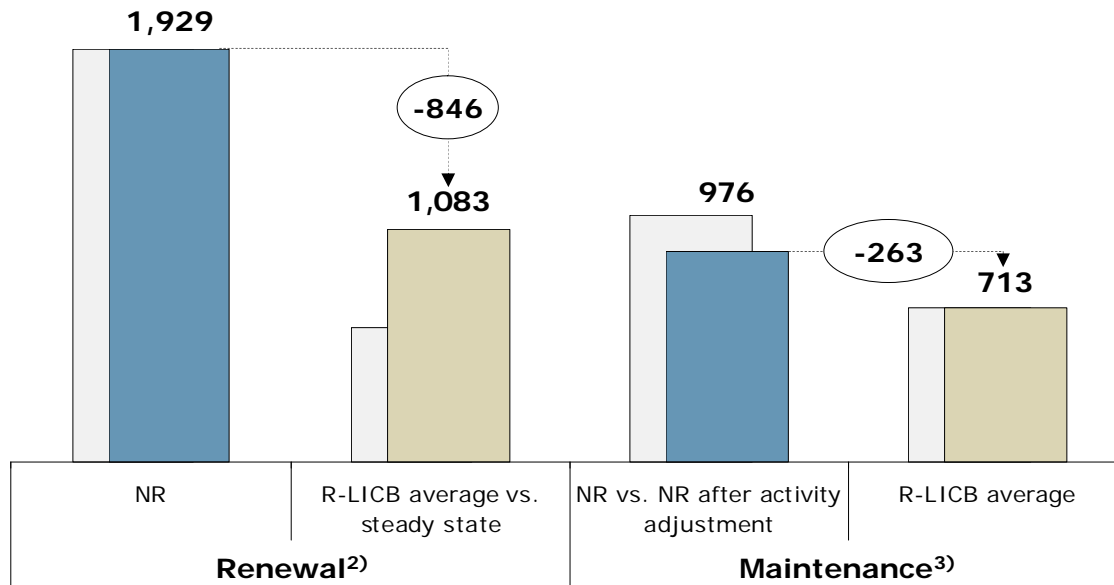
Sources	
Denmark	Kontrakt mellem Transport- og Energiministeriets departement og Banedanmark om forvaltning af statens jernbaneinfrastruktur i perioden 2005 - 2006
The Netherlands	ProRail Meerjaren vervangingsplan 2005 – 2025
France	Audit sur l'état du Réseau Ferré national Français
Sweden	Future plan for the Swedish Railways 2004-2015
Switzerland	Dritte Leistungsvereinbarung zwischen dem Bund und den SBB für die Jahre 2007 bis 2010
Germany	BSL-study: "Netzkosten im eingeschwungenen Zustand"
Norway	BSL-study: "Analysis of Jernbaneverket's Maintenance and Renewal Needs 2007-2040"
Luxembourg	BSL-study: "Ermittlung des aggregierten Instandhaltungs- und Erneuerungsbedarfes der Infrastruktur"
USA (Amtrak)	BSL-study: "Benchmarking of Infrastructure Maintenance"

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The remaining efficiency gap is £ 846m for renewal and £ 263m for maintenance

Normalised annual expenditures¹⁾

Network Rail efficiency gap to R-LICB
[£ m]



Intermediate Summary

- The adjustment of the activity level forms the basis for a valid comparison of efficiency
- Especially in renewal this "normalisation" has a significant impact on the interpretation of the gap
- The following efficiency analysis is based on this adjustment

1) Assuming the comparators to operate under similar conditions as Network Rail; 2006 price-level

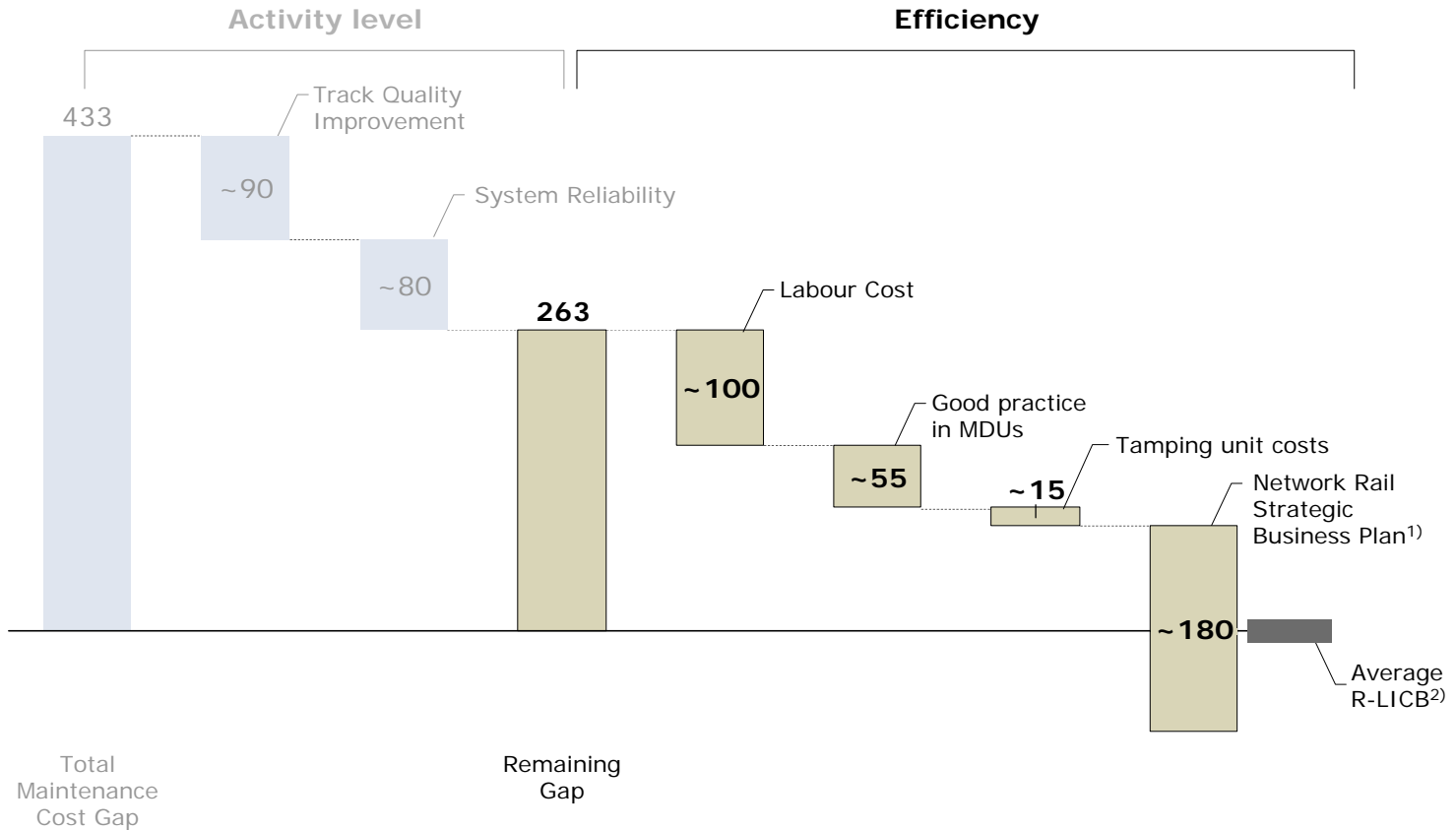
2) Annual average 1996-2006

3) Most recent available data; prevailing 2006

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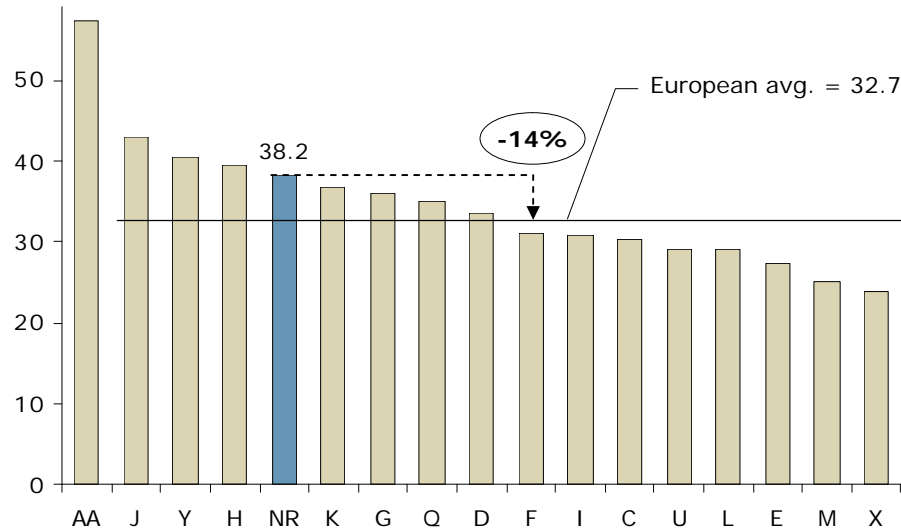
The overall maintenance efficiency gap amounts to £ 263m, of which £ 180m is already targeted in Network Rail's Strategic Business Plan



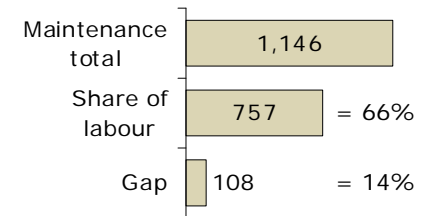
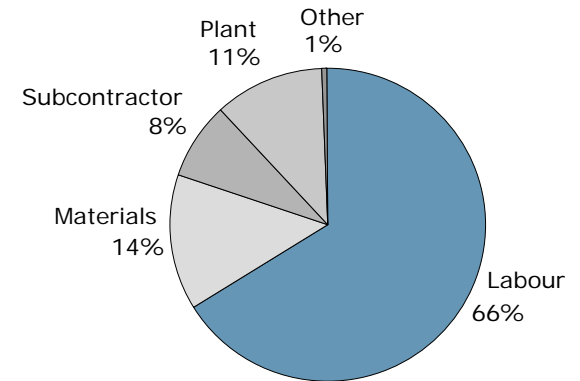
- 1) Efficiency gains (to be) achieved between 2006 and 2008 are not considered
- 2) Average R-LICB needs to be seen as a "moving target" as other countries aim to improve, too

About £ 100m of the gap in maintenance efficiency are due to Network Rail's labour cost level

Average annual labour cost levels¹⁾
 [£ 1,000/fte²⁾]



Maintenance efficiency model (October 2007)



- 1) Currency conversion by comparative price levels
- 2) Full time employee

Further characteristics and explanations regarding cost drivers and estimations

Good practice in MDUs

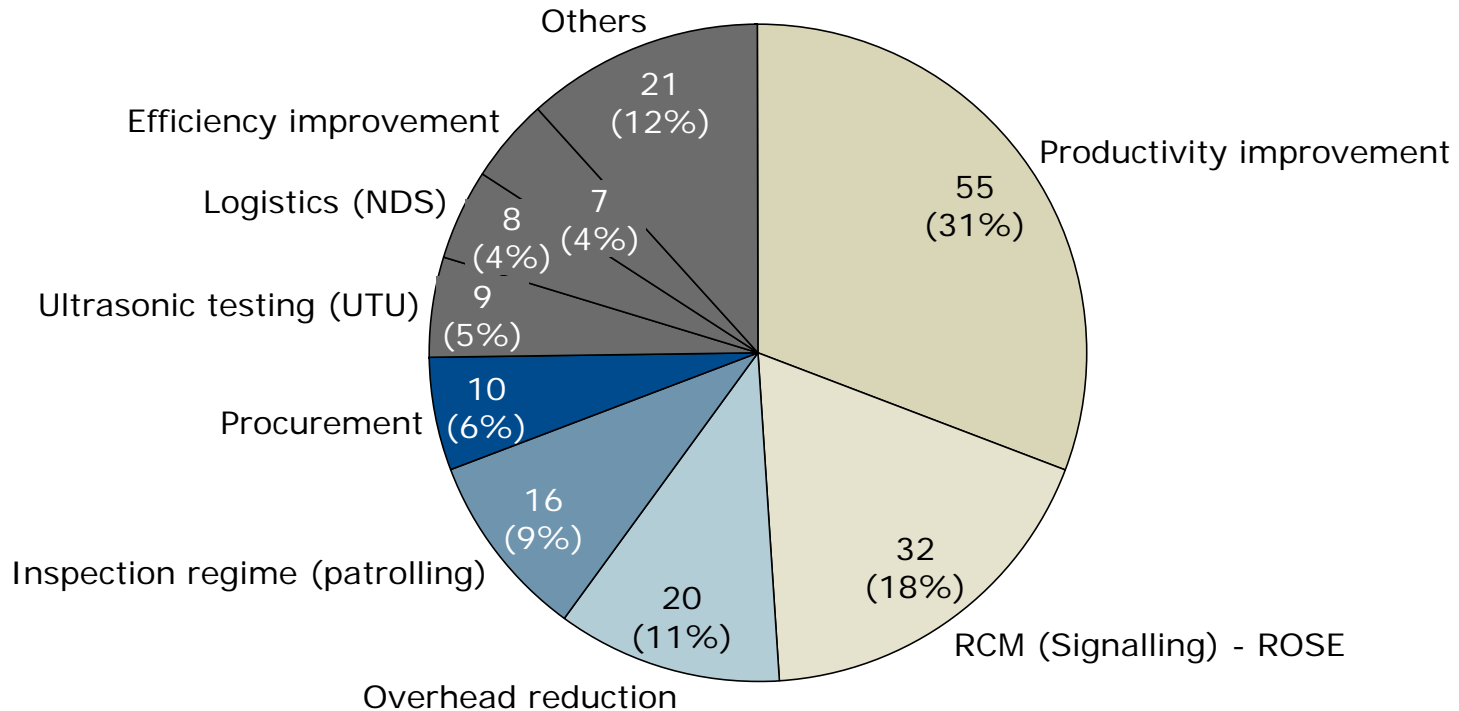
- Evidence from other European infrastructure managers indicates that the normalised cost spread of various maintenance regions can be up to 25%
- Data provided by Network Rail detailing the unit cost differences among the MDUs, support the assumption that a further convergence to good practices across the MDUs would have a cost reduction potential of at least 10%
- It is expected that some of this improvement (~20%) is already being achieved with the ongoing reorganisation of the maintenance divisions
- Based on £ 690m for permanent way and signalling, the estimation of 8% lower maintenance cost are equal to approx. £ 55m of the gap

Tamping unit costs

- Significantly oversized fleet of tampers, cranes (e.g.) and conversely heavy under-utilisation of machinery, due to track possession strategy, reliability of plant and lack of planning (good output-levels for tampers up to 1,000 m/hour at 80 hours/week)
- UK fleet conservatively assumed to go down from 100 units to 50 units not unrealistic
- Based on about £ 30m for tamping annually, the estimation of 50% lower cost are equal to approx. £ 15m of the gap
- Often quoted mark-ups of prices for plant in the UK not considered

Network Rail plans to reduce maintenance cost by about £ 180m until the year 2013/14

Objectives of the Strategic Business Plan



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Contractors with international exposure broadly share key-views about cost-drivers and opportunities for Network Rail

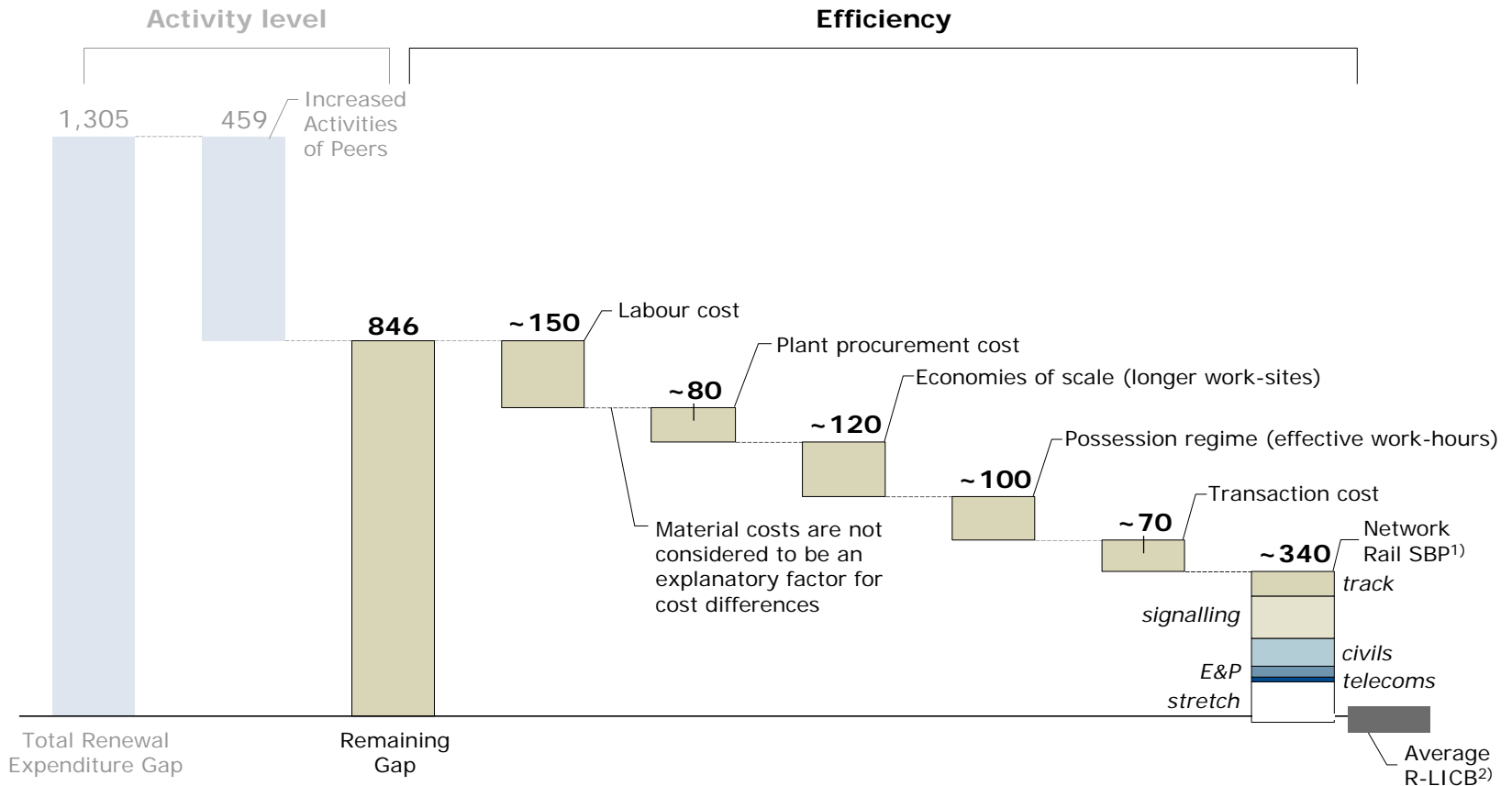
Network Rail – Main areas for improvement

Planning	Consistent, output focused planning and work programming, freezing of deadlines and compliance (" <i>clockwork mindset</i> ")
Possessions	Industrial Engineering driven track possession and utilisation policy ¹⁾ (" <i>resource deployment</i> ")
Standardisation	Standardisation of asset configurations for economies of scale and leaner processes
Quality	A genuine quality approach to asset condition and skilled labour

A fresh supply chain approach by Network Rail following the idea of "*competition and partnership*" can unlock efficiency gains from the contractors

1) More difficult in UK due to the fact, that the tracks are closer together than those of continental railways

The overall renewal efficiency gap amounts to £ 850m, of which £ 340m is already targeted in Network Rail's Strategic Business Plan



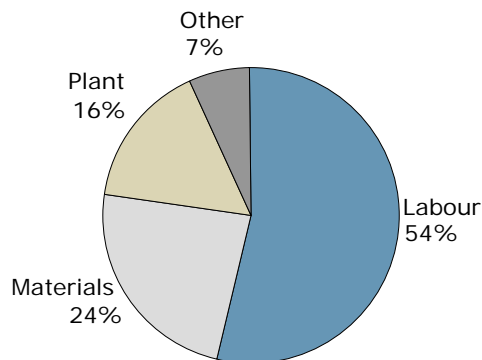
- 1) Annual saving in the final year of CP4 (2013/2014); stretch component calculated to meet an overall improvement of 17.6%
- 2) Average R-LICB needs to be seen as a "moving target" as other countries aim to improve, too

Differences of costs for labour and plant have an estimated effect on renewals of £ 230m

Plant Cost (16%)

- Purchasing prices of plant (incl. locomotives) are about 25% lower in continental Europe than in the UK (specifications, safety standards etc.), in some cases more; e.g. French tampers are half the UK-price; Plasser: +15% alone for UK-specification on crash-worthiness
- Based on 16% of £ 1,929m for plant in renewals, the estimation of 25% lower cost are equal to approx. £ 80m of the gap

Renewal Cost Categories¹⁾

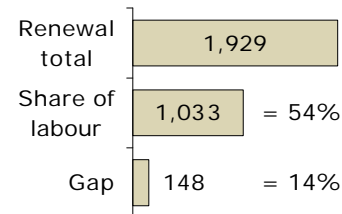


Material Cost (24%)

- Material costs are not considered to be an explanatory factor for cost differences

Labour Cost (54%)

- Approximately £ 150m of the gap in renewal efficiency are due to increased labour cost, assuming the same rates for contractors as for Network Rail

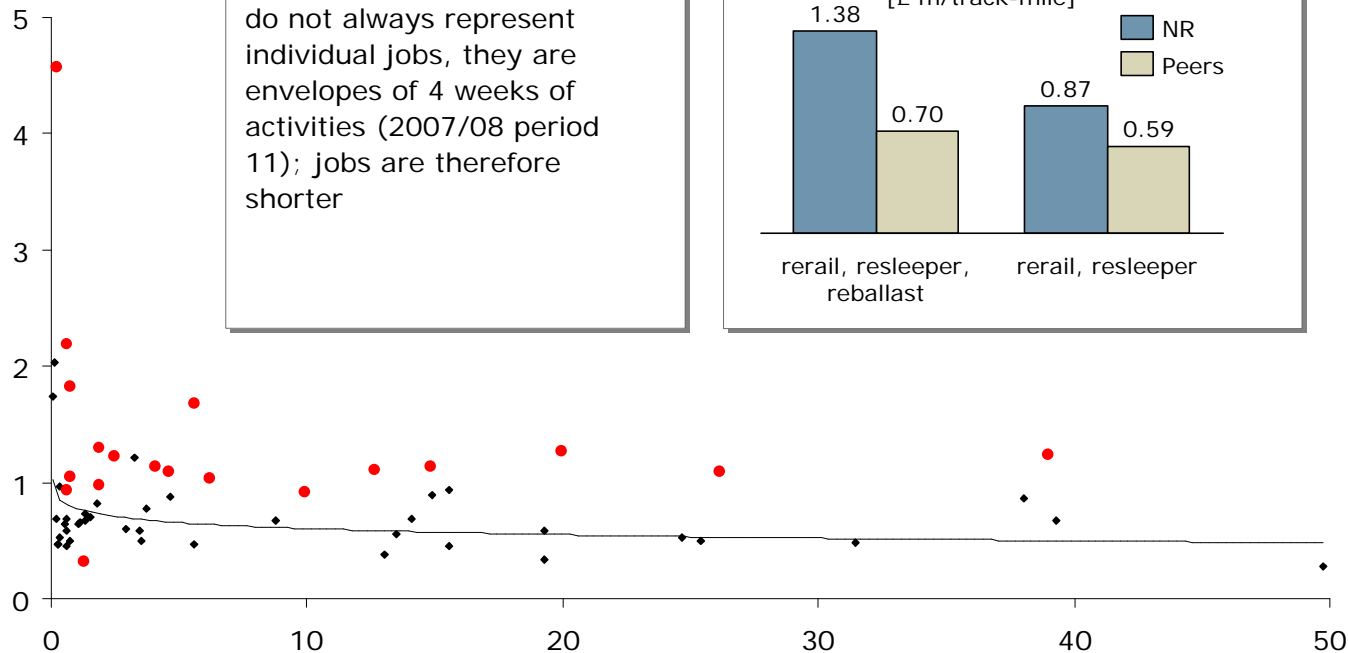


1) Based on LEK's Input Price Trends Summary Report (August 2007)

Average renewal projects in Europe are often 50% less expensive than in the UK

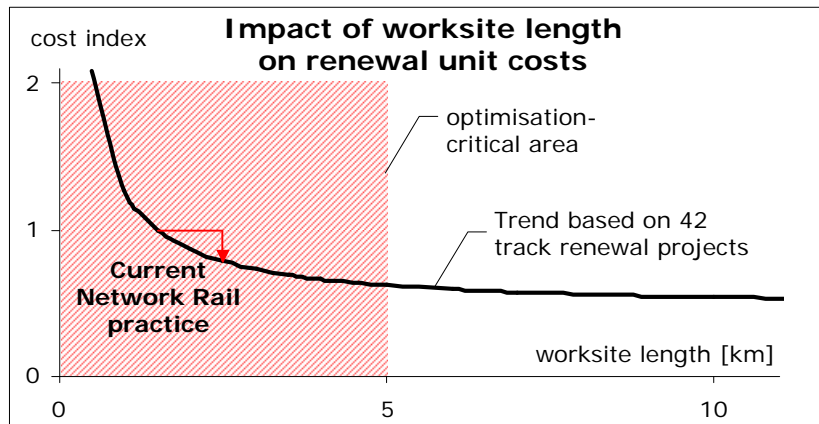
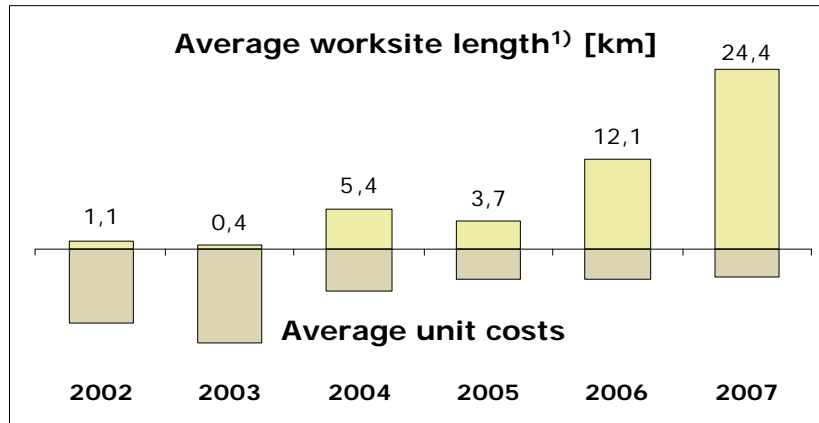
Track renewal¹⁾ – rail, sleeper, ballast

Renewal cost
[£ m/track-mile]



1) Total expenditures and total work done (in miles)

An empirical analysis from Denmark shows the strong correlation between renewal worksite length and unit costs



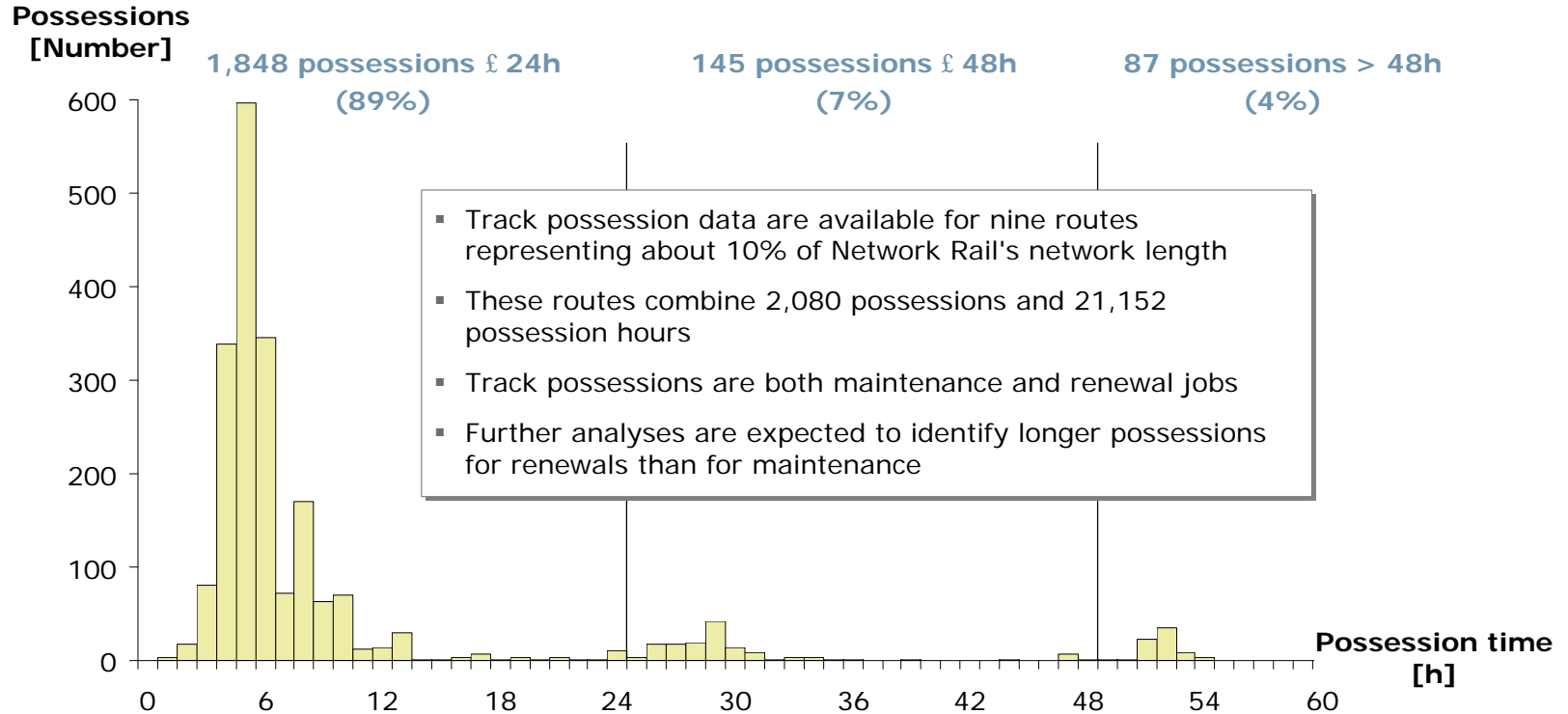
Economies of scale

- A BSL analysis of 61 superstructure renewal projects in Denmark clearly shows the strong correlation between worksite length and resulting unit cost
- The average worksite length of the full year forecast for Network Rail's complete renewals (more than 100 jobs; LNW 2007/08) is less than 1km
- Typically, several years are required to migrate patchy renewal patterns to more consistent ones; however, the benefit is very substantial
- As a cost impact assessment, the average worksite length is assumed to be increased from 1.5 km to 2.5 km resulting in 22% cost decrease
- Based on 29% of £ 1,929m for track renewals, 22% lower cost are equal to approx. £ 120m of the gap

1) Average worksite length = average length of work done per job

Apart from some long possessions, the typical track possessions are four to six hours

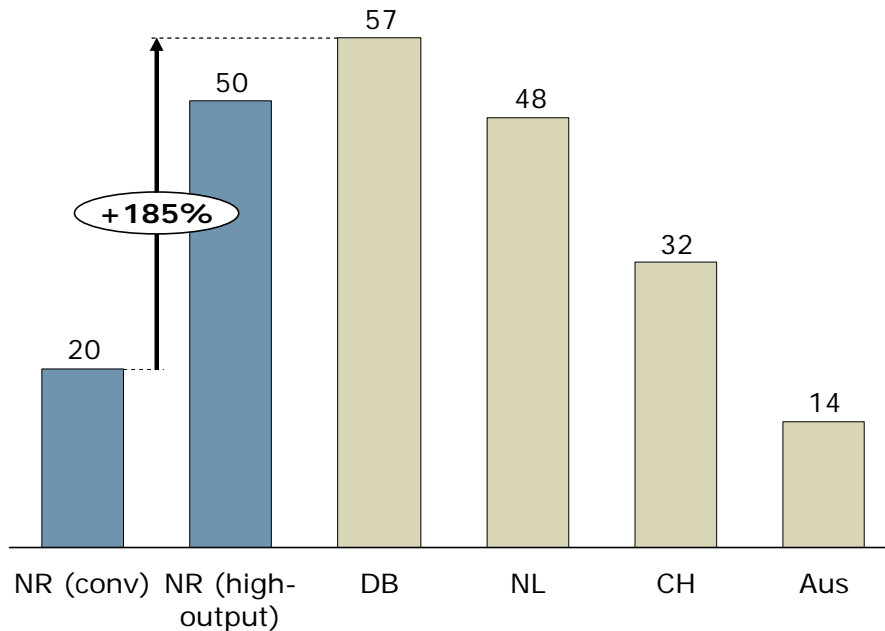
Track possessions



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The conventional plant dominantly used in the UK is considerably less productive than high output machinery

Output of renewal plant
[metres/hour]



Type of Plant

- In the UK mainly conventional plant is used for renewal work
- According to a study carried out for the ORR by LRRail, high output equipment is more commonly used at some other major European infrastructures
- The efficient use of high output machinery would require longer track possession times

The management of available possessions is less efficient than good continental European practice

Quotes (extract only) from contractors with international exposure

- *"We in the UK are relatively unproductive in work-site preparation and follow-up, we may get 3½ productive hours out of a 6 hour possession (and 6 hour possessions are already good, it's often less), the Swiss would typically get 7½ hours out of an 8 hour possession"*
- *"A need to reassess the track possession strategy, e.g. France with abundant use of high-output machinery (e.g. rail relaying) in typical weeknight-shifts, also allowing for efficient plant utilisation, if measured by 'capital employed per metre of output' the weeknight vs. weekend strategies compare by a ratio of 1:3"*
- *"Effect of warning-procedures on output and capacity utilisation of shifts (e.g. 6 h/night), net productive time for front-line staff and equipment sometimes less than half of continental European practice, let alone the higher amount of 'safety functions' on top (example single line working with 3-5 trains/hour may result in 10 minutes net productive time)"*
- For the quantitative assessment, the utilisation of human resources and machinery for all renewals in permanent way is estimated to be moderately increased, assuming a 20% cost decrease (**Note**: no additional assumption for other asset groups)
- Permanent way represents 37% of total renewals (~£ 715m); based on 70% for labour and plant, 20% lower cost are equal to approx. £ 100m of the gap

Transaction cost are perceived to be particularly high

Quotes (extract only) from contractors with international exposure

- *"Transaction cost for instance in a £ 25m project for a contractor alone some 10%"*
- *"Wide-spread practice of sub-contracting from labour-agencies in project work, typically half the front-line staff and sometimes even significantly more adding another layer of complexity and transaction costs"*
- *"Projects nevertheless planned well in advance, however no compliance with plan, last-minute changes with major cost-implications, freezing of plans and deadlines (e.g. in Switzerland) could provide substantial gains"*
- *"Good planning and mutual dependability in work programming at the success-critical interface between Network Rail and its contractors is a notorious concern, compliance with planned work arrangements is very poor; this effectively puts a significant waste of time, resources and money into the system"*
- For the quantitative assessment, transaction cost are estimated to account for 10% of the gap for all permanent way renewals (~£ 715m), equal to approx. £ 70m

Content

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- Revised LICB-Basis
- Gap-Determination
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 - Renewal
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 - Renewal
- **Conclusions and Outlook**

Conclusions (1)

- Based upon a revised LICB-data set the face value for the gap between Network Rail and an average benchmark is
 - £ 433m p.a. for maintenance
 - £ 1,305m p.a. for renewal
- Current track quality and system reliability require enhanced maintenance activity levels in excess of steady state needs at an estimated amount of £ 170m p.a.
- Through significant ratcheting-up of renewal (in order to remove backlog) Network Rail's investment activity over the past decade broadly reflects steady-state regeneration levels
- For the majority of peers in the comparison, LICB-data reflect investment levels below steady state regeneration
- A correct steady-state to steady-state comparison requires a mark-up for most LICB-peers, this accounts for £ 459m of the renewal-gap at face value
- After correcting the face value gaps for activity-levels as described above, the residual efficiency-gaps amount to
 - £ 263m p.a. for maintenance
 - £ 846m p.a. for renewal

Conclusions (2)

- BSL gap analysis for maintenance efficiency comes to the following estimates for key parameters
 - £ 100m p.a. for labour cost
 - £ 55m p.a. for good practice in MDUs
 - £ 15m p.a. for tamping unit cost
- Network Rail's "*Strategic Business Plan*" details a maintenance cost improvement of £ 180m p.a.
- BSL gap analysis for renewal efficiency has been studied in some detail for a whole set of dominant cost drivers, the broad estimates are
 - £ 150m p.a. for labour cost
 - £ 80m p.a. for plant procurement cost
 - £ 120m p.a. for economies of worksite scale
 - £ 100m p.a. for possession regimes
 - £ 70m p.a. for transaction cost
- Network Rail's "*Strategic Business Plan*" details a renewal cost improvement of £ 340m p.a.

Summary of Activity-Level Analysis

Explanatory factors	Impact	Principle Responsibility
Track Quality	<p>Basis: £ 690m maintenance for permanent way and signalling</p> <p>Assumption: "Moderate" improvement of track quality (70 to 80)</p> <p>Result: 13% equal to ~ £ 90m</p>	Network Rail
System Reliability	<p>Basis: £ 690m maintenance for permanent way and signalling</p> <p>Assumption: Reduction of train delaying infrastructure incidents by 50%</p> <p>Result: 12% equal to ~ £ 80m</p>	Network Rail

Summary of Efficiency-Gap Analysis (1)

Explanatory factors	Impact	Principle Responsibility
Labour cost	<p>Basis: £ 760m labour cost in maintenance £ 1030m labour cost in renewals</p> <p>Assumption: Reduction of labour cost levels (Network Rail as well as contractors) to European average</p> <p>Result: 14% equal to ~ £ 100m for maintenance and ~ £ 150m for renewals</p>	(?)
Good practice in MDUs	<p>Basis: £ 690m maintenance for permanent way and signalling</p> <p>Assumption: Further convergence of unit costs to good practices across the MDUs</p> <p>Result: 8% equal to ~ £ 55m</p>	Network Rail
Tamping unit costs	<p>Basis: £ 30m for tamping annually</p> <p>Assumption: Improved utilisation of human resources and tampers</p> <p>Result: 50% equal to ~ £ 15m</p>	Network Rail/TOCs

Summary of Efficiency-Gap Analysis (2)

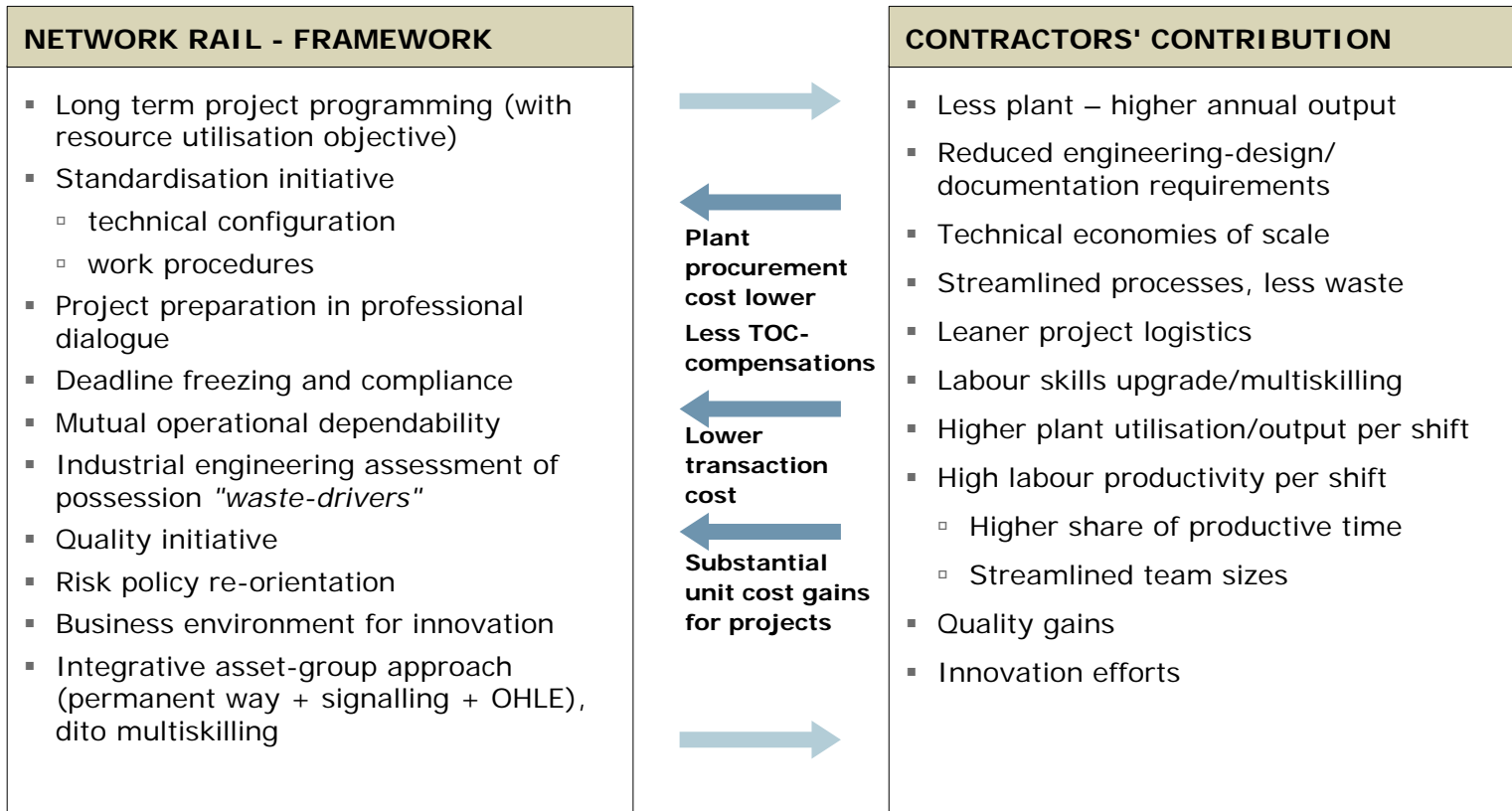
Explanatory factors	Impact	Principle Responsibility
Plant procurement cost	<p>Basis: £ 310m for plant in renewals</p> <p>Assumption: Reduction of purchasing prices to continental European level</p> <p>Result: 25% equal to ~ £ 80m</p>	<p>Network Rail (vehicle acceptance board)</p> <p>Rail Safety and Standards Board</p>
Economies of scale (longer work-sites)	<p>Basis: £ 550m for track renewals</p> <p>Assumption: Increase of average worksite length by 1 km from 1.5 km to 2.5 km</p> <p>Result: 22% equal to ~ £ 120m</p>	<p>Network Rail/Contractors/TOCs</p>
Possession regime (effective work-hours)	<p>Basis: £ 500m for labour and plant in permanent way renewals</p> <p>Assumption: Improved utilisation of human resources and machinery</p> <p>Result: 20% equal to ~ £ 100m</p>	<p>Network Rail/Contractors/TOCs</p>

Summary of Efficiency-Gap Analysis (3)

Explanatory factors	Impact	Principle Responsibility
Transaction cost	<p>Basis: £ 715m for permanent way renewals</p> <p>Assumption: Improved planning, less waste of time, resources and money</p> <p>Result: 10% equal to ~ £ 70m</p>	Network Rail
Strategic Business Plan	<p>Result: ~ £ 180m for maintenance</p> <p>~ £ 340m for renewals</p>	Network Rail

Network Rail can unlock contractor efficiency contributions by a fundamental shift of supply-chain relations

"Competition and Partnership"



As an immediate follow-up to tackle the most promising areas, Network Rail may consider four projects

Strengthening of an Industrial Engineering Function for Maintenance

- (Further ?) Build-up of a competence centre for knowledge management and innovation around key in-house maintenance activities
- Focus on process efficiency, productivity of labour, utilisation of plant and equipment, logistics of work and material supply, (self-) critical assessment of rules and regulations
- Systematic basis for continuous improvement programme

Programme for joint Supply Chain Overhaul together with Contractors

- Redefinition of business model under the guideline of "*competition and partnership*", with a management and an operational component
- Management focus on contract logic, risk allocation, planning framework, cooperation and control, innovation
- Operational focus on interfaces, logistics, possessions, industrial engineering, quality, standardisation of procedures

Initiative "*Good Planning Practice*"

- Fundamental redesign of the overall planning process (from long-term financial planning to actual work programming)
- Underlying philosophy to (1) provide planning stability, (2) enable high-level resource utilisation, (3) facilitate a clockwork approach to work programming
- Set up a migration path from patchwork renewals to more consistent, economic work execution

Establishment of a "*Shadow*" Industrial Engineering for Renewal

- Establishment of a competence centre for renewal process knowledge management as a "*mirror*" to contractual partners
- Focus on teaming effort to deliver efficiency gains in the context of "*Good Planning Practice*" and "*Supply Chain Overhaul*"
- Scope of tasks and areas of expertise similar to industrial engineering function for maintenance

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