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FINAL REPORT

Costs of Railway Outputs

Prepared for:

Rail Value for Money study team

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Executive Summary

Background

In early 2010 a Value for Money study team was formed by the Department for Transport (DfT) and the Office of Rail Regulation (ORR), under an independent chairman, Sir Roy McNulty, with a brief to investigate the value for money that is being achieved by the GB rail industry. Booz & Company was engaged as part of Workstream A, "Industry Objectives, Strategy and Outputs", to establish relationships between the outputs and costs of the GB rail industry, and to investigate the potential for cost savings through re-specifying required outputs.

Rail industry outputs

The outputs which revenues and Government subsidy buy are largely set by DfT and Transport Scotland. In creating output specifications, Government does not limit its role to specifying public service contracts for that part of the railway which is non-commercial. Government also attempts to anticipate market demand, and to specify services which will satisfy this demand.

While high level outputs have been set for safety, reliability and capacity, passenger train operating franchises also specify in great detail the services required and the standards to which these need to be delivered. Similarly, DfT and ORR specify the performance and capability of the railway network in terms of track mileage and layout, line speed, gauge, route availability and electrification. In particular, in CP4 Network Rail is charged with maintaining a baseline for network capability unless the specification is changed through the network change procedure.

Rail industry costs

Over the 10 year period to 2008-09, costs incurred by franchised TOCs and Network Rail increased by 30% in real terms. In the same period, revenue increased by 53% in real terms, with the effect that by 2008-09, revenue was able to cover TOCs' operating costs and ROSCO charges and make a small contribution to infrastructure costs. Nevertheless, the gap between revenue and total cost grew in absolute terms. The most important component of the cost growth was the increase in infrastructure renewals, partly due to the need to address the backlog of underinvestment by Railtrack. However, TOC operating costs also grew, at a faster rate than the growth in train or vehicle kilometres.

The project has focussed on the £10.1 billion costs incurred in 2009-10 by franchised TOCs and Network Rail, excluding infrastructure enhancements. TOC revenues in this year were £6.6 billion, resulting in a net cost of £3.5 billion. An indicative allocation of costs to sectors showed that services operated by London and South East franchises incurred the greatest proportion of the overall cost, around 40% of the total, and about 50% of passenger miles. However, over half of the net cost is incurred by services operated by regional franchises, which provide less than 20% of total passenger miles. The average net cost per passenger mile of regional franchises is 31.1p, compared with just 4.8p for LSE franchises and 7.3p for long distance franchises. Regional franchises therefore represented a prime area in which to examine opportunities for net cost reduction.

Rail cost drivers

The drivers of costs were examined for TOCs and Network Rail. The resource requirements of a TOC flow from the level of service and quality of service specified by Government as part of the franchise letting process. The level of service specification is described by the timetable, which sets out the routes to be operated, service frequencies, journey times between stations, stopping patterns and hours of operation. The timetable effectively defines the resources required to operate it. In particular, the fleet requirement is generally defined by the morning peak service requirements – including service in the contra peak direction, which may add to the total fleet requirement depending on whether trains can be turned and worked back in the peak direction.

Not all TOC costs vary with changes in outputs. For example, changes to the peak level of service specification may require additional fleet, additional train crew (an increment to variable track access charges) and additional traction energy but would be unlikely to require additional management or station resources. However, the relationships between costs and outputs are complex.

Network Rail's costs derive primarily from the size and configuration of the network and its utilisation (which are themselves functions of the levels of service requirements of freight and passenger train operators). Only some 10-15% of maintenance and renewal costs are variable with traffic (at current levels of traffic density), with operational and corporate costs largely insensitive to changes in traffic levels.

Savings opportunities

Opportunities were identified to generate savings by changing operational and network outputs.

The most significant savings related to operations are driven by changes in resources required to operate the peak. Net cost savings from changes to services, reliability targets and crowding parameters are relatively modest, although more significant savings may be realised if changes to crew working conditions can be negotiated. Reducing the complexity of the timetable also presents a substantial opportunity, but one which would be difficult to implement and which we have not been able to quantify at this stage.

To generate net cost savings on a greater scale, changes to infrastructure outputs are required – not necessarily removing lines but potentially changing the functionality of the network: in particular, the introduction of separate standards and maintenance regimes for the core network and the less dense regional networks. This could be extended by switching segregated regional lines to light rail. However, if network cuts are considered appropriate, these would need to go beyond small branch lines to have significant impact on costs. Potential net cost savings from major network reductions are clearly very large (certainly hundreds of millions), although a further study would be required to establish the size of this opportunity based on viability of individual lines.

The potential savings identified from changes to operational and network outputs are summarised in the table overleaf.

Identified Potential Savings

Options	Net Savings (£m pa)	Savings range (£m pa)	Timing	Implementation Cost
Changes to operations				
Reduction in reliability targets	26	20 - 30	Gradually up to 2020	Small
Changes to services - Removing contra peak - Bus shuttles - Lower off-peak frequencies - Removing first/last services	 26 15 small small*	 10 - 30 10 - 20	 Gradually up to 2020 Gradually up to 2020 N/A N/A	 Small Small N/A
Changes to crowding parameters	17	10 - 20	Gradually up to 2020	None identified
Changes to network complexity	Not quantified		Long term	Capex, re-design of franchises
Changes to crew working conditions	70	50 - 100	Long term	Potential major IR costs
Changes to network				
Changes to network functionality; **or**	170	100 - 250	Gradually up to 2020	None identified
Minor network reductions; **or**	[45**]	[30 - 60**]	£27m by 2015, the rest long term	Decommissioning, redundancy
Major network reductions	Large, not quantified		To be determined	Decommissioning, redundancy
TOTAL	**324**	**200 - 450**		

Notes:
* Small for train operators; reduction in infrastructure maintenance cost being addressed by Theme E (Asset Management)
** Not included in total due to overlap with network functionality option

Source: Booz & Company analysis

The table shows indicative total annual savings in the range £200-450m, partly depending on the degree of overlap between opportunities. Most of these net cost savings would be achieved in phases over the next 10 years, with franchise renewal being the trigger for implementation of many of the options.

These savings estimates have been derived by modelling the avoidable operating costs and estimating the degree of avoidability of the infrastructure costs. Further investigation would be required to determine the degree to which these costs are truly avoidable.

Recommendations – savings initiatives

We recommend that the savings opportunities identified above are pursued further and taken to the next level of detail. The key opportunities include:

- Removing services or adjusting outputs where such requirements drive the provision of additional under-utilised resources or excessive levels of back-up resources (staff, rolling stock); and
- Decommissioning or changing the functionality of underutilised parts of the network, where provision of transport by other modes may be more appropriate/cost effective in delivering customer requirements.

More strategic initiatives to deliver cost effectiveness and improved value for money in the longer term would need to address the reduction of network complexity through fundamental timetable redesign.

Recommendations - enablers of savings

In order to maximise the savings achievable and facilitate their delivery, we believe that a number of organisational and process changes needs to be addressed.

The key enablers for significant cost reduction include changes in the approach to, and responsibility for, service specification:

- The specification of service level commitments and high level outputs should be driven by value for money criteria; and
- Local, as opposed to central, service specification, can also reduce costs by allowing for service specifications better matched to market needs. TOC engagement, together with local and central Government, in the service specification is vitally important to ensure cost effectiveness and value for money. 'One size' outputs are not appropriate for all.

A re-design of incentive structures is also necessary in order to meet market demand more effectively. TOCs must be incentivised to deliver market requirements in the most efficient manner. This may require giving TOCs:

- More scope to flex required outputs to better meet market demand;
- Longer franchises, to incentivise them to improve staff productivity and address underlying legacy industrial relations issues;
- More responsibility for (and greater transparency in the composition of) fixed track access charges; TOCs should not be 'held harmless' but should be incentivised to engage actively with NR to drive appropriate infrastructure provision;
- More 'client' responsibility in defining infrastructure project requirements and in controlling the costs of their provision; and
- More responsibility for the delivery of minor enhancements at stations and car parks to meet customer needs.

Similarly, NR's incentive structure needs to be changed to make it more responsive to the requirements of its customers. This may require:

- Giving NR management greater focus on network performance and availability (i.e. OMR), by spinning off responsibility for non-core areas such as property, retail, major project development, and also asset management at some stations; and
- Enabling decision-making on infrastructure to be more responsive to customer needs through closer mapping of NR's management structure to franchise areas, moving more towards 'virtual vertical integration'.

1. Introduction

1.1 Background

In early 2010 a Value for Money study team was formed by the Department for Transport (DfT) and the Office of Rail Regulation (ORR), under an independent chairman, Sir Roy McNulty, with a brief to investigate the value for money that is being achieved by the GB rail industry.

In March 2010, the study team produced the Rail Value for Money Scoping Study Report[1] which, amongst other things, established a number of workstreams to be progressed, and identified a need for the rail industry to have clarity with respect to what it is required to deliver and to align its outputs properly with that requirement, It also identified a need for there to be an appropriate balance between passengers and taxpayers in paying for the railway provided.

The Scoping Study established that the responsibility for specifying the outputs to be delivered by the rail industry (including, at the highest level, capacity, quality and safety) lies with the Government, and that if the costs of these outputs are to be minimised and value for money optimised, there is a need to understand the drivers of the costs of railway outputs, the value that the outputs deliver, and the manner in which re-specification of outputs impacts costs.

As a result, as part of Workstream A: "Industry Objectives, Strategy and Outputs", Booz & Company was engaged to establish relationships between the outputs and costs of the GB rail industry, and investigate the potential for cost savings through re-specifying required outputs.

1.2 Project remit

Specifically, Booz & Company's remit was to:

- Identify the outputs of the GB rail industry;
- Examine the costs of the GB rail industry;
- Establish the drivers of costs and the relationships between cost drivers and outputs;
- Identify opportunities for cost savings by modifying output specifications; and
- Determine the value of net cost savings of such opportunities.

The outputs of the project were to be:

- Identification of key cost drivers, focusing on costs of Network Rail (NR) and TOCs;
- A set of evaluated options for reducing net industry costs by changing output choices and the process by which outputs are specified and bought; and
- Recommendations for an improved approach.

[1] Rail Value for Money Scoping Study Report, Sir Roy McNulty, DfT, 31 March 2010

Recognising that a great deal of the necessary research has either already been done by the Value for Money study or is in hand via the other workstreams, Booz & Company was charged with undertaking further research into costs and cost drivers as required, organising appropriate industry interviews to augment previous and ongoing workshops, and coordinating to the extent necessary with the other workstream leaders.

1.3 Approach and report structure

The structure of this report reflects the principle that the case for cost savings develops from the relationship between railway outputs, costs, and cost drivers.

Section 2 presents the explicit and implicit outputs of the GB rail system to set a reference point for the ensuing examination of costs.

An analysis of the current costs of the GB rail system is presented in Section 3 along with historic trends to gain insight into how costs and outputs have changed

This is followed by a discussion of the relationship between railway costs and their cost drivers, a specific examination of the drivers of the costs of the GB rail system, and the development of a costing methodology for use in evaluating cost saving opportunities – all presented in Section 4.

A number of opportunities to make net cost savings (that is, cost savings after adjusting for revenue impact), through changes to operations and to the railway network, are discussed and evaluated in Sections 5 and 6 respectively. In Section 7 we discuss the structural and process changes required to enable major changes to outputs and costs.

Conclusions and recommendations with respect to opportunities for potential cost savings are presented in Section 8.

2. GB rail industry outputs

2.1 Introduction

This section provides a brief introduction to the outputs specified for and delivered by the GB rail industry. In order to develop options for changing outputs, it is important to understand both:

- How outputs are currently specified (what metrics, by whom); and
- What levels of output are currently being delivered.

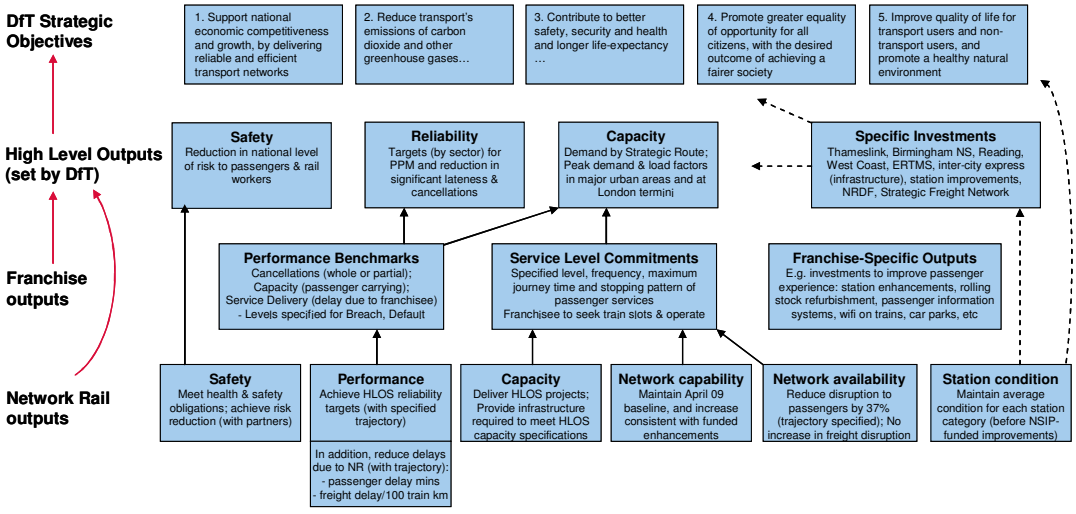
2.2 How outputs are specified

2.2.1 Form of outputs specified

The outputs which revenues and Government subsidy buy are largely set by DfT and Transport Scotland. In creating output specifications, Government does not limit its role to specifying public service contracts for that part of the railway which is non-commercial. Government also attempts to anticipate market demand, and to specify services which will satisfy this demand. We comment further on this role below, in Section 7.

The form of outputs specified by DfT for England and Wales is shown in Figure 2-1 below:

Figure 2-1: Hierarchy of Railway Outputs (England & Wales)



Sources: DfT, ORR, Booz & Company analysis

2.2.2 Outputs specified at high level

In its High Level Output Specification (HLOS) published in 2007, DfT specified requirements to be delivered by the end of CP4 (2013-14), in the following areas:

- **Safety** – a 3% reduction in risk relating to death or injuries to rail workers and to passengers from accidents on the railway, across Great Britain;
- **Reliability** – an improvement in the "public performance measure" (PPM) across franchised passenger services in England and Wales, to reach 92% for long-distance, 93% for London & South East and 92% for regional services. In addition, DfT requires specified reductions, again by sector, in the percentage of trains which arrive over 30 minutes late at their final destination or are cancelled;
- **Capacity** – an increase in the carrying capacity of the franchised passenger railway, expressed in terms of the ability to accommodate, firstly, additional passenger kilometres on each of 23 strategic routes and, secondly, additional passengers arriving at peak times in London and other key urban centres (within specified maximum average load factors); and
- **Projects** – the delivery of various major projects and other investments including the Thameslink Programme, improvements at Birmingham New Street, Reading and other stations, completion of the West Coast works, further work on ERTMS, infrastructure works to support operation of inter-city express trains, NR Discretionary Fund items and investment in a Strategic Freight Network.

These outputs can be seen in the context of DfT's broader strategic objectives (as set out in DfT's website) which include social, economic and environmental objectives for the transport sector as a whole.

Transport Scotland has set out network outputs for Scotland in three "tiers", as follows:

- Tier 1 essentially requiring existing capability, capacity and station condition to be maintained, and PPM to be increased to 92%, and allowing for small-scale interventions to accommodate some background growth;
- Tier 2 setting out a series of funded projects to increase capacity including Glasgow Airport Rail Link (cancelled), Airdrie to Bathgate, and the Borders Railway; and
- Tier 3 setting out additional priorities for enhancement, with delivery subject to availability of further resources.

2.2.3 Franchise outputs

The high level outputs set out for the industry as a whole are reflected in a series of intermediate outputs to be delivered by individual train operators and by NR.

Service Level Commitments in passenger franchises specify in great detail the services required, including their frequency, maximum journey time and stopping patterns – the franchisee is required to seek appropriate train paths. Each franchisee has to achieve given performance benchmarks in terms of proportion of whole and partial cancellations, passenger carrying capacity and levels of operator-caused delay, with different performance levels specified to trigger first breach and then default of the franchise.

In addition, various investments are specified to improve the passenger experience including car parks and other station enhancements, rolling stock refurbishment, passenger information systems and provision of wifi on trains – many of which are market-driven and would be in the interests of the operator to deliver given a sufficiently long timeframe to recoup the investment.

2.2.4 NR outputs

NR, for its part, has a range of output obligations covering safety, performance (reliability), capacity, network capability, network availability and station condition, which were set out by the ORR in its determination as part of the Periodic Review process and are detailed further in NR's Delivery Plan.

Defined outputs for **safety**, **performance** and **capacity** mirror the outputs set out by DfT and Transport Scotland in their respective HLOSs. In relation to reliability, NR has an additional obligation to reduce the delays it causes according to prescribed trajectories for passenger delay minutes and freight delays per 100 train kilometres.

NR must maintain the April 2009 baseline for **network capability** in terms of track mileage and layout, line speed, gauge, route availability and electrification, unless the specification is altered through the industry network change procedure.

Network availability has been introduced as a new output for NR in CP4, with ORR defining metrics for passenger and freight disruption due to planned possessions. Note that although neither network capability nor network availability map directly to HLOS metrics, they do contribute to the industry's ability to satisfy demand.

Finally, NR is required to maintain average **station condition** at or above a baseline level for each station category, and across all station categories in Scotland, before taking account of incremental improvements funded under the National Stations Improvement Programme (NSIP). This does not contribute directly to any of the HLOS output metrics but can be seen to support DfT's strategic objectives, in particular to "improve quality of life for transport users…"[2]

NR is also bound by certain conditions in its licence which are relevant to outputs, in particular Condition 1 which requires NR to manage the network so as to satisfy the reasonable requirements of service providers and funders, and Condition 2 which specifies requirements for provision of timetable information.

2.3 Output metrics

Levels delivered in 2009-10 for some industry output metrics are shown in Table 2-1 below:

[2] DfT website: http://www.dft.gov.uk/about/aimandobjectives

Table 2-1: GB Rail Output Metrics 2009-10

Metric		Value
Capacity / Volume Metrics		
Passenger Miles[1]	(Bn)	31.2
Vehicle Miles[1]	(Bn)	1.5
Reliability Metrics		
PPM (MAA)[2]	(%)	91.5
Significant Lateness & Cancellations[2]	(%)	4.6 (Long Distance) 2.5 (London & SE) 2.1 (Regional)
NR Delays to Passengers[2]	(000 Mins)	6,742
NR Delays to Freight	(Mins/100kms)	4.0

1. DfT Network Modelling Framework (NMF) model
2. ORR, National Rail Trends 2009-10 Yearbook

In the next section, we will consider the cost base and how costs compare with outputs, sector by sector and in terms of trends over time.

3. GB rail industry costs

This section provides an overview of the costs of outputs delivered by the GB rail industry, as follows:

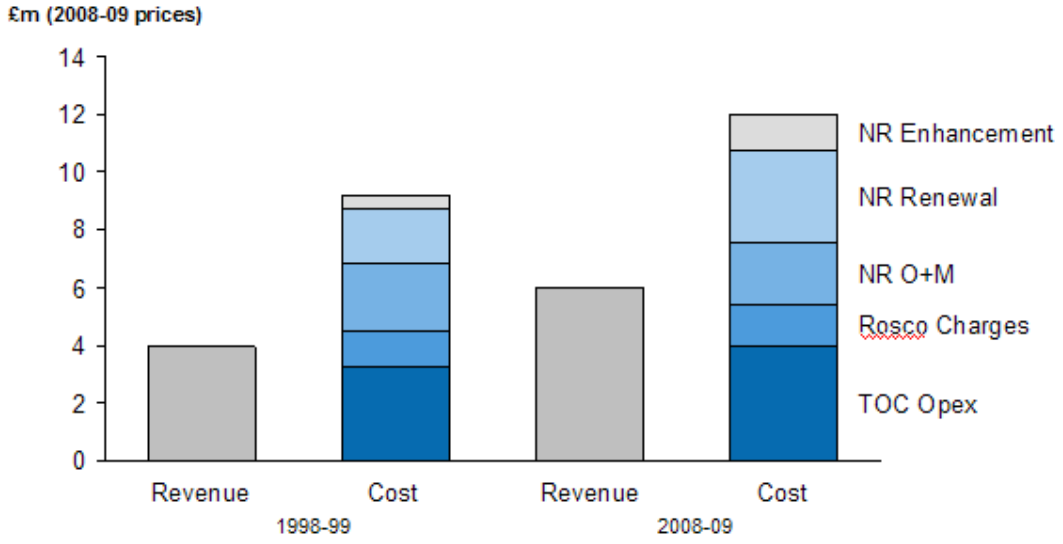
- Section 3.1 analyses trends in costs and outputs over the 10 year period up to 2008-09;
- Section 3.2 sets out the current (2009-10) costs of outputs and explains the way in which we have analysed these, which form the basis for evaluation of cost reduction opportunities later in the report; and
- Section 3.3 provides a breakdown of costs and outputs by sector.

3.1 Historic trends in costs and outputs

In order to obtain some insight into how costs may have been influenced by outputs in recent years, we examined trends in costs and outputs over the 10 year period from 1998-99 to 2008-09. Throughout Section 3.1, the data presented is based on that provided by the Rail Value for Money study team, and all costs and revenues are expressed in 2008-09 prices.

Figure 3-1 below compares rail passenger revenues and costs, including all costs for franchised TOCs and NR, in 1998-99 and 2008-09.

Figure 3-1: Passenger Rail Revenues and Costs, 1998-99 and 2008-09



Source: DfT National Network Modelling Framework

In real terms during this period, total TOC and NR costs increased by 30%, from £9.2 billion to £12 billion. In the same period, revenue increased from £3.9 billion to £6.0 billion, so that the net cost (cost less revenue) for the industry increased from £5.3 billion to £6.0 billion – a rise of 14%.

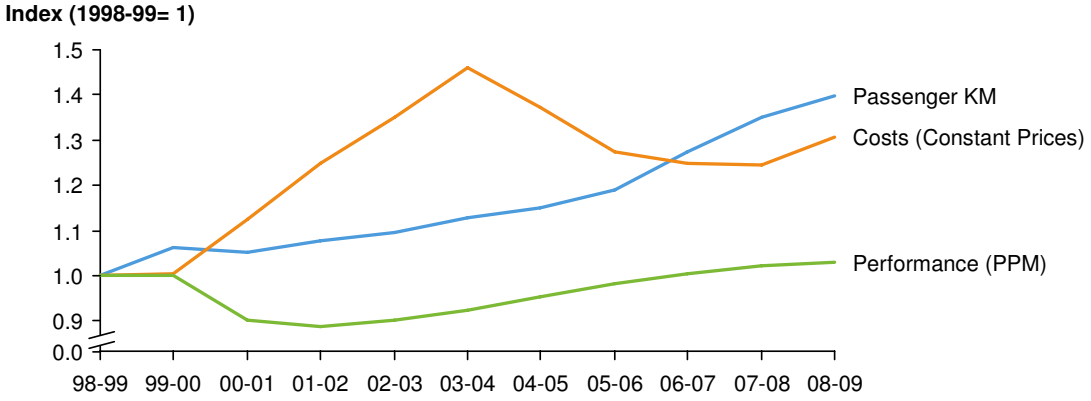
Although the net cost increased, a positive development was that revenue grew by 53% - faster than the growth in costs – so that by 2008-09 revenue at least covered TOCs' operating costs and ROSCO charges, which it did not do in 1998-99.

In the same 10 year period, key output measures also increased:

- Train performance (PPM) dipped from 88% to 78% following the Hatfield incident, but then recovered to reach 90.6% by 2008-09; and
- Passenger kilometres increased by 40%, with demand growing in particular as train performance improved; train kilometres increased by 13%, vehicle kilometres by 14%.

Figure 3-2 below shows the growth in PPM, passenger kilometres and costs, all indexed to 1998-99 levels.

Figure 3-2: Indexed Trends in Performance, Passenger Kilometres and Costs

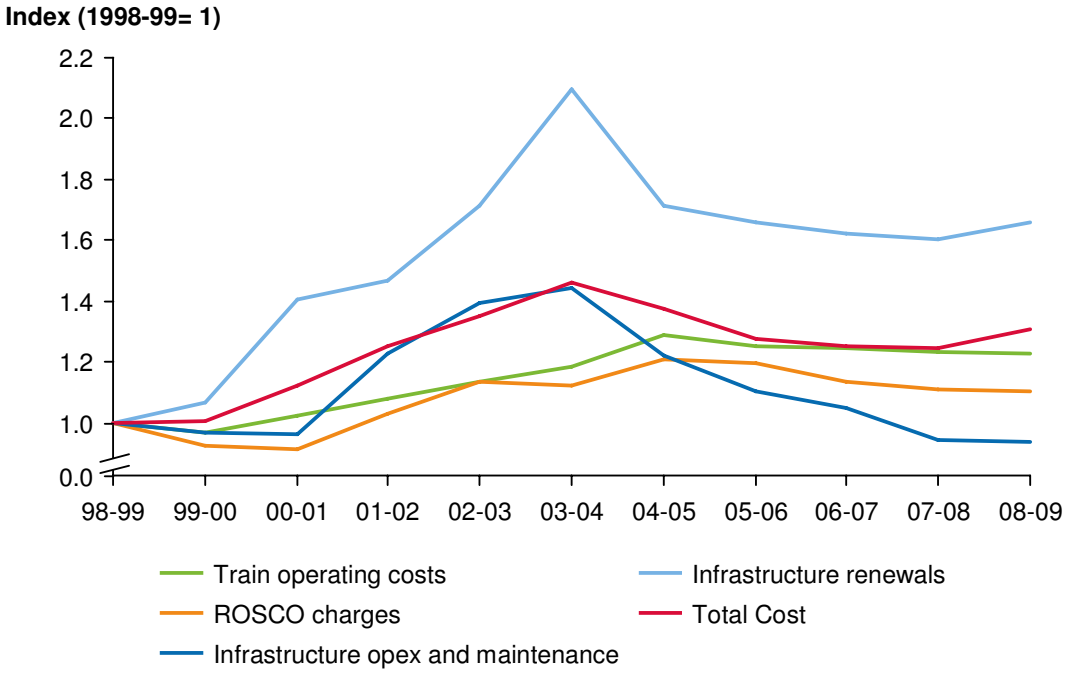


Sources: DfT National Network Modelling Framework
ORR National Rail Trends Yearbook

It can be seen that in real terms, although costs rose rapidly after 1999-2000 they have fallen significantly since 2003-04. Over the 10-year period as a whole, costs rose less rapidly than passenger kilometres – real costs per passenger kilometre fell by 7%. However, there was a 15% increase in real cost per vehicle kilometre, indicating an underlying increase in industry unit costs.

To obtain further insight into the 30% increase in real costs and how this may have been affected by outputs changes, we examined the change in each of the main components of cost between 1998-99 and 2008-09, which are shown (excluding enhancements) in indexed form in Figure 3-3 below.

Figure 3-3: Indexed Trends in Rail Industry Cost Components



Source: DfT National Network Modelling Framework

Over the 10 year period in which train kilometres and vehicle kilometres increased by 13% and 14% respectively, TOC operating costs increased at the faster rate of 23%, while ROSCO charges increased by just 10%.

Infrastructure opex and maintenance costs shrank by around 6%, reflecting efficiency improvements during CP3.

Infrastructure renewal costs grew by 66% and represent the largest part of overall cost growth. In part, this was due to increased renewals volumes required to address the backlog left by Railtrack's underinvestment, and it can be argued that steady state volumes should remain higher than volumes during the period of underinvestment. Efficiency improvements have been harder to deliver through the supply chain in renewals (particularly in track) than in operations and maintenance.

Infrastructure enhancement costs, not shown in Figure 3-3 because they distort the overall picture, increased by 175% over the 10 years, but this growth was erratic and from a relatively small base, reflecting the profile of major projects such as the West Coast upgrade.

3.2 Current costs

In the remainder of this report, and in particular in estimating potential cost savings, we have used as our cost base the industry's costs in 2009-10. In defining the cost base we adopted the following key principles to reflect the requirements of the study:

- The cost base includes only the costs of franchised TOCs and NR, as these are the focus for this project. We recognise that NR's costs include costs attributable to

Freight and Open access operators, but this does not affect the conclusions from our work;

- The analysis of TOC costs and revenues is based on operators' 2009-10 actual expenditures as reported in their periodic management accounts submissions to DfT. TOC profit is included as a cost, recognizing that this is part of overall industry costs (and can be influenced through different approaches to specifying outputs);
- NR costs are drawn from the organisation's Infrastructure Cost Model:
  - The model's projected 2009-10 costs are used for Operations and Maintenance
  - In order to reflect cost causation, Long Run Annual Average (LRAA) costs are used for Renewals, the 35-year average of projected renewals costs, post efficiency
  - Enhancement costs are excluded, since the focus of this project is on costs of current outputs rather than costs of future outputs;
- Adjustments have been made to avoid double-counting caused by transfer payments between organisations, and to reflect the amount of each organisation's costs that relate to its own operation:
  - TOC costs exclude access charges paid to NR
  - Electric traction charges (EC4T), for which TOCs reimburse NR, are shown as TOC costs and are excluded from NR's costs
  - Payments between TOCs for services rendered (commissions, rolling stock hire, station access) have been removed from both the cost and revenue of the TOC performing the service so that the TOCs' costs reflect their own outputs.

Based on these principles, we defined a cost base which is summarised in Table 3-1 below, with a net industry cost of £3.5 billion.

Table 3-1: GB rail net cost, 2009-10

Cost item	2009 10 (£m)
TOC costs[1]	5,720
NR costs[2]	4,395
Total costs	**10,115**
Less Revenues[1]	6,570
Net cost	**3,545**

1. DfT Network Modelling Framework (NMF) model costs and revenues for franchised TOCs
2.NR Infrastructure Cost Model, all NR OM&R costs

A reconciliation of this presentation of the cost base to that used by the Value for Money study team is provided in Appendix A.

3.3 Analysis by sector

A high level analysis of costs and revenues was undertaken in order to gain some understanding of the relative net costs of the three sectors: Intercity, London and South East (LSE), and Regional.

Without undertaking detailed costing of each service group, it was not possible to obtain accurate results. However, by allocating franchise costs to sectors in line with passenger revenues, indicative results were produced, which are shown in Table 3-2 below along with the corresponding outputs for each sector.

Table 3-2: Breakdown by sector of the costs and outputs of GB Rail, 2009-10

Metric	Long Distance Franchises		LSE Franchises		Regional Franchises		Other	Total Network	
Passenger miles[1] (bn)	9.4		15.7		6.0		N/A	31.1	
Vehicle miles[1] (bn)	0.45		0.72		0.30			1.47	
PPM MAA[3] (%)	88.8		91.4		92.5			91.5	
	Total (£m)	**Per pass mile (p)**	**Total (£m)**	**Per pass mile (p)**	**Total (£m)**	**Per pass mile (p)**	**Total (£m)**	**Total (£m)**	**Per pass mile (p)**
NR Cost[2]	1,224	13.0	1,563	9.9	1,389	23.1	219	4,395	14.1
TOC Cost[1]	1,508	16.0	2,529	16.1	1,683	28.0	0	5,720	18.3
Overall Cost	2,732	29.0	4,092	26.0	3,072	51.1	219	10,115	32.4
Revenue[1,4]	2,039	21.6	3,332	21.2	1,199	19.9	0	6,570	21.1
Net Cost	693	7.3	760	4.8	1,873	31.1	219	3,545	11.4

1. DfT Network Modelling Framework (NMF) model costs and revenues for franchised TOCs
2.NR Infrastructure cost Model, all NR OM&R costs
3. ORR, NR monitor, Quarter 4 of Year 1 of CP4, Jan - March 2010 and annual assessment 2009 -10. PPM MAA data is inclusive of England and Wales only. Scotland Regional Franchises 90.6%
4. Allocation of revenue across sectors was based on NMF Revenue by service group, but as the data was incomplete in a number of areas, certain assumptions had to be made and the results differ slightly from National Rail Trends figures

Note: The £219m identified as "other" represents costs associated with freight lines that are not directly associated with a particular TOC or TOCs.

The table shows that LSE franchises account for the greatest proportion of the overall cost, around 40% of the total, and about 50% of passenger miles. However, over half of the net cost is incurred by regional franchises, which provide less than 20% of total passenger miles. The average net cost per passenger mile of regional franchises is 31.1p, compared with just 4.8p for LSE franchises and 7.3p for long distance franchises.

Notwithstanding the higher average train performance achieved in regional franchises, it is clear that these franchises represent a prime area for further examination. Section 6 provides further analysis of variations in financial performance across the network in order to point to where the greatest opportunities for cost reduction may lie.

4. GB rail cost drivers

This section discusses the drivers of railway costs, separately identifying drivers for TOCs and for NR, and outlines the relationship between costs and specified outputs.

4.1 Overview of cost drivers

The factors which influence industry costs are summarised schematically in Figure 4-1 overleaf. The following sections explore the linkages between outputs, resources and costs of the TOCs and NR.

4.2 Drivers of TOC costs

4.2.1 Developing the costs of train operations in GB

The resource requirements of a TOC flow from the level of service and quality of service specified by Government as part of the franchise letting process.

The level of service specification is described by the timetable, which sets out the routes to be operated, service frequencies, journey times between stations, stopping patterns and hours of operation. The level of service specification also effectively sets the parameters for the fleet size and type (as a result of the stopping patterns and intermediate journey times, the acceleration/deceleration parameters of rolling stock are defined which effectively prescribes the fleet type). The specification will generally also include requirements in terms of train lengths and the capacity of vehicles, with quality specifications also defining levels of comfort and onboard facilities such as toilets.

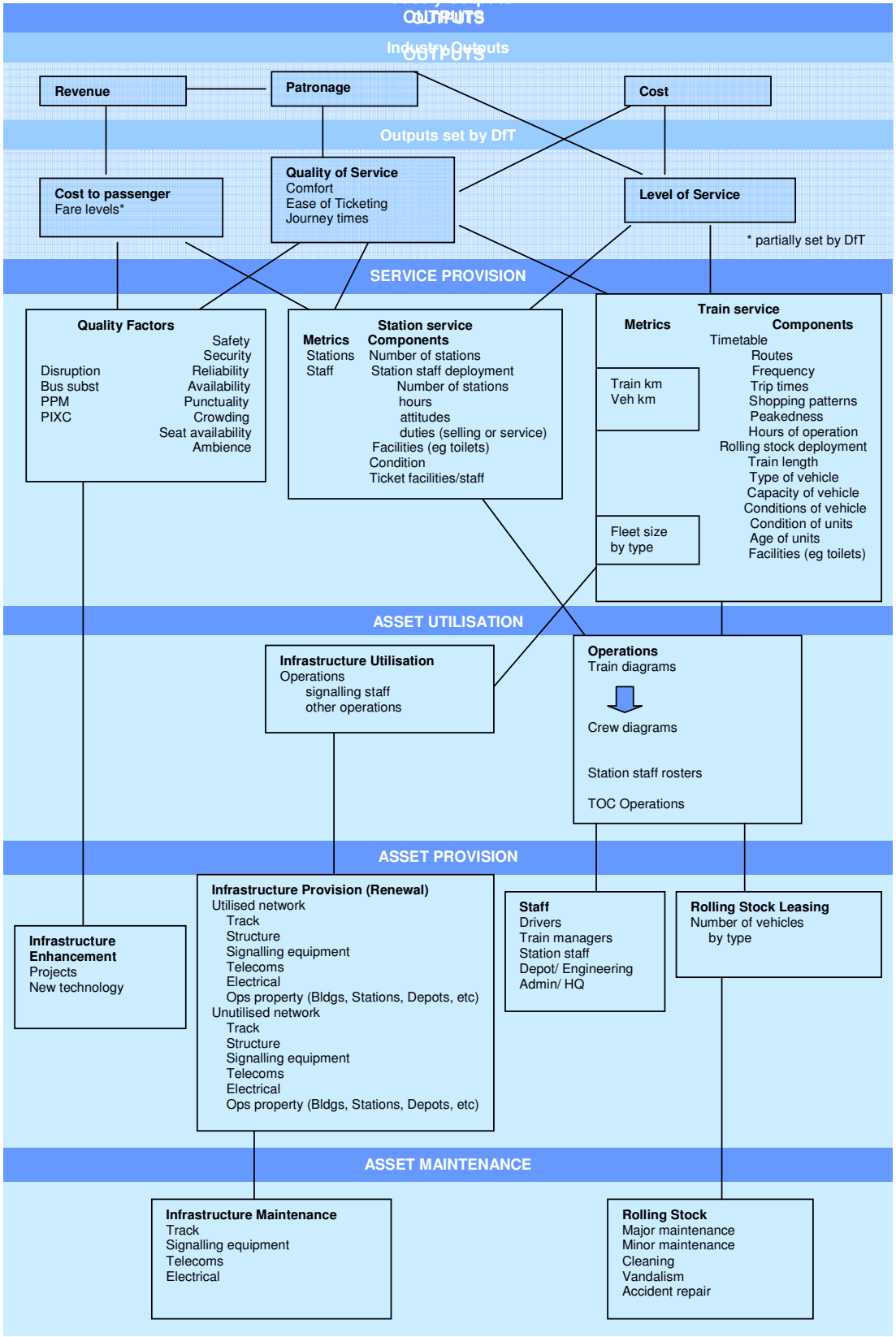
The timetable effectively defines the resources which are required to operate it. Generally, the fleet requirement is defined by the morning peak service requirements – including services in the contra peak direction, which may add to the total fleet requirement depending on whether or not trains can be turned and worked back in the peak direction. Train crew rosters are developed from the train diagrams. Traction energy requirements are defined by the fleet type, the service/stopping pattern and the hours of operation. Staff resources required for operations and management are also effectively defined by the train operating resources.

Station resource requirements are defined by both the level of service specification (number of stations) and the desired levels of service quality (staff deployment on ticketing, safety or service functions, hours of operation, etc.

Track access charges are paid to NR, with fixed and variable components relating to the timetable operated. For the purposes of this industry analysis, we consider those charges as costs of NR (see below).

Rolling stock is generally leased by the TOC from one or more of the rolling stock leasing companies (ROSCOs). The lease payments are normally expressed in terms of per vehicle per month, and can be either 'wet' leases which include all maintenance, 'dry' leases which include no maintenance, or any number of variations in between such that the maintenance is shared between the ROSCOs and the TOCs. Under any of these scenarios there is a capital

Figure 4-1: GB rail cost to cost driver relationships for passenger TOCs



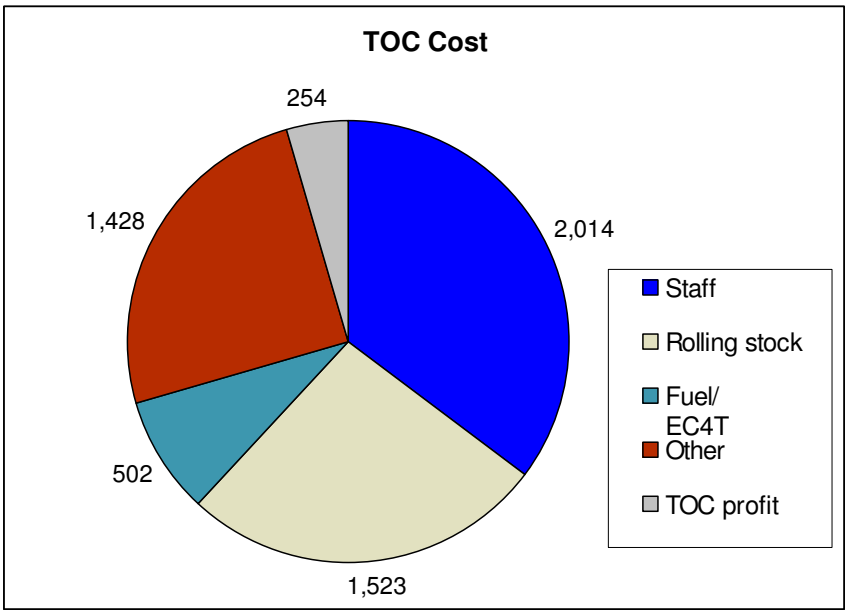
cost charged per vehicle and maintenance costs in some combination of per vehicle heavy maintenance (which is 'lumpy', but generally averaged to give an annual figure) and per vehicle mile light maintenance.

TOCs may choose to operate depots for light maintenance of the stock, which will require resources with appropriate engineering and maintenance capabilities. This approach may give the TOCs more control over the availability of rolling stock for operations (particularly at peak times).

TOCs also have a corporate centre for managing the franchise (including Finance, HR, Communications/Customer Relations functions) and will contract for a range of ancillary services such as cleaning.

The composition of TOC costs, after allowing for transfer payments between the TOCs and to NR, is shown in Figure 4-2 below.

Figure 4-2: TOC cost by category



The major categories of TOC cost are staff costs (35%) and ROSCO charges (27%). The cost of fuel/EC4T (9%) is an operating cost driven by train mileage. The remaining 29% of costs are associated with the TOCs' management of their organisations, including headquarters and admin costs, and TOC profit.

4.2.2 Impacts of changes in outputs on TOC costs

Not all TOC costs vary with changes in outputs. For example, changes to the peak level of service specification may require additional fleet, additional train crew (an increment to variable track access charges) and additional traction energy but would be unlikely to require additional management or station resources. However the relationships between costs and outputs are complex.

Increases in performance targets may simply require more disciplined work processes, in order to reduce the incidence of delays and/or to better manage recoveries from delays.

However, to the extent that specified outputs are greater than would apply under normal commercial operations and/or that penalties under the Schedule 4 incentive regimes are very high, TOCs will deploy additional standby resources (fleet and train crew) to deliver the timetable requirements. Reductions in performance targets may therefore generate cost savings resulting from the release of standby resources.

Performance is also an output which is managed at industry level, requiring that the TOCs co-operate and collaborate with NR. In the 2008 Periodic Review, ORR determined that an increase in industry performance from 90.6% to 92.0% could be achieved without additional cost but that a further increase to 92.6% would require an additional industry expenditure of £179m (£167m in 2006-07 prices), split between capital investment and additional operating expenditure.

Similarly, increases in targets relating to safety risk may simply require more disciplined work processes but may also define additional resource requirements – for example, staffing levels at stations – or specific investment needs.

4.3 Drivers of NR costs

4.3.1 Composition of NR costs

NR's costs derive primarily from the size and configuration of the network and its utilisation (which are themselves functions of the levels of service requirements of freight and passenger train operators).

NR's operating costs consist of controllable opex, mainly signalling staff and other operational staff, and related costs, and non-controllable opex which is primarily electricity for traction (in this analysis considered as part of TOC costs) but also includes fees for various industry bodies such as ORR, BTP and RSSB, and cumulo rates.

Signalling staff resources are not directly variable with the level of train operations but rather depend on the train control technologies deployed.

NR's infrastructure maintenance and renewal costs are a function of the assets which are required to deliver the size and functionality of the network required by the service level specification. Such assets include track, structures, signalling, telecoms and electrification equipment and other operational property. Maintenance and renewal costs will be driven by NR's asset management policies, which are intended to deliver minimum life cycle costs. The proportion of such costs which are variable with traffic is a function of traffic density – that is, the higher the traffic density, the greater the proportion of costs which are usage-related.

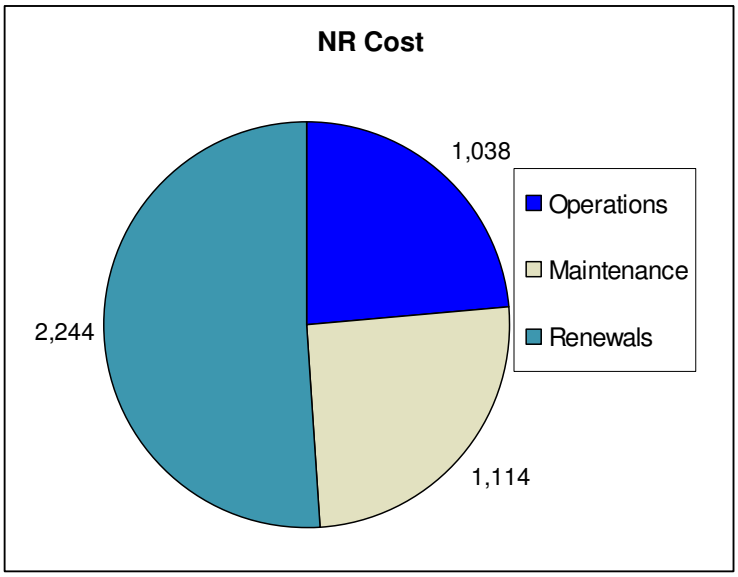
However, costs are also driven by network complexity (in particular, the number of points and crossings), technology deployed and by the availability of the network for engineering works. Typically, works are undertaken in engineering possessions at night and at weekends, when equipment/labour productivity may be low due to short possessions and the costs of labour are high due to anti-social hours.

NR's costs in any year also include enhancement projects, which are effectively the costs of future increases in network capability. Enhancement costs are not included in our analysis.

NR also has a corporate centre for managing the infrastructure business (including Finance, HR, IT, Legal, Planning & Development, and Communications).

Based on the use of 2009-10 costs for Operations and Maintenance and Long Run Annual Average costs for Renewals (as described above), the composition of costs for NR (in 2009-10 prices) excluding EC4T, Schedule 4&8, enhancements, interest and corporation tax is as shown in Figure 4-3 below.

Figure 4-3: NR cost by category



Renewals represent just over half of the NR costs shown here, with maintenance and operations each making up about a quarter.

The 'Operations' category of cost includes the direct operating cost of signalling staff (approx 5% of total cost), and corporate (mainly staff) costs (approx 20% of total costs).

4.3.2 Impacts of changes in outputs on NR costs

Only some 10-15% of maintenance and renewal costs are variable with traffic (at current levels of traffic density), with operational and corporate costs largely insensitive to changes in traffic levels. The majority of NR's costs are determined by the size of the network and its functionality.

As with TOCs, increases in performance targets may simply require more disciplined work processes, in order to reduce the incidence of delays and/or to better manage recoveries from delays. As with the TOCs, the requirement to deliver high levels of performance may encourage NR to invest in assets and/or to deploy standby resources to the extent justified by the associated incentive/penalty regimes.

Similarly, increases in targets relating to safety risk may simply require more disciplined work processes but may also define additional resource requirements or specific investment needs.

Increases in capacity outputs will generally require enhancement investments. In the 2008 Periodic Review, ORR determined that an increase in capacity to meet HLOS targets of an extra 65,000 passengers in London and an extra 18,000 in other urban areas in the 3 hour morning peak would require additional funding of £801m ((£718m in 2006-07 prices); and an extra 6.7 billion passenger kilometres on Strategic Routes which would require additional

funding of £568m (£509m in 2006-07 prices) to enhance capacity on the East Coast mainline and funding for the Thameslink upgrade project. Conversely, a partial reduction in capacity outputs would produce few cost savings, as the infrastructure would likely not be decommissioned and would need to be maintained, but may provide additional operational flexibility leading to performance improvements.

There are also aspirations to increase the availability of the network for revenue services, by moving towards specification as an output a "24/7" railway operating around the clock including at weekends. This would require capital investment, for example in bi-directional signalling, and would also increase the costs of engineering works for maintenance and renewal. Some funding was included in the 2008 determination in order to facilitate a move towards this aspiration (£179m in capex (£160m in 2006-07 prices) and £67m (£60m in 2006-07 prices) in CP4).

Output specifications requiring a reduction in journey times also require capital investment in enhanced infrastructure. Four projects in the NR Delivery Plan update indicate that such schemes depend on specific local conditions and range from £1.0m to £7.7m per one minute saved.

5. Changes to operations

5.1 Introduction

In this section we explore the impact of potential changes to services run on the network, and the way those services are operated. We have explored a wide variety of opportunities with a range of impacts on costs, passengers, the economy and the environment, although we recognise that the greatest savings are likely to be achieved by reducing the resources required to serve the morning peak.

Opportunities for cost savings are considered in relation to the following initiatives:

- Changes to reliability targets;
- Changes to services;
- Changes to crowding parameters;
- Changes to timetable complexity; and
- Changes to crew working conditions.

We also considered the opportunity for procurement savings resulting from greater standardisation of rolling stock, but these savings are not included in this report as they are covered in more detail by Theme F (Supply Chain Management).

Recognising the importance of the difference between allocated and avoidable costs, we have modelled the avoidable operating costs and estimated the degree of avoidability of the infrastructure costs. Further investigation would be required to determine the degree to which these costs are truly avoidable.

For each opportunity, we set out the following elements:

- Description and discussion of the opportunity;
- Evaluation of the opportunity including:
  - The range of potential annual savings
  - Other potential impacts, including on passengers, the economy and the environment
  - Implementation actions, timescales and associated costs; and
- Outstanding questions to be addressed (where applicable).

5.2 Changes to reliability targets

The opportunity

Targets for train performance, or reliability, have been specified by DfT and Transport Scotland. In England and Wales, by the end of CP4 (2013-14), reliability as measured by the "public performance measure" (PPM) is required to reach 92% on long-distance services, 93% on London & South East services and 92% on regional services, giving an overall average of 92.6%. Reductions in the percentage of trains significantly late or cancelled are also required. In Scotland, PPM of 92% is required by 2013-14.

The opportunity we have considered is that cost savings may be achieved by setting lower PPM requirements nationally and allowing greater local flexibility to optimise operations around PPM, journey times, maintenance spend and standby operational resources to reflect local demand.

The first question to consider is whether the PPM increases required in CP4 represent good value for money, and whether there is a case to lower these targets on a national basis. There is some evidence on this from the last Periodic Review: for CP4, NR was allowed a performance fund of £160m intended to support achievement of the final 0.6% of improvement in national PPM from 92% to 92.6%. The proposed cost was estimated to be 60% capital expenditure, such as fitting train condition monitoring equipment, and 40% operating expenditure – for example, increasing the number of Mobile Operations Managers (MOMs). We understand that £70m of the £160m spend is not yet committed, so in theory could be saved. Based on standard industry demand elasticity parameters we estimate that the 0.6% increase in national PPM will generate around £70m additional annual revenue, suggesting that the investment may be justified as a commercial business case. This does raise the question of why a performance fund was required to achieve a reliability increase which would have been justified on business criteria alone – it may be that there is a misalignment between costs and benefits at the level of individual actors; or that national average demand elasticities do not apply to individual initiatives.

Note that this not mean that further reliability increases beyond 92.6% would be justified, as greater investments may be required and the impact of reliability on demand will diminish at some point.

The next question is whether a net saving could be achieved by lowering national PPM targets, say to 90%. There is some evidence that high levels of reliability targets and associated penalties for failing to deliver them may create incentives for TOCs to carry higher levels of rolling stock and standby train crews than would be the case under commercial market conditions. Similarly, there may be opportunities for NR to reduce MOMs, security teams and fault teams. Scope for savings is limited, firstly because it is difficult to "disinvest" in capital assets where improvement has been achieved and secondly because network maintenance spend is driven more by safety standards than reliability standards. Moreover, if an investment to increase reliability from 92% to 92.6% is justified on revenue grounds then it seems likely that a reduction in reliability would bring about (in due course) a loss of revenue greater than potential savings.

However, we believe that a change to punctuality targets is worthy of further consideration, for several reasons:

- The above analysis is at national level, whereas demand elasticities vary across the network and cost savings opportunities are bound to be uneven, giving rise to local opportunities for reductions in reliability targets. For example, demand for peak London commuter services is relatively inelastic to changes in reliability, while revenue from regional services with lower load factors may be insufficient to justify expenditure to maintain reliability;
- While much of the improvement in reliability in recent years has been delivered through increased management focus, some improvement has been achieved at the expense of increased journey times. There is a trade-off between reliability, journey time, maintenance cost, rolling stock cost and other parameters which is difficult for Government to optimise, especially at national level; and

- The current HLOS targets are set by sector and imply some levelling up of reliability across TOCs, with the greatest improvement required for long distance TOCs - at March 2010, PPM (Moving Annual Average) stood at 84.6% for Virgin Trains and 87.4% for East Coast. We think it likely beyond a certain point, levelling up of PPM will require disproportionate investment, since lower hanging fruit will already have been taken.

A different approach to setting reliability targets may therefore be required. For example, Government could set a minimum national threshold for reliability (perhaps 90%, but could be lower) considered adequate to support minimum customer requirements and avoid excessive knock-on delays from one operator to another. Operators, working with NR, would then be free to work to higher standards of reliability where this was justified, and to find the right balance of reliability, journey time and cost. NR and TOCs would continue to invest in schemes to improve reliability to the extent that track access charges and franchise agreements incentivised them to do so. Note that this may require changes in incentive regimes to allow NR to share TOC benefits, and vice versa. In addition, local authorities or regional bodies could choose to pay for additional reliability where it was felt this was important for the local economy.

Evaluation of opportunity

Potential savings	Net savings of up to £26m per annum, with the maximum assuming: £10m savings by removing standby trains, based on 25 units at an average £0.4m annual cost of leasing and crew. £12m savings by reducing MOMs – this is one fifth of the additional CP4 expenditure of £60m on MOMs planned by NR to move from 92% to 92.6% PPM. It is possible that further MOMs could be saved by reducing the target to, say, 90%. £4m savings by reducing NR security teams (again, one fifth of the planned increase in CP4). No loss of revenue – in practice there will be revenue loss, but local decision-making on reliability targets would mitigate this to some extent
Other impacts - Passengers	Passenger satisfaction will be impacted by any fall in reliability, although this could be mitigated by shorter journey times where operators make the trade off (and anyway maintaining current levels of passenger satisfaction may not represent value for money)
- Economy /Environment	Loss of user benefits (time savings) and non-user benefits (de-congestion, emissions) where reliability is reduced.
Implementation - Actions	DfT to specify minimum level of reliability required across network, then re-specify franchise agreements. ORR to review incentive aspects of track access charges regarding reliability.
- Timescales	The initiative would require the return of rolling stock to lessors Rolling stock leases easiest to change at franchise renewal, when

	franchise agreements can also be re-specified (i.e. benefits would be phased over a 7 year time horizon, depending on franchise).
- Costs	Advisors regarding franchise re-specification and track access charges – relatively small incremental cost if done as part of regular franchise renewal and Periodic Review processes

Outstanding questions to be addressed

In order to validate the estimates of cost savings and revenue losses, it would be necessary to undertake a more detailed review at a local level. If Government is interested in pursuing this option, a sensible next step would be to undertake a pilot study on one or more franchises representing commuter, long-distance and regional operations. The purpose of the study would be to understand how operators would react to a change in reliability requirement - where they would seek cost savings and make trade-offs at a local level.

5.3 Changes to services

5.3.1 Reducing peak resource requirements

The opportunity

As a TOC's fleet size and train crew complement are both primarily determined by the requirements of the morning peak, any service changes that reduce the numbers of vehicles and staff required to operate the morning peak service should generate operating costs savings.

A number of such opportunities have been identified including:

- Cutting out certain contra peak services that prevent train sets from operating peak services;
- Operating bus shuttles instead of morning peak services on some branch lines thus freeing up train sets to operate the peak on core routes; and
- Operating bus shuttles all day on some branch lines (discussed under network rationalisation in Section 7).

Case studies

Cutting out contra peak services

The opportunity here concerns train sets operating only in the contra-peak direction during the morning peak, such that they effectively make no contribution to the peak fleet requirement. If it is possible to turn such a contra-peak service short so that it is able to return in time to also operate a service in the peak direction, savings should result from both a reduction in the total number of train sets required for the morning peak, and train crew costs. (Alternatively the freed up set might be used to run an additional peak service with a view to realising the benefit through increased revenue, but we have not evaluated this option.)

The example we have analysed involves an outbound service from London which currently does not return in time to serve the London peak. We have modelled the situation where the contra-peak service is terminated at an appropriate interim location and turned to operate a peak service back to London. It is assumed for the sake of the calculation that this is possible, although we do recognise that there may be:

- Operational issues to do with suitable turnback locations;
- Some re-diagramming required;
- Some offsetting cost of (re-)positioning of rolling stock and crew; and
- Some reduction in service to/from the outer end of the line.

The underlying premises are that very few passengers would be inconvenienced by the removal of the outer part of the early morning contra-peak trip, and the inconvenience to any early morning up passengers from the end of the line would be justified by the higher value for money to be obtained from the extra peak service on the inner part of the line.

Operating bus shuttles on branch lines in the morning peak

This opportunity involves freeing up train sets to operate the peak on core routes by replacing the peak service on some branch lines with shuttle bus services.

There would clearly be a significant saving in terms of a reduction in the peak fleet requirement as well as crew costs.

This would be offset by the costs of running buses, and there may be issues around the type of rolling stock as some branch line services are operated by the poorest quality rolling stock which may not be suitable for use elsewhere.

Nevertheless, we have modelled this opportunity assuming that rolling stock and crew savings are possible and there would be little if any loss of revenue.

Evaluation of opportunity

Potential savings	Potential cost savings across the network would be of the following magnitude: ▪ Removing contra peak services – Case studies indicate savings of c. £0.9m per change, made up of £650k for an EMU, £80k for EC4T, £50k for NR's variable costs, £140k for train crew; assuming that each of 14 urban/ commuter franchises might find 3 such examples (we found 4 possible opportunities looking at one particular TOC), annual savings of £38m are possible – Revenue losses are estimated at approximately £0.3m per change, or £12m in total, to give annual net savings of £26m ▪ Bus shuttles

	– Case studies indicate savings of c. £0.6m per change could be achieved by simply using buses to provide a similar peak service on the branch line, offset by bus costs of £0.2m; assuming that each of 17 franchises might find 2 such examples, annual savings of £15m are possible with minimal loss of revenue ▪ Savings are based on being able to dispense with the freed up set(s). Alternative uses for the freed up set(s) might be considered, for example to provide an extra peak service on one of the core routes, but these options have not been evaluated
Other impacts - Passengers Economy /Environment	Inconvenience to relatively small number of passengers, which might be offset by an increase in convenience to a larger number of passengers if the option is taken up of using the freed up set to bolster the peak fleet and operate an extra peak service Both opportunities involve some marginal disbenefit to a small number of passengers in terms of increased travel time and/or reduced frequency of service
Implementation - Actions - Timescales - Costs	 Depending on the nature of changes proposed, significant effort may be required to develop and agree new timetables and train diagrams Although the benefit of needing fewer train sets and crews could be achieved as soon as the necessary timetable modifications could be introduced, the resulting cost savings would not necessarily be realised immediately as the rolling stock leases might not be able to be renegotiated prior to lease end – usually the end of the franchise – meaning that benefits would be phased over a 7 year time horizon, depending on franchise Implementation costs - relatively minor, including cost of planning new timetable

Outstanding questions to be addressed

The main issues to be addressed are the identification of suitable opportunities, examination of the operational feasibility, and detailed modelling of the impacts on passengers of each opportunity.

5.3.2 Reducing off-peak frequencies

The opportunity

As many of the off-peak services currently being run are believed to be failing to cover their train operating cost, an opportunity has been identified to reduce net cost by reducing off-peak frequencies (including weekends) where services are not viable from an economic perspective.

In general, reductions of off-peak frequencies save only fuel/power costs and marginal infrastructure wear and save little if any rolling stock or crew costs. But removal of uneconomic services with short formations carrying fresh air would increase network capacity for freight services – and/or the time available for maintenance – and/or reduce the compensation costs of taking weekend possessions.

Evaluation of opportunity

Potential savings	Minor savings only to TOCs as unlikely to impact crew requirement and no impact on fleet. Maybe benefits to freight operators and/or NR but would need to be considered on a case by case basis.
Other impacts - Passengers	Some loss of revenue as service frequency is a major factor in pdfh but this opportunity would only be pursued on services that were lightly loaded so revenue loss would be minimal
- Economy /Environment	Minor impact expected on either the economy or the environment
Implementation - Actions	Likely to require a change to the service level commitments in the franchise agreements
- Timescales	Could be implemented at next timetable change
- Costs	None identified

Outstanding questions to be addressed

Further work would be required to quantify any savings available, although we do not believe that the level of savings would be sufficient to justify making this a priority.

5.3.3 Removing some first/last services

The opportunity

Removing some first/last services which are not viable from an economic perspective has the potential to enlarge the window for track maintenance, which may enable the maintenance to be undertaken more efficiently. The time taken to set up and dismantle equipment is a significant part of the overall maintenance window - as much as two of some four hours available in a weeknight possession, for example. Substantial efficiencies might therefore be gained through a relatively small increase in the size of this window (for example, an extra two hours would double the working time available.

Evaluation of opportunity

Potential savings	Opportunities to reduce infrastructure maintenance cost are being addressed by Theme E (Asset Management) and are not quantified here. Potential savings to train operators are small, as with the previous opportunity to reduce off-peak services.
Other impacts - Passengers	Likely small loss in terms of passenger numbers, but passenger satisfaction may suffer as, although first and last trains are generally lightly loaded, their timing is a high profile issue
- Economy /Environment	Some loss of user benefits in terms of overall accessibility
Implementation - Actions	Likely to require a change to the service level commitments in the franchise agreements
- Timescales	Could be implemented at next timetable change
- Costs	None identified

Outstanding questions to be addressed

NR would need to identify areas in which a larger maintenance window would be of benefit.

5.4 Changes to crowding parameters

The opportunity

Service levels in peak periods are a primary driver of the total fleet and train crew resources required by a TOC to operate the timetable. Peak fleet requirements are driven in part by considerations of passenger crowding levels. There may be an opportunity to reduce TOC costs by adjusting the definition of overcrowding to achieve a higher number of passenger km per vehicle km. This might involve defining a nation-wide common maximum average load factor, such that in urban areas such as Cardiff, and Manchester the average load factor for the high-peak hour might be raised from current values (43% in Cardiff, 49% in Manchester) to the 76% used in London. It might also involve increasing the average peak load factor on London services.

An increase in average crowding levels could be achieved either by holding constant the size of fleet and service schedule serving the peak (i.e. allowing increased levels of crowding as demand increased against a constant supply of capacity); or it could be achieved by a reduction in the size of the fleet serving current demand (i.e. reducing current capacity). The latter option might also be delivered through a reduction in service levels (i.e. removing a train from the peak schedule); or by reducing train lengths.

In evaluating this option, we examined two London commuter services[3] which in HLOS are scheduled to receive two additional 8-car services, implying that current crowding levels are high. The key cost variables are train leasing costs, train maintenance and operating costs and NR variable costs. There are also losses in revenue associated with service level reduction which have been taken into account.

We first considered removal of one service from the "shoulder peak" (both morning and evening) and found that this was strongly justified in cost/benefit terms, with net financial cost savings of £0.72m (cost savings of £0.87m, revenue losses of £0.15m).

However, when we extended the analysis to include the removal of a service in the "high peak", the option was not justified in cost/benefit terms. But even though this is the case, it can be observed that costs exceed revenues on these services even at the "high peak".

Reducing train lengths was not formally evaluated as an option. In practice, this might require the substitution of 3-car set for 4-car sets and implementation would therefore depend on the availability within the GB fleet mix of the required rolling stock.

It may also be desirable to reconfigure seating provision in commuter vehicles to allow for higher load factors, allowing for more standing passengers as has been achieved by London Overground on taking over the former Silverlink Metro services. This could be facilitated by a change in the definition of crowding parameter from a ratio of passengers/seats to a metric of passengers per m^2. This option has not been formally evaluated, as it would likely require the acquisition of new stock in the 'Metro' configuration and can therefore be seen as a longer term opportunity.

Evaluation of opportunity

Potential savings	Net cost savings from removal of shoulder peak services of £0.72m on the services modelled. Further modelling is required to determine the scope of this opportunity nationally. For current purposes, we assume 25 opportunities nationally, implying a saving of £17.5m annually.
Other impacts - Passengers	Some loss in patronage, and commuters on other services will suffer higher levels of crowding
- Economy /Environment	Some disbenefits from modal shift from rail to road as result of greater crowding
Implementation - Actions	Re-specify crowding parameter as passengers per m^2 Re-specify service requirements for TOCs serving commuter markets
- Timescales	Short term savings may be achieved depending on break clauses in rolling stock leases Longer term, further savings may be achievable with new train fleet

[3] London Waterloo services to Aldershot and to Reading

- Costs	with revised seating configuration None identified

Outstanding questions to be addressed

An alternative option would be to allow regional and local bodies to specify and fund the difference in costs to provide services at lower maximum levels of crowding.

5.5 Changes to network complexity

Network complexity is a major driver of cost; the opportunity is to reduce cost by simplifying the network and/or the timetable in various ways, for example:

- Remove unnecessary complexity in the network, for example by simplifying station and yard layouts, removing switches where these are simply to provide "operational flexibility" where this is not value for money;
- Dedicate lines to specific traffic types, instead of mixing high speed services with high density commuter services and freight services;
- On each route, operate a standard service in which, as far as possible, each train has the same destination and stopping points; and
- Avoid running services which intersect with each other at junctions.

In terms of simplifying network complexity, examples from mainland Europe demonstrate that significant savings are achievable by re-thinking requirements. For example in the Netherlands, some 40% of switches were removed from Utrecht station where the layout had been designed to permit every train from any direction to access every platform: fewer assets has meant fewer failures and the possibility of some increase in speeds into and out of the station. A reduction in "operational flexibility" may have consequences for train performance, although these should be tested in value for money analysis. In GB, layouts have been adjusted at times of line upgrade or signalling renewal, although perhaps not subject to as rigorous analysis as might be desirable at a time of constrained funding.

Interspersing different traffic types with different speeds and calling points uses capacity inefficiently. If the timetable could be designed to separate traffic types, more traffic could be carried without further infrastructure investment. This may involve re-routing freight paths and/or freeing up lightly used freight paths.

Standard destinations and stopping points takes this a step further, and in the extreme trains could run on headway, so that passengers start to focus on the gap between services rather than timetable - like the London Underground service

Crossing points also consume capacity - the price of avoiding these is a reduction in choice of direct journeys (more changes).

This option involves a range of changes to the services, from the simple to the radical, with detriments to performance, journey choices and journey times traded off in return for cost reductions.

Some initiatives may also require substantial capital investments in order to facilitate change, although these may be commercially justified as a result of the increases in capacity made available (on Swiss railways, for example, step change increases in capacity were realised as a consequence of relatively small, targeted capital investment projects).

However, the option is perhaps best considered as a long term aspiration, rather than a short term opportunity to reduce industry costs.

Evaluation of opportunity

Potential savings	Savings not quantified Reduction in future infrastructure cost when capacity increases are required Revenue would be impacted in several ways - would need to be modelled carefully for each proposed change
Other impacts - Passengers	Some journeys would be more difficult or take longer, but services may be more frequent
- Economy /Environment	Economic, social and environmental impact would need to be assessed for each individual change
Implementation - Actions	
- Timescales	Requires capital expenditure, and either contract re-negotiation or a new franchise round, therefore savings would only be realised in the long term
- Costs	Complex redesign of multiple franchises required, and possible re-negotiation of rights with freight companies Any consultation process would be difficult given the mixture of winners and losers in relation to journey choice/time

Outstanding questions to be addressed

Reducing complexity would itself be complex to design, evaluate, negotiate and implement and may require investment. However, with the current structure of industry incentives, it is not clear that any of the industry players are motivated to begin to think through such options.

5.6 Changes to crew working conditions

The opportunity

The opportunity here is to reduce overall crew costs by improving the utilisation of train crews. Industry sources have suggested that the overall utilisation of train crews by the GB Rail TOCs is currently less than fully efficient with the number of footplate hours worked by drivers in an eight hour shift sometimes being as low as two hours. A major cause of this inefficiency is the constraints imposed on crew schedulers by the terms & conditions under which the drivers and onboard staff are employed, and this analysis looks at the savings that might be achieved by modifying these terms and conditions.

The problem is that there is a mismatch between the current practice of using eight hour shifts and the need for short pieces of work that is created by the peakedness of most of the train services especially in the commuter areas. With the number of trains in service in the morning peak and (to a lesser extent) in the pm peak being much higher than the base number of trains in service throughout the day there is a significant number of train crews that sign off after operating only one or two train services in one of the peak periods. Although drivers' and guard/train managers' terms and conditions vary between TOCs the common theme of a minimum shift length of the order of eight hours means that any crew operating only one or two peak services will necessarily return low efficiency figures in terms of hours worked per shift.

This issue has been addressed by other railways and urban transit systems throughout the world through measures such as:

- Split shifts – where the driver works 3-4 hours in the morning peak before signing off and returning to work 3-4 hours in the evening peak
- Allowing wider variation in shift lengths – by having some drivers work say a 5 hour shift one day and a 12 hour shift another day, the driver would still be rostered to work 40 hours per week but would show a far better utilisation on the 5 hour shift days
- Part time working – where a driver would work fewer than 40 hours per week

Although such measures might have been looked at in the UK, there is currently no incentive for individual TOC to address such legacy industrial relations issues with the inherent risk of potential disruption over a long period.

In order to estimate the potential savings associated with such changes to crew conditions, we developed a high level crewing model using crew scheduling algorithms that we have successfully developed, calibrated and implemented in Australia and New Zealand, where use of split shifts is common practice. Our algorithms replicate the crew scheduling process to derive estimates of the numbers of crew shifts required for a given time of day profile of numbers of trains in traffic for each of several different sets of crew working conditions. Based on a case study for a London TOC with 160 shifts per day, the model estimated that split shifts would enable the TOC to operate the same service with 140 shifts – a saving of 12%. Coincidentally, the use of 5-12 hour shifts also produced a requirement of 140 shifts.

Although modified crew conditions might provide some savings for all TOCs, the major savings would relate primarily to those TOCs that have a highly peaked operation i.e. those operating commuter services.

Evaluation of opportunity

Potential savings	The eight LSE TOCs employ some 8000 drivers at approximately £50k pa for a wage bill of some £400m. There are slightly fewer guards and there wages are approximately 80% of those for drivers so the total cost of guards is approximately £300. Assuming that implementing split shifts and/or 5-12 hour shifts could save up to 10% of train crew costs, the total saving could be up to £70m, comprising: Drivers £40m pa across the LSE TOCs Guards £30m pa across the LSE TOCs There might be some further savings available for regional TOCs that operate urban commuter services in cities other than London but these have not been evaluated There would be no loss of revenue associated with this opportunity as there is no impact on the passenger service
Other impacts - Passengers	No impact on passengers
- Economy /Environment	No impact on the economy or the environment
Implementation - Actions	DfT to radically alter franchise specification and procurement process and restructure franchise agreements with respect to TOC incentives
- Timescales	Process cannot begin until after the first franchise renewal under the new, yet to be specified, franchise agreement; and then it will take some years to implement (minimum 10 years to achieve the full potential cost savings)
- Costs	Advisors regarding franchise re-specification– technical, legal, financial. TOCs looking to change shift patterns may face industrial relations costs during implementation, either in terms of disruption or payment of additional wages, or both.

Outstanding questions to be addressed

Implementation of any such modifications to crew conditions would depend on the enabler of the introduction of longer, more purposive franchises (see Section 7). Any modification to staff working conditions would be a major industrial relations issue and it is unlikely that it would be worth the while of any TOC to take on such a challenge unless the length of the franchise provided a sufficiently long payback period and the franchise agreement was structured to provide the TOC with sufficient incentive to take on the industrial relations issues.

6. Changes to network outputs

6.1 Introduction

DfT and ORR specify, as an industry output, the capability of the railway network in terms of track mileage and layout, line speed, gauge, route availability and electrification. In particular, in CP4, NR is charged with maintaining the April 2009 baseline for network capability, unless the specification is altered through the "network change" procedure.

However, the financial performance of the industry varies considerably across the network. There may therefore be opportunities to improve industry value for money through changes to the functionality, size and/or configuration of the network. Such opportunities are analysed in this section.

6.1.1 Analysis by geographical area

In order to analyse changes in network outputs, we have examined the level of cost recovery at the level of the passenger rail franchises. Table 6-1 presents the net costs by sector:

Table 6-1: Summary of net costs by franchise sector, 2009-10

Sector	Long distance	LSE	Regional	Unallocated NR Cost	Total
Net costs (£m)	693	760	1,873	219	3,545

Source: Table 3-2

Typically, the greatest costs incurred by railways are on their main lines, the busiest on the network. However, in terms of net cost, it is apparent that the regional franchises have the greatest requirement for Government support.

Table 6-2 presents the contribution of particular franchises to total net costs.

Table 6-2: Net cost by franchise

Franchise	Net Cost	% of GB Rail Net Cost	NR Cost as % of TOC cost	TOC Cost as % of revenue
ScotRail	570	16%	79%	168%
Northern Rail	549	15%	102%	188%
Arriva Cross Country	303	9%	116%	87%
Arriva Trains Wales	264	7%	111%	148%
First Great Western	223	6%	81%	73%
West Coast	208	6%	56%	83%
Remainder	1,429	40%	71%	78%
Total	3,545	100%	77%	87%

Source: Booz & Company analysis

Four franchises account for 47% of the net cost financing requirement – ScotRail, Northern Rail, Cross Country and Wales franchises. In addition, three of the four franchises return higher levels of TOC costs than are generated by revenues (and thereby make no contribution at all to the costs of infrastructure). It should be recognised that the performance of train service groups across individual franchises will not be uniform and there will be some service groups (such as commuter services to Leeds, Manchester, etc) which will return better financial performance than others. From a purely financial perspective, the currently specified service levels of the poorer performing service groups should be re-examined and alternative options should be considered.

Further, the costs of network infrastructure represent over 100% of TOC costs in three of the four franchises with the highest net costs. Although we would stress that not all costs are avoidable, these figures do suggest that the configuration of infrastructure may not be well aligned to the levels of train service being operated, and warrants further examination. It should be noted that, in thinking about ways to reduce the costs of operating these services, the demands of freight operators should be fully incorporated (the data above excludes freight revenues, operating costs and network charges).

Development of the GB rail network in recent decades has involved only incremental changes to the legacy network and service levels. There has been little appetite for network rationalisation and no recent fundamental review of needs against network provision. Indeed, certain aspects of the 'social railway' have increased over time, for example where build quality has increased due to "gold-plating" or to comply with disability legislation. Certainly the size of the overall subsidy required has grown, as was discussed in Section 3.

The output requirement for NR to maintain the April 09 baseline for network capability, along with the continued specification of TOC Service Level Commitments which would not otherwise be delivered by the market, imply a commitment to maintaining the social railway at the current level.

The historic commitment to the social railway has been driven by social policy as well as economic objectives. In its White Paper "Delivering a Sustainable Railway"[4] DfT stated that "Social goals cannot be simply encapsulated as economic or environmental goals. At the broadest level, the key challenge for transport is to support social inclusion by improving personal mobility." But this does not mean that social objectives need to be delivered by the railway alone – or even in part. Government procurement decisions should take account of social and economic needs and the ability of the various transport modes to provide efficiently for those needs.

6.1.2 Where next?

Identification of the extent, profile and cost of the social railway could permit Government to make more informed buying decisions.

Such analysis is beyond the scope of this study, but it has been possible to do some high level analysis which gives some indication as to the areas in which net cost savings might be made.

The remainder of this chapter examines potential opportunities for cost reduction by changing the functionality, size and configuration of the network:

- Section 6.2 examines changes to network functionality to reducing network and industry costs;
- Section 6.3 analyses potential savings from minor network reductions, focussing on closure of small branch lines; and
- Section 6.4 takes a look at the opportunity for more major network reductions, with some indicative scaling of the scope for savings.

We have modelled the avoidable operating costs and estimated the degree of avoidability of the infrastructure costs. Again, further investigation would be required to determine the degree to which these costs are truly avoidable.

6.2 Changes to network functionality

Many railways have established infrastructure asset management systems based on line classification[5], defining standards and maintenance/renewal regimes for categories of line based on the commercial and operational requirements of traffic using those line sections. It is apparent that the standards and requirements for high speed, high density lines are very different from those appropriate for low speed, low density lines used, for example, only for freight operations. On commercially driven railways, infrastructure managers need to be ruthless in their determination to adjust their infrastructure to a level consistent with the current/future traffic level, so that scarce funds are not squandered on redundant or little used infrastructure.

[4] "Delivering a Sustainable Railway" (DfT, July 2007)

[5] As, for example, embodied in UIC 714R 'Classification of lines for the purpose of track maintenance')

In GB, we recognise that NR has made a start by defining a classification system based on tonnage and linespeeds, which dictate inspection frequency and some maintenance activities. However, NR is constrained by its regulatory regime: now 'output-based', this provides a broad requirement for efficiency improvement across the network but is not directed to identifying or specifying opportunities for cost reduction in particular areas. Indeed, the network output specification requires maintenance of current levels of network integrity/functionality. Relaxation of this constraint may bring opportunities to secure significant cost reduction within the industry from a systematic analysis of the needs and requirements of current/future market demand and to adjust infrastructure and train operation service provision to appropriately serve those needs.

Such an approach has been adopted by several of the European railways. In the Netherlands, for example, a 'core network' of mainline services has been established as separate from a 'regional' network, with the latter having a different set of standards (for example lower axle loads, lighter rail) and different inspection and maintenance regimes[6] appropriate for low density lines which are not carrying freight traffic. The difference in terms of maintenance and renewal expenditure on line sections on the regional as opposed to the core network is in the range of 1:2 to 1:3.

Applied to GB, it is possible to conceive of a core network of lines serving high speed, long distance, urban commuter and freight operations, maintained to current standards, and a regional network maintained to a standard appropriate to the types of traffic using that network, at a lower cost.

Furthermore, where traffic on regional lines can be segregated from traffic on the core network (i.e. with no interfaces), there will also be an opportunity to deploy light rail vehicles, which would reduce the costs of train operation significantly as a result of lower vehicles costs (LRV capital costs are typically 33% of equivalent heavy rail EMUs) and reduced operating and maintenance costs (which in particular would apply to driver costs) but at the same time offering improved service quality to users (including faster journey times). Such operations are now common across Europe, dating from the early 1990s in Karlsrühe in Germany, but now widespread across Germany, France and the Netherlands: and there are also reference cases within GB rail, notably Manchester's Metrolink system and the planned conversion to light rail of the Watford – St Albans "Abbey Line".

The data does not support a detailed analysis of this opportunity by line section as it would be necessary to distinguish between costs which are truly avoidable and those which have simply been allocated to line sections. However, we note that 42% of the network carries less than 5 million equated gross tonnes per annum (EMGTpa) of which 25% is less than 2.5 EMGTpa (the 10% most densely trafficked lines in GB carry in excess of 20 EMGTpa), which indicates that there could be a significant opportunity for such a strategy.

Assuming that 15% of the network provided the characteristics suitable for light rail operation, and assuming savings of only 25% of attributed infrastructure costs and savings of 50% on fleet and operating costs, a conservative estimate of potential savings would be £170m per annum, comprising £69m in NR cost savings and £101m in TOC cost savings.

[6] Specified by the infrastructure manager ProRail, which is also responsible for the regimes on the core network

6.3 Minor network reductions

Underutilised rail infrastructure represents poor value for money. In a number of instances across the network, there are candidate lines for closure which are being preserved due to Service Level Commitments in franchise agreements or due to lengthy closure procedures. Typically these are short, rural branch lines with high net cost and very low passenger numbers, so that any economic benefit also tends to be low.

There may be an opportunity to close these lines and operate bus services as appropriate to meet customer requirements. Line closures can achieve savings in the costs of infrastructure operations, maintenance and renewal, station management and train operations. However, cost savings are relatively small in scale and would need to be offset against additional bus costs, any revenue losses and decommissioning costs. Our estimates are based on calculations for a small sample of branch lines, from which we have estimated savings for similar lines on a per track km basis.

Evaluation of opportunity

Potential savings	Our case studies indicate that closing an 8 km branch line would typically save about £910k per annum net of revenue losses, comprising: Infrastructure maintenance £100 k pa (£12k per track km) Rolling stock £330 k pa TOC traincrew £450 k pa TOC operations £70 k pa Station management £60 k pa **Total savings** £**1010** k pa Less revenue losses £100 k pa **Net savings** **£910** k pa In the longer term, infrastructure renewal costs of about £71k pa per track km might also be saved Infrastructure renewals 71 * 8 = £570 k pa **Net savings (Inc Renewals)** **£1480** k pa Across the network, a programme to close 30 branch lines averaging 8 km in length could therefore generate net savings of £27m excluding renewals savings (£45m including renewals).
Other impacts - Passengers	The overall numbers of passengers affected would be relatively low and their requirements could be met by other modes, including buses and taxis.
- Economy /Environment	There may be a significant impact on some specific local communities, which would need to be ameliorated. Additional bus operating costs of about £250k pa per case would be incurred. There would be marginal impacts on safety and possibly also environmental costs.

Implementation - Actions	Government would need to conduct analysis to identify a list of candidate lines for closure. Closing lines and stations involves a lengthy consultation process (the alternative being to change the process, which would also require significant effort, time and expense).
- Timescales	It may take several years to close lines under existing procedures. Savings of some operating and maintenance costs may then be realised immediately. Further savings would be dependent on dates for infrastructure renewal and rolling stock replacement. It may be possible to bring forward some of the savings by removing services and running rail replacement buses.
- Costs	Line decommissioning costs Redundancy costs for any staff displaced

6.4 Major network reductions

The closure of branch lines can only ever achieve minor savings because relatively small amounts of money are spent on these lines. In order to achieve major savings through network rationalisation, it will be necessary to go beyond incremental changes and identify a much larger programme of infrastructure rationalisation – in effect shrinking the "social railway" network.

The scale and distribution of net costs across the network suggests that a large number of lines would not continue to be paid for by the market (or at least, not beyond key renewal dates) if they were not specified by Government. As we saw above, the majority of net costs are associated with regional franchises, in particular the areas served by Northern Rail, ScotRail and Arriva Trains Wales (ATW), where the imbalance between revenues and costs is clearly not restricted to small branch lines.

Without comprehensive cost information for individual TOCs as well as for NR, we cannot identify systematically the cost recovery of each line and therefore we cannot estimate reliably the cost savings from a major closure programme – we can only look at the level of whole franchises. However, to gain some insight into potential savings, we observe that the ATW franchise has a net cost of £264m per annum and has relatively limited overlap with other franchises, except where it meets the Great Western Main Line. Not all ATW services may be uneconomic, but it is likely, therefore, that cessation of the ATW franchise and removal of the infrastructure dedicated to ATW could remove most of the £264m. This is clearly a extreme case and not one that Government would be likely to pursue, but it serves to illustrate the size of the prize.

Similar observations could be made for Northern, ScotRail and indeed a number of other franchises with high net costs. However, the analysis is less clear where there is a high degree of overlap between franchises, which limits the available infrastructure savings.

Clearly, decisions to de-commission assets need to take account of economic and social impacts as well as financial impacts. In particular, some lines which are not financially viable may make a net contribution to economic growth and ultimately generate increased tax revenues, so that the financial equation is positive for the UK if not for the rail industry.

If Government wishes to look seriously at significant network rationalisation, a major study will be required to test comprehensively the viability of the various parts of the network, as described in the introduction to this section. Alternatively, industry parties need to be incentivised to conduct such studies to present to central/regional Governments the subsidy requirements of particular services or networks. We note that other European rail companies have begun to undertake such analyses, for example in the Netherlands where ProRail has estimated cost recovery for each of 90 lines using their own understanding of operator cost and income.

Any closure programme would begin with lines for which revenue is less than short term operating costs. Decisions on lines for which short term but not long term costs are met could be made in the run-up to renewal dates.

7. Enablers to secure changes to outputs

7.1 Introduction

In the previous two sections we set out the main areas of opportunity for cost savings as a result of changing outputs, in terms of changes to operations and to the size, functionality and configuration of the network. We have identified some specific initiatives, but we believe that the delivery of greater long-term, sustainable cost savings will be facilitated if a number of organisational and process changes are also addressed.

Firstly, there is a fundamental question as to whether the Government actually needs to specify outputs for the whole railway. If it were possible to identify separately the commercial and non-commercial, or "social", parts of the railway, Government could specify public service contracts for the social part and let the market determine what was required elsewhere. In principle, this could lead to a better allocation of resources, with cost savings and improved value for money for passengers and taxpayers. In practice, it is not always easy to distinguish the commercial and social parts of the railway: this is firstly because even where the railway pays for itself, Government may wish to specify quality improvements for social reasons (for example, access for disabled people), so that no part of the railway is ever completely commercial; and secondly because there may be changes over time in the extent of the commercial railway as a result of movement in demand and costs. However, such objections should be resolvable if there is a sufficiently strong desire to make a radical change to Government's role in specification.

Other enablers of cost savings opportunities are discussed below under the following headings:

- Alignment of incentives;
- Level of specification of outputs (including length and specification of franchises);
- Transfer of responsibilities;
- Changes to NR structure; and
- Changes to HLOS and RUS processes.

Within the constraints of this study, in most cases it has not been possible to identify the incremental impact on cost savings of these enablers; hence our arguments are mainly qualitative. However, the views expressed in this section are consistent with those of many of the stakeholders we spoke to. Many of these issues are being addressed elsewhere in the Value for Money study.

In this section we do not attempt to describe the overall industry impact of each enabler; instead we focus on the way in which each enabler might influence outputs (or, in the case of driver shifts, how outputs are delivered) in order to achieve the cost savings described in the previous two sections.

7.2 Alignment of incentives

We believe that current industry incentives are not properly aligned and that this leads to delivery of inappropriate outputs, adding cost as a result. The problem is highlighted by the

fact that at present, TOCs are held harmless by Government for changes in fixed track access charges, providing no incentive for TOCs to drive NR cost improvements.

Proper alignment of incentives would mean that the supply chain functions according to normal market mechanisms:

- Each player would be incentivised to deliver only what the market needs (including public service obligations), as efficiently as possible; and
- In particular, TOCs would buy from their supplier NR only what they require in order to serve their markets effectively.

With the right incentives, TOCs would question the need for specific infrastructure and consider how investments might be prioritised to maximise value. TOCs would seek to avoid over-specification ("gold-plating") and inefficiency. Given sufficiently disaggregated information and charging, TOCs would be in a position to question whether specific junctions, sidings etc which they paid for were actually needed. This could lead to network rationalisation, for example removal of switches which were found to be of no benefit but in fact slowed trains down or represented a performance risk (potential savings from network changes have been discussed in Section 6 above).

An illustrative example of the potential from proper alignment of incentives is that neither TOCs nor NR have a strong incentive to optimise losses on the DC network, due to NR's pass-through of charges and the fact that cost savings from any reduction in usage are spread across all users through a year end reconciliation process (the "wash-up"). Although this issue is now being addressed through metering initiatives, it highlights the possibility of other opportunities on which no-one is presently focusing.

Better alignment of incentives with market requirements could enable the industry supply chain to function more effectively and deliver only those outputs which the market needs.

7.3 Level of specification of outputs

A number of stakeholders feel that outputs are over-specified by Government. We touched on this idea in Section 5 where we discussed the idea of a lower threshold level of reliability.

The general point is that Government needs to decide and communicate clearly what outcomes it requires, then deliver a high-level specification that leaves the market free to decide how it will be delivered. Where there is an effective market, it is unnecessary for Government to specify individual services or levels of reliability. Even where Government wishes to influence the market in order to fulfil a particular social or economic objective, this may be done by setting out criteria to be satisfied rather than by purchasing a specific set of outputs (or in some cases, inputs). However, it is essential that there is clarity around desired outcomes and an appropriate regime of financial incentives to support delivery of these outcomes.

Given the current debate around franchise length and structure, we comment further on this issue. It has been argued that franchises should be both longer and less tightly specified, and indeed there are a number of advantages to this approach, including the following:

- TOCs would have a greater incentive to innovate on services offered, and to make investments with a payback beyond existing franchise terms;

- Assuming that TOCs were not held harmless as today for changes in access charges, TOCs would have a greater incentive to drive down on NR's costs. In this case, there is a risk that TOCs would focus on short-term costs over the remainder of their franchises rather than whole-life costs - one way to mitigate this risk is to extend TOCs' time horizons by increasing the length of their franchises;
- With the longer time horizon, TOCs would have more incentive to take on difficult industrial relations challenges – in particular, persuading the workforce to accept changes to rostering patterns (the cost savings from which are estimated in Section 5); and
- Less specificity in franchises could allow TOCs to flex their outputs, and hence their costs, in response to passenger demand. Each TOC would adopt a different approach but the overall result would be to match services more closely to passenger requirements so as to improve value for money and reduce cost to the taxpayer (potential cost savings from service alterations are estimated in Section 5).

These additional freedoms could allow TOCs to price franchise bids more keenly (although TOCs could also need to consider any added risks arising from longer franchises).

Fewer franchise competitions would also reduce tender costs (which can be around £3m per bidder per tender, in addition to DfT costs). Moreover, less frequent rebranding by incoming franchise operators (in the region of £10m on each time) would also produce some modest savings.

However, the creation of longer, more purposive franchises also gives rise to a number of important risks:

- Without safeguards, TOCs with longer franchises may feel "safe" for longer and less incentivised to perform well;
- As noted above, where TOCs take on additional risks these will be priced into franchise bids; and
- TOCs are naturally focused on their commercial objectives, but with longer and more purposive franchises this could be at the expense of changing social and economic objectives through time. Giving TOCs the ability to flex outputs could, unless public service contracts and incentives are structured appropriately risk the loss of services which the Government considers valuable.

In conclusion, longer, more purposive franchises – and a higher level specification of outputs more generally - could be key to driving long-term cost effectiveness, but incentives need to be structured carefully to avoid creating new risks to value for money.

7.4 Transfer of responsibilities

Another enabler for cost reduction is to ensure that industry responsibilities are allocated to those organisations best able to manage cost and risk. This is relevant for this report for those responsibilities where decisions are required about what to deliver and the level of quality needed.

In particular, cost reduction may be made easier by transferring certain responsibilities from NR to TOCs. TOCs may be able to reduce cost through active scoping, project management and tight cost control, and in some instances TOCs may be better placed to price and

manage risk (which enters industry costs in various ways including NR's pricing of enhancements and the TOC profit priced into franchise bids).

Transfer of responsibilities should be considered in the following areas:

- Asset management at some stations where responsibility is currently split - with increased clarity of responsibility, TOCs could make asset management decisions to optimise benefits to passengers;
- Enhancements to stations - TOCs could seek to specify station developments so as to achieve business requirements at minimum cost based on an understanding of passenger needs, and could drive down on scope creep. An alternative to TOC control of station enhancements would be for a specialist property company or companies to take on this responsibility; and
- Enhancements to car parks - given an appropriate time horizon for investment (for example, through longer franchises) TOCs might be expected to specify car park developments so as to maximise profit for the business as a whole, taking into account both farebox and car park revenues. Their understanding of passenger markets puts them in a good position to price revenue risk on developments.

In addition, TOCs should have greater involvement in specification of new infrastructure – an example is provided by Chiltern's Evergreen programme where Chiltern's management team have played an active role in driving down cost in order that NR deliver only what is required by the market. The extent to which responsibility can be transferred to an individual TOC for an infrastructure enhancement will depend on the complexity of stakeholder relationships (the Evergreen case is relatively straightforward) but what is important is the involvement of TOCs in specification and their ability to bring to bear their market perspective to influence what is delivered.

Potential savings resulting from transfer of responsibilities relate mainly to enhancement savings and are not covered in previous sections. In a sample of enhancement projects surveyed by Nichols[7], projects delivered by TOCs had a higher delivery efficiency than the average achieved by Network Rail; however, Nichols noted that it would not be reasonable to draw firm conclusions about the relative performance of TOCs and Network Rail in delivering station enhancements as the TOC sample size was too small. Other third party estimates (which we have not validated) suggest potential savings from more focused sponsorship on major projects at 20% of project cost, suggesting potential annual savings of hundreds of millions of pounds.

7.5 Changes to Network Rail structure

A wide range of options may be considered for changing NR's structure, with a view to increasing accountability, alignment with TOCs and value for money, including the following:

- Greater autonomy of regional units, either breaking up the company or creating separate P&Ls;

[7] "Comparison of railway enhancement costs in Great Britain and barriers preventing delivery of station projects by train operators", Nichols, June 2010:

- Functional separation - for example, property, retail development and major projects could be separated in order to make the activities of each function more transparent and market-orientated, leaving NR to focus on core operations, maintenance and renewals; and
- Changes to governance, in order to drive greater efficiency and market responsiveness - for example, re-introduction of equity to make NR responsible to shareholders rather than members.

Structural options are being explored by other themes of the Value for Money study (especially Theme C) but the first option above merits further comment here. We believe that some form of "regionalisation" of NR could help to increase accountability and drive down cost if this were accompanied by:

- Better alignment with TOC goals and incentives;
- Planning and decision making aligned to needs of specific markets;
- Standard regional reporting, to support benchmarking and driving best practice; and
- Safeguards put in place to protect interests of national operators (including freight).

Break-up of NR into regions would create benchmarks for efficiency improvement. If it was demonstrated that better value for money could be delivered through closer co-operation between TOCs and NR, this could lead later, if desired, to vertical integration - probably in stages, starting with pilots in Merseyrail and possibly Scotland.

However, many of the benefits could be achieved without break-up or vertical integration: if NR was organised in regions, aligned to TOC areas and each with its own P&L account, this would allow for "virtual vertical integration". Stronger partnerships between TOCs and NR at a local level would help to drive greater collaboration in defining what needs to be delivered and how to deliver it efficiently.

7.6 Changes to HLOS and RUS processes

Changes to HLOS and RUS processes could make specification of outputs more focused on value for money. To date, HLOS and RUS processes have taken place in an environment of growth and have tended to identify increments to existing services and capacity required.

Instead, the HLOS process could start from the perspective that all services need to have stronger justification on a value for money (VfM) basis. DfT could set VfM criteria to be delivered alongside safety, reliability and total cost. This change in perspective for HLOS could be an enabler for reducing cost by cutting poor VfM services (as described in Section 5), rationalising low value parts of the network (as described in Section 6) and avoiding unnecessary enhancement expenditure.

The RUS process could also help to drive down on cost by:

- Focussing more on making best use of existing capacity;
- Making funders more aware of available choices; and
- Seeking ways to improve VfM in each area.

The setting of VfM criteria implies the creation of a VfM metric which could be calculated at a disaggregated level across the network and would include economic benefits and costs as well as financial implications. Achievement of significant cost savings on existing services would require visibility of disaggregated costs and the right industry incentives and structures (as described in previous sections) to drive down on these costs.

The VfM metric for appraising existing services needs to be aligned to the criteria used for assessing new investments, where current affordability constraints will mean that tougher hurdles are required – not all the projects which offer good value for money in socio-economic terms may be affordable. This could be simply a matter of raising the Benefit-Cost Ratio which projects need to exceed.

8. Conclusions and recommendations

8.1 Summary of potential savings

The potential savings identified from changes to operational and network outputs are summarised in Table 9-1 below.

Table 9-1: Identified Potential Savings

Options	Net Savings (£m pa)	Savings range (£m pa)	Timing	Implementation Cost
Changes to operations				
Reduction in reliability targets	26	20 - 30	Gradually up to 2020	Small
Changes to services - Removing contra peak - Bus shuttles - Lower off-peak frequencies - Removing first/last services	 26 15 small small*	 10 - 30 10 - 20	 Gradually up to 2020 Gradually up to 2020 N/A N/A	 Small Small N/A
Changes to crowding parameters	17	10 - 20	Gradually up to 2020	None identified
Changes to network complexity	Not quantified		Long term	Capex, re-design of franchises
Changes to crew working conditions	70	50 - 100	Long term	Potential major IR costs
Changes to network				
Changes to network functionality; **or**	170	100 - 250	Gradually up to 2020	None identified
Minor network reductions; **or**	[45**]	[30 - 60**]	£27m by 2015, the rest long term	Decommissioning, redundancy
Major network reductions	Large, not quantified		To be determined	Decommissioning, redundancy
TOTAL	**324**	**200 - 450**		

Notes:
* Small for train operators; reduction in infrastructure maintenance cost being addressed by Theme E (Asset Management)
** Not included in total due to overlap with network functionality option

Source: Booz & Company analysis

The table shows indicative total annual savings in the range £200-450m, partly depending on the degree of overlap between opportunities. Most of these net cost savings would be achieved in phases over the next 10 years, with franchise renewal being the trigger for implementation of many of the options.

The most significant savings related to operations are driven by changes in resources required to operate the peak. Net cost savings from changes to services, reliability targets and crowding parameters are relatively modest, although more significant savings may be realised if changes to crew working conditions can be negotiated. Reducing the complexity of the timetable also presents a substantial opportunity, but one which would be difficult to implement and which we have not been able to quantify at this stage.

To generate net cost savings on a greater scale, changes to infrastructure outputs are required – not necessarily removing lines but potentially changing the functionality of the network: in particular, the introduction of separate standards and maintenance regimes for the core network and the less dense regional networks. This could be extended by switching segregated regional lines to light rail. However, if network cuts are considered appropriate, these would need to go beyond small branch lines to have significant impact on costs. Potential net cost savings from major network reductions are clearly very large (certainly hundreds of millions), although a further study would be required to establish the size of this opportunity based on viability of individual lines.

As commented previously, these estimates have been derived by modelling the avoidable operating costs and estimating the degree of avoidability of the infrastructure costs. Further investigation would be required to determine the degree to which these costs are truly avoidable.

8.2 Recommendations

Savings initiatives

We recommend that the savings opportunities identified are pursued further and taken to the next level of detail. The key opportunities include:

- Removing services or adjusting outputs where such requirements drive the provision of additional under-utilised resources or excessive levels of back-up resources (staff, rolling stock); and
- Decommissioning or changing the functionality of underutilised parts of the network, where provision of transport by other modes may be more appropriate/cost effective in delivering customer requirements.

More strategic initiatives to deliver cost effectiveness and improved value for money in the longer term would need to address the reduction of network complexity through fundamental timetable redesign.

Additional issues outside the scope of this study also need to be addressed, including:

- Standardisation of rolling stock specifications
- Cancellation or curtailment of projects where these are not financially justified

Enablers of savings

In order to maximise the savings achievable and facilitate their delivery, we believe that a number of organisational and process changes needs to be addressed.

The key enablers for significant cost reduction include changes in the approach to, and responsibility for, service specification:

- The specification of service level commitments and high level outputs should be driven by value for money criteria; and
- Local, as opposed to central, service specification, can also reduce costs by allowing for service specifications better matched to market needs. TOC engagement, together with local and central Government, in the service specification is vitally

important to ensure cost effectiveness and value for money. 'One size' outputs are not appropriate for all.

A re-design of incentive structures is also necessary in order to meet market demand more effectively. TOCs must be incentivised to deliver market requirements in the most efficient manner. This may require giving TOCs:

- More scope to flex required outputs to better meet market demand;
- Longer franchises, to incentivise them to improve staff productivity and address underlying legacy industrial relations issues;
- More responsibility for (and greater transparency in the composition of) fixed track access charges; TOCs should not be 'held harmless' but should be incentivised to engage actively with NR to drive appropriate infrastructure provision;
- More 'client' responsibility in defining infrastructure project requirements and in controlling the costs of their provision; and
- More responsibility for the delivery of minor enhancements at stations and car parks to meet customer needs.

Similarly, NR's incentive structure needs to be changed to make it more responsive to the requirements of its customers. This may require:

- Giving NR management greater focus on network performance and availability (i.e. OMR), by spinning off responsibility for non-core areas such as property, retail, major project development, and also asset management at some stations; and
- Enabling decision-making on infrastructure to be more responsive to customer needs through closer mapping of NR's management structure to franchise areas, moving more towards 'virtual vertical integration'.

Appendix A - Supporting information on costs

Detailed cost data was provided to us and, as far as possible, we used this detail in combination with our knowledge of the drivers of costs to develop useful cost relationships. However, due to the short timescales available, certain simplifying assumptions had to be made and the results should be considered as providing an indication towards areas worth further investigation.

Rail Industry Costs

For this analysis, we defined Rail Industry costs as the total of:

- TOC costs excluding payments to NR
- NR Operations, Maintenance, Renewals, and Enhancement costs

This enabled us to use NR's detailed information on its expenditure on infrastructure rather than the track access charges paid by the TOCs to NR which are a derived representation of NR's expenditure.

Allocation to sector

Allocation of costs to sector was approximated by first allocating costs to TOCs then allocating each TOC to the sector in which it primarily operates.

This is not ideal because several TOCs operate in two or three sectors but examination of revenue by TOC by sector has shown that allocation of each TOC 100% to a sector is satisfactory for most TOCs but it understates Regional revenue by 25% (£230m) and overstates LSE and IC by about 5%. A similar skewing of costs might be imputed.

This should not effect our overall conclusions but more detailed analysis should be undertaken with respect to any sector-specific options, especially Regional.

Historic cost analysis

Recent trends in costs were based on data from DfT's NMF model. Data was not yet available for 2009-10 so we used 1998-99 to 2008-09 as a ten year span.

Current cost breakdown

TOC costs (and revenues) for 2009-10 were based on actuals for the 2009-10 financial year. They were based on the management account information routinely provided to DfT by the TOCs. The data is not ideal in that not all TOCs provide it and the categorisation is not totally consistent across TOCs.

To complete the data set we took data for Scotrail, Merseyside and LOROL from other sources and estimated the cost categorisation. The categorisation of payments made to NR was not consistent between TOCs but was sufficient to enable us to isolate and remove it. The cost of EC4T for each TOC was taken from NR's income statements as it was not always identified by the TOCs.

NR's costs for 2009-10 were taken from their Infrastructure Cost Model in terms of post efficient 2006-07 prices, which were factored up to 2009-10 prices using the November 2005 and November 2008 RPI values.

- Opex and Maintenance costs were represented by 2009-10 costs
- For Renewals and Enhancements, the long run annual average (LRAA) forecast was used

- The ICM was used to allocate to TOCs all NR's costs (except Opex), at a detailed level based on the drivers of costs in each category of expenditure
- Opex is a little more complicated and some items warrant more detailed examination, but we allocated Opex across TOCs as per NR's FTAC calculation for now.

Costing of options

Our costing of options was based on a set of unit costs for TOC operations based on our detailed knowledge of TOC costs.

Unit costs for NR were taken from the ICM.

Application of these unit costs was subject to a number of assumptions:

- Expenditure is not 100% avoidable
- Renewals expenditure on specific items could only be saved in the longer term
- Network wide average unit costs are not directly applicable to all areas, especially rural branch lines:
    - Little avoidable infrastructure Opex assumed
    - Maintenance and Renewals assumed 60% of system average

With respect to TOC costs:

- Where possible costs by class of rolling stock were used but in some cases, rolling stock classes had to assumed
- Station staffing levels on branch lines were assumed based on public information about staffed stations

Although we were able to cost specific examples of most options, our ability to extrapolate as to how many cases of each such option might exist across the network was limited to broad generalisations.

Reconciliation to Value for Money study team cost base

The cost base we defined in section 3 and summarised in Table 3-1 is repeated here for reference

Cost item	2009 10 (£m)
TOC costs[1]	5,720
Network Rail costs[2]	4,395
Total costs	**10,115**
Less Revenue[1]	6,570
Net cost	**3,545**

The cost base used by the VfM Study team, based on the allocation of NR's revenue requirement is shown below:

Cost item	2009 10 (£m)
TOC costs	7,286
TOC profit	254
NR grant	3,733
Total costs	**11,273**
Revenue	6,785
Net cost	**4,487**

A reconciliation is presented below showing how our cost base was developed from that used by the Value for Money study team.

VfM Study source data								Adjusted costs and revenues	
Cost item	**2009 10**	**Adjustments**						**Cost item**	**2009 10**
		Transfer payments (Commissions etc)	**NR charges**	**add back EC4T**	**Replace NR grant with NR costs**	Adjusted cost item			
	(£m)								(£m)
TOC costs	-7286					-7286			
		215				215			
			1,873			1873			
				-269		-269			
TOC profit	-254					-254			
							5,720	TOC costs[1]	5,720
NR grant	-3733				3733	0			
					-4,395	-4395			
							4,395	Network Rail costs[2]	4,395
Total costs	**-11273**						**10,115**	**Total costs**	**10,115**
Revenue	6785	-215				6570			
							6,570	Less Revenue[1]	6,570
Net cost	**-4487**	0	1873	-269	-662	-3545	**3,545**	**Net cost**	**3,545**