

**Network Rail October 2007 Strategic
Business Plan**

Supporting Document

Demand Forecasting in the SBP

Executive Summary

The capacity strategy in the SBP is drawn from a range of sources. The HLOSs specify a small number of key schemes to be delivered. Aside from this, the strategy draws primarily on RUSs (where these exist); on business case work for specific enhancement schemes; and on route plans, which we have developed in conjunction with our customers and other stakeholders.

In this sense, the SBP is not based on a single demand forecast. Rather, it is implicitly based on a range of demand forecasts prepared over the last two to three years.

These forecasts are broadly consistent, in methodology and assumptions and outcome. They are all based on PDFH, with exceptions in key non-London markets in which it is now recognised that PDFH fails to capture what is going on. They are based on similar assumptions regarding economic growth, population, future fares levels, road congestion and the cost of motoring. And they all show significant growth over the next 10 years, in all sectors. In key markets we typically predict average background growth of around 2 per cent a year in London commuting; 3 per cent a year in inter-urban travel; and up to the order of 5 per cent a year for commuting into some regional cities.

These are background growth forecasts: and do not take account of additional demand stimulated by improvements to rail services (which could be substantial).

These forecasts are broadly similar to those underpinning the HLOSs. Although there are some differences in forecasts at individual route level, these would not make any difference to the resulting strategy, and are generally within the margin of error that can be expected when forecasting rail demand 7-10 years out.

During the preparation of this plan, it has become clear that train operators generally believe that growth is likely to be significantly higher than this. For example, ATOC has suggested that passenger volumes may well grow by around 40 per cent between now and the end of CP4.

We believe that the SBP is generally robust to the possibility of significantly higher growth, though more rolling stock would be needed if the government's aspiration of maintaining load factors was to be realised in this scenario. For example, on a particular route we may be confident that train lengthening and consequent platform lengthening is the correct strategy; but the precise number of trains lengthened, by when, will depend on what demand materialises (which is unlikely to exactly match any particular forecast).

1 Context: Role of demand forecasts in developing the SBP

Our strategy described in the SBP aims to meet a number of requirements (between which there are significant overlaps):

- **HLOS requirements:** delivering key schemes specifically required by the HLOSs, and also (in the case of the England & Wales HLOS) the infrastructure necessary to match or better the safety, capacity and performance metrics. (The Scottish HLOS specifies capacity requirements in a different way, primarily by specifying schemes to be progressed, without explicit reference to a metric underpinned by a demand forecast. The remainder of this document therefore refers to England and Wales unless otherwise stated.)

DfT's demand forecasts underpin these HLOS metrics. In the case of the capacity metric, DfT stated in its HLOS that it would be at risk for the out-turn demand levels, i.e. that the load factors were not targets but, rather, that the HLOS specifies the total capacity that the government wants to fund.

- **Reasonable requirements of our customers:** including schemes necessary to meet franchise commitments and aspirations
- **Other schemes:** not explicitly specified in HLOS, or required to deliver the HLOS metrics, but which have a good case and which contribute towards wider themes consistent with government policy, such as improving inter-urban connectivity

In developing our plans we have drawn on a number of sources:

- RUSs, where these exist or are in progress. The RUSs are based on demand forecasts that were made at the time of their development. Each RUS strategy and the demand forecasts underlying it are fully supported by the relevant Industry Stakeholder Management Group
- Route plans and discussion with train operators and other industry stakeholders in areas where RUSs are not yet underway.
- Specific enhancement plans (including those specified in the HLOSs) and the business cases for them. Each business case has a demand forecast, made during scheme development, underlying it.

Therefore no single demand forecast underlies the SBP. Rather, the strategy is implicitly and explicitly based on a series of forecasts made at different times and with varying levels of detail. Inevitably these forecasts do not match in every detail.

The key issues are why the various forecasts differ; by how much they differ; and, most importantly, whether the differences between them have a material effect on strategy.

This document therefore sets out:

- in section 2, the key methodological differences between the various demand forecasts underpinning this plan;
- in section 3, a comparison between the various forecasts; and
- in section 4, conclusions as to whether the differences have a material effect on strategy.

The document concludes with a brief overview of longer-term demand issues.

2 Overview of methodology for demand forecasts

Passenger Demand Forecasting Handbook

Forecasts of rail passenger demand typically use the forecasting methodology in the Passenger Demand Forecasting Handbook (PDFH). The PDFH is produced by industry parties, managed by ATOC, and contains the industry's standard approach to demand forecasting.

The PDFH methodology predicts changes to rail passenger demand based on changes in a number of key factors, or "drivers" of rail demand. Some of these are external to the rail industry, such as GDP, population, employment, road congestion and motoring costs; others are internal to the industry, such as fares levels, and the service frequencies and journey times offered to passengers.

Moreover, many forecasts of rail passenger demand do not just use the same methodology; they use similar inputs. For example, predictions of "background" demand growth (i.e. growth excluding the effects of changes to train services) are typically made using the following inputs:

- GDP, population and employment projections from official or highly regarded independent sources (e.g. the DfT's TEMPRO database, the London Plan, Oxford Economic Forecasting, Cambridge Econometrics)
- Government estimates (from TEMPRO) of trends in competing modes, notably the cost of fuel and road journey times.
- An assumption that all fares increase by RPI+1% each year

The PDFH methodology, applied to consistent or broadly similar assumptions, has been used for our demand forecasts for RUSs; for the DfT's forecasts underpinning the England & Wales HLOS; and for most business cases for individual enhancement schemes. We therefore expect a broad consistency between the various forecasts. This is typically what we find, as described in section 3 of this document.

Urban areas outside London

It is now widely recognised that, in the major urban areas outside London, growth over the last 5-10 years has been significantly higher than would have been predicted by the PDFH. We found this in the North West RUS for Manchester and Liverpool, and in the ECML RUS for Leeds and Newcastle. Current work in the Yorks & Humber RUS (around Leeds and Sheffield) and in the Wales RUS (around Cardiff) is identifying the same phenomenon.

There is no established alternative methodology for these areas, so RUSs have developed or are developing bespoke forecasts in consultation with stakeholders. DfT have adopted a similar approach for the England & Wales HLOS.

Wider concerns with the PDFH

The PDFH methodology has worked well, in the past, at predicting demand changes at a broad level over several years in many markets. However, during the preparation of the SBP, it has become clear that many train operators expect significantly higher growth than the PDFH predicts, not just in non-London urban areas but more generally.

ATOC, for example, believes there is a high likelihood that growth will continue at or close to current rates for some time, and that this could lead to growth of around 40 per cent by the end of CP4. This is 10 to 15 per cent higher than typically predicted by the PDFH. This belief is based partly on current high rates of growth, and partly on

factors such as the marketing and pricing initiatives of operators; ongoing improvements to rolling stock; increasing public awareness of rail's environmental benefits relative to car travel; and the strong incentives on operators to drive passenger numbers and revenues as high as possible.

There is some evidence to support this belief. The very high rates of growth in 2006/07 have continued into 2007/08. The ORR's latest National Rail Trends publication reports that passenger volumes (measured as passenger km) increased by more than eight per cent last year across the network as a whole. If anything, growth has accelerated recently, especially in commuter markets – season ticket sales have increased by nearly ten per cent in a year.

Recent work for the Passenger Demand Forecasting Council concluded that much (though not all) of this high short term growth in 2006/07 might represent a “catch-up” from earlier years, in which demand grew by less than the PDFH would have predicted. However, the reasons for recent high growth are not fully understood, and as current growth rates persist then this “catch-up” explanation becomes less plausible.

Looking over a longer timescale, there is also evidence that the PDFH has for some time been under-predicting growth on non-London inter-urban flows. In terms of strategy, this does not generally have a big effect on London-based services, as the heaviest loads tend to be at the London end and it is this that drives capacity requirements. For non-London services (principally TPE & Cross Country) this is potentially more of an issue, though even here the main capacity constraints are associated with peak demand into regional cities, when these operators help to carry commuters as well as inter-urban passengers.

In our view, this suggests that there is a significant risk that growth may be higher than predicted by the PDFH. However, we do not believe that there is yet sufficient evidence to conclude that the PDFH framework should be abandoned and replaced, say, by forecasts based largely on extrapolation from recent trends.

3 Comparison of demand forecasts

Overview

As described in the previous section, the PDFH has generally been used as the basis of demand forecasts developed for the RUSs, for the HLOS; and for business cases for specific enhancements. It is therefore no surprise to find that these forecasts are broadly consistent. Although the headline growth rates in different forecasts may appear different, these differences are typically easily explainable. Common causes of apparent differences are:

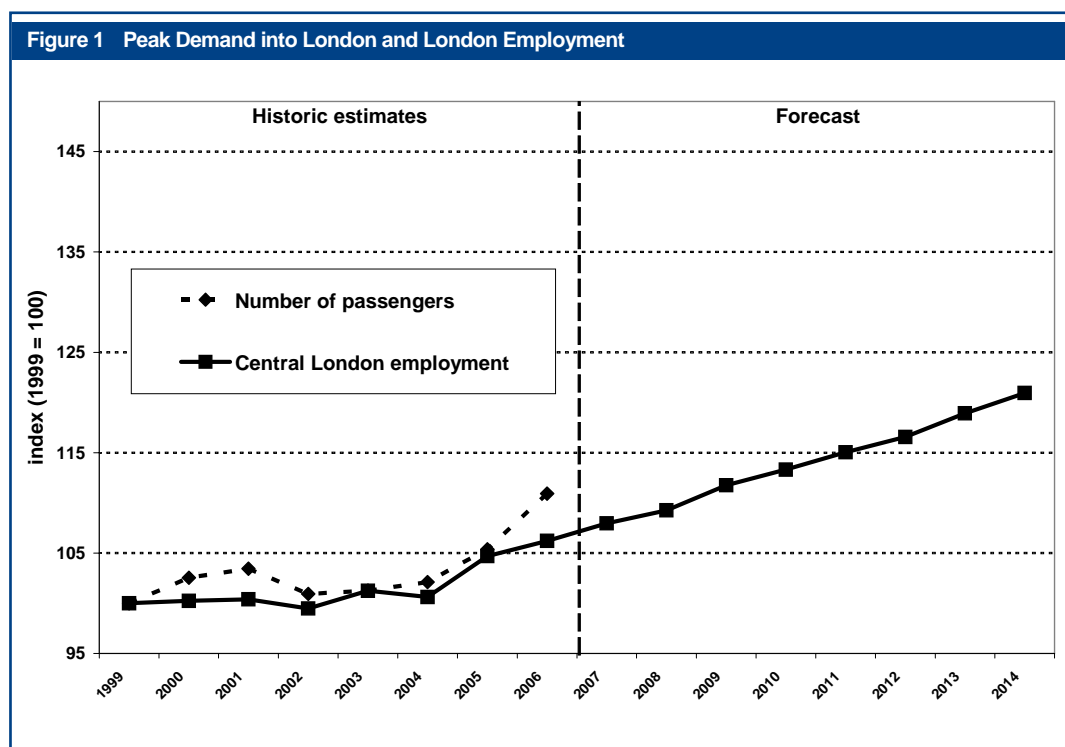
- The inclusion or exclusion of service changes associated with planned or committed schemes, eg more frequent or faster or more punctual train services
- The inclusion or exclusion of constraints on increases in patronage caused by on-train crowding, and the treatment of crowding in different models
- The inclusion or exclusion of competing modes of transport (particularly the Underground for forecasts of demand around London).

PDFH-based forecasts typically predict background growth of around 30 per cent over the next ten years, i.e. an average rate of 2.5 to 3.0 per cent a year from the 2006/07 level of 46.5 billion passenger km. Significant growth is predicted in all three sectors (Long Distance, Regional and London & South East).

Improvements to train services are expected to generate additional growth, over and above background growth. This extra growth is expected to be substantial in some cases, most notably the new WCML timetable in December 2008. Improvements to punctuality will also generate additional growth.

HLOS Markets: London peak demand

The primary driver of peak demand for travel into London is employment in central London. Since 2000 central London employment has increased by 1 per cent a year on average while morning peak counts of standard passengers have shown an



average increase of 1.3 per cent a year. This matches the prediction of PDFH exactly though there is considerable variation from year to year (at least in part because of the variability inherent in passenger counts), as can be seen in Figure 1. Central London Employment is forecast to increase by an average of 1.4 per cent a year to 2014. This implies that commuter demand will increase by around 16 per cent from 2006/07 levels by the end of CP4 around London, implying pure background growth of about 2 per cent a year on average.

Figure 2 shows, for London termini, annual average rates of morning peak passenger demand growth that have been predicted for use in RUSs (including those that are in progress); and demand forecasts produced using the NMF Demand Module with overlays consistent with those used by DfT when preparing the HLOS.

Figure 2 Demand Forecasts (2006/07 – 2014/15)
Annual average predicted growth rates (AM Peak)

London Terminal	RUS	NMF/HLOS
Blackfriars	1.0% (inner services)	2.0%
Euston	n/a	2.2%
Fenchurch Street	1.4%	1.7%
King's Cross	1.3% (commuter) 3.0% (inter-city)	1.9%
Liverpool Street	1.9%	2.0%
London Bridge	1.0% (Inners services)	1.9%
Marylebone	n/a	2.1%
Moorgate	1.3%	1.9%
Paddington	n/a	2.2%
St Pancras	n/a	1.7%
Victoria	1.0% (Inner services)	1.9%
Waterloo	1.5% - 2.0%	2.1%

HLOS/NMF forecasts are typically 0.5% - 1.0% per year higher than the RUS forecasts. There are three primary reasons for this difference:

- RUSs have not included the impact of performance on passenger demand in their general forecasts, while the NMF/HLOS does. Our work (using PDFH parameters) estimates that the HLOS target level of performance could drive passenger demand around 0.5 per cent a year higher.
- The estimated response to ticket price increases is different. RUSs use parameters from PDFH v4.1 while NMF uses PDFH v4. There is some debate in the industry about which version produces better estimates; and indeed there is some evidence that suggests that passengers in London

respond to price increases less than either version of the PDFH suggests.¹ We think it reasonable to use either version of the PDFH.

- RUSs model the impact of LUL competition. Planned increases in capacity on the tube reduces rail demand growth estimates relative to NMF, which does not model changes in LUL capacity

HLOS Markets: Peak Demand in Regional Cities

The drivers of passenger demand in regional cities are less well understood than they are in London. As noted above, the PDFH methodology has consistently underestimated growth in the past. For the North West RUS we developed bespoke forecasts for the peak markets, in conjunction with stakeholders; a similar approach has been used by DfT to produce overlays in NMF for the HLOS. We are also developing bespoke forecasts for regional cities as part of other RUSs.

Figure 3 shows background growth forecasts from RUSs and those that underlie the HLOS estimates for regional cities subject to HLOS capacity metric requirements. The percentage changes in the table are predicted annual average background growth rates.

Figure 3: Demand Forecasts
Average annual predicted growth rates (AM Peak)

City	RUS	NMF / HLOS
Birmingham	n/a	2.8%
Cardiff	2.3%	2.8%
Leeds	3.1%	5.0%
Manchester	3.0%	3.0%
Bristol	n/a	1.6%
Leicester	n/a	2.5%
Liverpool (ex Merseyrail)	3.0%	0.8%
Newcastle	3.5%	4.0%
Nottingham	n/a	1.7%
Sheffield	3.6%	5.3%

As with the London market, the NMF / HLOS forecasts tend to be higher than the RUS forecasts, with greater differences for individual cities. This is not surprising. We would expect NMF / HLOS demand forecasts to be higher because they include the effects of improvements in performance, and use PDFH4 parameters to estimate the response to changes in fares. And the differences for individual cities are likely to be greater, as the markets are less well understood.

¹ "Review of London Fares Elasticities", unpublished, MVA for PDFC, May 2006.

Only for Liverpool does the NMF / HLOS predict a lower growth rate than the RUS. The NMF did not apply an overlay for its forecast for Liverpool, whereas the North West RUS did so. Given recent growth in demand into Liverpool, we believe that the RUS estimate is the better one to plan to in this case. However, differences in demand forecasts here would have a limited effect on the plan, because two of the three routes concerned (the Chat Moss and the CLC) link Liverpool and Manchester, so much of the proposed infrastructure and train lengthening would be necessary in any event in order to provide additional capacity into Manchester.

4 Effects on strategy

In considering different demand forecasts, the most important issue is whether differences between forecasts would have a material effect on strategy. For example, is train & platform lengthening adequate to meet capacity requirements, or not?

We conclude that:

1. After allowing for performance effects and LUL capacity changes, differences between RUS and HLOS forecast growth rates around London would be immaterial.
2. Regional demand forecasts suffer greater uncertainty than those for London. Rail has a much lower market share in the regions allowing greater scope for passengers to switch mode; and the type of job opportunities in regional city centres has been changing as their economies have diversified away from their traditional manufacturing bases. However, even here, there is reasonable agreement between RUS forecasts and the HLOS.
3. RUSs do not therefore need to be revisited for the purpose of the SBP; nor do existing business cases for enhancement schemes.
4. Strategies developed through the RUS process have generally been designed to cover 10-12 years. The HLOS forecasts imply that growth may happen sooner than predicted in the RUSs, so capacity interventions may be needed in CP4 that under the RUS forecasts may not have been needed until CP5.
5. Even if growth were to be significantly higher than predicted in the HLOS, we do not believe that there would be a need for fundamental changes of strategy. The proposed interventions in the SBP either provide infrastructure adequate to handle higher rates of growth, or are at least consistent with what would need to be done should growth exceed the forecasts.
6. We are therefore content, for purposes of the SBP, to adopt HLOS growth forecasts for quantifying rolling stock requirements and potential load factors.
7. There is however a need for the industry to retain flexibility in its ordering of new rolling stock, in order to be able to react to actual growth (which will inevitably differ from any forecast). For example, if growth is significantly higher than forecast, additional passenger capacity will need to be delivered more quickly than planned if load factors are to be maintained or reduced.

5 Longer term prospects for growth

There is, of course, greater uncertainty around rail demand further out into the future than for shorter term forecasts. However, we believe that the prospect for continuing increases in rail patronage beyond the horizon of current forecasts is good. The primary drivers of demand growth over the last 10 years have been underlying economic trends – particularly increasing income and wealth – and we expect these to continue (albeit with potential fluctuations in line with economic cycles).

Other trends that favour rail over private transport are expected to continue and we are, at least, confident that they will not reverse. These include:

- Changes in the economic and employment structure in major cities through the continuing development of city regions
- Road congestion and increasing fuel prices
- Environmental concerns

It is important that we plan for flexibility in delivering capacity so that if demand growth arrives sooner than predicted the infrastructure is ready to accommodate more or longer trains along the key capacity constrained routes.

If we do not meet demand growth, the result will be unacceptable levels of crowding on many services around the country, and a loss of demand as people become increasingly unwilling (or in some cases physically unable) to travel by train.