

# Chapter 1



## **Optimised Alternative to HS2 - The Scope for Growth on the Existing Network**

Prepared by Christopher Stokes

# 1 OPTIMISED ALTERNATIVE TO HS2 – THE SCOPE FOR GROWTH ON THE EXISTING NETWORK

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1.1 This submission relates to the following questions listed by the Committee:

- 2.1 – alternative investment in the “classic” network.
- 3.1 – the methodology used in evaluating HS2 against alternatives.
- 3.2 – evaluation of upgrading the West Coast Main Line.
- 3.3 – consideration of alternative means of managing demand.

## Introduction

1.2 Rigorous evaluation of proposals to construct a £32 billion rail project should properly include consideration of all alternative options, with the project itself evaluated against the best alternative, rather than an artificial “do minimum” case, as has been the case with HS2.

1.3 Taking the present position as a start point, there is currently limited crowding on the West Coast Main Line in standard class. This is concentrated on Friday evenings, particularly on departures immediately after 7 pm when cheaper “saver” are available. In contrast, first class load factors are low, at about 20%.

1.4 Provision of additional capacity is already planned through the committed project for lengthening 31 out of the existing 52 Pendolino units from 9 to 11 cars by adding two standard class cars, together with the procurement of four new 11 car trains. However, there is likely to be significant further demand growth, and it is certainly appropriate to identify options to meet this.

1.5 Options should be considered incrementally, starting with proposals which prime facie offer the best value for money. The options would include:

- Effective use of the capacity provided by Chiltern Railways as a result of the Evergreen 3 project, which will provide 90 minute journey times between London and Birmingham from later this year.
- Rolling stock reconfiguration, particularly conversion of some first class vehicles to standard class.
- More effective demand management, including use when appropriate of obligatory reservations.

- Operation of longer trains, to the extent that this is possible without major infrastructure expenditure.
  - Targeted infrastructure investment to clear selected bottlenecks to enable frequencies to be increased.
  - Construction of new infrastructure (HS2).
- 1.6 It should be noted that the Department for Transport (DfT) and HS2 Ltd have given **no** consideration to rolling stock reconfiguration and improved demand management, and have not optimised their evaluation either of train lengthening, or of incremental infrastructure investment.
- 1.7 This submission considers these options, focussing on the West Coast Main Line, and also includes brief summaries in relation to the East Coast and Midland Main Lines. The options for the West Coast Main Line have been evaluated to produce an “Optimised Alternative”, a low risk, incremental approach, with much lower costs than for HS2 and the ability to trigger incremental expenditure as and when it is required, rather than the “all or nothing” approach which is unavoidable with construction of a new route.
- 1.8 The Optimised Alternative is based on the incremental interventions in Table 1.1.
- 1.9 The Optimised Alternative therefore delivers a 211% increase in standard class seating over DfT’s 2008 “base”, the derivation of which is detailed in Annex 1, without taking into account the potential capacity upgrade on the Chiltern route, or assuming any benefits from more effective demand management. This increase is over twice the high “background growth” figure of 102% forecast by DfT.
- 1.10 The proposed incremental changes are considered in more detail in this chapter.

### **Evergreen 3**

- 1.11 DfT’s evaluation takes no account of the committed Evergreen 3 project on the Chiltern route. This will be completed later this year, and will give journey times on the Chiltern route only a few minutes longer than on Virgin to Euston. The standard timing from Birmingham New Street to Euston is 84 minutes; Chiltern will offer 90 minute journey times when Evergreen 3 is completed, and Chiltern serves the affluent Solihull area more conveniently than the West Coast railhead at Birmingham International. Given that fares on Chiltern are generally significantly cheaper than on Virgin, it is likely that the Chiltern route will abstract significant traffic from Euston.

1.12 At present, Chiltern generally operate short (3 or 4 car) trains, and capacity could be readily increased by operating longer trains without any additional infrastructure expenditure.

**TABLE 1.1 INCREMENTAL INTERVENTIONS FOR OPTIMISED ALTERNATIVE**

Interventions	Daily Trains	Daily Standard Class Seats	% Increase above 2008 Base	Comments
<b>Train Investment with no/little Infrastructure Investment</b>				
HS2 2008 Base		59,298		Base used by DfT for evaluation of HS2. Predates full WCML upgrade timetable.
Current timetable	286	81,924	38%	Includes Voyager services (30 daily)
Evergreen 3	[68]	[28,900] <sup>1</sup>	[55%]	Committed scheme – complete in 2011 Illustrative numbers – excluded from totals
Committed lengthening project	286	10,5924	79%	Committed scheme – implemented from 2012
December 2013 additional services	306	113,769	92%	Additional hourly off-peak train each way
First class reconfiguration	306	134,379	127%	One car converted from first to standard
12 car sets (except Liverpool)	306	166,908	181%	Major physical constraints at Liverpool
<b>Infrastructure Investment</b>				
Additional services	336	184,326	211%	30 additional daily trains following investment to relieve pinchpoints

<sup>1</sup> Illustrative Evergreen 3 figures assume Chiltern trains currently 4 car class 168 units (275 seats), lengthened to 6 car class 168 (425 seats)

- 1.13 A combination of extra seats on the West Coast Main Line and Chiltern routes is fully able to meet high growth scenarios for the London – West Midlands corridor.

#### **Rolling Stock Configuration**

- 1.14 First class load factors are much lower than standard class currently (c20% only, compared with c50% in standard class) and first class volumes have recently dropped, reflecting reductions in corporate and public sector expenses paid first class business travel as a result of the recession and public expenditure cuts. First class yields per passenger have also declined substantially, reflecting the shift to much cheaper, train specific advance purchase tickets.
- 1.15 If, conservatively, one out of the current four first class car in each unit is reconfigured as standard class, this would increase overall seating. For an 11 car unit, the new capacity would be 99 first/519 standard, compared with 145/444 at present. The reduction in crowding would be significantly greater, reflecting the much higher load factors in standard class; the units would have 75 additional standard class seats, giving an overall increase in standard class of 19%. It may be that detailed analysis would show that overall capacity would be optimised by reconfiguring two first class cars to standard class in each train. It is also possible that bidders for the new West Coast franchise will propose reconfiguration themselves.
- 1.16 This change could almost certainly be carried out without any reduction in revenue, as the limited number of trains on which a reduction of one first class vehicle would cause a shortage of first class capacity could be managed through yield management techniques.

#### **Improved Demand Management**

- 1.17 The majority of the existing overcrowding is on departures from Euston after 1900 on a Friday evening, as these trains are the first for which the regulated, non-train specific "saver" fares are available. Given the increases in open ticket prices since privatisation, the regulated "Saver" fares represent very good value, and are cheaper than advanced purchase prices in the evening peak period. But this is an artificial peak, directly caused by the fares structure, and could be reduced by changes to the structure for fares regulation.
- 1.18 In the medium term, the development of smarter IT will certainly enable better demand management, with flexible, fully reservable trains, enabling passengers to arrive at the last minute, and book a seat "on the run", using mobile devices,

provided space is available. Given the pace of IT development, it is inconceivable that such systems will not be in place by 2026 when HS2 Phase 1 is due to open.

- 1.19 Effective demand management would enable load factors to rise on a sustainable way without increased overcrowding; both Eurostar and French TGV services already operate at load factors of about 70%. This would also significantly improve the poor financial performance of the rail industry, as set out in the National Audit Office’s report “Increasing Rail Capacity”<sup>2</sup>, which recommended:
- “The Department should...[evaluate] further the costs and benefits of demand management as well as capacity enhancement approaches to tackling peak time overcrowding..”*

### **Operation of Longer Trains**

- 1.20 The current InterCity fleet comprises 52x9 car Pendolinos, each with 145 first class and 294 standard class seats, together with 21x5 car diesel “Voyager” units which are used on Euston – Chester/North Wales and Birmingham – Glasgow/Edinburgh services. The analysis of options for increasing train capacity only considers the Pendolino fleet, but it is equally possible to lengthen or reconfigure the Voyager fleet to deliver equivalent proportional capacity increases.
- 1.21 The existing project to lengthen 31 of the Pendolino units to 11 cars and build 4 new 11 car units will increase total standard class capacity by 42%. Full use of the four new trains will be delivered through use of the extra path identified by DfT in the West Coast franchise consultation document<sup>3</sup>.
- 1.22 A further increase in train lengths to 12 cars is deliverable cost effectively except on the Euston – Liverpool route. Conservatively, it would be necessary to retain 10x11 car sets to ensure that sufficient units were reliably available for the Liverpool services, which, as a self contained service, currently require 8 units each day. It should be noted that DfT considered operation of 14 and 17 car trains in its review of alternatives, but both were rejected because of the major infrastructure work required – but there was no serious evaluation of full 11 or 12 car operations.

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<sup>2</sup> Executive Summary:NAO rept (HC 33 2010-2011): Increasing passenger rail capacity [Exec summary] (pdf - 65KB - opens in new window)

<sup>3</sup> InterCity West Coast Consultation Document – January 2011 page 52  
<http://www.dft.gov.uk/consultations/closed/2011-01/>

1.23 Work carried out by Atkins for DfT did however indicate that only modest infrastructure expenditure would be required to enable 12 car operation on all routes except Liverpool, where lengthening platforms would be prohibitively expensive.<sup>4</sup>

#### **Targeted Infrastructure Investment**

1.24 **Short term.** The most urgent action required is work to enable the peak fast commuter frequency to Milton Keynes/Northampton to be increased. This requires two actions:

- Construction of a grade separated Junction at Ledburn, south of Leighton Buzzard, to enable commuter trains to transfer from the fast to the slow lines without conflicting with trains in the other direction. This work was identified in “Rail Package 2” (“RP2”), the best alternative evaluated by DfT, at an estimated cost of £243 million. The site of the junction is remote from housing and is unlikely to present insuperable difficulties in terms of obtaining Transport and Works Act consent.
- Procurement of new, high performance trains for operation of the fast commuter services to minimise the impact of capacity on the route south of Ledburn junction. DfT has already considered introducing new “IEP” trains for these services, and indeed has included equivalent units for the fast Kings Cross – Cambridge trains on the East Coast Main Line in its recently announced commitment to the IEP project. As would be the case on the West Coast Main Line, the new trains will run to the same timings as the long distance InterCity services on the route, hence maximising route capacity.

1.25 **Medium term.** As and when it becomes clear that the increased train capacity set out above will not meet realistic forecasts of demand, further work should be undertaken to mitigate pinchpoints north of Rugby:

1.26 **Construction of a fourth line between Attleborough and Brinklow.** This work would shorten the section of route north of Rugby which currently has only one northbound track which has to accommodate InterCity services together with up to three freight trains an hour. Completion of the current Felixstowe – Nuneaton route upgrade will potentially allow a significant reduction in the number of freight trains on the route south of Nuneaton, but this capacity may be taken up

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<sup>4</sup> “Rail Interventions Report of the High Speed 2 Strategic Alternatives” Appendix E  
<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/alternativestudy/pdf/railintervention.pdf>

by new flows, for example from new port developments such as London Gateway.

- 1.27 Both the RP2 work and independent work for this evaluation validate that this section of the route will provide sufficient capacity to allow operation of an upgraded InterCity service. The estimated cost of this work is £187 million.
- 1.28 The “**Stafford bypass**”. There are significant capacity constraints south of Stafford and at Stafford itself:
- Colwich junction, where the route to Manchester via Stoke-on-Trent leaves the main line, is not grade separated.
  - The main line from Colwich junction towards Stafford is only two track for c3 miles, with a flat junction where the four track section resumes.
  - There is a flat junction with the Birmingham – Stafford route just south of Stafford.
- 1.29 Network Rail has been evaluating possible options for mitigating these constraints, including construction of a “Stafford bypass” which would also allow some reduction in journey times. Firm proposals have not yet been developed, but it is assumed in RP2 that these pinchpoints can be resolved at an estimated cost of £1.23 billion.
- 1.30 It should be noted that HS2’s own analysis assumes that *“some infrastructure/ signalling works have taken place in the Stafford area to alleviate this known capacity constraint”<sup>5</sup>*, so HS2 makes no allowance for the costs of this work. RP2 is therefore inconsistent with this, resulting in a significant bias towards HS2 in DfT’s evaluation.
- 1.31 Other works proposed by DfT in its review of strategic alternatives<sup>6</sup> are not necessary, either because other schemes will provide the necessary capacity (for example the Manchester “Hub” scheme will free up capacity for additional InterCity trains at Manchester Piccadilly and its approaches, and is assumed to

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<sup>5</sup> Technical Appendices, Appendix 2, para 2.20

<http://webarchive.nationalarchives.gov.uk/20110131042819/http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/hs2ltd/technicalappendix/pdf/report.pdf>

<sup>6</sup> HS2 Strategic Alternatives Study – Rail Interventions Report (March 2010)

<http://webarchive.nationalarchives.gov.uk/+http://www.dft.gov.uk/pgr/rail/pi/highspeedrail/alternativestudy/pdf/railintervention.pdf>

have been completed in DfT's evaluation of HS2 itself) or because the additional capacity is not required, as between Coventry and Birmingham.

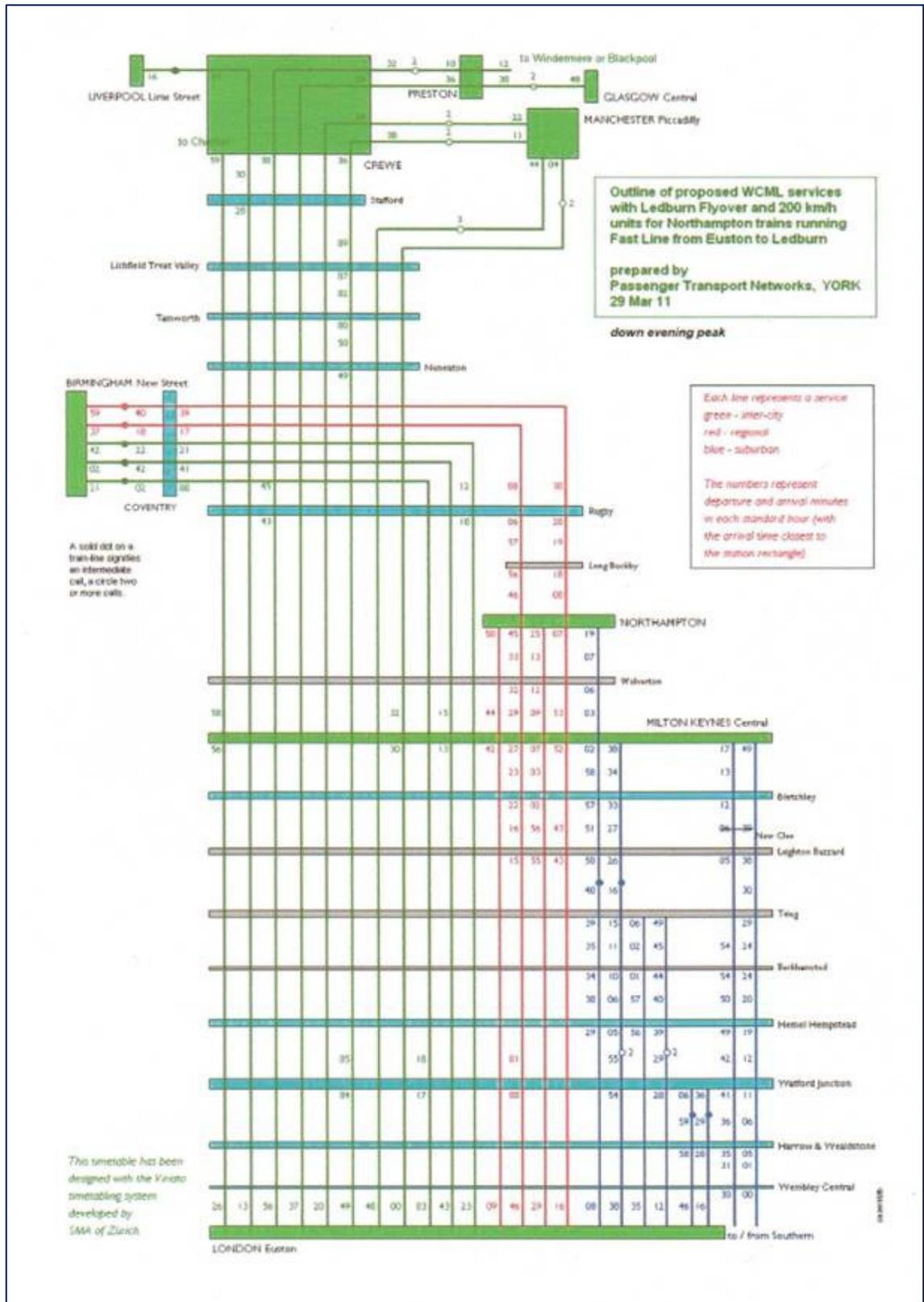
- 1.32 The capital costs of the Optimised Alternative (£2.06 billion) are detailed in Table 1.2, which also gives a comparison with DfT's estimate of capital expenditure for RP2.

### **West Coast Main Line - Summary**

#### ***InterCity Services***

- Overall, InterCity standard class capacity can be increased by 181% by rolling stock reconfiguration and train lengthening.
  - A further incremental capacity uplift (giving a total increase of 211%) can be achieved by carrying out a number of specific infrastructure improvements at an estimated cost of £2.06 billion, to allow an increase in all day frequency to 11 trains per hour. An illustrative pattern for this level of service is provided in Figure 1.1. This service pattern provides faster journey times for a number of key flows, increased overall capacity, and improved journey opportunities for key intermediate stations.
- 1.33 As discussed earlier, the key issue in relation to crowding is standard class capacity. However, we have also analysed the Optimised Alternative against HS2 and RP2 (see annex 2). This shows that the Optimised Alternative delivers a lower overall load factor than HS2 (52% compared with 58% for HS2), and provides broadly the same capacity as RP2 at little more than half the capital cost.
- 1.34 There is therefore no case for construction of HS2 to meet any need for increased capacity for the foreseeable future.
- 1.35 **Fast commuter services.** There is an immediate and more serious overcrowding problem on peak trains between Northampton, Milton Keynes and Euston. Capacity constraints on the route only currently allow operation of a half hourly service from London in the evening peak. All peak trains are already overcrowded, with passengers standing for at least 30 minutes.
- 1.36 Urgent action is needed to provide additional capacity on this route, and capacity could be doubled in five years by construction of the proposed grade separated junction at Ledburn at an estimated cost of £243million, and procurement of new, higher performance rolling stock. But construction of HS2 will delay this until 2026 at the earliest.

**FIGURE 1.1 SERVICE SCHEMATIC FOR ILLUSTRATIVE SERVICE**



**TABLE 1.2 CAPITAL EXPENDITURE: RP2 COMPARED WITH OPTIMISED ALTERNATIVE**

Scheme	Scenario B (£bn)	Optimised Alternative (£bn)
Stafford area bypass	1.230	1.230
Ledburn grade separated junction	0.243	0.243
Euston station – 3 extra platforms	0.062	N/A
Manchester Piccadilly – 3 extra platforms	0.395	N/A
Attleborough to Brinklow – 4 tracking	0.187	0.187
Northampton Loop speed improvements	0.003	0.003
Beechwood/Stechford 4 tracking	0.903	N/A
Power supply + disruption + other items (+24%)	0.737	0.390
<b>Total</b>	<b>3.759</b>	<b>2.062</b>

Scenario B schemes are identical to those for RP2, and are shown in "Strategic Alternatives to the Proposed "Y" Network, page 41

(<http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hsr-strategic-alternative.pdf>)

1.37 **Freight.** Freight traffic uses the "slow" lines during the daytime, and would only be affected by increased InterCity services at pinchpoints which would be eased (chapter 6). In addition, the current upgrade of the Felixstowe – Nuneaton route will allow diversion of over half the existing freight trains south of Rugby, creating significant capacity for future growth.

1.38 Freight capacity issues are discussed in more detail in Chapter 7.

#### **East Coast Main Line**

1.39 Overall seating capacity can be increased by 87% by the committed frequency increase from May 2011, the introduction of planned higher capacity trains ("IEP"), the use of higher capacity trains on open access services, and a further timetable revision to allow an extra train per hour on the route, as envisaged in Network Rail's East Coast Main Line 2016 Capacity Review (December 2010).

1.40 In the longer term, further capacity increases can be delivered with infrastructure enhancements costed at £1.159 – 1.615 billion. With improved demand management, the 115% background growth forecast for 2043 in DfT's HS2 documentation can be readily absorbed without further major infrastructure

enhancements. There is therefore no case for construction of HS2 to meet any need for increased capacity on the East Coast Main Line for the foreseeable future.

### **Midland Main Line**

- 1.41 Almost half the trains arriving at St. Pancras during the morning peak period have standing passengers, but this is entirely due to relatively short distance commuting from Bedford, Luton and Luton Airport Parkway - the current average all day load factor south of Leicester is only 39%.
- 1.42 The Thameslink project, now under construction, will deliver a major increase in capacity south of Bedford, with train lengths extended from 8 to 12 cars. When this additional capacity is delivered, the Thameslink service will be a good alternative for passengers who currently use Midland Main Line trains. It is certainly not value for money to provide additional long distance capacity solely to provide short distance commuting capacity between Bedford and London.
- 1.43 DfT's future forecast demand growth of c100% can therefore be met without any significant further infrastructure investment. This can be delivered through a combination of lengthening InterCity trains and transfer of some short distance London commuter traffic to Thameslink services, once additional capacity is available as an output of the Thameslink project.
- 1.44 There is therefore no justification for the service levels or scope of infrastructure work proposed by DfT in the Alternatives Study<sup>7</sup>.

### **Conclusions**

- 1.45 **The above analysis shows that there is no case for construction of HS2 on capacity grounds. Future foreseeable growth can be met by incremental cost effective measures, delivering earlier benefits when needed and avoiding the “all or nothing” approach which is inevitable with HS2.**

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<sup>7</sup> High Speed Rail Strategic Alternatives Study, February 2011  
<http://highspeedrail.dft.gov.uk/sites/highspeedrail.dft.gov.uk/files/hsr-strategic-alternative.pdf>