Fast Forward – Funding Report

Delivery of High Speed Rail in Britain

February 2010

GREENGAUGE21

PRICEWATERHOUSECOOPERS

Contents

Introduction

This summary report on the delivery of High Speed Rail (HSR) in Britain has been prepared by PricewaterhouseCoopers LLP (PwC) on behalf of Greengauge 21.

The report covers:

- commercial and organisational issues;
- contractual mechanisms including risk allocation;
- funding and financing sources; and
- an illustrative structure for the delivery and operation of HSR.

It describes the work carried out by PwC for Greengauge 21's HSR development programme, as reported in *'Fast Forward – a high speed rail strategy for Britain'.*

We have described an illustrative delivery and financing structure for a single corridor, London-Birmingham-Manchester, the first stage of the proposed high speed North West Scheme. This can also be used as a model for the financing of subsequent corridors. However, the benefits of economies of scale and increased understanding of risk might reduce the average cost to the public sector and lead to modifications to the structure for these later corridors.

This report makes a fundamental assumption that delivery of HSR could not be funded solely from its own revenue and therefore substantial Government involvement will be required. Despite the current pressure on Government finances, it is important that funds continue to be found for investment in key strategic infrastructure.

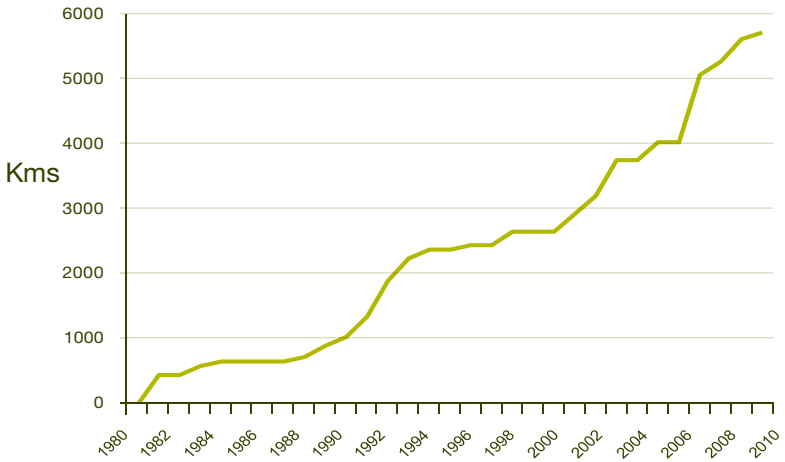
Overview of High Speed Rail

High Speed Rail, which is broadly defined by the industry as trains travelling at over 250km per hour, began in Japan in 1964. The first high speed line of 515km was between Tokyo and Osaka. Japan now has a high speed network of over 2000 km and since opening the network has carried 6 billion passengers.

The first European high speed line of 420km was inaugurated in 1981, between Paris and Lyons. The graph below shows the growth of high speed rail in Europe since 1981 and a projection to the end of 2010.

The UK has a single 108km high speed line from the channel tunnel to St Pancras known as High Speed 1 (see case study).

Figure 1: Length of high speed infrastructure in Europe in Kms



Case study: High Speed 1

The Channel Tunnel Rail Link (CTRL), now known as High Speed 1 (HS1), is a 108km high-speed line between the Channel Tunnel and St Pancras, London. London to Paris now takes 2 hours 15 minutes and Brussels less than 2 hours. The total cost of building the infrastructure was £5.2bn.

The Government decided that the entire project should be a Public Private Partnership (PPP). In 1994, an open competition was undertaken to find the appropriate private sector partner to part fund and manage the project.

A 999 year concession was awarded to London and Continental Railways (LCR) in 1996. Under the concession agreement LCR would finance, build and operate the link, drawing on revenues primarily from the Eurostar service and additionally from later use of the link by domestic train operators.

The financing of the project was originally highly dependent on forecast revenues of Eurostar UK (British operations owned by LCR).

In 1998 the project ran into financial difficulties. The project was restructured and the length of the lease was reduced to 90 years, ending in 2086.

A recovery programme was agreed whereby LCR issued government backed debt to pay for the construction of section 1 (Channel tunnel to North Kent). A further restructuring occurred in 2001 when LCR also took over Section 2 (North Kent to St Pancras) which Railtrack had taken responsibility for after the first restructuring. LCR is now the sole owner of both sections of the CTRL and development property around St Pancras. Detail of the restructuring is set out in the NAO Report published 28th March 2001, "The Channel Tunnel Link".

In June 2009 the Department for Transport novated bonds issued by LCR to the Department and took control of LCR ready for sale in 3 discrete parts being the infrastructure, the UK train operator and the property assets.

LCR is the 100% owner of:

- High Speed 1 Limited, the company which operates St. Pancras International Station and the high speed line to the Channel Tunnel;
- London & Continental Stations and Property (LCSP) which is the property division of LCR.

Since the restructuring this year, LCR is also 40% owner (with SNCF and SNCB) of Eurostar, which operates international train services.

Lessons learnt:

- It is not practical to transfer revenue risk to the private sector on a new-build railway in Western Europe; and
- Public sector involvement in the funding of projects of this size is inevitable.

Scope of a High Speed Rail project

To deliver a HSR project the following elements of the project need to be considered and in most cases specified and procured through contracts of various types:

- **Planning of the network and land acquisition:** preparation of detailed plans, business cases, environmental impact assessments and management of the statutory planning process then in force to obtain relevant planning consents; acquisition of land for the line and for construction and access, including compulsory acquisition. All activities need to include consideration of integration with other land uses and transport modes and a plan to ensure the benefits of the project are realised.
- **Design:** concept design through to detailed design of each work package – different levels of design would be carried out by different parties.
- **Construction of the infrastructure:** new build dedicated high speed lines plus enhancements to and interfaces with the classic network so that it can sustain high speed trains. The work comprises civil engineering plus signalling, communications and power supply and distribution.
- **Maintenance of the infrastructure:** scheduled lifecycle refurbishment such as periodic renewal of track, unscheduled maintenance such as repairing damaged power lines and routine inspection and servicing.
- **Operation of the infrastructure:** signalling and train control plus safety management including maintaining security and responding to incidents.
- **Rolling stock manufacture:** designing, manufacturing, testing and commissioning new high speed trains to run on the network.
- **Rolling stock maintenance:** scheduled and unscheduled maintenance and servicing. Servicing includes watering, tank emptying and the cleaning of both the outside and inside of the trains. Scheduled maintenance may include periodic major overhauls.
- **Train operations:** the day to day operation of the train service includes despatch, driving, on board customer service, ticket inspection and provision of refreshment services. Train operators also typically carry out a range of other activities as part of their business including marketing and sales, station and car park operation and provision of customer information.
- **Property construction (stations and depots):** stations, depots and stabling facilities for the rolling stock. This may require existing property assets to be upgraded and new assets to be built as well as integration with neighbouring property such as roads, bus/tram stations, offices or retail facilities.
- **Property maintenance:** unscheduled and scheduled maintenance for new and enhanced property assets.

The private sector is typically responsible for all the above activities for new lines except for project planning and the specification and procurement of the other elements, which Government is normally best placed to manage.

Summary of key risks

The inherent technical, environmental, financial and political complexity means any HSR project will inevitably involve a large number of major risks. The identification and allocation of the most significant project risks is a critical factor in deciding upon the most appropriate financing and ownership structure for the project. The party best able to bear or manage a risk should have responsibility for that risk.

Land acquisition and planning risk

The risk of acquiring land and appropriate planning consents for HSR corridors would lie with Government as it is able to manage this risk most efficiently particularly where HSR corridors pass through conurbations or sensitive land. This is consistent with the procurement of other major rail projects in developed countries.

A specific area where risk might be passed to the private sector is the acquisition of land and planning consents for depots and stations. In Great Britain this is normally undertaken by Network Rail or train suppliers.

Construction cost overrun and delivery risk

Delivery of high speed infrastructure on time and on budget is probably the biggest risk faced by Government and so it would normally wish to transfer this risk to the private sector. In practice the private sector will not have the financial capacity to take on the level of risk associated with the scale of HSR. It will limit its liability in respect of cost overruns and therefore any cost overruns above that level would be a Government retained risk. Alternative delivery options such as a PPP might seek to transfer a greater level of construction risk to the private sector. However the financial capacity of the private sector to take risk is a limiting factor regardless of the delivery structure taken forward. PPPs might allow full risk transfer for discrete sections of the route though this creates additional interface risk.

Maintenance and operational cost risk

Maintenance and operation risks for the infrastructure are relatively small in comparison to construction risks. Risks of operating and maintaining HSR infrastructure should be transferable to the private sector, though possibly this would be best done for periods of 5-10 years at a time as is the case with Network Rail under its regulatory structure.

Ideally, maintenance risk should be born by the same party as the construction risk in order to incentivise whole life cost optimisation and performance. Separating responsibility for operation and responsibility for build from maintenance therefore reduces the potential for effective risk transfer. For equipment, and in particular for rolling stock, this means there are benefits in the design, construction and maintenance being the responsibility of one organisation of consortium.

Interface with Network Rail risk

Any high speed network that is not discrete from the national network will have a high degree of interface risk with Network Rail, the asset manager and operator of the national network. This includes a variety of different risks ranging from access to national network infrastructure for construction to integration of signalling systems, to knock-on impacts of operational performance between networks. These are complex risks to allocate. Network Rail has only limited capacity to absorb risk and the private sector will not take risks it cannot manage, so much of the risk potentially remains with Government.

Revenue risk

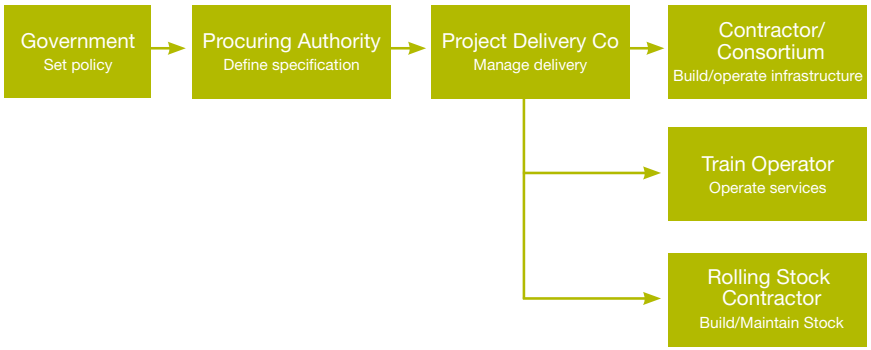
Private sector investors in HSR Infrastructure or Rolling Stock are unlikely to accept a funding model that includes significant demand risk (i.e. that the repayment of finance and/or funding of operations is dependent on the level of customer revenue or the number of trains using the network). Customer demand is heavily affected by factors outside the control of the private contractor such as the provision and relative cost of competing modes and the general performance of the economy. The private sector bore revenue risk under the original CTRL funding model but over optimistic revenue assumptions ultimately meant sufficient finance could not be raised for construction. Once the revenue stream is proven however, lenders and investors may be willing to take greater levels of revenue risk as they do for example when lending corporately to public transport operators. Franchise operators are more comfortable taking revenue risk but typically this is in respect of services with a history of operation which high speed rail would not have at the outset. Therefore, even for a HSR operating franchise, the revenue risk may need to be shared between public and private sectors in the early years.

Structure of the project delivery organisations

The national strategic importance of HSR combined with the requirement for substantial public funding means that public sector leadership for such a project is essential. In addition Government will need to ensure new HSR meets safety standards and that the specification of the project meets its strategic objectives and complies with EU interoperability requirements.

The private sector also has a significant role to play in the delivery, operation and financing of HSR and Government will need to put in place a structure that optimises the private sector role. Currently national network track infrastructure, which is largely a historic legacy, and the delivery of significant enhancements, are managed by Network Rail under a statutory regulatory structure (but using some private sector contractors). Train manufacture and operations are delivered by the private sector to a Government specification under the franchise system. The Government has a recent history of procuring large non-rail infrastructure projects using PFI/PPP structures that seek to optimise private sector operational and financial participation.

Figure 2: Roles to be fulfilled for project delivery



The delivery structure for the project needs to have the following attributes:

- Focus on key strategic objectives
- Ability to mobilise resource
- Ability to secure funding and finance
- Minimal bureaucracy and overhead costs
- Independence of sectional interests

The key roles to be fulfilled for the delivery of HSR have been identified in Figure 2.

- **Government:** would decide to procure each HSR project, manage the business case and retain ultimate responsibility for key strategic decisions such as defining the objectives of the project (including the degree of integration with the classic network and other modes), which corridor to procure and the precise route. Government lead is likely to be the Department for Transport (DfT) which would manage the relationship with other Government stakeholders such as HM Treasury. It may appoint a private sector organisation to oversee its interests in the project.

- **Procuring Authority:** would develop the detailed specification of what to procure. It would prepare the detailed documentation and run the procurement process to select parties to fulfil the other roles. It would also have to ensure compatibility between different projects on the HSR network. The Authority would most likely have the powers to acquire land. Post construction, the Authority would oversee operation of HSR as well as procuring further projects to extend the network. The Authority would need to liaise closely with Network Rail, the national infrastructure manager, regarding integration into the existing network. For example capacity allocation and signalling will need to be managed in an integrated way across the enlarged network.
- **Project DeliveryCo:** would be responsible for delivering the project to specification, timescale and budget including integrating the different aspects being delivered by different parties and ensuring the overall functionality of the project. It would act as a single point of contact for the Procuring Authority and might also run the tender process for some aspects of the project on the procuring Authority's behalf. The Project DeliveryCo might own the infrastructure or transfer it to the Procuring Authority or another long term owner.
- **Contractor(s) / Consortium(a):** would undertake the construction and maintenance works and might raise part of the finance.
- **Train Operating Company (TOC):** will operate train services and act as interface with customers.
- **Rolling Stock Contractor:** will build and maintain the rolling stock.

Some of the above roles could be combined or sub-divided. For example the Government could be the Procuring Authority or the Procuring Authority could also carry out Project Delivery in-house. The line between private and public sector roles could be drawn in a number of places but falls most naturally in between Procuring Authority (which is naturally a public sector role) and Project DeliveryCo (which could be public or private but the private sector has more experience in this role).

Two other organisations recently established by Government could play a significant role in developing HSR. These are:

- **Infrastructure UK:** the Government has recently announced the establishment of Infrastructure UK to advise on management and planning for the UK's critical infrastructure. It is intended that Infrastructure UK will identify long term infrastructure needs and will consider interdependencies between large projects; and
- **The Infrastructure Planning Commission ("IPC"):** The IPC was set up under the 2008 Planning Act to make the application process for nationally significant infrastructure projects faster, fairer and easier[1]. Unless new corridors were authorised by a specific Act of Parliament (as for Crossrail), the IPC would be involved in examining and determining planning applications for a high speed network.

1 See Report by Bircham Dyson Bell (Feb 2009) for further information on the role the IPC would play http://www.greengauge21.net/hsr-development- programme.html

Case study: Crossrail

The £16bn Crossrail project will run from Maidenhead and Heathrow in the West of London to Shenfield in the East and Abbey Wood in South East London. It will carry more than 1,500 passengers on each train during peak periods. Preliminary works commenced during 2009. Construction will start in 2010 and operations are scheduled to commence in 2017.

The delivery of Crossrail is set up on the following basis:

- **Government:** DfT working with Transport for London (TfL). The DfT has appointed a joint venture between Jacobs and KPMG as its project representative;
- **Procuring Authority:** CLRL (now Crossrail Limited) was established as a joint venture between the Strategic Rail Authority and TfL, but is now owned by TfL. TfL is to be the Procuring Authority for the operating concession and the supply of trains. Crossrail Limited will own the completed infrastructure;
- **Project DeliveryCo:** Transcend – a private sector joint venture between AECOM, CH2M Hill and Nichols Group – has been selected as the Programme Partner. Transcend will work with Crossrail Limited to coordinate eight separate strands of work including links with the London Underground network, utilities, and overground rail sections built by Network Rail. The value of the contract is approximately £100m;
- **Contractor Consortium:** Bechtel, supported by Halcrow and Systra, has been appointed to be the Programme Delivery Partner and will be responsible for delivering the central London tunnel from Paddington branching to the north and south of Whitechapel. The value of the contact is approximately £400m;
- **Contractors:** 12 companies have been selected to be on the Crossrail design framework and they will competitively tender for pieces of design work. The Programme Delivery Partner will tender separate packages for construction of the tunnel;
- **Train Operating Company (TOC):** an operating contract will be procured by TfL and will operate services through the tunnel as well as taking over some services currently in other franchises on the national network; and
- **Rolling Stock Contractor:** Still to be appointed.
- **Finance:** The financing of Crossrail is managed by TfL and is mainly from public sector sources (including a Supplementary Business Rate and bonds repayable from future fare revenues) with some significant contributions from private sector beneficiaries. Neither the Programme Partner nor the Programme Delivery Partner is raising finance though they have an element of their contract revenue at risk. The trains and depots are planned to be privately financed.

Funding sources

The principal sources of funding for HSR are described below. Funding requirements for the London-Birmingham-Manchester route are set out in Appendix B.

Customer revenue

Customer revenue will be a key source of direct funding for HSR. However, given the considerable investment requirements for the HSR programme, customer revenue alone will not provide sufficient income to cover the total cost of construction and finance of infrastructure and rolling stock, operation of train services and operation, maintenance and renewal of infrastructure.

The level of customer revenue will be affected by decisions about the trade-off between the competing policy objectives of socio-economic welfare optimisation and revenue maximisation. Prioritisation of socio-economic welfare might result in fares being set by Government at a level that optimises the socio-economic benefits to users. In contrast, a private sector determined fares strategy would seek to maximise the total revenue generated net of variable costs, with no regard to the overall social benefit. For example, social objectives might suggest the maximum possible number of seats to be made available at regulated low prices whereas profit maximisation might require a greater proportion of first class seats which take up more space in the train. A practical compromise might involve targeted provision of cheaper fares combined with maximisation of revenue from other sources (e.g. business travel) as happens currently on intercity franchises on which 'saver' fares are regulated but others are set by the operator.

For all routes it is likely that HSR will have a negative impact on the revenue of existing franchises on competing routes, which will lead to a need for additional public sector support and/or service changes.

This report assumes customer revenue is primarily from passengers but the new line could also generate access charge revenue from freight train operators.

Public sector funding

In light of the likely revenue shortfall described, it can be assumed that some form of public funding will be needed to support the development of the HSR programme and maintain the classic rail network and services. Possible funding mechanisms include:

- providing capital grants directly to the Project DeliveryCo or the Consortium/contractor through the DfT, which would be funded by HM Treasury ultimately from taxes or borrowing;
- having the Procuring Authority (or the Project DeliveryCo if in the public sector) raise its own debt finance to invest in HSR with the backing of Government guarantees. Crossrail will come from bonds issued by TfL whose credit rating benefits from various forms of implicit or explicit Government credit support. The European Investment Bank (EIB) has committed to buy £1bn of these bonds.

In terms of governance, finance raising by the Procuring Authority, rather than funding through HM Treasury, would promote robust financial management of the project as the board of the Authority would have direct responsibility for balancing sources and use of funds. It would also be more transparent to stakeholders, and is a more flexible structure, should Government later decide to sell the asset;

- providing financial guarantees to a private sector Project DeliveryCo or the Consortium/contractor to enable it to raise finance, with lenders able to rely on the sovereign credit rating of the Government (rather than that of the private sector borrower). Guarantees would be provided by the DfT or HM Treasury. This is likely to enable a greater amount of finance to be raised at lower nominal cost than if left to the private sector.

  This approach was employed for CTRL when it was restructured, and various forms of Government support also underpin the funding of Network Rail.

  Government is required to recognise such guarantees as a contingent liability in its accounts, rather than on the balance sheet (unless there is a likelihood of the guarantee being called) and so the commitment can be "off-balance sheet". The government would need to manage its exposure under these guarantees. This could be done, for example, by ranking ahead of private sector finance such as equity, and by putting appropriate governance in place; and

- contracting to pay annual subsidies to fund access charges payable by the TOC or to pay availability charges direct to the infrastructure owner so that the infrastructure owner has a secure revenue stream against which it can borrow to finance the project. This is a route used for some smaller infrastructure enhancements on the national network and for some light rail schemes and non-rail PFI projects such as the £1.15bn M25 Widening PFI.

The overall funding package may contain a combination of all the above mechanisms. The project needs to be structured so that future revenue flows from subsidy or customer revenue can repay any external finance raised by the borrower(s).

Other sources

A variety of other funding sources could be available to fund a high speed line. The beneficiaries of HSR extend well beyond HSR users and include road users and rail passengers and freight on the existing network. In addition to the sources identified other sources might include:

- hypothecated charges on road or aviation users, additional levies on council tax or business rates and environmental charges;
- planning levies or development gain taxes on developers or land owners who will benefit from HSR;
- capital grants from strategic beneficiaries such as airports (who might alternatively commit to fund their own interfaces with the HSR network); and
- local funding from cities or regions which will benefit from high speed rail. For example the East TGV benefited from up to 80% of local funding.

There is also likely to be some scope to realise major property value uplifts in the vicinity of HSR stations and these could be used to defray some of the capital cost. The extent to which property gains will materialise is largely dependent on the availability of development land at station locations as well as the general economic performance of the property sector. Historically it has proven difficult to capture development gains to fund a particular project due to their dispersed and varied nature, and the difficulty of calculating how much gain is due to the effect of a particular project. CTRL was part-funded by development profits but the gains available to fund HSR are likely to be smaller. The Borders rail link in Scotland is being partly funded by a levy on planning consents in the area which will benefit. Crossrail is to be partly funded by a Supplementary Business Rate on London businesses as well as contributions from BAA, Canary Wharf Group and the City of London Corporation.

Private sector finance

Most project costs are incurred in advance of passenger and other revenues being received, and public funding such as capital grants or subsidies may not be matched with the timing of expenditure. Private finance in the form of debt and equity may be a means to bridge this gap.

The decision to use private finance is a complex one. It needs policy setters to establish whether the premium paid for private finance over the cash cost of Government debt is less than the benefits achieved from transferring risk to the private sector.

Long term private finance is consistent with the concept of payment for services as they are received (e.g. paying for rolling stock availability rather than a particular train technical specification). In defining a level of service required, and paying for it when it is delivered, the public sector is able to transfer risk of delivery to the private sector. This entails private financing of the construction of the asset over a number of years. Non-performance of the asset leaves financiers at risk of not being repaid.

Where risk is being transferred to the private sector in this way, the involvement of private finance plays a key role as the investment at risk gives the private sector partner an incentive to ensure the project is properly specified and planned from the beginning, and has the financial capacity to absorb downsides.

Efficient allocation of risk to the party best able to manage or bear it is an important component in ensuring that projects are completed on time, take into account whole life costs and perform at the level required over the long term. The benefit of this risk transfer can make the overall risk adjusted cost of a project cheaper and therefore potentially better value for money than a project financed purely by Government.

Two extreme cases illustrate this point: with Eurotunnel (a concession), a very significant cost overrun was borne by private sector financiers rather than the taxpayer whereas in contrast on the Jubilee Line extension (which was a traditional directly procured construction contract), the taxpayer had to bear a significant cost overrun.

Funding structures used for other large rail projects

Project	Value	Fixed Price contract?	Details
Crossrail	£16bn	No	Mainly publicly funded with some private funding
Taiwan HSR	£9.3bn	Yes	Private ownership financed through a combination of Government grants and private finance, currently being rescued by Government following shortfall in revenue
West Coast Mainline	£8.6bn	No	Initially to be funded by Railtrack but had to be funded mainly by Government through Network Rail after Railtrack's insolvency
CTRL (now HS1)	£5.8bn	Initially	Combination of Government grants and Government guaranteed private finance. Taken over by Government following shortfall in revenue but now to be sold to a private investor
RAVE (Portugal)	£5.7bn	Yes	PPP split into 3 high speed lines currently in procurement. Supported by capital grants from European Commission
HSL-Zuid (Holland)	£4.8bn	Mixed	Superstructure procured as PPP raising £0.8bn. Substructure of £4bn was procured directly by Government
Öresund Bridge (Denmark/Sweden)	£3bn	No	Financed by government guaranteed bonds issued by the government owned project company
Nuremberg-Munich (Germany)	£1.6bn	No	Funded by Deutsche Bahn, the Government owned national railway company
Perpignan Figueras (France)	£0.8bn	Yes	PPP

The table provides an overview of past and present multi-billion pound rail and high speed rail projects. It suggests that there is a ceiling above which the funding requirement and risks become too large to attract private investors on a fixed price basis. It is therefore highly likely that some form of construction risk sharing and possibly contract packaging will be necessary in order to deliver HSR in the UK.

HSR delivery and financing structure: illustrative model

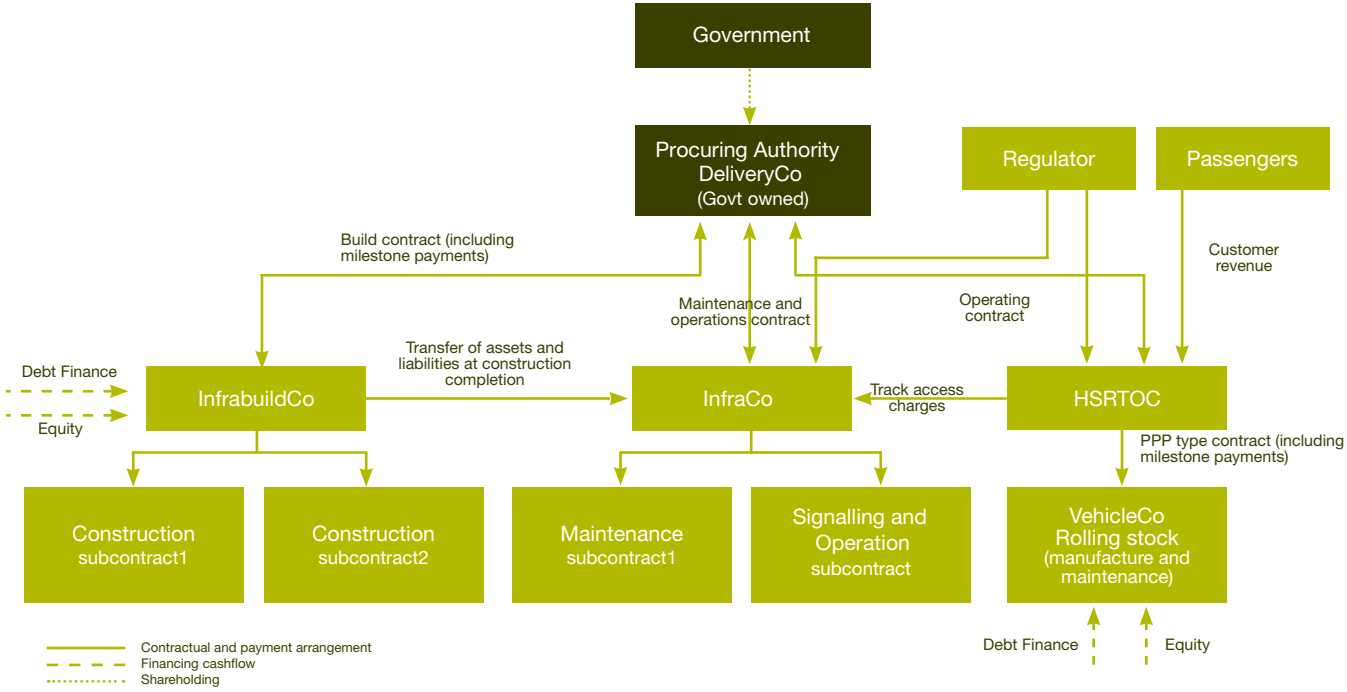
An illustrative delivery and financing structure is set out in Figure 3. This is one possible approach which demonstrates how the project might be delivered. Other approaches might also be considered and it is premature to determine the preferred structure at this early stage in the project. It will for example be useful to consider lessons from the delivery of Crossrail and the sale of HS1 as well as other current projects before such a decision is made. Further detail on other possible structural options is provided in Appendix A.

The role of each party is described below:

Government

The role of Government would be as described earlier in 'Structure of project delivery organisations'.

Figure 3: Illustrative delivery and financing structure



Procuring Authority and Delivery Company (DeliveryCo)

DeliveryCo would have overall responsibility for the HSR specification and procurement of private sector contractors. DeliveryCo would be a central government-owned company with a dual role to reduce administration and aid accountability and governance. Other stakeholders such as local authorities might also be shareholders or partners.

Pre-construction design and planning works would be managed and procured by DeliveryCo in order to enable it to optimise the specification and risk allocation in the main contract.

DeliveryCo would tender a contract for construction of the HSR line and the winning tenderer would form a Special Purpose Vehicle (SPV)[2], in this case InfrabuildCo. DeliveryCo would make milestone construction payments to InfrabuildCo to meet the cost of construction that cannot be met through finance raised by InfrabuildCo.

DeliveryCo would set up an infrastructure management SPV (InfraCo) which would manage and operate the infrastructure for a long concession period, say 30-40 years. This company could initially be owned by Government but could be floated or sold to private or trade investors once construction is complete.

The scale and cost of the infrastructure is such that it would not be possible for DeliveryCo to fully transfer delivery and price risk to InfrabuildCo. InfrabuildCo would seek to limit its liability to the amount of its equity investment. Therefore to the extent that the cost of the delivery of the infrastructure increases because of construction price increases or late delivery, DeliveryCo would have to bear the majority of this risk. In addition DeliveryCo would need to provide an undertaking that InfraCo would accept the transfer of the assets and liabilities of InfrabuildCo at construction completion on certain conditions.

The transfer price and terms (including the acceptance process for approval of the completed project) will therefore be a key risk allocation mechanism.

DeliveryCo would also be responsible for ensuring that InfrabuildCo is incentivised to design into the infrastructure whole life cost benefits. Failure to do so would create a risk that ongoing costs are greater than expected and, again, DeliveryCo would bear this risk.

Alternatively DeliveryCo could tender the construction and management of the infrastructure to a single consortium which would both form InfrabuildCo and also sign a maintenance contract with InfraCo. This would incentivise whole life asset cost optimisation but would also make the tender process more complex so this issue will need further analysis and consultation with the market.

2 In this context SPV means a company set up by a private sector consortium to raise finance for and deliver the specific asset identified. The project might be split into more than one tender and any individual consortium might in practice work through more than one SPV

DeliveryCo would also tender one or more operating franchises for HSR train services on the corridor. The selected Operator (HSRTOC) formed by the winning bidder would be obliged to operate HSR services according to the terms of the franchise which might specify a timetable or, more likely specify certain minimum service levels with some flexibility to enable HSRTOC to respond to the market. The tender process would set a subsidy/premium payable by DeliveryCo (or DfT) to HSRTOC or vice versa based on the difference between the winning bidder's forecast revenues and operating costs.

Finally, DeliveryCo will also tender a contract for the provision of rolling stock to HSRTOC by VehicleCo.

Infrastructure build Company (InfrabuildCo)

InfrabuildCo would be owned by the winning consortium of contractors and financiers and would deliver its obligations through a Design-Build-Finance-Transfer (DBFT) contract. It is responsible for constructing the asset over a period of around 5 years, after which point the assets and liabilities of InfrabuildCo would be transferred to InfraCo on agreed terms.

InfrabuildCo would raise a significant amount of the finance required to construct the HSR infrastructure. Finance is expected to be raised by InfrabuildCo in two forms:

- **Debt:** assumed to be in the form of government guaranteed listed bonds and/or bank debt.
  The amount of debt raised of approximately £6bn is considered too large to be raised without Government support. Finance is anticipated to be raised on a long term basis and therefore InfrabuildCo and its financiers will require an undertaking from Government that InfraCo will take over InfrabuildCo's repayment obligations; and
- **Equity:** assumed predominantly in the form of shareholder loan notes and a notional amount of ordinary share capital, mainly subscribed by consortium members.

Given the realistic constraints on availability for both of the above sources of finance for a project of this scale, InfrabuildCo would also receive construction payments similar to grant funding from DeliveryCo on achievement of scheduled construction milestones.

InfrabuildCo would manage the construction and therefore would enter into a series of sub-contracts to deliver the constituent elements of the HSR corridor.

Infrastructure Asset Management Company (InfraCo)

InfraCo is anticipated to be an asset manager similar to Network Rail, which in theory could take on this role.[3] InfraCo would be granted a long term concession by DeliveryCo to manage and operate the infrastructure. InfraCo's duties would include maintenance of the HSR track, operation of the signalling and maintenance and operation of stations and ancillary facilities. In the case of HS1, part of this activity is sub-contracted to Network Rail. Alternatively stations could be maintained and operated by HSRTOC or the functions could be split.

InfraCo would be financed primarily by debt taken over from InfrabuildCo and equity from new investors in the completed project. The finance could be raised by flotation or private tender which would be designed to attract investors such as infrastructure funds.

InfraCo would receive access charge revenue from HSRTOC in return for providing access to the infrastructure. InfraCo is not assumed to take demand risk (ie payments would not be linked to the number of services that use the infrastructure) but it may take some availability risk (i.e. it would have a contractual obligation to make the infrastructure available and receive a lower payment if it did not achieve this). The access charge would be paid by HSRTOC from customer revenue received from providing HSR services augmented by subsidy. There may also be open access operators. Part of the access charge would be fixed or partially variable for demand for the life of the concession, which would give investors an appropriate degree of certainty. The remainder of the access charge relating to maintenance and operations costs would be reset periodically to give InfraCo the ability to cover its costs. HS1 is proposing to put in place a similar access charge structure.

Alternatively, a full regulated structure could be put in place whereby the entire access charge was re-set periodically (similar to Network Rail and utilities). However, it is expected such a structure would be less attractive to investors, as their returns would be subject to regulatory risk, which could increase the cost of borrowing and depress a sale price.

3 The Financial responsibilities and risks might be seen as disproportionate in relation to its existing core business, but it is possible that Network Rail's financial structure will have changed by the time HSR is developed.

Train Operating Company (HSRTOC)

HSRTOC would enter into a franchise agreement with the DeliveryCo under which HSRTOC would operate and provide train services. HSRTOC would plan and market services, sell tickets generating passenger revenue over the operating period and would be responsible for its operating costs.

In practice there could be more than one TOC operating HSR services on a single corridor. Additionally, services may also be operated under open access. Open access operators would pay track access charges to InfraCo but would not be subject to the same franchise arrangements as HSRTOC.

Revenue risk would be primarily with HSRTOC as an incentive to maximise demand, deliver good customer service and generally to be responsive to the market. However, an optimal arrangement could allow for it to share some of the demand risk with DeliveryCo or DfT with subsidy/ premium adjusted according to a revenue risk (or profit) sharing mechanism. This would reflect the fact that some of the main drivers of revenue are outside the control of the train operator.

It is assumed that HSRTOC would also operate the adjacent classic network, at least during the construction and initial operation phase, so that the transition to high speed rail services can be managed more efficiently and shortfalls in revenue on one network might be offset by revenue on the other. This is the approach adopted for new domestic services on HS1.

Vehicle Owning Company (VehicleCo)

The HSR rolling stock fleet would be delivered by a SPV (VehicleCo) under a long term Design-Build-Finance-Maintain (DBFM) contract (similar to a PPP). VehicleCo would be set up by the winning consortium following a tender process run by DeliveryCo. Consortia are likely to be led by train manufacturers supported by independent equity investors.
The detailed structure would be able to draw on lessons from the Intercity Express, Thameslink and Crossrail train procurements. VehicleCo would contract with HSRTOC to provide the required number of trains at the start of each day and this train availability contract would set out VehicleCo's detailed obligations and how it is paid.

The rolling stock leasing companies (ROSCOs) created at privatisation of British Rail do not currently have the capacity to finance a fleet of this size though they might become members of bidding consortia. The broader leasing market would be an alternative to DBFM, should capacity return.

As the franchise arrangement entered into by HSRTOC may be shorter than the contract with VehicleCo there would be arrangements for successor franchisees to take over the contract and an appropriate usage guarantee from Government protecting VehicleCo from not having a franchisee to contract with. Such a guarantee is intended to enable VehicleCo to repay its finance over a longer period than the initial train availability contract with HSRTOC.

VehicleCo is assumed to raise a significant amount of the finance required to manufacture, deliver into service and maintain the HSR train fleet against the anticipated stream of train availability payments payable by HSRTOC.

Finance is expected to be raised by VehicleCo in two forms:

- **Debt:** assumed to be non-recourse commercial bank debt or possibly bonds. This is not anticipated to be backed by government guarantees unless such an approach was deemed to provide better value for money;
- **Equity:** assumed predominantly in the form of subordinated loan notes and a notional amount of ordinary share capital subscribed by the manufacturer and independent investors.

The level of franchise subsidy payable to HSRTOC would need to be high enough (in addition to passenger revenue) for it to fund the availability payments to VehicleCo. The DBFM contract would transfer construction risk to VehicleCo. VehicleCo would receive a train availability payment from HSRTOC. Performance would be measured through the contract and VehicleCo would face deductions from the payment for poor performance or unavailability. VehicleCo is assumed to take performance risk under the agreement but not demand risk. VehicleCo is likely to manage its risk by transferring it onto sub-contractors namely the manufacturer/maintainer.

The train availability payment would be set to meet the on-going costs of maintaining the vehicles, repaying commercial debt, meeting the covenants of the debt (e.g. cover ratios) and providing a target return to equity providers.

As an alternative, HSRTOC could lead the procurement and financing of the trains, but this would require the franchise to be tendered several years in advance of services starting. Also, HSRTOC could be a new enterprise or a subsidiary of a well established franchise operator. However, as it would have no history of operating HSR on a new line, the business might be viewed as higher risk than an established TOC and this might affect the availability and cost of private finance for trains.

The Regulator

The Third Railway Package (the European rail directive which regulates international high speed operations in Europe) requires infrastructure to be open to international passenger operators. This is not currently a requirement for domestic high speed operators, but clearly might become so. UK law for the classic network makes access to the network subject to the supervision of the independent Office of Rail Regulation (ORR) which has established policies concerning access to the network by open access operators. The nature of the access regime will be important to the economics of HSR. Open access may have the beneficial effect of encouraging competition, thereby leading to improved and cheaper services. The access charge regime for open access needs to be designed to capture the surpluses back from all operators over the HSR network and optimise overall cost recovery.

But clearly, an open access system would create an additional risk to achievement of forecasts and therefore to certainty of realising the planned benefits of the investment. In particular, it would be difficult for an open access operator to raise finance for trains. The pros and cons of open access will therefore need to be considered alongside the funding of the project. There may be a case for limiting access in the early years of operation. The relationship between the access regime on the high speed network and that on the classic network will also need to be considered.

We have had helpful discussions with ORR on the challenges of regulating a new high-speed railway. As well as the rules governing access, these include:

- setting access charges so as to incentivise efficiency, together with a focus on the needs of customers, while enabling the infrastructure manager and train operators to plan their businesses with a reasonable degree of certainty and secure appropriate remuneration of investment;
- in support of this, periodic reviews of access charges;
- providing assurance for users of the network and Government about the quality and capability of the infrastructure; and
- securing efficient management of the interface between the high speed and classic networks.

These issues, and the appropriate regulatory mechanisms for dealing with them, will need to be considered as part of the further development of the programme.

Delivering the national HSR network

The illustrative structure described in this report is a contractual structure for a single corridor. It is expected that this structure could also be used for subsequent high speed corridors.

This structure has a number of key benefits for rolling out the wider network being:

- Government retains oversight of construction and the option to sell the asset manager. This gives it flexibility in the long term. For example it could manage the timing of the sale of the asset manager to maximise the sale price and to take account of the building of subsequent corridors;
- once the construction of the infrastructure is complete and the asset manager has begun steady state maintenance and operations there is an opportunity for different railway networks to combine their activities. This provides scope for corporate mergers and acquisitions which may increase the attractiveness of this type of investment;
- once high speed services have commenced, franchises can be combined or split across different corridors and the national network operations. The short-to-medium term nature of franchise contracts gives Government flexibility to optimise how services are delivered. In addition, the possibility of multiple franchises across different corridors creates a potential market for train operators which could improve competition for franchises as more participants enter the market;
- the structure can realise cash at the end of a construction period (similar to HS1) and so the sale proceeds of one corridor could be used to fund later corridors thereby reducing the ongoing impact on the public purse;
- a new high speed regulatory structure and regime should remain consistent across different corridors. Therefore the cost and timing of setting up the new regime would be incurred only once and could be improved by experience. In addition should the Government wish or the regulator require services to be run purely by open access operators then the franchise system could operate alongside open access operations.

Special consideration will need to be given to how high speed infrastructure and services are extended onto existing high speed corridors, for example from Manchester to Glasgow. Ideally there would be a common infrastructure manager across different parts of the same corridor although this is not absolutely necessary. This would reduce infrastructure interface risk, increase maintenance and operational efficiency and allow for a common set of access charges on a single corridor.

An extension to a corridor is likely to require a new franchise to be tendered which would have to be for the whole corridor (the benefit of this structure is that it allows for this possibility).

In practice Government will seek to maximise competition in any sale/concession/franchise process. Therefore, Government will have to think carefully about how to attract infrastructure and operator bidders. Owners of adjacent infrastructure, and operators of adjacent services, will be able to price in economies of scale. As incumbents, they will have an understanding of operations that may give them a material advantage during the bidding process.

Conclusion

This report seeks to provide an illustrative delivery structure for a HSR network in the UK. At this stage of development there is no right answer to how HSR should be delivered. There are a wide range of stakeholders in Government, local and regional councils and the private sector. The views of all these stakeholders will need to be taken into account when defining the final structure. In addition, by the time Government takes forward HSR we assume the UK economy will have lifted out of recession which will change some of our assumptions and may change the appetite of various parties to take different risks. However, it is likely that the fundamental conclusion of this report will remain the same; being that HSR is too large and complex for the private sector to deliver without considerable Government support. For it to be a success, Government will have to play a significant role in the planning, specifying, funding and procurement of HSR.

Appendices

Appendix A: Delivery options

This Appendix describes the options which are likely to be considered for delivery of the reference HSR project. All options listed here are potentially feasible but as an illustration, the summary report describes one approach in detail. The options considered have been analysed in detail in the Funding Workstream 2 Report prepared by PwC as part of our work for Greengauge 21.

Delivery options have been analysed separately for the following components:

- infrastructure provision, namely infrastructure build, maintenance and operation and property construction and maintenance; and
- rolling stock and service provision, namely train manufacture and maintenance and train service operation

A further option for a single contract for integrated services, being a combination of the above two components into a single vertically integrated contract was also analysed.

Some form of split between infrastructure and rolling stock/ services is consistent with the structure of the industry more generally in the European Union, although this leaves the risk at the interface to be managed by the public sector. Even this split is a simplification as the final structure is likely to be a combination of a variety of approaches; for example stations could be delivered on a different basis from the remainder of the network.

Table 2 below summarises the options for HSR. Infrastructure Option A and Rolling stock and services Option 2 are described in more detail in the summary report. The remainder of this Appendix describes each option at a high level.

Table 2: Options for HSR

Infrastructure provision

Option	Description
A	Short term construction contracts with asset transferred to asset manager (InfraCo) on completion
B	PPP structure, i.e. long-term DBFM contract
C	Regulated structure – Network Rail or a Government-owned infrastructure manager builds and operates infrastructure and property

Rolling stock and service provision

Option	Description
1	Operating franchise; train lease
2	Operating franchise; train PPP
3	Integrated train operations PPP
4	Open access regime

Integrated infrastructure, rolling stock and service provision

Option	Description
5	Integrated railway PPP

Infrastructure provision

Option A – Short term construction contracts with asset transferred to asset manager (InfraCo) on completion

Infrastructure and property assets are delivered through short term construction contracts with an assumption of sale on completion to an infrastructure manager who performs ongoing maintenance and operation of the infrastructure (which could be Network Rail or an alternative manager). There would be a guaranteed transfer arrangement for the infrastructure manager to take over the operations and maintenance of the assets and repay or take over any construction finance. Property construction (stations and depots) could be undertaken by same entity.

Payments during the construction phase are likely to be based on contracted milestones whereas after the take out by the asset manager there could potentially be a choice between a regulated payment structure or a contractual payment structure. This structure is typically known as a Design, Build, Finance, Transfer (DBFT).

Financing is assumed to be a mixture of private equity and government guaranteed debt and construction milestone payments.

The structure has been described in more detail as part of the illustrative structure in main report.

Key benefits

Transparency and incentives – DeliveryCo performance easily scrutinised

Competition – market appetite for appropriately sized InfrabuildCo contract should be maximised

Precedented – HS1 as restructured demonstrates that a variant of this option can be successful

Flexible – allows Government option to develop different post construction structure

Governance – degree of public sector involvement reflects unavoidable level of risk retention

Key disadvantages

Risk transfer – Government retains delivery and whole life cost risk and therefore appears to transfer less risk to private sector than other options

Infrastructure provision
Option B – PPP structure

Whole life contracts are awarded to service providers to build finance and maintain the infrastructure and the property assets. Infrastructure and property construction may be undertaken by same entity or not. This structure is typically known as a Design, Build, Finance, Maintain (DBFM).

This option differs from Option A in that it is a long term contract with much greater incentive for the contractor to optimise whole life cost as the contract remains in its control for a much longer period than in Option A.

Payment to the service provider is normally direct from Government, through availability payments for service delivery. The Procuring Authority would need to manage operator access arrangements.

The PPP finance market currently could not finance an entire HSR line on this basis but the approach might be suitable for elements of the project.

This is the procurement model used on some recent high speed procurements such as Dutch HSL-Zuid (although the PPP did not include civil engineering) and Taiwanese HSR and is the model currently being used to procure high speed networks for Portuguese HSR, and the Bretagne-Pays de la Loire High speed line in France.

Key benefits
Risk transfer – transfers delivery and whole life cost risk to private sector, thus incentivising value for money
Precedented – PPP contracting mechanism is understood by the market
Capability – requires less in-house skill in public sector

Key disadvantages
Deliverability – limited financial capacity in private sector means risk transfer may be illusory given size of project
Debt capacity – limited market capacity to fund large infrastructure without explicit government guarantees
Affordability – finance costs may be higher, although the aim is that this is outweighed by benefits of risk transfer
Procurement timescales – can be protracted

Infrastructure provision
Option C – Network Rail build and operate infrastructure and property assets

An infrastructure manager, in this case Network Rail, would build, operate and maintain infrastructure and property assets over the life of the assets (i.e. it would act as both InfrabuildCo and InfraCo). In practice the infrastructure manager may subcontract the work required to private sector contractors, as Network Rail does with its own national network projects, but retain overall control of the work and the interface risk. Alternatively, a separate infrastructure manager, which might be Government owned, could be created to fulfil this role.

This model was used on the first high speed rail procurements in France, Japan and Spain. However more recently, France is using PPP contracts to procure major railway lines.

This option assumes a regulated structure and the new line might become and be financed as an integral part of National Rail's existing operations. National Rail would be paid through a combination of access charges (payable by the high speed operator for use of the infrastructure) and Government grants. This simplifies the structure, in particular avoiding the need for a formal handover from InfrabuildCo to InfraCo though project acceptance into service would remain a key source of risk.

In the UK such a regulated structure has not normally been used for major new-build projects and there would be a risk that the roles of client (Government) and regulator (ORR) would overlap and come into conflict. This would be avoided if a new Government owned body was created to build HSR as happened in Spain. Furthermore, Network Rail has said publicly that it would not want to be responsible for building high speed rail.

Key benefits

Simplification – Network Rail would build and manage the infrastructure avoiding interface risks between build and maintenance phases and between HSR and classic network

Balance sheet – Network Rail is a private company and so assets and liabilities are not recognised in Government accounts though the accounting treatment for a new line might be different

Key disadvantages

Financial capacity – Network Rail is not currently set up to finance such a major large project, however it is possible that its financial structure will change by the time HSR is developed

Risk transfer – Network Rail does not have the financial capacity to take all the risk on the development of a HSR line

Capability – Network Rail does not currently have the experience of building new high speed lines

Rolling stock and service provision
Option 1 – Operating franchise structure, train lease

A train operator would be awarded a franchise to deliver the high speed services over a defined period which is normally 7-10 years for current franchises although for a high speed service it might be longer, possibly up to 20 years. A longer franchise would require some sort of periodic review mechanism. The operator under the franchise agreement would be responsible for procuring and providing appropriate rolling stock from a manufacturer. The operator would maintain the stock though it might subcontract some aspects to the manufacturer. This is the current industry arrangement in Great Britain.

The train operator would fund itself through farebox revenue and possibly a subsidy from Government determined in the tender process should operation of the services not be profitable, which is likely in the early years. If profitable it may pay a premium to Government.

The rolling stock would be financed by a rolling stock leasing company or bank ("ROSCO") who would buy the rolling stock from the manufacturer and lease it to the train operator. A ROSCO would be unlikely to take credit risk on a new operation, so some form of Government support for the borrowing would be needed. A ROSCO may also provide some heavy maintenance.

Key benefits

Simple – the franchise structure is a mature contracting process in the UK

Interaction with classic network – the franchisee could run services in both high speed and classic networks thereby enabling it to manage transition risk

Key disadvantages

Revenue risk – high speed services would not initially have a financial history which could depress bids to run the services

Market capacity – today there is not capacity in the leasing market to fund high speed rail rolling stock, although the market might evolve by the time the finance is needed

Timing – the franchise would need to be tendered at least three years in advance of the start of services to allow time for the manufacture of rolling stock. This would make the franchise process more complex

Rolling stock and service provision
Option 2 – Operating franchise, train PPP

A train operator would be awarded a franchise to deliver the high speed services as above. DeliveryCo would procure rolling stock by means of a contract with a consortium of manufacturer and financier. The manufacturer would maintain the rolling stock. Variants of this are being procured for the Thameslink and Intercity Express rolling stock transactions.

The manufacturer sells the rolling stock to the financier who provides the rolling stock to the train operator in return for lease or availability payments subject to performance incentive arrangements.

The rolling stock would be financed by equity and long term debt which would be repaid by the consortium based on the availability payments it expects to receive over the life of the contract.

This structure has been described in more detail as part of the illustrative structure in the main report.

Key benefits

Simple – franchise structure is a mature contracting process in the UK

Interaction with classic network – the franchisee could run services in both high speed and classic networks thereby enabling it to manage transition risk

Market capacity – currently infrastructure investors have greater capacity to invest in rolling stock than lessors

Key disadvantages

Revenue risk – high speed services would not initially have a financial history which could depress bids to run the services

Rolling stock and service provision
Option 3 – Integrated train operations PPP

The train services are operated and the rolling stock is supplied and maintained by the same entity under a long term PPP contact. Typically this is delivered using an SPV structure which subcontracts the manufacturing, maintenance and train service obligations to different parties in the joint venture which owns the SPV. Structures similar to this have been used for some light rail projects.

The SPV would receive availability payments from DeliveryCo for making the train services available and might or might not also receive all or a share of passenger revenue.

Key benefits

Risk transfer – long term risk transfer of maintenance and operating cost risk

Procurement – only one contract is required rather than several under Options 1 and 2.

Key disadvantages

Inflexible – PPP contracts cannot be varied or flexed easily. Operations have to be tendered for the same period as train maintenance

Risk transfer – PPP investors unlikely to take significant revenue risk so this may remain with Government

Market appetite – the complexity and higher level of risk transfer sought may erode competition

Rolling stock and service provision
Option 4 – Open access regime

The Government puts in place arrangements which allow any operator to come and operate services on the network, subject to satisfying certain criteria and being granted access rights by the regulator.

Under this option a HSR operator would operate its own trains which it would have to procure and finance.

Key benefits
Regulation – likely to be consistent with emerging European regulations which may require open access on national networks
Risk transfer – maximum risk transfer to the private sector
Market focused – Government not involved in specifying train services

Key disadvantages
Appetite – no guarantee that open access operators will want to use the network
Usage risk – Government would need to underpin access charge revenue without assurance that operators would use the line
Affordability – open access competition would be unlikely to maximise the contribution that passenger revenue could make to repaying construction costs
Bankability – it is unlikely that an open access approach could provide the financial security needed for the private sector to supply significant finance for the infrastructure or trains

Integrated infrastructure, rolling stock and service provision
Option 5 – "Integrated railway PPP"

The Government would tender a single PPP contract for the provision of infrastructure build, maintenance operations and train operations including the manufacture and maintenance of rolling stock. This is similar to the model used to procure CTRL (now High Speed 1). LCR was contracted to build the line and operate it under a 999 year concession.

The market is unlikely to support a structure for a new high speed network in the UK that replicates the original structure of CTRL whereby the private sector was expected to take significant revenue risk. However that does not mean that a single vertically integrated contracting structure would not be feasible, just that the risk taken by it would need to be reconsidered to make it viable.

The PPP SPV would need to receive payments from Government for making the services available though it could take some revenue risk and pass this through to an operating subcontractor. These payments would need to be sufficient to pay projected operating costs and any financing costs.

Financing is assumed to be similar to Option 2 where there is equity, government guaranteed debt and construction milestone payments.

Key benefits

Procurement – a single contract, albeit a very complex one

Key disadvantages

Appetite – such a large PPP would erode competition as companies would have to form bidding consortia thereby reducing the potential number of bidders for the project

Risk transfer – lack of competition may lead to erosion of risk transfer through contract bidding and negotiation process

Precedent – the CTRL PPP had to be restructured several times indicating the structure did not work well

Inflexible – operations need to be tendered for same period as infrastructure and train maintenance

Market capacity – this deal would be larger than current market capacity

Appendix B: Financial modelling results and public funding requirement

We have assumed that high-speed rail services will earn in passenger revenues substantially more than they cost to operate. However, there is insufficient surplus to make a great contribution to the infrastructure costs particularly once account is taken of the worsening in the financial performance of the classic lines. Therefore significant public sector expenditure will be required to deliver the capital elements of the project.

The design development/consent stage of work for the first corridor and the preliminary development of future stages are assumed to run from 2011 to 2015 and entail projected expenditure of roundly £80m – £120m per annum. Assuming a staged programme commences in 2015, this is when the major capital expenditure would start.

Table 1 shows the net cashflows required from Government to fund a new high speed rail line (London-Birmingham-Manchester) over a 38 year concession, assuming high speed services commence from 2021.

High speed rail services are anticipated to generate more revenue than the costs of operating those services and therefore from 2023 the cashflows from high speed rail are positive. When high speed services commence in 2021, the fall in revenue on classic rail services is offset only partially by a fall in operating costs. The net financial impact of high speed services less the abstractive impact on the classic network results in a total real cost (2008 prices) to the public purse of £27.5bn.

Costs to the public purse are stated on a 'post tax' basis. Tax payments from HSR operations are not added back in the figures quoted.

The funding analysis excludes Optimism Bias which is a feature of the business case appraisal; its inclusion here would add 65% or £17.3bn to the costs and have the effect of increasing the costs to the public purse to £43.7bn.

Table 1: Cost to public purse[4]

£bn 2008 prices	Total	2011 -15	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026 -53
Government receipts/(payments) in respect of HSR	8.1	(0.5)	(1.4)	(1.4)	(1.4)	(1.7)	(1.7)	(1.3)	(0.1)	0.0	0.1	0.2	17.2
Net impact on classic network	(35.6)	-	-	-	-	-	-	-	(0.3)	(0.4)	(0.5)	(0.6)	(33.7)
Total projects costs to Government	(27.5)	(0.5)	(1.4)	(1.4)	(1.4)	(1.7)	(1.7)	(1.3)	(0.4)	(0.4)	(0.4)	(0.4)	(16.5)

Notes to the table above:

Breakdown of total costs to Government	(£bn)
Design and consent work	(0.5)
Infrastructure build and maintenance	(13.8)
Rolling Stock build and maintenance	(6.0)
Financing costs (incl. tax)	(7.5)
Net income from HSR operations	35.9
Classic Rail Abstraction	(35.6)
Total project costs to Government	**(27.5)**

4 The total cost to the public purse is £1bn greater than published in the "Fast Forward a high-speed rail strategy for Britain" in September 2009. Revenue and tax assumptions in 2012 and 2013 have been updated to reflect revised forecasts.

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About Greenguage 21

Greengauge 21 is a not-for-profit organisation which aims to research and develop the concept of a high speed rail network, and to promote its implementation as a national economic priority.

Founded by Jim Steer, one of the country's leading transport sector specialists, Greengauge 21 has been established to progress the debate on High Speed Rail and to promote it in the public interest. The organisation has been conceived as an umbrella under which all those with an interest in supporting and promoting a High Speed Rail network can come together and openly and publicly debate the merits of alternative routes, priorities and technologies, alternative implementation strategies and the economic and environmental benefits for Britain.

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About the authors

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About PricewaterhouseCoopers Transport

The transport industry practice provides a wide range of advice and support to clients, ranging from audit and tax to corporate finance advice on deals and support for capital projects.

In 2009 PwC advised the UK Highways Agency on the £1.15bn M25 PFI financing, the largest infrastructure financing in the UK in 2009. We advised the Slovak Government on the €1.8bn R1 road financing and the Polish Government on the €1.6bn A2 road PFI. PwC is currently advising on the two largest orders of rolling stock in the UK since privatisation. PwC was voted 2009 European Adviser of the Year by Project Finance International.

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