
Tim Smart

Director Engineering & Assets

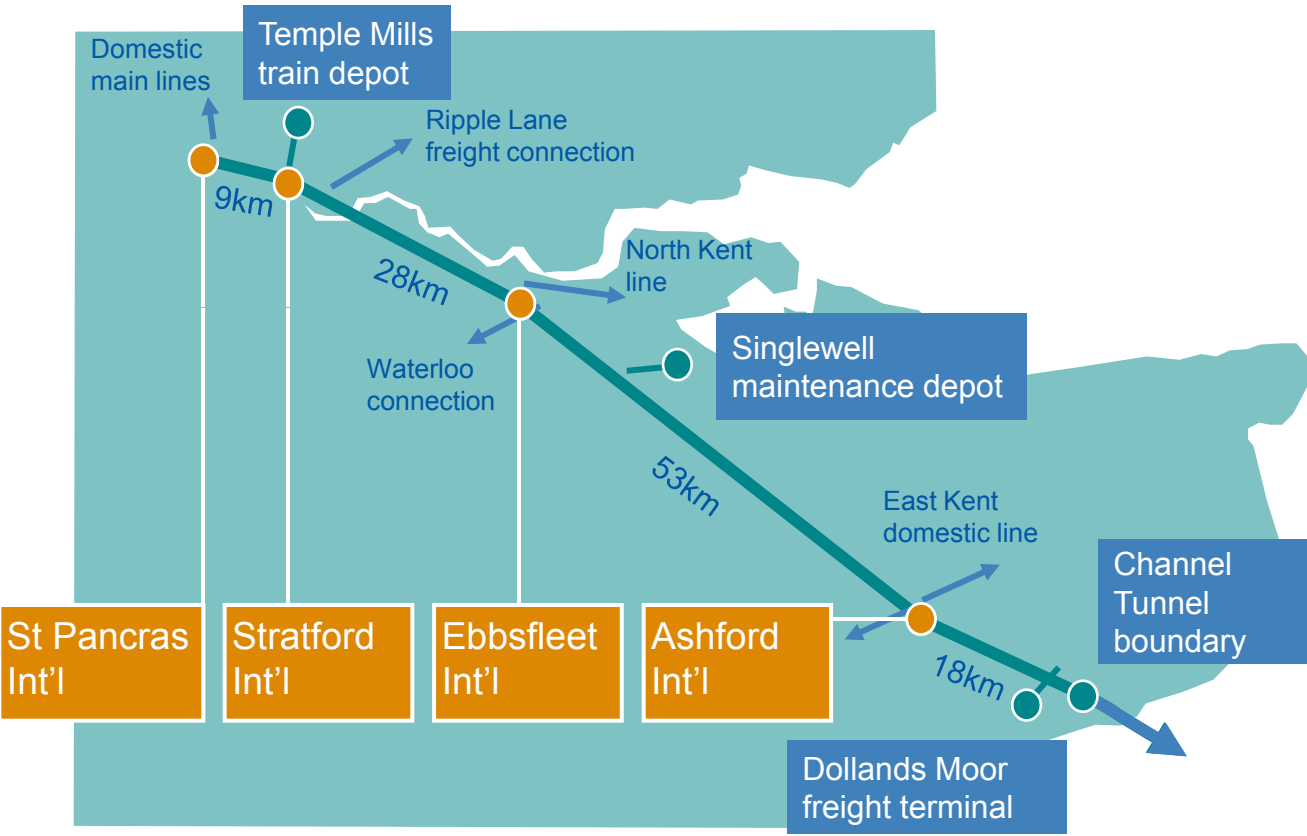
HS1

AGENDA

- ***HS1 Overview***
- Construction & Engineering Overview.
- Funding
- Procurement & Delivery
- Operating Railway



HS1 Overview: Infrastructure



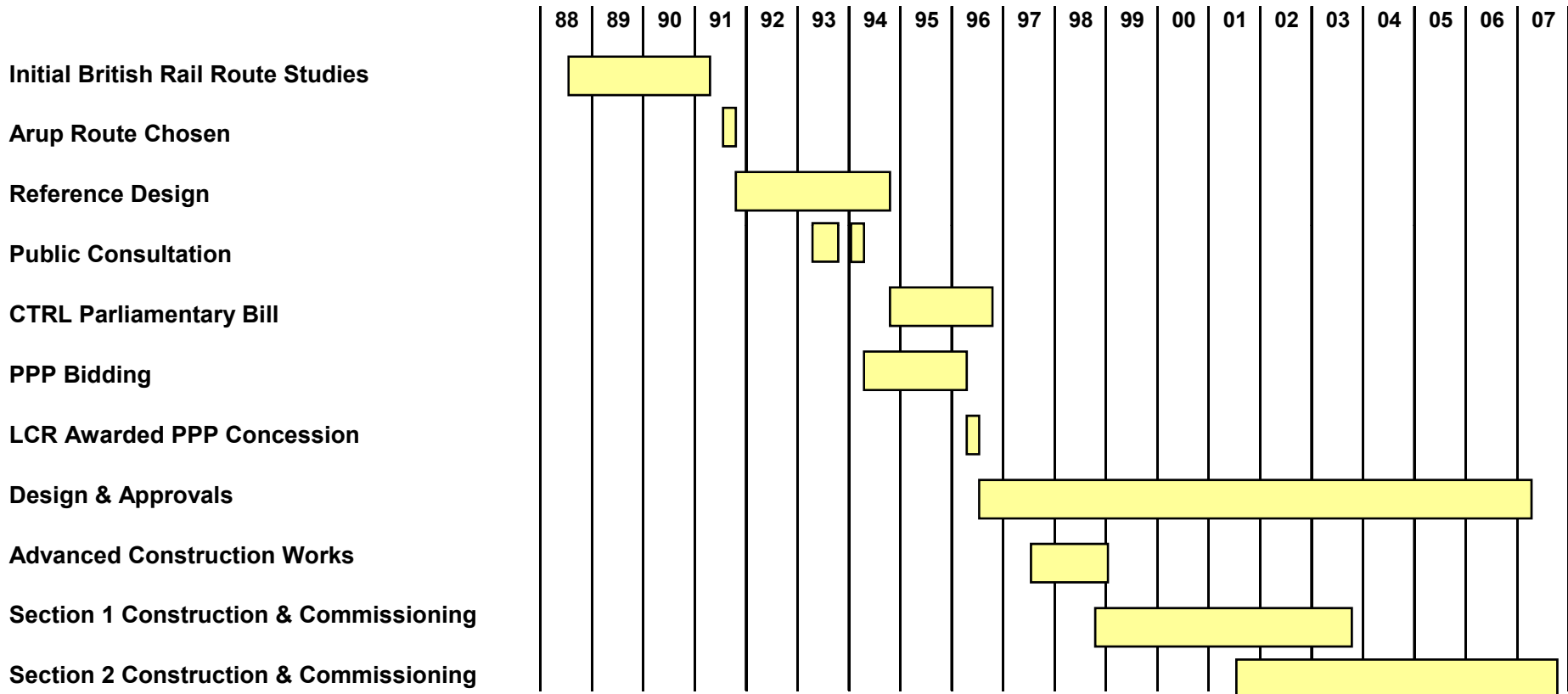
- 109 km modern, high speed track linking London to Europe
- 4 international stations in areas undergoing major regeneration and growth
- Breadth of connections to classic network



HS1 Overview: Key Aspects

- UK's first High Speed Line.
 - London to Paris 2hr 15 min
 - London to Brussels 1 hr 51mins
 - Kent fast domestics service provides under half the journey time
- Connects to Europe as part of the TEN's
- 109 Km of high speed track.
 - Max line speed 300km/h. Freight 140 Km/h
- Project included construction of 4 stations; 2 depots.
- HS1 as stimulated significant regional growth

HS1 Overview: Timeline

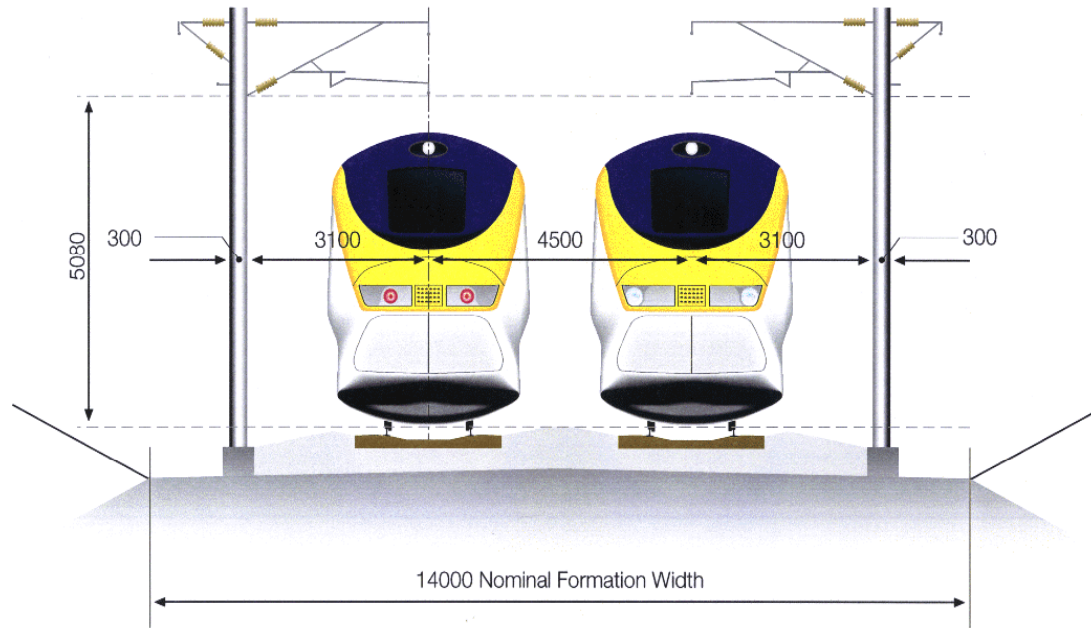


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Construction & Engineering Overview: Open Line Cross Section

Typical Cross Section of Open Line



All Dimensions in millimetres

UIC Gauge C.

Largely TSI compliant

90 Km on ballasted track

Construction of the railway also required 65 Km roads

Route constructed low and in cutting for environmental reasons

Construction & Engineering Overview: Significant Structures.



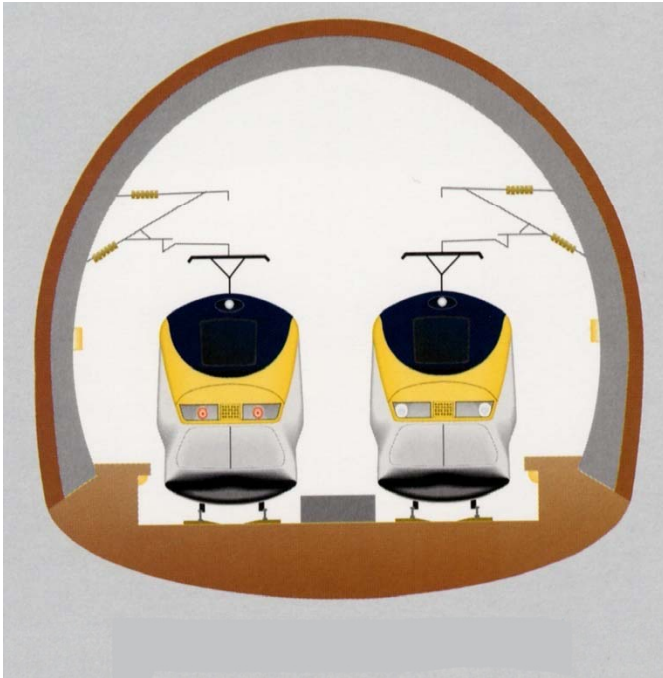
1.2 Km Medway Viaduct under construction



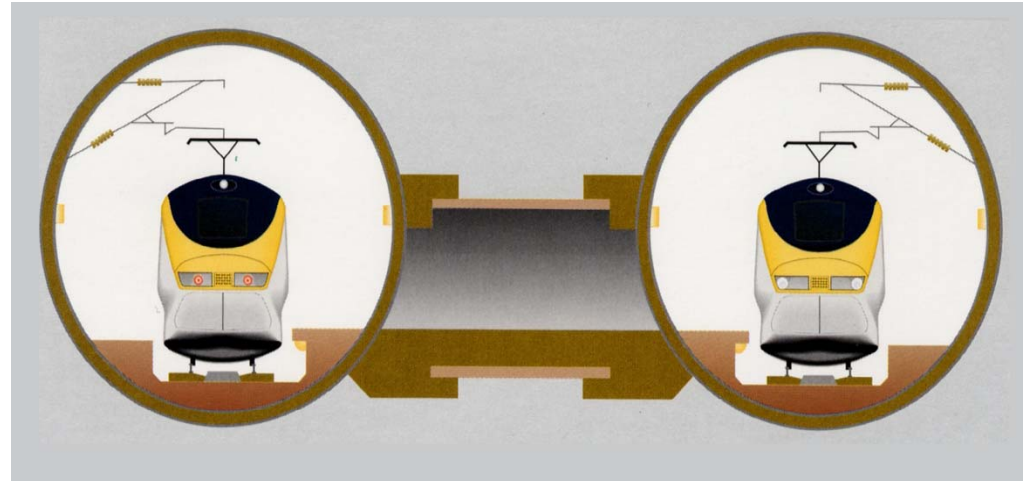
and completed.

HS1 has over 4 Km track on significant viaducts and required the construction of over 150 bridges

Construction & Engineering Overview: Tunnels 1



Cross section North Downs tunnel 13 m o.d
Sprayed concrete lining.



Cross section of the London running tunnels: 8m o.d
Fibre reinforced segments.

Over 25 Km of the HS1 route is in tunnel, particularly the more urbanised sections closer to London. The tunnelled sections include 32 cross passages and five ventilation/intervention shafts up to 52m deep.

Construction & Engineering Overview: Tunnels 2



Completed Thames tunnel ready for track laying

Kawasaki EPB TBM



- Route is bi-directionally signalled for 20 tph at 3 minute headways
- Computer based ITCS signalling system managing;
 - Interlocking which is fixed block.
 - Cab signalling and Automatic train protection.
- TVM 430 [French TGV technology] In cab signalling for profile/speed limit control.
- St Pancras terminal uses conventional colour light run from the ITCS with KVB as the ATP system due to complexity of junctions.
- 25 Kv Auto transformer power.
 - Three main grid supply feeder stations
 - 20 auto-transformer sub stations at 5 Km intervals.
 - 11Kv/ 400v low voltage distribution system.

Construction & Engineering: HS1 Stations



St Pancras Int'l



Ebbsfleet Int'l



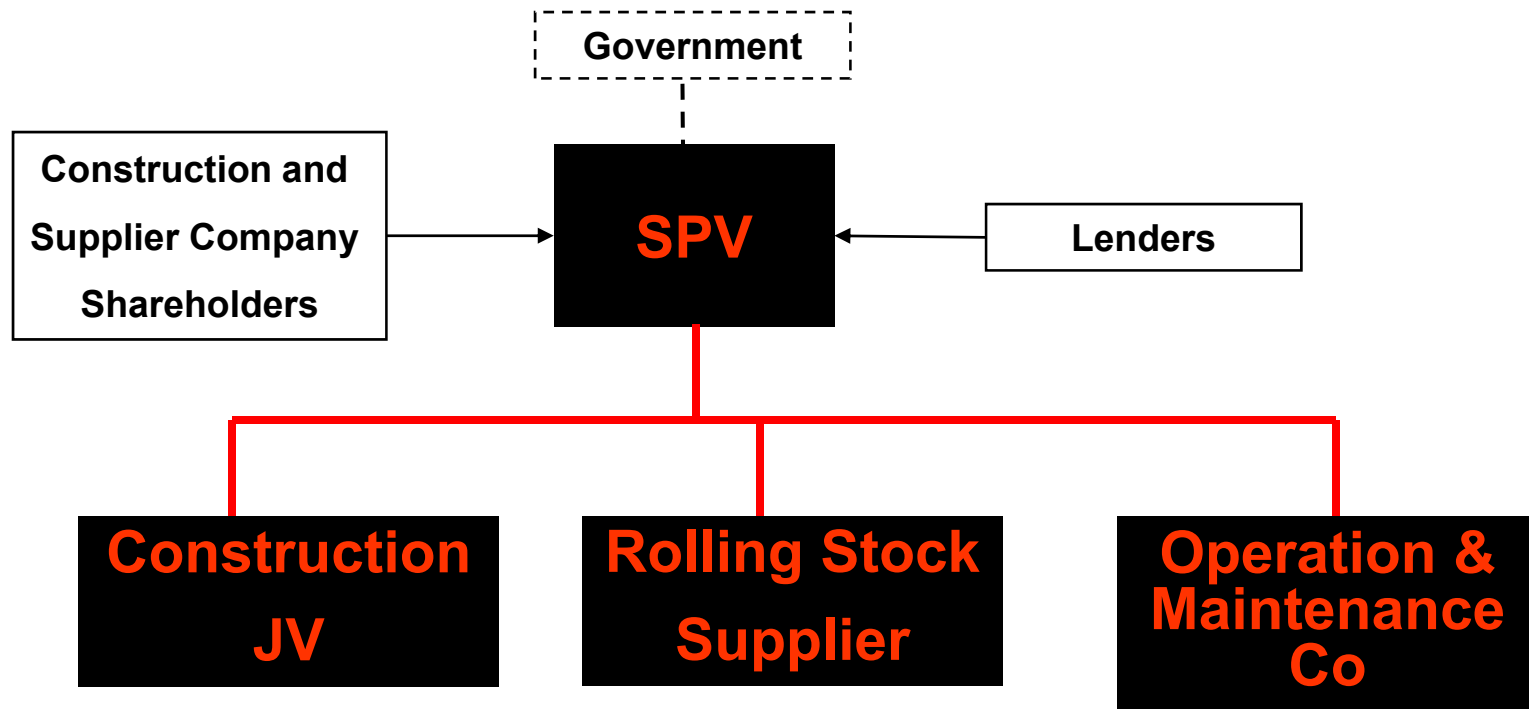
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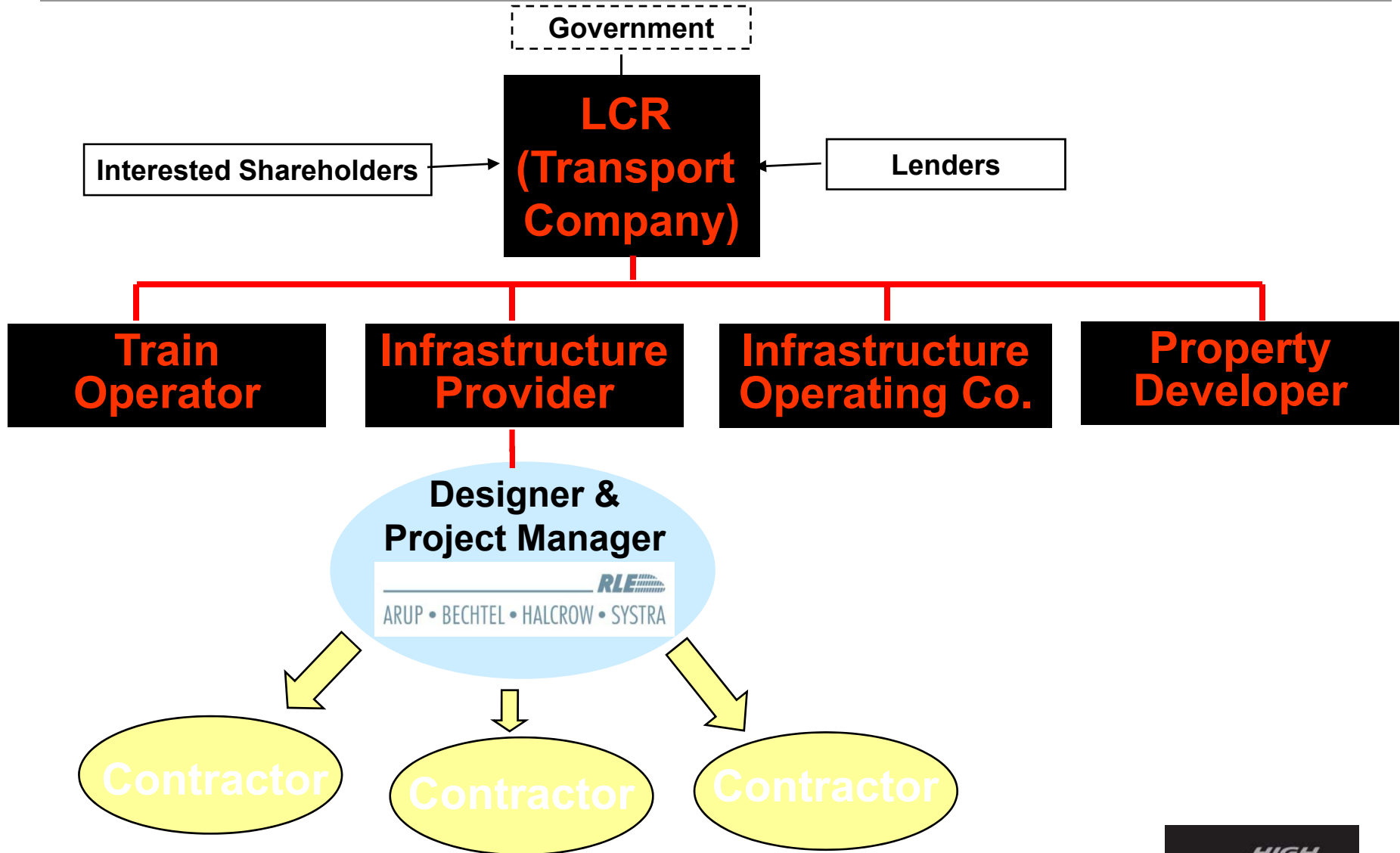
Funding: A different approach

- Approach we took on High Speed 1 was radically different from standard project finance/PFI format
 - (which is unlikely to work for rail projects)
- Starts with the client
- Low cost funding + overlay of risk transfer
- Substantially greater risk transfer achieved than vast majority of PFI/PPP projects

Funding : Typical Transport PPP

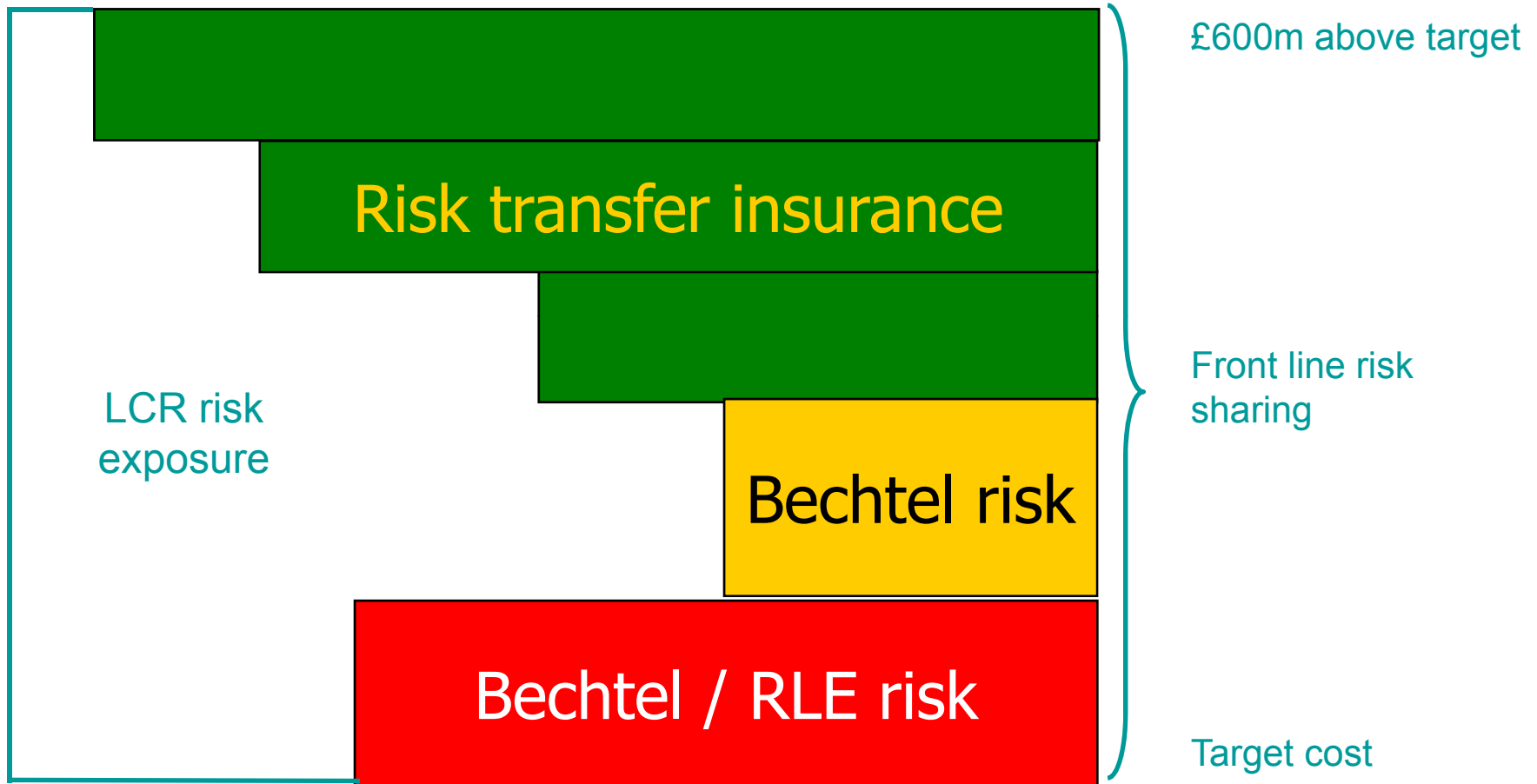


Funding : HS1 Approach



Funding: Low cost and stable financing

- Large scale of the project demanded a fresh approach.
- Project funded with £6.1bn of debt via bond market with 30, 40, 50 year maturity. Government support was crucial to securing the deals at under 5% cost of funds plus some European Grant monies.
- Repayment profile suited to rail project pay-back via long term access revenues
- Low cost of funding makes the economics 'add up' – an affordable sustainable approach
- Low cost funding plus appropriate risk allocation and overlay.
- Government recovers costs of financing the project by selling the franchise after completion

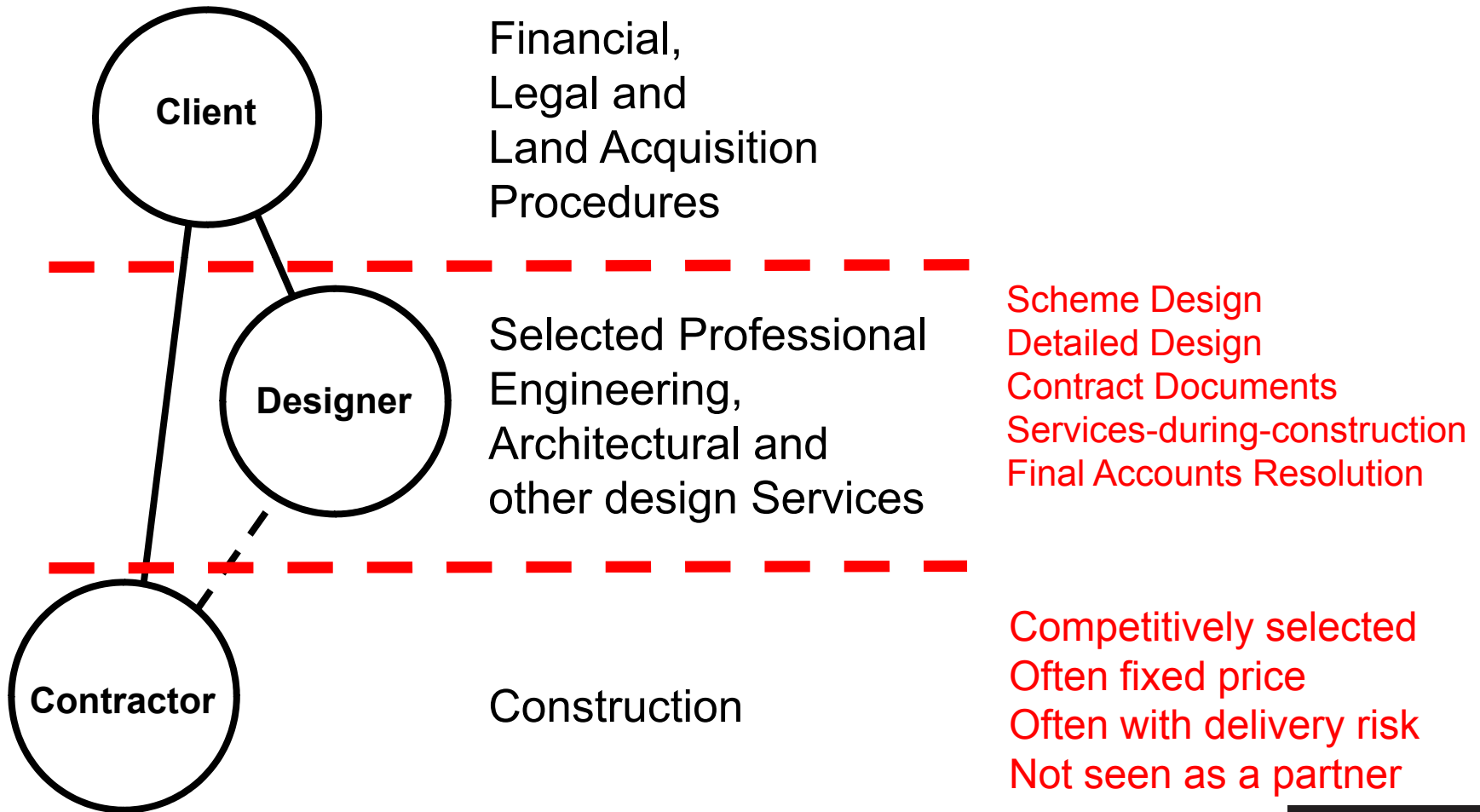


2/3rds of the risk of the first £600m of overruns laid off at the front line

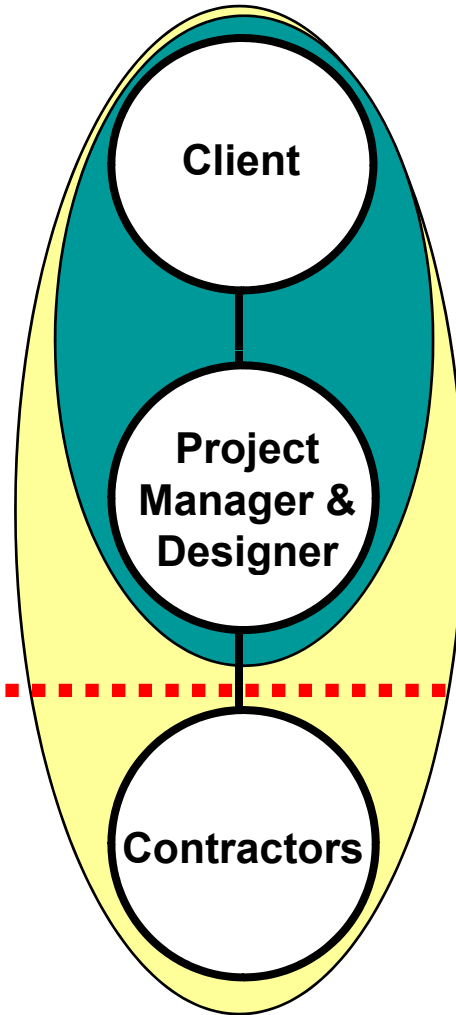
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Procurement & Delivery : Typical Approach



Project definition, design, approvals and consents, construction planning, sequencing and packaging all established before bringing in Contractors



Financial,
Legal and
Land Acquisition
Procedures

Comprehensive
Engineering/Design Services,
Project Procurement and
Construction Management
(EPCM 'delivery partner' role)

Construction partner
Risk allocated as appropriate
Benefits from good performance

Procurement & Delivery: Project client role

- **More than simply a sponsor at arms length**
- **But not a Project Manager**
- **Begins with the Client Brief ensuring all the components of the project are properly defined**
 - Safety, operational requirements, full performance specification, environmental considerations, regulatory arrangements
 - infrastructure description and scope
- **The client then has ultimate responsibility for ensuring that each bit of the railway fits together and will support the intended operating and ownership arrangements**
- **High level of involvement required to:**
 - make prompt decisions on project issues
 - which means deciding to spend money/release contingency before problems get worse
 - where appropriate, challenge and direct activities of project managers and contractors

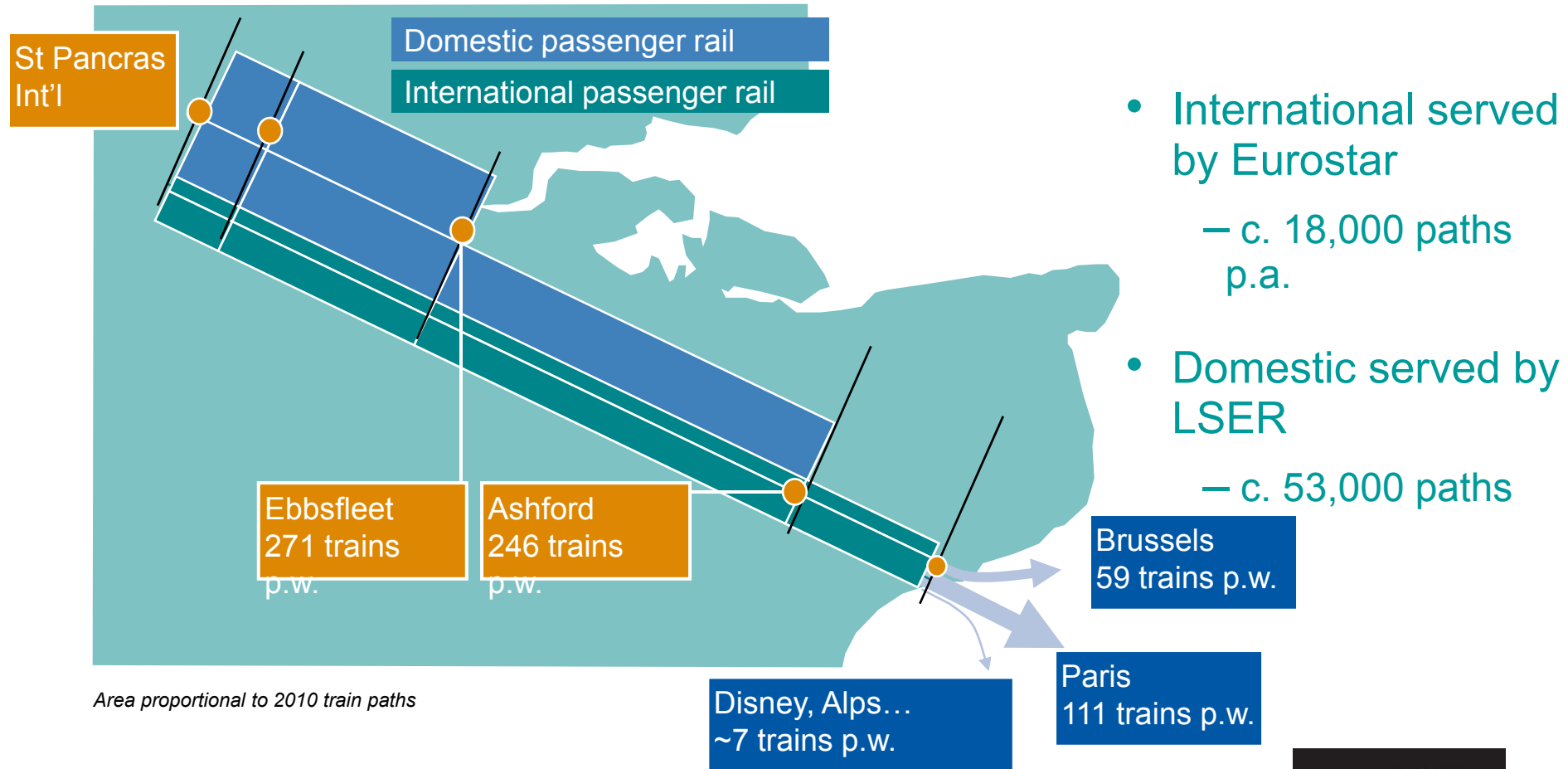
- **Intelligent division of works into small number of construction contracts**
- **New Engineering Contract Target Price with shared gains and/or losses**
 - Appropriate allocation of risk
 - Visibility of performance and programme achievement
 - Incentivisation to encourage successful delivery
- **Alliances with Contractors**
 - Open Book
 - Non adversarial relationships
 - No man for man marking
 - Self certification
 - Common Cost items by Client (eg. Insurance, security)
- **Early involvement of Contractors to develop economic designs together**
- **High importance of safety on site**

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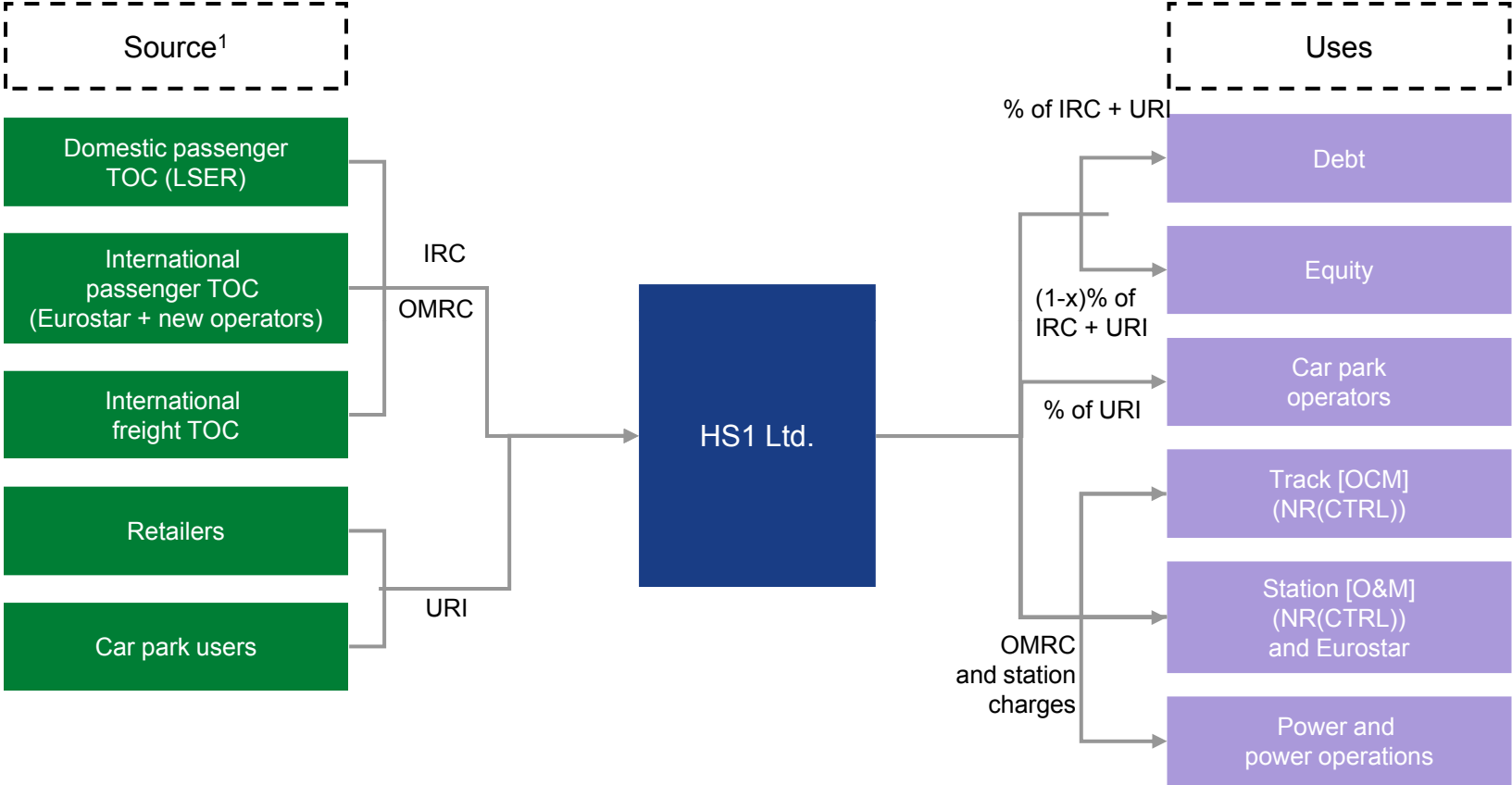
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Each way journeys per week



Operating Railway: How does the business model work?



Operating Railway: Benefits

- Eurostar passenger numbers increased 15% on the opening of Section 1 in 2003 and a further 10% on completion in 2007
- Train delays down at 6 secs per train MAA.
- Increased capacity on the classic rail network
- Fast domestic service introduced in December 2009
- Regeneration of previously derelict areas.
 - Post construction report identified a positive CBR of 2.4 for purely the rail investment
 - The report also identifies an additional £10bn of economic benefit arising from the Regeneration for which HS1 has been a catalyst