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*Secretary of the Cabinet and Head of the Civil Service*

CHANCELLOR

cc. **Prime Minister**  
**Transport Secretary**  
**Ed Llewellyn**  
**Simon Case**  
**Catherine Fall**  
**Ed Whiting**  
**John Manzoni**  
**Will Cavendish**

**HS2 PERIODIC UPDATE – PHASE 2 REPORT**

1. On 12 May, I provided advice on options for reducing the cost of HS2 Phase 1. That report outlined possible savings of between £700m and £1.25bn, which would bring the Phase 1 costs back into line with the Spending Review envelope of £24.7bn.
2. I indicated that we could expect to see greater savings in the Phase 2 build, given its earlier stage of design. In this note, I set out over £6bn of potential Phase 2 savings that we have now identified. Crucially, if Ministers accept these savings options, then Phase 2 can be built at a cost per km that is broadly in line with the agreed international benchmarks.
3. We have also scrutinised the proposed £7.1bn rolling stock and depot costs, and identified further potential savings of £743m. Finally this note updates the original Phase 1 savings, which are now in the £875m to £1.05bn range. **In total, then, the review has identified potential savings of roughly £8bn in capital costs across the two phases of the project.**

**The Phase 2 Build**

4. PwC's International Benchmarking Study (IBS) showed that DfT and HS2 Ltd were planning to build Phase 2 of HS2 at a cost per km significantly higher than reasonable comparators. Adjusting to 2015 prices, and

## OFFICIAL SENSITIVE

excluding the costs of rolling stock, the IBS suggested that the closest comparator high speed line in Europe was built for £45m per km. It found that some of the cost differences between the UK and other European high speed lines are due to conscious differences in project scope – for example, more stations and lines going to city centres. Allowing for this, we have established and agreed with DfT and HS2 Ltd (and Treasury officials) an adjusted benchmark cost to aim at of £65m per km. Given the 342.5km length of the Phase 2 route, this suggests a cost-effective total infrastructure cost, including contingency, of £22.3bn for the Phase 2 project as a whole (equivalent to £15.9bn excluding contingency).

5. As of January this year, HS2 Ltd were estimating that the total infrastructure costs of Phase 2, excluding contingency, would be £22.2bn. This ‘point’ cost estimate<sup>1</sup> did not reflect the efficiency and value engineering programmes that HS2 Ltd had already begun to identify, but did include £1.76bn of route refinements and £370m savings from land and property. However, it left the point cost estimate of the Phase 2 infrastructure build still £4.8bn more expensive than the pre-contingency SR envelope of £17.4bn, and £6.3bn more expensive than the adjusted cost-effective point cost for Phase 2 of £15.9bn.
6. Working closely with DfT and HS2 Ltd, my review team, led by Will Cavendish, have helped to identify specific savings that close the entire **£6.3bn** gap between HS2 Ltd’s costings and the agreed international cost benchmark. Embedding these savings would allow Phase 2 to be built at an overall point cost of £15.9bn, or a cost including contingency of £22.3bn (i.e. at £65m per km). That would also obviously be comfortably within the Phase 2 SR envelope of £24.4bn.

### Route Decisions

7. The savings start with the Transport Secretary’s proposal (his minute to you of 3 June) to adopt an ‘Eastern Leg’ route that more closely follows the M18 – an option that HS2 Ltd were already developing and that saves £768m.

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<sup>1</sup> ‘Point cost’ is the cost without any contingency allowance. This is sometimes also known as ‘base’ cost.

## OFFICIAL SENSITIVE

Rather than building a brand new – and expensive – station at Meadowhall, Sheffield would instead be served by a connection off the high speed network to the existing Sheffield Midlands station. The savings figures presented here assume that HS2 Ltd would then fund a further connection back to HS2, north of Sheffield, creating a ‘loop’ for journeys from Sheffield to Leeds and destinations further north. This not only eliminates the need for the £337m Meadowhall station; it also brings an HS2 service directly into Sheffield centre. In addition, it also has the advantage of delivering the Sheffield – Leeds ambition of Northern Powerhouse Rail. All the other savings options set out below are costed on the basis that this revised route is adopted.

### Earthworks

8. **The second big saving we have identified and agreed with DfT and HS2 Ltd is a reduction of £1.22bn from changes to the earthworks that are planned along the line.** These come from a combination of: building the Phase 2 line closer to ground level, rather than artificially sinking the line; adopting reasonable engineering standards for depth and slopes, rather than highly conservative ones; and reusing material locally wherever possible, rather than costly transportation up and down the line. You should note that full delivery of this saving depends on Ministers taking a firm approach when it comes to parliamentary scrutiny in regard to route alignment, and not agreeing to unnecessary tunnels, or the sinking of the line in the face of stakeholders’ requests, as was the case on Phase 1. For example, the average depth of the Phase 1 line was 2.9m below ground level when originally planned. It ended up 10.7m below after concessions were made on tunnels and on sinking the open line out of site, hugely increasing the amount of earth that needs to be transported away from the point of excavation.

### Other Cost Savings

9. A range of other savings options are set out more fully in individual annexes to this paper. All have been agreed by DfT officials and HS2 Ltd, subject to the further work and assurance I describe later. Key proposals to note are:

## OFFICIAL SENSITIVE

- a. replacing 25% (11.5km) of the previously planned viaducts with cheaper embankments, based on revised expert engineering advice (**£310m saving**);
  - b. holding the cost of building viaducts and tunnels at the level of reasonable, benchmarked comparators. For viaducts this means building at £23m per km rather than the originally budgeted cost of £32m per km; and for tunnels at £21,000 per single bored metre, rather than the £26,900 originally planned (**£750m saving**);
  - c. holding the indirect costs of Phase 2 – such as the costs of running the HS2 Ltd company itself – to a benchmarked maximum of 16.5% (**£539m saving**);
  - d. setting cost envelopes for the four new stations being built in Phase 2 that reflect the benchmarked costs of new build (**£60m saving**);
  - e. driving efficiencies in the £2.2bn budget for local, specific construction costs (**£495m saving**);
  - f. adopting international best practice on supply chain payment systems, thereby avoiding unnecessary financing costs (**£325m saving**);
  - g. improving supply chain productivity as a result of the lessons learnt during Phase 1 construction (**£1.4bn saving**); and
  - h. a combination of other, smaller savings (**£440m saving**).
10. There is scope to go further. The review team has identified Phase 2 income opportunities of **£260m-£300m**, for example by: achieving greater rental receipts from Phase 2 land and property; and winning more funding from the EU’s Connecting Europe Facility. These further reduce the net cost of the project.

### Rolling Stocks and Depots

11. Turning to rolling stock and depots, the total ‘point’ cost estimate for these over both phases of HS2 is £5.5bn, with £1.6bn added on top for contingency. This covers HS2 Ltd’s projected cost of purchasing the 165 trainsets that they estimate they need to run the full high speed service pattern, plus associated depots and spares. Here, the review has identified a further £743m of (pre-contingency) savings, roughly as follows:

## OFFICIAL SENSITIVE

- a. in Phase 1, procuring only ‘classic compatible’ trainsets (that can be used on both HS2 and existing lines), rather than a mix of classic compatibles and trains that are ‘captive’ just to the high speed line (**£206m saving**);
- b. setting a benchmarked purchase price of £20m per trainset, versus the £22.5m price originally budgeted for by HS2 Ltd, for the trainsets still needed. (And I believe it should be perfectly possible to drive a hard bargain on the unit cost per trainset given the sheer size of the order, in which case it may be possible to increase the saving further) (**£405m saving**); and
- c. combining rolling stock and infrastructure depots on each of the legs of the route, rather than having separate depots on each leg. (**£132m saving**).

### Phase 2: Other Issues

12. There could be some further small Phase 2 savings in areas that we have not been able to dig into properly because of time, such as in environmental impact costs and the £2.3bn land and property portfolio. But my judgement is that further significant savings would now only come by looking at options that were out of scope for this review, for example:
  - a. Euston – using Old Oak Common as the London terminus in Phase 1, so delaying a decision on whether to use Euston at all; and
  - b. Church Fenton – removing the link from HS2 back to the East Coast Main Line north of Leeds, so that Newcastle and York continued to be served from King’s Cross, and not by HS2 as well.
13. For completeness, there are some major items where there is capital provision currently in the HS2 budget, but where a different financing structure, which would reduce C-DEL and instead switch some spend into R-DEL, may ultimately be both sensible and efficient. The two biggest are:
  - a. a train operating company or rolling stock company purchasing Phase 2 rolling stock, funded via fare revenues, reducing C-DEL by £3.3bn; and

## OFFICIAL SENSITIVE

- b. power companies paying for electrical distribution equipment, and then charging the HS2 operator for the power used, reducing C-DEL by £468m.
14. These decisions are not needed now, and will of course only affect the fiscal aggregates if we can design an alternative financing structure that takes this off-balance sheet. But DfT should be robust in ensuring that HS2 Ltd works on these options with a strong efficiency focus.

### Phase 1: Revised Savings

15. As promised in my first note, over the last month the review team have also worked to firm up numbers for savings available on Phase 1. These are now estimated to be between £875m to £1.05bn (i.e. an increase in the bottom-end savings forecast of £170m). There have been a number of moving parts, but the biggest is that we have upped the level of savings that can be achieved on the costs of stations, in line with the benchmarking approach adopted for Phase 2. There is more to be done to examine the costs of the £766m High Speed station at Old Oak Common, but I return to this later.

### Next Steps and the Power of Benchmarking

16. Overall, then, the work over the last 2 months has identified **a total of £8bn of savings** – roughly £1bn on Phase 1, £6.2bn on Phase 2, and £743m on rolling stock and depots. I am very grateful to the team for their excellent work and for the close cooperation from DfT and HS2 Ltd that has facilitated it. This has been a genuinely collaborative effort.
17. As you will have seen, and as the annexes show, many of these savings have been identified through adopting a ‘benchmarking’ approach. This has involved challenging the bottom-up, disaggregated and siloed costings of different aspects of the project with good evidence on what key components of the project should actually cost, drawn from other sectors or from international comparators, and asking logical questions about the reasons for any difference.

## OFFICIAL SENSITIVE

18. Though simple in concept, this approach allows project funders and sponsors to build intelligent challenge into the oversight and delivery of a major project such as HS2, where otherwise such cost scrutiny is hard to achieve. I believe this technique should be a permanent, on-going feature of the approach that both DfT and HS2 Ltd take to project oversight and assurance, and should be reflected as appropriate in the governance and funding regime between HMT and DfT, between DfT and HS2 Ltd, and within HS2 Ltd itself. Furthermore, I believe that this ‘benchmarking’ approach should be adopted much more widely in our approach to all major projects – including through business case development and gateway reviews – and indeed not just for costs, as we have done here, but for project benefits and project timetables too.

### Next steps

19. In terms of next steps and recommendations, these are as follows:

#### *Phase 2 Savings and Project Costs*

20. Subject to your, the Transport Secretary’s and the PM’s decisions, DfT are keen to consult on the M18/Sheffield route, and to use the wider savings identified in this work in their response to the NAO’s report on HS2 Phase 2. I recommend that they are supported to do this.
21. For the savings options listed in this report that you wish to pursue, I recommend that HS2 Ltd and DfT are mandated to develop them further, to inform final decision-making on Phase 2 in the autumn. More specifically:
  - a. the Phase 2b Route Decision and strategic outline business case (SOBC) are due for approval this autumn. I recommend that these savings proposals should be an explicit part of the SOBC’s financial case, including being rooted specifically in the benchmarking data and approach developed in this review;
  - b. similarly, the Outline Business Case for Phase 2a, due early in the New Year, should be accompanied by a revisiting of the Phase 2a financial case that likewise explicitly firms up and embeds the savings proposals and benchmarking approach developed here; and

## OFFICIAL SENSITIVE

- c. this SOBC should be scrutinised by both DfT's Perm Sec-chaired internal investment committee, as well as by the Treasury and Cabinet Office co-chaired Major Projects Review Group (MPRG). For the MPRG, the Infrastructure Projects Authority should be asked to assure that the Phase 2b financial case, and later the update to the Phase 2a financial case, have properly embedded the savings proposals laid out in this note.
22. As a result of this review it is now feasible to expect Phase 2 of the project to come in beneath its SR envelope. However, I do not recommend a downward reduction in the SR15 funding now: this is a decision for the future once route decisions and scope are firmed up.
23. However, I strongly recommend that **HMT and DfT set HS2 Ltd a new, Benchmarked Total Design Cost (BTDC) for Phases 2a and 2b of the project.** Unless someone can come up with strong arguments to the contrary, I recommend that this is based on the benchmarked cost of **£65m per km, meaning a BTDC for Phase 2 as a whole of £22.3bn (assuming the M18 route).** Final numbers will need to be subject to detailed assurance by DfT's Board Investment and Commercial Committee and by the MPRG, however the specific BTDC for Phase 2b should be set by Ministers following advice from the MPRG this autumn and for Phase 2a in the New Year. **These should be the targets used by HS2 Ltd in all of their planning work;** in pricing and incentivising the preliminary service contractors; and in reporting back to DfT.
24. DfT and HS2 should be allowed to manage flexibly within this BTDC. But to ensure an on-going drive for efficiency, I recommend that an additional set of **Benchmarked Indicative Asset Costs (BIACs) be introduced for all major asset types and that HS2 be asked to challenge and assure its plans against these, with reporting against these back to DfT and HMT.** The intention here is to embed, at the asset level, a far stronger 'design to cost' approach within the work of HS2 Ltd, and in its approach to procurement. These BIAC's should cover tunnels; viaducts and bridges; earthworks and embankments; stations; utilities and roadworks; land and property returns; rolling stock; depots; and project overheads. They should

## OFFICIAL SENSITIVE

be finalised at the MPRG this autumn, and be based on the detailed benchmarking data on quantities and costs that have been developed in this process.

25. In some areas, I am not wholly satisfied that the full potential to bear down on costs has been realised. So I recommend that the MPRG this Autumn only sign off the Phase 1 rolling stock and station procurements that are to come if they are satisfied that DfT and HS2 Ltd have taken proper account of the review's findings:
- a. on rolling stock, where I believe there are opportunities to drive down unit costs below £20m per trainset, by leveraging the fact that this will be the largest order of high speed trainsets in the world; and
  - b. on stations, where I believe there is potential to go further to reduce the costs of roofs and other components, through a proper analysis and benchmarking of costs, and where more ambitious savings are particularly needed for Old Oak Common high speed station.

### *Embedding Benchmarking in Future Governance and Assurance*

26. As a result of this review, HS2 Ltd have developed their own plans for using benchmarking to control costs and drive delivery. For example, they are planning to use this formally within their board decision-making, and to set up an 'International Benchmarking Club' to share confidentially key performance and cost data between major high speed nations. (COMET, an equivalent club of city metro authorities, already works well for urban transportation). These HS2 Ltd initiatives should be warmly welcomed.
27. However, going forward, John Manzoni and I believe that benchmarking should now be used as a core and on-going part of the governance and assurance between government and HS2 Ltd, not just a one-off for this autumn, and not just within HS2 Ltd itself. So I recommend that:
- a. the approach outlined above, of an overall BTDC and of asset-specific BAICs, be adopted for HS2 Phase 2 in the future;
  - b. that this approach is properly reflected in the framework of financial delegation from the Treasury to DfT, and from DfT to HS2 Ltd, giving HS2 Ltd greater autonomy to deliver the project, but within a clearer

**OFFICIAL SENSITIVE**

accountability framework of benchmarked cost and delivery. Consideration should be given as to whether the development agreement between DfT and HS2 Ltd, which sets out the approach to the establishment of a 'Target Price' (hitherto on Phase 1 only), should be revisited, or whether the benchmarking approach can be built effectively into it;

- c. these BTDC and BAICs are formally assessed and re-set every two to three years prior to the start of construction – for example, as part of the next SR process – and cascaded to HS2 Ltd as appropriate;
- d. the detailed benchmarking quantity and cost data on which these budgets are set, be refreshed at the same time, to reflect (for example) cost-reducing innovations and technical breakthroughs happening in the rest of the world; and
- e. these detailed benchmarking data are assured internally by the Infrastructure Projects Authority, as part of the process of budget review.

**JEREMY HEYWOOD**

22 June 2016