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## Rolling stock plan

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### Introduction

1. The White Paper 'Delivering a Sustainable Railway', published in July 2007, stated that the Government would publish a rolling stock plan by January 2008, setting out in more detail how rolling stock would be used to deliver increased capacity. This document is that plan.

2. The Rail Technical Strategy (RTS), published at the same time, set out the Government's long term aspirations for rail vehicles.

3. The main focus of this plan is on the steps that will need to be taken to enable the English Train Operating Companies (TOCs) and Network Rail to deliver the additional capacity in the HLOS period 2009 to 2014 (otherwise known as Control Period 4 or CP4). However, this rolling stock plan will also set out the steps that the Government is taking to achieve the longer term aspirations set out in the RTS.

4. In terms of HLOS, in some cases the additional capacity will be secured through the procurement of new rolling stock; otherwise, it will be secured through re-deploying existing rolling stock which is displaced by new. (In the rail industry, this process is known as 'cascade'.)

5. Possible procurement routes for new additional rolling stock are explored in this plan.

6. However, this rolling stock plan does not set out detailed lists of rolling stock fleets or exact dates for their introduction on specific routes. It will be some time before this detail is finalised, having been developed through close working with the industry. However, the plan is intended to set out a base strategy within which the railway industry can develop its plans constructively and effectively.

## **Delivering the Rail Technical Strategy**

7. The Government has already taken the first steps in delivering the next generation of rolling stock as set out in the RTS. This rolling stock will be lighter, more reliable and more energy efficient.

8. Network Rail, through its leadership of the Network Route Utilisation Strategy (RUS) process, will take this work forward with the support of the cross-industry Technical Strategy Advisory Group.

9. The Intercity Express Programme (IEP), Thameslink and Crossrail programmes are intended to take forward the next generation of rolling stock. These programmes are all now likely to proceed and each requires that a substantial number of new vehicles be delivered on to the network.

10. The impact on rolling stock of these programmes and other significant projects is set out below.

## **Intercity Express Programme (IEP)**

11. It is expected that the vehicles for the Intercity Express Programme will meet the aspirations in the RTS for the next generation of vehicles for longer distance travel and inter urban routes. The IEP base case introduces approximately 90 full train length equivalent diagrams from 2013 to 2017. There are options for a further approximately 50 full train length equivalent diagrams for introduction between 2014 and 2018. The procurement for the IEP is led by DfT with industry stakeholder involvement, including TOCs and Network Rail to deliver lowest whole life and whole system cost. The winning bidder will be responsible for design, manufacturing, financing, long-term maintenance plus operational reliability and availability. The IEP invitation to tender is available on the DfT website.

## **The Thameslink Programme**

12. The Thameslink Programme delivers additional capacity onto this key cross London route. The programme is staged, with additional capacity (Key Output 1 - KO1) delivered in December 2011 and a further tranche of capacity (Key Output 2 - KO2) delivered in December 2015.

13. It is expected that the new vehicles for the Thameslink Programme Key Output 2 (KO2) in 2015 will be the next generation design for Electric Multiple Units (EMUs) as described in the RTS. The completion of the Thameslink Programme KO2 in 2015 requires the introduction of up to 1300 new vehicles. In order to introduce such a large number of new vehicles, it is anticipated that they will be phased into service over a period of time in advance of 2015.

14. The procurement options for the rolling stock for this project are currently being evaluated but it is likely that this will be led in the initial stages by the DfT.

15. In addition, the programme requires additional vehicles for KO1 in 2011. It is expected that these vehicles will be either cascaded existing EMU vehicles or new vehicles based on existing designs with some, but maybe not all, of the features of the next generation vehicles. However, it is possible that the next generation vehicles proposed for KO2 in 2015 could be delivered earlier, possibly by 2010 to 2011, if manufacturers are capable of delivering the required outputs.

16. Once next generation vehicles are introduced for KO2, the existing fleet of EMUs operating the Thameslink routes could be used for cascade on to other routes to deliver additional HLOS capacity.

## **Crossrail**

17. The new Crossrail services require the phased introduction of approximately 600 vehicles by 2017 to operate services across London, once the tunnelling works are complete.

18. Procurement will be led by Transport for London and Cross London Rail Links. It is likely that these vehicles will also meet the aspirations for the next generation of EMUs and may be similar, but probably not identical, to those proposed for the Thameslink Programme.

19. The expanded fleet for this project will displace some existing stock and whilst some of these (Class 315s for example) will be nearing the end of their planned lives, others, such as Class 165s and 360/2s would be available for use elsewhere on the network.

## **Next Generation Multiple Unit and Tram Train**

20. DfT has already started discussions with the industry regarding the development of the designs for next generation multiple units. It is proposed that this family of trains meets the long term aspirations for both regional and urban diesel and electric trains, making best use of emerging technologies.

21. In addition, a project is also being developed to establish a trial for a tram train in the UK. If successful, this could lead to wider introduction on urban, rural and Community Rail routes.

22. Whilst both these two projects are currently led by DfT, there has been no decision yet on the role of DfT and it is not necessarily the case that DfT would take the lead on the procurement arrangements.

## **Procurement and Financing of Rolling Stock**

23. Rolling Stock in the UK is privately owned and financed. It is appropriate that Government takes the initial lead on complex projects, setting a framework for them to be financed and delivered by the private sector. To facilitate delivery of these projects and to ensure value for money, it is sometimes appropriate for DfT to specify rolling stock in franchises. Whole life costs and value for money considerations will continue to lead the DfT to the most appropriate specification, financing and procurement solutions.

24. Almost all of the current passenger rolling stock is financed via operating leases. However, the risk and reward structure for IEP, and potentially Thameslink and Crossrail, may be different.

25. The DfT has concerns over operation of the passenger rolling stock leasing market. On the 28th June 2006, DfT made a submission to the Office of Rail Regulation (ORR) to request that the ORR refer these markets to the Competition Commission for investigation under section 131 of the Enterprise Act 2002. After due consideration, the ORR made this reference to the Competition Commission on the 26th April 2007.

26. DfT is keen to ensure that the new vehicles for delivering the capacity metric in HLOS are procured in a manner that delivers best value for money and appropriate transfer of risk. Furthermore, DfT is keen to see private sector experience used in the procurement process and therefore expects that TOCs will lead in the procurement of the additional vehicles.

## **European Rail Traffic Management System (ERTMS)**

27. The implementation of ERTMS requires synchronisation between the fitting of rolling stock and of infrastructure. The Network Rail led National ERTMS team has developed a detailed implementation programme based on assumptions of where rolling stock will be operating over the next twenty years. DfT will continue to work with Network Rail to ensure the alignment of infrastructure enhancement and rolling stock deployment.

## **Meeting Access Standards by 2020 (RVAR and PRM TSI)**

28. The Rail Vehicle Accessibility Requirements (RVAR) and the Persons with Reduced Mobility Technical Standard for Interoperability (PRM TSI) set out clear requirements for access to rolling stock. Whilst new vehicles meet these requirements there are many older fleets of trains which do not.

29. Full compliance with the standards could be very expensive and for some fleets with only a short remaining life, it could be uneconomic to undertake the work.

30. In applying the RVAR and PRM TSI, the Government will adopt a pragmatic approach and will consider instances of minor non-compliance on a case-by-case basis. DfT believes that this pragmatic approach will be supported by disability stakeholders.

31. The rolling stock leasing companies (ROSCOS) and train operating companies (TOCs) have already started to develop and promote pragmatic proposals to make fleets substantially compliant. DfT welcomes these approaches and looks forward to proposals covering other fleets.

32. The proposals depend on the level of investment which the train owners and operators are prepared to put into individual fleets so therefore it is neither necessary nor appropriate for the DfT to publish lists of which vehicles it expects to be in service beyond 2020 and which vehicles it does not expect to be in service beyond 2020.

33. These arrangements should deliver early improvements in access to vehicles as well as allowing TOCs and ROSCOs to plan for the long term.

## **Longer Term Development**

34. While the primary focus of this rolling stock plan is on delivering the additional capacity in CP4, it is appropriate that consideration is given to the longer term. During CP5 (2014 to 2019) and CP6 (2019 to 2024) a number of significant changes to the railway are likely to be happening which need to be reflected both in planning for rolling stock acquisition and in the industry's research and development agenda.

35. The Railway Technical Strategy, published in July 2007, set out an approach to the development of a "family" of train specifications aimed at lower whole life, whole system cost combined with lower emissions, higher capacity, flexibility of power source and appropriate levels of performance for the duty. This work is now being taken forward within the Network RUS, under the overall supervision of the Technical Strategy Advisory Group. The initial target for this work was the Inter-City Express Programme. Further work is going on to establish a specification for a "New Generation Multiple Unit" which will be reflected in the Thameslink new generation urban electric rolling stock and that for Crossrail in due course.

36. A critical aspect of the new generation design is to lower whole system, whole life cost by adopting a "low mass train, high quality low maintenance track" approach. The IEP Programme has pioneered this work in the UK and has built on commitment from Network Rail to improve its track standards to the point where a significant reduction in train mass and overall cost can be expected. DfT intends this approach to apply to all long term rolling stock developments from now on. A feature of CP5 is that there are fleets of EMUs and DMUs that will be approaching the end of their planned lives. This will provide a further opportunity for the introduction of the next generation multiple units.

37. The introduction of "next generation" EMUs for the Thameslink programme is likely to generate a cascade of existing EMUs, for use elsewhere on the network, very early in CP5. This presents a significant opportunity in considering the business case for incremental or infill electrification schemes.

38. DfT recognises the need for electrification to be planned on a long term basis taking account of likely future trends in electricity generation mix, portable fuel availability and price and the social cost of carbon. Network Rail with its industry partners is working through the Network RUS to review and develop the business case for further electrification and will take account of the implications of this document.

39. The advent of Stage IIIB of the Non Road Mobile Machinery Regulations (NRMM) in 2011/12 may make the design of underfloor diesel trains more difficult and complex, particularly for high powered trains given the constraints of the UK loading gauge. This may improve the long term case for electrification.

40. Whatever programme emerges for electrification, it is clear that self powered trains will be running on diesel with an increasing element of biofuel for many years to come. Hybrid drives using flywheels, hydraulic accumulators, batteries or supercapacitors to store regenerated energy are feasible now and offer significant improvements in energy efficiency as demonstrated by their use on Londonbuses. It is likely that self powered trains of the future will use these technologies and DfT is encouraging industry to bring forward the development so that they are available sooner.

41. The same technology can be used to improve the efficiency of electric trains by storing regenerated energy locally rather than depending on another train to re-use it. Electric trains with on-board energy storage could in principle operate "off the wires" and DfT will be investigating with industry the potential of this type of system to avoid high electrification costs for operation of local services or where single major infrastructure constraints exist on a route which is otherwise suitable for electrification.

42. Hydrogen fuel cells for automotive transport are the subject of a high level of research and development funding in the US and Europe. In principle this technology is applicable to rail, but unless a low carbon source of hydrogen is also developed it is unlikely to displace electrification for high density and high speed routes in the foreseeable future. However, it is a potential long term solution for low density and rural routes where electrification may never be justified and DfT is encouraging industry to participate in European development in this area.

43. Whatever power source is used for future trains, they will need to be lighter whilst maintaining the same safety standards for passengers and crew. European framework research in this area is currently lacking funds, but the work is important and should be continued by cooperation between manufacturers and national railway bodies, if necessary supported by a consortium of member states.

## **High Level Output Specification (HLOS)**

44. The Railways Act 2005 (RA05) Statement (published at the same time as the July 2007 White Paper) contained the Government's High Level Output Specification (HLOS).

45. The HLOS capacity metric sets out the total demand to be accommodated on the network and is expressed in terms of annual passenger kilometres (demand) to be accommodated on each of the 23 English & Welsh strategic routes by 2013/14. This is set out in Table A3 of the RA05 Statement.

46. Within the HLOS, the capacity metric sets out the additional peak three hour and high peak hour passenger capacity in London and other main urban areas to be provided by the end of Control Period 4 (CP4). This is set out in table A5 and A4 of the RA05 Statement and reproduced in Appendix A of this plan.

47. Each table specifies the number of arriving passengers to be accommodated on services into stated destinations on a weekday morning in the peak three hours, and in the high peak hour. As with the Strategic Route demand, this is expressed as a forecast of the 2008/09 'base' demand and the additional demand to be accommodated by 2013/14.

48. As well as specifying Birmingham, Cardiff, Leeds and Manchester, Table A4 includes a specification for "Other Urban Areas". The HLOS leaves it open to the industry to determine the cities in which this additional capacity is to be provided, although certain cities (Bristol, Leicester, Liverpool, Sheffield,

Nottingham and Newcastle) are noted as having been evaluated in our preparatory work, on the grounds of having significant rail commuting.

49. The White Paper noted that accommodating this demand was likely to require around 1,300 additional carriages for English franchises by 2014. Owing to the lead times on design, procurement, manufacture and introduction it is expected that most of these new vehicles will be based on existing designs, but with some, but maybe not all, of the features of the next generation multiple units.

50. The vehicles required for the Thameslink Programme KO1 in 2011 are included in the total of 1300 new vehicles. It is expected that some of the vehicles required for the full KO2 service in 2015 will also be introduced during CP4.

51. Network Rail has recently produced its strategic business plan (SBP) for CP4 which includes the industry's proposals on how best to introduce the additional capacity required to deliver HLOS. Network Rail will be responsible for delivering the infrastructure enhancements, (such as longer platforms, power supply upgrades and changes to depots and stabling sidings), associated with the introduction of longer trains. It is essential that the development of these infrastructure plans is aligned with the proposals to introduce new trains and DfT will continue to work with Network Rail and the industry to ensure this is the case.

52. Detailed development of these proposals will continue over the coming months. The emerging indicative number of vehicles is set out in Appendix B. The additional trains may be new vehicles or vehicles cascaded from other services.

## **HLOS delivery plan**

53. The regulatory framework will determine the scope and cost of Network Rail's SBP. However, the full cost of implementing capacity increases committed in the HLOS not only includes infrastructure changes but also the cost of train service provision, which the DfT, as the franchising authority, is directly responsible for procuring.

54. Where the incidence of a franchise replacement allows the timely provision of the required extra capacity, the DfT will specify the additional capacity in the Invitation to Tender for that franchise.

55. However, much of the extra capacity will be procured through variations to current franchises, for which DfT will follow a process with each TOC of detailed specification development, pricing and negotiation - in accordance with the terms of the franchise agreement between each franchisee and the DfT.

56. The portfolio of capacity requirements could change given the two critical 'gateways' of credibility (is the right amount of capacity delivered by the proposal) and deliverability (is there a robust, franchise-owned, plan for delivering the capacity) which will apply to the process, and flexibility will be needed to respond to this.

57. The solution design phase has already started with meetings between DfT, TOCs and Network Rail and detailed development of solutions will take into account the capacity requirement, the infrastructure enhancement requirements, TOC opportunities and constraints and rolling stock availability. The output from the solution design phase will be an agreed HLOS specification for each TOC.

58. Once the specification design has been agreed, the DfT will prepare a request for proposal (RfP) to send to the TOC. The RfP will require the TOC to price the agreed specification (which will be attached as an annex to the RfP). The RfP will also require the TOC to provide a CP4 delivery plan (taking into account any infrastructure enhancement requirements, provided by Network Rail, and other project interfaces).

59. The TOC will develop a priced proposal based upon the agreed specification supported by a detailed delivery plan. This will include an incremental financial model, the results of a re-run of the Franchise Financial Model (FFM) and a marked up copy of the Record of Assumptions (RoA). In parallel, DfT will update its comparator model (incremental financial model) and make an assessment of the changes required to the inputs and assumptions within the RoA).

60. The evaluation and negotiation phase will determine the affordability and value for money of each proposal - the final two gateways in the process - and again flexibility will be required to respond to proposals that do not meet these criteria.

## **HLOS Joint Industry Plan**

61. Whilst, at one level, DfT's primary role in the HLOS capacity programme is to specify the capacity that it wants to buy and the budget that it has set aside to do so, it does have a responsibility to the fare payer and the tax payer to ensure that the capacity is acquired and deployed in an efficient, affordable and value for money manner.

62. On the face of it merely specifying the capacity required at various stations would lead to a large number of small to medium rolling stock procurement initiatives managed by individual TOCs. This cannot be the most efficient route to delivering the capacity nationally and for this reason DfT has, over the last few months, engaged with various stakeholders within the industry to develop and review options for an appropriate national rolling stock procurement, cascade and deployment plan.

63. The plan, as it has developed, has been based on a small number of important principles; the general aim being to ensure deliverability, affordability and value for money. These principles are:

- To balance the need for long term improvement in energy efficiency and life cycle cost through improved rolling stock design with the goal of the HLOS programme which is to provide additional capacity when and where it is most needed, and to recognise that this is likely to result in many cases in incremental builds based largely on existing designs.
- To improve TOC cost efficiency and improved service performance by encouraging the development of homogeneous fleets.
- To enable manufacturers to reduce costs by minimising manufacturing "spikes" and keeping the orders for new rolling stock to a minimum number of high volume orders.
- To keep costs down by utilising where appropriate existing rolling stock that may be coming off-lease or may otherwise be available.

64. Whilst a cross industry plan will not be fixed for some time, and to a certain extent will be subject to change up to the point of implementation, there are some emerging conclusions from the industry stakeholder engagement work stream.



65. It is apparent that some initiatives are discrete with little or no dependencies on external activities - for example lengthening Pendolino rolling stock to provide additional capacity on the West Coast.

66. In other areas initiatives are necessarily more complex - as large, cost effective, orders of rolling stock in one franchise will release rolling stock to be cascaded to others.

67. An example of the procurement and cascade principle would be the competition for the new South Central franchise, commencing in September 2009, which provides an opportunity for the new franchisee to order a significant number of new trains which then facilitates a cascade to other franchises.

## **Depots and Maintenance**

68. The additional vehicles for HLOS will need to be cleaned, stabled and maintained. Whilst some maintenance depots and stabling locations have spare capacity for these vehicles, there are many that do not. DfT will work closely with TOCs, NR and other industry players to ensure that new or enhanced facilities are developed in time for the deployment of the vehicles.

## **Other funderâs aspirations**

69. DfT is not the only funder of railway services wishing to see additional capacity delivered on the railway. Hence, DfT will continue to work closely with Transport Scotland, the Welsh Assembly Government, Transport for London, Merseytravel and other Passenger Transport Executives to co-ordinate the provision of additional rolling stock.

## **Appendix A â Tables A4 and A5 from the RA05 statement**

<b>Table A4: Peak demand to be accommodated in major urban areas by end of CP4</b>						
<b>City</b>	<b>Peak three hours</b>			<b>High-peak hours</b>		
	<b>Forecast demand in 2008/09</b>	<b>Extra demand to be met by 2013/14</b>	<b>Maximum average load factor at end CP4 (%)</b>	<b>Forecast demand in 2008/09</b>	<b>Extra demand to be met by 2013/14</b>	<b>Maximum average load factor at end CP4 (%)</b>
<b>Birmingham</b>	32,000	4,600	48%	15,400	2,400	55%
<b>Cardiff</b>	8,500	900	39%	4,000	600	43%
<b>Leeds</b>	23,400	5,100	64%	11,300	2,700	70%
<b>Manchester</b>	22,100	4,100	45%	10,700	2,200	49%
<b>Other urban areas</b>	27,700	3,600	41%	12,300	2,000	46%

<b>Table A5: Peak demand to be accommodated at the main London termini by end of CP4</b>						
<b>London Terminus</b>	<b>Peak three hours</b>			<b>High-peak hours</b>		
	<b>Forecast demand in 2008/09</b>	<b>Extra demand to be met by 2013/14</b>	<b>Maximum average load factor at end CP4 (%)</b>	<b>Forecast demand in 2008/09</b>	<b>Extra demand to be met by 2013/14</b>	<b>Maximum average load factor at end CP4 (%)</b>
<b>Blackfriars</b>	21,900	3,500	67%	11,200	1,200	76%
<b>Euston</b>	23,800	3,400		10,600	1,600	
<b>Fenchurch Street</b>	26,000	2,500		13,900	1,600	
<b>Kings Cross</b>	18,300	2,300		8,000	1,100	
<b>Liverpool Street</b>	74,300	10,600		36,700	4,900	
<b>London Bridge</b>	127,600	12,600		65,200	7,800	
<b>Marylebone</b>	9,100	1,000		4,600	600	
<b>Moorgate</b>	13,000	700		7,400	400	
<b>Paddington</b>	24,100	2,900		11,500	1,400	
<b>St Pancras</b>	25,900	10,900		13,100	5,700	
<b>Victoria</b>	58,700	5,300		29,300	2,800	
<b>Waterloo</b>	74,300	9,200		36,800	4,900	

## Appendix B

### Indicative Number of Additional Vehicles required by English TOCs by 2014

	<b>TOC</b>	<b>Number of Additional EMU vehicles</b>	<b>Number of Additional DMU Vehicles</b>
1	C2C	40	0
2	One	188	0
3	National Express East Coast	0	0
4	First Capital Connect	256	0
5	East Midlands Trains	0	3
6	London Midland	66	26
7	Intercity West Coast	106	0
8	Chiltern	0	12
9	First Great Western	0	52
10	South Western	105	0
11	South Central	106	0
12	South Eastern	110	0
13	Cross Country	0	6
14	Transpennine Express	0	42
15	Northern	24	158
	<b>England - Total</b>	<b>1001</b>	<b>299</b>

**Notes to the table**

The following are the assumed actions which underlie the rolling stock numbers by TOC presented in this Appendix B. They are not intended to be prescriptive, or to limit the development process with the industry, and therefore the final outcome could well be different.

1. The additional vehicles on C2C would be cascaded EMUs â likely to be either ten class 321 units from London Midland or ten class 317 units from the One franchise.
2. The One franchise would take on lease class 321 units cascaded from London Midland. In addition, the franchise would order new EMU vehicles for services on the West Anglia route to Stansted airport, in turn releasing Class 317 vehicles to provide more coaches on other services
3. National Express East Coast is already committed to introducing additional locomotive hauled carriages as part of the recently awarded franchise.

4. First Capital Connect would take on lease class 321 units cascaded from London Midland for use on Great Northern services. First Capital Connect would also take on lease class 313 units cascaded from the London Rail Concession for use on Great Northern inner suburban services. The Thameslink project will also introduced new EMU vehicles.

5. East Midlands Trains would introduce additional DMU vehicles, cascaded from the Northern franchise, for use on services into Leicester and Nottingham. Alternatively, the Cross Country franchise would provide additional vehicles on services into Leicester.

6. London Midland is already committed to introducing new trains into the franchise. The introduction of these new vehicles will facilitate cascades to other franchises. The London Midland franchise would introduce additional class 323 vehicles cascaded from Northern, (which would be back filled with new build or cascaded vehicles).

7. The Intercity West Coast franchise would introduce additional coaches into the Pendolino trains.

8. It is expected that Chiltern will introduce additional DMU vehicles as part of the existing franchise agreement.

9. First Great Western would introduce additional class 150 DMU vehicles for regional services around Bristol cascaded from London Midland, as well as new DMU vehicles for London suburban services. Furthermore, the possibility of lengthening some existing HST sets to increase capacity on the Thames Valley route into Paddington is being investigated.

10. Additional capacity on South West Trains would be delivered through a combination of new EMU vehicles together with possibly some EMU vehicles cascaded from the South Central franchise.

11. It is expected that the new South Central franchisee will order new suburban EMU vehicles. This will enable them to convert existing class 377 vehicles to operate as dual voltage units and then make them available to First Capital Connect for the operation of Thameslink services. Once new next generation EMUs are introduced on Thameslink, the class 377 vehicles can be returned to the South Central franchise. Furthermore, the introduction of new EMU vehicles on South Central will enable class 465 EMU vehicles to be returned to SouthEastern.

12. Additional capacity is to be delivered in the SouthEastern franchise through the SLC2 timetable maintaining train frequencies and lengths and the introduction of High Speed domestic services to St Pancras.

13. Cross Country franchise is already committed to introducing forty additional vehicles with the introduction of five High Speed Train sets. Additional DMU vehicles would provide additional capacity around Leicester.

14. It is expected that Transpennine Express will introduce additional new DMU vehicles to strengthen existing services and provide additional capacity in many regional conurbations.

15. Northern would introduce new DMU and EMU vehicles not only to deliver additional capacity within the franchise but also to ensure existing DMU and EMU vehicles (class 323 units) can be cascaded. Other additional capacity in the franchise is likely to be provided by cascaded vehicles from the West Midlands

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franchise and the London rail concession.