

Board

Date: 1 July 2015

Item: Modernisation of the District, Metropolitan, Circle and Hammersmith & City lines, and Automatic Train Control Contract

This paper will be considered in public

1 Summary

- 1.1. The purpose of this paper is to provide an update to the Board on the status of the modernisation of the District, Metropolitan, Circle and Hammersmith & City lines (the Programme) including the reprocurement of the Automatic Train Control (ATC) Contract.
- 1.2. The Board is asked to approve a revised Project Authority for the Programme and subject to satisfactory close of the remaining issues with Thales Ground Transportation Systems UK Limited (Thales), to delegate to the Commissioner authority to:
 - (a) grant Procurement Authority within the upper limits set out in the paper on Part 2 of the agenda for the award of the ATC Contract, Maintenance Support Contract and the Capital Framework Agreement (the Agreements) and to agree the substantive terms of the Agreements; and
 - (b) grant Procurement Authority within the upper limits set out in the paper on Part 2 of the agenda for the Rolling Stock Contract with Bombardier Transportation UK Limited to enable the train fitment for the ATC Contract.
- 1.3 On 17 June 2015, the Finance and Policy Committee endorsed the recommendations in this paper. The issues raised by the Committee are summarised in section 11 of this paper.
- 1.4 A paper is included on Part 2 of the agenda, which contains exempt supplementary information. The information is exempt by virtue of paragraph 3 of Schedule 12A of the Local Government Act 1972 in that it contains information relating to the business affairs of TfL. Any discussion of that exempt information must take place after the press and public have been excluded from this meeting.

2 Recommendations

- 2.1. **The Board is asked to note the paper and the supplementary information on Part 2 of the agenda, and:**
 - (a) **grant revised Project Authority, of £5,412m, for the Sub-Surface Upgrade Programme for the modernisation of the District,**

Metropolitan, Circle and Hammersmith & City lines (the Programme), such Project Authority to be split into the two sub-programme authorities specified in Table 6;

- (b) delegate to the Commissioner authority to:**
 - (i) grant Procurement Authority within the upper limits set out in the paper on Part 2 of the agenda for the Automatic Train Control (ATC) Contract, the Maintenance Support Contract and the Capital Framework Agreement (the Agreements);**
 - (ii) approve the substantive terms of the Agreements;**
 - (iii) subject to satisfactory terms being agreed, authorise TfL Officers and Subsidiaries (as described in paragraph 2.2) to finalise and enter into the Agreements with Thales Ground Transportation Systems UK Limited;**
 - (iv) grant revised Procurement Authority within the upper limits set out in the paper on Part 2 of the agenda for the Rolling Stock Contract with Bombardier Transportation UK Limited to enable the train fitment for the ATC Contract;**
 - (v) authorise the agreement and execution (whether by deed or otherwise on behalf of TfL or any Subsidiary (as appropriate)) any documentation to be entered into in connection with the completion and implementation of the Agreements and the Rolling Stock Contract and any of the matters referred to in them (including, without limitation, all agreements, deeds, guarantees, indemnities, announcements, notices, contracts, certificates, letters or other documents);**
 - (vi) authorise TfL Officers and Subsidiaries to do all such other things as they consider necessary or desirable to facilitate the execution and implementation of the Agreements and the Rolling Stock Contract and the matters referred to in them;**
- (c) in the event that a sub-programme's risk is inadequate, to authorise the Managing Director Finance to approve an increase in the Project Authority of that sub-programme and a corresponding reduction of Project Authority in the other sub-programme, such that total Project Authority is not exceeded;**
- (d) note that the Maintenance Support Contract has a duration beyond the end of the current Business Plan and future Business Plans will need to provide for the remaining years of operation; and**
- (e) note the proposed arrangements for the engagement of a Programme Support Partner and that authority for entering into the contract will be sought in accordance with Standing Orders.**

2.2. The following Officers and Subsidiaries shall have delegated authority:

- (a) TfL Officers: the Commissioner, Managing Director Finance, Managing Director Rail and Underground, General Counsel, Chief Finance Officer; and**

- (b) Subsidiaries: Subsidiaries of TfL including Transport Trading Limited and any other subsidiary (whether existing presently or to be formed) of Transport Trading Limited and any of the directors of the relevant company shall be authorised to act for and on behalf of that company.**

3 Background

- 3.1. The Programme is delivering the modernisation of four London Underground (LU) lines (District, Metropolitan, Circle, and Hammersmith & City). This modernisation will renew aging assets and allow more trains to run on these lines, to support London's growing population, which is expected to increase by 1.4 million people by 2030.
- 3.2. The District, Circle, Metropolitan and Hammersmith & City lines together make up nearly 40 per cent of the London Underground network, and include the oldest part of the network built in 1863. As well as circling central London, the lines serve suburbs in the West, North West and East of the capital and carry around 1.3 million passengers a day. Following completion of this work up to 32 trains per hour will operate on the core sections of these lines, and peak passenger capacity will be increased by an average of 33 per cent.
- 3.3. The Programme is London Underground's top priority, and will provide a crucial contribution to the increased capacity of London's transport network. It aligns closely with the Mayor's Transport Strategy Goals of: Improving Transport Opportunities, and Safety and Security, for all Londoners; Enhancing the Quality of Life for Londoners; and Supporting Economic Development and Population Growth.
- 3.4. The Programme is scoped to deliver work in two significant tranches, which, in combination, will achieve the necessary modernisation of the four lines, as follows:
- (a) introduction of new trains and substantial associated enabling works; and
 - (b) replacement of signalling with modern Automatic Train Control (ATC), supported by associated enabling works, to deliver faster, more frequent and more reliable services.
- 3.5. A significant proportion of the first of these tranches of work has been delivered. As of Period 1 2015/16 132 out of 191 new walk-through, air cooled, high capacity "S Stock" trains have been introduced onto the network. Three quarters of the existing authority has been successfully delivered to date, including the following:
- (a) replacement of the Metropolitan line A stock trains with a fleet of 58 eight car S8 trains;
 - (b) replacement of the Circle and Hammersmith & City line C stock trains with a fleet of 53 seven car S7 trains;
 - (c) partial replacement of the District line D stock trains with 21 out of an eventual fleet of 80 seven car S7 trains;
 - (d) track and signalling modifications at Edgware Road, Baker Street and Aldgate;

- (e) 224 stabling sidings enabled for S Stock use, including creation of a new stabling facility at Lillie Bridge;
- (f) 113 stations enabled for S Stock including upgraded communication interfaces between the new trains and platform equipment;
- (g) 17 platforms have been lengthened to accommodate the new trains;
- (h) adjustments to existing signalling on 310kms of track to accommodate the new fleet of trains, including replacement of track circuits and relocation of signals;
- (i) adjustments to existing power supply to accommodate the new fleet of trains, including 72kms of new low resistance conductor rail;
- (j) upgraded depot and stabling facilities have been delivered at Neasden and Hammersmith; and
- (k) construction of a new Service Control Centre building at Hammersmith to provide centralised control for all four lines.

3.6. Project Authority was first approved in July 2009 following the administration of Metronet. In April 2011, the Finance and Policy Committee, acting under delegated authority from the Board, approved revised Project Authority of £4,225m to reflect rebaselined Programme scope and cost. Contingency of £364m was also approved but was centralised at LU level, with drawdown requiring Board approval.

3.7. In February 2013, the Board approved the inclusion of three budgeted projects that were previously outside the scope of the Programme to maximise delivery efficiencies. This increased the overall Project Authority to £4,244m. In November 2013, the Board approved a drawdown of £15.3m from contingency, in order to undertake additional scope, increasing the overall Project Authority to its current value of £4,259m.

3.8. Following cancellation of the ATC Contract with Bombardier at the end of December 2013, LU began a comprehensive rebaselining of the Programme, and in parallel a new procurement was launched to select a modern ATC system for these lines.

4 Programme Scope

4.1. In addition to the delivered scope outlined in paragraph 3.5, the remaining items of the Programme, not yet delivered, included in the April 2011 scope were as follows:

- (a) completion of the roll-out of S Stock trains on the District line;
- (b) S Stock stabling, train maintenance and cleaning facilities at Ealing Common and Upminster depots;
- (c) completion of power supply modifications;
- (d) new Automatic Train Control (ATC) system incorporating Automatic Train Protection, Operation, Route Setting and Supervision to replace existing signalling;
- (e) installation of associated signalling equipment on S Stock, engineering vehicles and heritage trains;
- (f) fit out of the Service Control Centre and Integration of signalling and other management systems, including train arrival information;

- (g) signalling enabling works including power supply for the signalling system, equipment rooms and cable routes;
- (h) track layout changes where necessary to enable higher trains per hour, reduce the capital costs of resignalling, improve journey times, and reduce whole life costs; and
- (i) installation of signalling equipment to allow existing Piccadilly line trains to be manually operated under the protection of the new signalling system where they operate over the same tracks as District and Metropolitan trains; to include installation of lineside signalling on the section of the Piccadilly line which links these two areas (Rayners Lane Junction to Hanger Lane).

- 4.2. Following the shortlisting of Thales as the preferred bidder for the new ATC contract, see paragraph 7.2.2, a review of the previously authorised programme scope has been carried out in order to align works with the functionality of the Thales ATC systems, and review all other deliverables within the Programme. This review has incorporated lessons learnt from the Northern Line Upgrade (NLU).
- 4.3. This process has also included an in-depth review to identify the minimum scope to deliver Programme benefits. This considered whether reductions in geographical coverage of ATC, or implementation of fewer track modifications, could be accommodated whilst protecting the Programme benefits. The latter element of this has resulted in some significant scope reductions, but retention of the full geographical coverage of ATC across the four lines and corresponding benefits.
- 4.4. The revised scope has had cross-business consultation to ensure the impacts are fully assessed. To oversee and direct the ATC reprocurement and programme rebaselining, the Managing Director, Rail & Underground established a Steering Group that includes participation from the Independent Investment Advisory Programme Group (IIPAG).
- 4.5. As a result of the above reviews, the following changes are proposed to the previously approved scope:
- (a) revisions to ATC programme scope to provide the interfaces with the Thales ATC system;
 - (b) revisions to the technical signalling solution on some of the sections where tracks are shared with other services:
 - (i) the Wimbledon branch of the District line, which is Network Rail managed, will now have an ATC signalling overlay rather than full resignalling (matching the established solution for the Richmond branch and consequently reducing design variants);
 - (ii) Piccadilly line trains will not be fitted with new signalling equipment;
 - (iii) the section of the Piccadilly line between Rayners Lane Junction and Hanger Lane Junction will no longer be resignalled by the Programme; and
 - (iv) the signalling solution for the interoperable sections of the Sub-Surface Railway (SSR) and Piccadilly lines will include conventional signals to allow for continued operation of Piccadilly services on these sections. This solution will provide a suitable starting point for the

- subsequent New Tube for London Programme modernisation of the Piccadilly line;
- (c) the number of planned track layout changes to be delivered by the Programme has been reduced following an extensive review, which has incorporated system modelling delivered as part of the ATC System Readiness project (see paragraph 7.4.4):
 - (i) this has demonstrated that fewer changes are required to deliver the 33 per cent capacity increase with the Thales signalling system;
 - (ii) changes to simplify the existing track layout and therefore minimise the cost of ATC have been retained; and
 - (iii) to reduce delivery risk, other previously planned track layout changes are to be delivered (subject to business case) after the commissioning of the ATC system, and outside of the Programme;
 - (d) addition of a package of platform works to reduce the stepping distance between trains and platforms; and
 - (e) additional long term, S Stock train overhaul capability at Neasden Depot.

5 Programme Delivery

5.1. Programme Management

- 5.1.1. The Programme delivery organisational structure has been changed to focus on the ATC phase of the programme. These changes have achieved the following:
 - (a) ATC and New Trains have been brought together in one Railway System Delivery Team;
 - (b) an Infrastructure team holds the remainder of the delivery of LU's enabling obligations;
 - (c) Engineers have been embedded within these delivery teams to support delivery; and
 - (d) A central engineering team has also been retained to support assurance and systems integration.
- 5.1.2. In addition, a cultural transformation programme is now underway, with a strong collaboration focus. This programme will be extended to suppliers, including Thales and Bombardier, and stakeholders as part of the One Team initiative (see paragraph 5.2).
- 5.1.3. In order to enhance the Programme delivery capability and build upon the successful delivery of the NLU, a number of key leadership roles have now been filled by NLU experienced people. These roles include the Programme Director, Head of Railway Systems Delivery and Programme Delivery Managers for Signalling and Trains. Further experienced managers and engineers from LU's NLU and Victoria line Upgrade projects have also been brought into the Programme. These appointments supplement existing experienced staff who have successfully delivered the Programme scope to-date in trains and infrastructure.
- 5.1.4. To bring a more strategic focus to the Thales relationship across the Rail and Underground portfolio, all Thales-facing staff are being brought into the Programme, so a programme management approach can be adopted to ensure that Thales deliver all of their commitments, not just ATC.

- 5.1.5. In terms of Thales commercial management, a co-ordinated approach will also be adopted across the various Thales contracts.
- 5.1.6. In the UK, Thales staff involved in the Programme and LU project staff will be co-located. It is intended that LU will retain a Site Resident Engineer in Canada and will undertake risk based surveillance in other parts of the supply chain.

5.2. One Team Approach

- 5.2.1. The Programme has established and rapidly deployed the 'One Team' approach successfully utilised on the NLU. All key suppliers (including Thales and Bombardier) and key stakeholders have supported this approach. The One Team approach has at its heart:
 - (a) collaborative behaviours;
 - (b) a single source of truth on programme status, reviewed weekly at a senior management led 'Hub' meeting; and
 - (c) rapid escalation and resolution of issues at Hub meetings.
- 5.2.2. This approach will be strengthened by the inclusion of partnering arrangements in key contracts (particularly Thales for ATC and Bombardier for fitment of signalling equipment to trains).

5.3. Programme Support Partner

- 5.3.1. LU intends to appoint a Programme Support Partner (PSP) to enhance Programme delivery capability as a component of an integrated LU team.
- 5.3.2. The PSP will be directly employed by LU and will provide a core team to help support effective collaboration between all parties and drive efficiencies, and will have a remit to drive an integrated programme management approach throughout the ATC Programme.
- 5.3.3. The PSP will also have the capability to supply technical resources for ad hoc programme management roles within the ATC Programme team. This part of the team can be expected to vary in size over time and the actual requirements will be identified during the implementation of ATC Programme partnering, which may include:
 - (a) providing temporary resources, as necessary, to support LU management teams in effective programme management;
 - (b) on an exceptional basis, providing temporary programme management resources, as necessary, to support LU suppliers in the delivery of their obligations; and
 - (c) transferring programme delivery skills and knowledge to the LU team.

5.4. Delivery Dates

- 5.4.1. The completion of S Stock introduction on the District line is currently forecast to be achieved by the target dates of December 2016, specified in the DfT 2010 TfL spending review agreement.

- 5.4.2. An integrated LU and Thales schedule for ATC introduction has been produced based on the commissioning of a set of Migration Areas (MAs) which, in combination, cover the four lines. This has been subjected to an initial Quantified Schedule Risk Assessment. The expected commissioning dates for these MAs are forecast to be between June 2019 and January 2022.
- 5.4.3. The phased introduction of the new ATC system from 2019 will mean that train services will become increasingly more reliable. These early benefits are partly as a result of the consolidation and improved visibility of the train control function at the new Hammersmith Control Centre. In addition, the Thales ATC system will control the headway between trains to make the service more regular and, in advance of new timetables that utilise the improved runtimes, will provide better capacity to recover from delays.
- 5.4.4. Based on the above expected commissioning dates, a series of incremental timetable changes are proposed from May 2021 onwards to take up new capability once ATC is delivered. These are planned to take place at carefully timed points during delivery to ensure benefits are delivered as early as possible, see Table 1.
- 5.4.5. These steps would result in the peak service frequency initially being increased in December 2021. Service frequency on the central London sections will be raised to the ultimate level of 32 trains per hour (tph) for 90 minute peak periods from May 2022. This is then forecast to be extended to cover the full three hour peak periods from December 2022, delivering the vast majority of Programme benefits by this date.
- 5.4.6. Work remains ongoing to ensure benefits are realised at the earliest point during roll-out, and opportunities to deliver benefits ahead of these dates are being explored. A number of infrastructure improvements will improve operational flexibility including the commissioning of additional track point work in Summer 2017 at Earl's Court. This will reduce congestion, particularly for Wimbledon branch services.
- 5.4.7. Given the above commissioning dates, sufficient train availability and the necessary track works, the options being explored, subject to final confirmation, could include:
- (a) Extension of "shoulder" peak period services on busy sections by up to an hour by 2017;
 - (b) Additional trains between Earl's Court and Wimbledon from 2018; and
 - (c) Extending further east District line off-peak services which currently terminate at Tower Hill by 2018.

Table 1 Proposed Timetable Change (subject to confirmation closer to delivery dates)

Timetable step	Main change(s)	Planned Timetable Date
1	Runtime improvements on central area sections	May 2021
2	30tph in central area and 24tph on Metropolitan trunk for 90 minute peaks	Dec 2021
3	32tph in central area and 26tph on Metropolitan trunk for 90 minute peaks	May 2022
4	32tph in central area and 26tph on Metropolitan trunk for three hour peaks	Dec 2022
5	32tph in central area and 28tph on Metropolitan trunk for three hour peaks	May 2023
6	Off peak enhancements	Dec 2023

5.5. Risk

- 5.5.1. The programme is undertaking its risk management and quantified risk assessment activities in accordance with existing defined processes. Jacobs, who is undertaking an independent risk review has confirmed the appropriateness of the process and competence of the staff undertaking this exercise.
- 5.5.2. An initial Quantified Schedule Risk Analysis (QSRA) for the overall ATC programme has taken place, following receipt of the final ATC programme from Thales. This has considered all known integrated programme risks; however there is some further work to ensure this is fully mature. Key risk areas relate to: potential additional scope due to the emergence of issues with legacy and inter-operability interfaces (e.g. depots, Network Rail, old signalling interfaces); potential delays due to restricted access or late provision of LU enabling works; and provisions to deal with unexpected levels of decommissioning and completion risks.
- 5.5.3. The QSRA has informed the risk provisions included in the Project Authority request and central contingency reserve using conservative figures to ensure the provisions will not be exceeded. The output of the QSRA work will be jointly reviewed by the IIPAG and external risk experts from Jacobs prior to seeking Procurement Authority.
- 5.5.4. The level of detailed analysis of the contractor's programme and its interaction with client works (and hence associated level of confidence), considerably exceeds what would normally be expected in a pre-contract award process.

5.6. Impact on Operations and Maintenance

- 5.6.1. The ATC "One Team" approach has involved Operations and Maintenance teams throughout the development of the new ATC scope. The Operations and Maintenance approach will be based on proven, in-service, experience of the Thales system on the Jubilee and Northern lines.
- 5.6.2. The modernisation of the railway will lead to the service control staff for all four lines for the first time, being brought together into a single control facility at

Hammersmith with modern facilities and control functionality. These lines are currently controlled by staff at thirteen different locations across London.

- 5.6.3. Analysis of the ATC solution, based on real in-service data gathered from LU's increasing experience of Thales systems on the Docklands Light Railway, Jubilee and Northern lines, indicates that the high level of reliability required can be achieved.

5.7. Closures

- 5.7.1. A number of closures for engineering works will be required to deliver ATC. A programme of access requirements is being developed by LU and Thales, using a similar approach to that deployed on NLU. Every effort will be made to minimise the number, duration and extent of closures, including seeking all opportunities to deliver work during closures required for other projects.
- 5.7.2. The review of track layout changes referred to in paragraph 4.5 has enabled a number of multi-week central London blockades to be removed from the Programme closure requirements, and other efficiencies to be made by combining worksites with previously planned renewal works. The number of closures forecast to be required for completion of the Programme is as follows:
- (a) 70 partial line weekend closures to deliver ATC; and
 - (b) 11 partial line closures specifically for track layout modifications (note some additional track works are also being delivered in closures required for condition based works).
- 5.7.3. As noted in paragraph 5.4.2, the four lines will be divided into multiple MAs. There are 15 MAs to be implemented over the Programme. However, at any one time, the actual extent of partial line closures will be kept to a minimum. Each closure will apply to one or a small number of migration areas only, with the remainder of services continuing to operate and interchange with other services retained where possible to minimise inconvenience. The number of closures experience by any individual part of the four lines will therefore be very considerably fewer than the total number of closures.

6 Business Case

- 6.1. The Programme will deliver substantial benefits to London through:
- (a) a step-change increase in peak capacity on each of the four lines (33 per cent on average), which are at capacity on the busiest sections, to cater for the forecast expansion of London's population and supporting its continued economic growth:
 - (i) District line 24 per cent;
 - (ii) Metropolitan line 27 per cent;
 - (iii) Circle line 65 per cent; and
 - (iv) Hammersmith & City line 65 per cent.
 - (b) faster and more reliable journeys; and

- (c) improved journey quality, with improved accessibility, air cooling and enhanced customer information.
- 6.2. In addition, it will deliver the essential asset renewal required to continue to operate safe and reliable services on these lines.
- 6.3. As referred to in Section 3, Programme delivery is well underway, with the introduction of rolling stock and associated infrastructure works largely complete. However, completion of the ATC element of the Programme is vital to realisation of the total programme benefits. The majority of the passenger benefits, three quarters, result from journey time and service level enhancements made possible by ATC.
- 6.4. There is no “Do nothing” option for this project as significant investment in the existing aging assets would be required to sustain services on these lines in all cases, and consequently the business case is assessed against a “Do Minimum” option for sustaining safe and reliable services on these lines.
- 6.5. The Programme business case includes the costs for a range of other authorised projects required for the full upgrade benefits which are not part of the Programme Estimated Final Cost (EFC) (e.g. SSR Major Power Works).
- 6.6. The business case has been updated to reflect the rebaselined scope, schedule and the upper estimate of Project Authority. The results of the business case analysis are shown in Table 2. The Benefit Cost Ratio (BCR) of the Programme is 4.7 to 1, which falls into the DfT classification of projects which are very good value for money.

Table 2 Business Case Results

Present Values <i>Incremental to Do Minimum</i> (£m)	
CAPEX	(2,149)
OPEX	(408)
Revenue	1,411
Net Financial Effect	(1,146)
Passenger Benefits	5,633
Carbon Emissions	(215)
Total Benefit, £k	5,418
Benefit : Cost Ratio	4.7 to 1
Business Case for ATC	Financially Positive

- 6.7. The business case for ATC is stronger still. The incremental case for completing ATC, against a base case of stock introduction plus “Do Minimum” signalling, is “financially positive”.

7 Automatic Trains Control (ATC) Project

7.1. The main element of the Programme which remains to be delivered is ATC. This section provides more detail on this element, and the work undertaken on the rebaselining and reprourement to date.

7.2. ATC System Contract Procurement

7.2.1. Following the cancellation of the ATC Contract with BT at the end of December 2013, LU commenced reprourement and an OJEU Notice was published on 2 January 2014.

7.2.2. Two bidders responded to the Pre-Qualification Questionnaire (Thales and Siemens). On 25 March 2014 LU confirmed that only one bidder (Thales) had achieved the necessary score to progress to the ITT stage.

7.2.3. LU has engaged with Thales in a number of joint workshops covering the Works Information and schedule to achieve a high level of confidence of delivery. A final tender was submitted on 18 May 2015.

7.3. Scope / Technical

7.3.1. Over the last year, the Programme team has refined the ATC scope by implementing a series of changes to:

- (a) minimise levels of novel and complex integration (e.g. fully integrating Connect into the Operational communication system);
- (b) reduce interface complexity (e.g. removal of interface to Chiltern trains signalling system);
- (c) remove complex functions which have low business benefit (e.g. removal of functions that would allow fully automatic train operation at reversing sites);
- (d) simplify solutions where tracks are shared with other services; and
- (e) apply the knowledge of system operation and performance of the Thales solution (from Jubilee and Northern lines) to further refine scope.

7.3.2. This has resulted in a clear and well understood scope and contract Works Information which will meet the overall business benefits.

7.3.3. A review was undertaken of the scope which can best be delivered by LU and Thales. The review used experience of the NLU to determine the optimal split.

7.3.4. The ATC team has developed a detailed understanding of the differences between the Thales Northern line baseline solution and the specific application proposed for SSR. These differences are necessary for a number of reasons:

- (a) functional requirements to address SSR geography, scale and interfaces;
- (b) moving from loop to radio-based communication solution; and
- (c) developments in hardware and technology.

- 7.3.5. These changes and associated system maturity have been assessed by the ATC team, and independently by Parsons and Nichols through a technical due diligence activity. The risks associated with the changes are understood and will be managed as part of Programme risk management.
- 7.3.6. The ATC system is built upon the Northern line solution with updated hardware and software in some sub-systems. This system has most recently been deployed on the Hyderabad Metro. To minimise safety assurance and adaption risks, and to ensure confidence in the system, the Project has been in correspondence with the Hyderabad Metro Operator.
- 7.3.7. Section 1 (seven stations plus the depot) of the Hyderabad Metro project is complete and in Trial Operations. The system will be used in passenger service at the end of this year when Sections 2 and 3 are completed.
- 7.3.8. Whilst a high degree of confidence can be gained from the system being in Trial Operations, the Programme team has undertaken a site visit (commencing 8 June 2015) to continue the technical due diligence and ensure on-going monitoring of this reference site (a lesson learnt from the previous ATC contract).
- 7.3.9. A telecoms review was undertaken which determined that, where cost effective, provision will be made for future communications capacity needs. Furthermore, additional communications engineers have now been transferred into the Programme to support the Systems Delivery Team.

7.4. ATC Commercial Arrangements

- 7.4.1. As the technical due diligence and commercial negotiations have developed, the parties have agreed that the form of Contract will be based on the NLU terms and conditions. This is an NEC target price with appropriate amendments to reflect the requirements of ATC.
- 7.4.2. The proposed terms and conditions of the ATC Contract are in the final stages of negotiation with Thales. A summary of terms and conditions to be included in the Contract is provided in the paper on Part 2 of the agenda. It is proposed that Procurement Authority to enter into the ATC Contract be delegated to the Commissioner together with authority to approve the substantive terms of the ATC Contract (currently described in the paper on Part 2 of the agenda).
- 7.4.3. In parallel to the re-tendering of the ATC contract, LU engaged Thales to undertake a series of Interoperability Trials to demonstrate the feasibility of implementing Thales' radio-based signalling system (CBTC) across the Northern and Jubilee lines as well as understanding the implications for implementing this across the four lines.
- 7.4.4. In order to ensure system readiness, LU has subsequently engaged Thales to undertake feasibility work pending the award of the ATC Contract. The key objectives of this arrangement are to:
 - (a) use the findings from the trials and studies undertaken to develop initial designs, and enable the commencement of physical works at the Old Dalby Test Track facility. This is developed to a sufficient level to further

demonstrate and provide assurance of the 'G0 Programme Deliverable Milestone Date';

- (b) ring-fence critical Thales Canada signalling design resources to the ATC programme to avoid the risk of key resources being demobilised and lost to other national and international projects; and
- (c) undertake performance modelling to enable track layout scope changes to be assessed and enhance overall confidence around the expected performance of the system when it is implemented on the SSR.

7.4.5. Work packages have been delivered to-date in relation to the follow areas of scope:

- (a) Preliminary Design Review;
- (b) Train / Vehicle Fitment Programme (tri-partite working Bombardier / Thales / LU);
- (c) Wayside Implementation (migration area surveys and design);
- (d) Test track equipment (installation of Thales system at Old Dalby Test Track);
- (e) Service Control Centre building fit-out (feasibility and early design work at Hammersmith);
- (f) Governance (project management);
- (g) Procurement (laboratory equipment and long lead items);
- (h) Information Control System (progress early design works);
- (i) Enabling works (assisting LU with planning for infrastructure delivery);
- (j) Systems engineering (including software development and interface management);
- (k) Engineering vehicles (early feasibility work); and
- (l) Track interface (supporting LU on track layout option selection).

7.4.6. The sums expended specifically for ATC under these interim arrangements will be included in the ATC Contract target price and the Procurement Authority referenced in the paper in Part 2 of the agenda.

7.5. Maintenance Support Contract (MSC)

7.5.1. Accompanying the ATC System Contract is a separate Maintenance Support Contract (MSC). The ATC System Contract requires the Contractor to maintain the ATC system from the start of equipment installation until functional completion of each section of works, at which point the responsibility transfers to the MSC.

7.5.2. The MSC will be mobilised for the completion of the first section of works under the ATC System Contract and run for a period of 10 years with an option available to both parties to review the scope of services and price after seven years.

7.5.3. The MSC obliges the contractor to provide a dedicated ATC System spares and repairs service including the repair, overhaul, procurement and supply of spares, materials and equipment for the rates and prices set out in the accepted version

of the Spares and Repairs Catalogue applicable at the time of the request (subject to indexation).

- 7.5.4. The contractor is also required to attend regular meetings and to provide core log analysis, core technical support, an annual obsolescence report, a test bed and/or simulator equipment service, and a moves, changes and minor projects service.
- 7.5.5. It is proposed that Procurement Authority to enter into the MSC be delegated to the Commissioner and granted at the same time as seeking approval to enter into the ATC Contract.
- 7.5.6. This agreement will extend beyond the current business planning period and future Business Plans will need to provide for the remaining years of operation until the expiration of the initial 10 year term of the contract, the exact timing of which is dependent on the actual ATC completion date.
- 7.5.7. Further details are provided in the paper on Part 2 of the agenda.

7.6. Capital Framework Agreement

- 7.6.1. The ATC Contract includes provision that the Parties will agree and enter into a framework for certain capital works within six months. The form of contract will be based on NEC Main Options A (priced contract with activity schedule), Option C (target contract with activity schedule) and Option E (cost reimbursable contract). The appropriate contract option will be selected for each call-off against pre-agreed rates. The framework will be for a period of five years (with an option to extend for a further five years) and is intended to support future system changes and ancillary works arising from, or associated with, the main ATC Contract scope.
- 7.6.2. It is proposed that Procurement Authority for entering into the Capital Framework Agreement be delegated to the Commissioner.

7.7. Benchmarking

- 7.7.1. The ATC Contract price has been subject to benchmarking with comparable signalling projects (i.e. the recently completed NLU). This analysis is in the process of being updated with final contract figures and will be completed prior to request for the Procurement Authority for the ATC Contract.

8 Financial Implications

8.1. Project Authority

- 8.1.1. This section summarises the financial implications of the rebaselined Programme, and provides comparison to existing budgets and authorities.
- 8.1.2. As part of the rebaseline exercise, scope and schedule impacts have been reviewed across the programme, which has, in part, contributed to an increase in the Programme EFC. EC Harris has been engaged to update the baseline review they conducted during 2014 in line with these changes. A cost assurance review was undertaken by the Programme's senior leadership team

and also included representatives of the NLU team, Commercial, Finance, Sponsor and EC Harris. Of the total un-contracted Cost to Go, excluding the Thales contract sub-programme, 90 per cent of costs were subject to this review. EC Harris has concluded that this exercise has challenged scope, helped to identify areas of cost with lower confidence, and improved cost reporting consistency. It also made a number of recommendations which are being worked through. The review concluded that the cost assurance is sufficient for the level of maturity of the programme reviewed. LU will continue to look for available efficiencies in delivery of this work where possible.

- 8.1.3. As part of the procurement process for the ATC contract EC Harris has also been retained: to provide an independent estimate, to examine the submission from Thales and provide assurance regarding the cost estimates submitted.
- 8.1.4. The Programme EFC is now forecast to be £5,412m, which is lower than the £5.543m quoted in the 24 March 2015 announcement, and within the range reported to the Finance and Policy Committee on 17 June 2015. As noted in paragraph 5.5.3, the EFC includes the output of the QSRA and risk reviews.
- 8.1.5. Table 3 provides a summary of the EFC by year, which has been re-phased to reflect the revised schedule.

Table 3 Programme EFC Breakdown

Costs and Funding	Prior Yrs, £m	2015/16	2016/17	2017/18	2018/19	Future	Total
Cost (Out-turn)							
Estimated Final Cost	3,374	361	514	456	270	437	5,412

- 8.1.6. Table 4 provides a summary of the development of the Programme EFC since the last comprehensive rebaselining and identifies the main elements contributing to the increased EFC.

Table 4 Development of Programme EFC

Description	Forecast Cost
£'m	
Current SUP Authority	4,259
ATC Programme Cost Increases	
ATC Programme Scope	(31)
ATC Programme Cost Increases (including enabling works)	908
ATC Budget Transfers	9
Sub-Total ATC Programme Increase	886
Train Roll-Out Cost Increases	
Train Roll-Out Additional Scope	42
Train Roll-Out Cost Increases (including enabling works and depots)	169
Train Roll-Out Budget Transfers	56
Sub Total Train Roll-Out Increase	267
Total Increase	1,153
Total Revised Authority	5,412

8.1.7. Table 5 compares the EFC to the current authority and the budget / plan as of Quarter 3 2014/15. The EFC is £1,153m above current Project Authority and £9m more than the budget in the business plan.

Table 5 Authority Summary

Investment Funding	Prior Yrs, £m	2015/16	2016/17	2017/18	2018/19	Future	Total
Cost (Out-turn)							
This Authority Request	3,374	361	514	456	270	437	5,412
Current Authority	3,510	335	181	157	67	9	4,259
Authority Surplus/(Shortfall)	136	(26)	(333)	(299)	(203)	(428)	(1,153)
Budget/Plan Q3 2014/15	3,414	398	508	346	277	460	5,403
Plan Surplus/(Shortfall)	40	37	(6)	(110)	7	23	(9)

8.1.8. The current Project Authority of £4,259m was originally allocated across 11 sub-programmes. Nine of the 11 sub-programmes relate to work which has subsequently either been completed, is now nearing completion, or is related to one of the two remaining work tranches.

8.1.9. Of the revised Project Authority of £5,412m, the remaining cost to go relates to the ATC sub-programme, remaining train roll-out, depots and risk. It is recommended that the revised Project Authority is allocated across two sub-programmes as shown in Table 6, as follows:

- (a) ATC Sub-Programme – including ATC Contract, fitment of signalling equipment to S Stock and LU enabling works; and
- (b) Train Roll-out Sub-Programme – including completion of train introduction and final enabling works.

8.1.10. In the event that a sub-programme's risk is inadequate, authority will be sought from the Managing Director Finance to increase the Project Authority of that sub-programme and make a corresponding reduction of Project Authority in the other sub-programme, such that total Project Authority is not exceeded.

Table 6 Proposed Programme Sub-Authorities

Sub-Programme	Project Authority £m
ATC	2,268
Train Roll-Out	3,144
SUP P50 EFC	5,412

8.1.11. The Programme has implemented a programme controls solution similar to that used by the Crossrail Programme, to enable consistent integrated performance reporting.

8.1.12. A “Crossrail-style” Programme Board report has also been introduced that summarises progress, performance and issues, which is issued each period. It is proposed that this is circulated to key programme stakeholders to provide added assurance that the Programme remains on target to deliver within authority.

8.1.13. Programme reporting uses the Prism G2 project controls system and is available at a granular level to support day-to-day management and transparent stakeholder management of the programme forecast.

8.2. Risk and Contingency

8.2.1. An additional £78m of P80 contingency for the programme is to be held within the central contingency provision, a £2m reduction on the current business plan, see Table 7.

Table 7 Contingency

Contingency Phasing	Prior Yrs, £k	2015/16	2016/17	2017/18	2018/19	Future	Total
Latest Forecast	0	0	0	0	0	78	78
Budget/Plan Q3 2014/15	0	0	0	60	0	20	80
Plan Surplus/(Shortfall)	0	0	0	60	0	(58)	2

8.2.2. This balance now includes the output of the QSRA and risk reviews. The sum reflects:

- (a) the maximum values of three point estimates used in determining the base and P50 cost estimates; and
- (b) an allowance for re-work for some work packages where scope is currently less well-defined, an allowance for programme prolongation in the event of certain risks occurring and unknown unknowns that cannot currently be envisaged or cannot be readily quantified.

8.2.3. Any drawdowns on this contingency balance would be subject to Board approval.

8.3. Wider Business Plan Impacts

8.3.1. The revised Programme scope and schedule also impacts on fare revenue and Operating Expenditure (OPEX) forecasts in the business plan.

8.3.2. Table 8 shows the fare revenue generated by the Programme. The revised delivery dates have resulted in reduced fare revenue by £20m compared to the current business plan. This change will be addressed as part of the annual business planning process this year.

Table 8 Fare Revenue

Fare Revenue	2018/19	2019/20	2020/21	2021/22	2022/23	Future	Total
Timetable Date Revisions	0	0	(3)	(8)	(7)	(2)	(20)

8.3.3. Table 9 shows the corresponding operating costs changes resulting from the Programme. Both the current business plan (Quarter 3 2014/15) and the latest forecast are shown. The revised delivery dates have resulted in increased Operating Costs of £2m compared to current business plan. This change will be addressed as part of the annual business planning process this year.

Table 9 Operating Costs

Operating Costs	Prior Yrs, £k	2015/16	2016/17	2017/18	2018/19	Future	Total
Current Estimate	(1)	(6)	(5)	5	17	65	75
Budget/Plan Q3 2014/15	(1)	(6)	(5)	5	18	62	73
Plan Surplus/(Shortfall)	0	0	0	0	1	(3)	(2)

8.3.4. Table 10 shows the total Programme impact on the business plan. The table summarises the capital costs impact, as well as fare revenue, operating cost and central contingency provision impacts. In addition, further development of the scope associated with the Neasden Heavy Maintenance Facility has resulted in £26m, previously budgeted in SSR Other, being transferred into the Programme.

Table 10 Business Plan Impacts

Cost	Prior Yrs, £k	2015/16	2016/17	2017/18	2018/19	Future	Total
Programme Plan Surplus/(Shortfall) (per Table 5)	40	37	(6)	(110)	7	23	(9)
Neasden Heavy Maintenance Facility Budget Transfer from SSR Other	0	(9)	(3)	24	9	5	26
Fare Revenue Surplus/(Shortfall) (per Table 8)	0	0	(3)	(8)	(7)	(2)	(20)
Operating Cost Surplus/(Shortfall) (per Table 9)	0	0	0	0	1	(3)	(2)
Sub-Total	40	28	(12)	(94)	10	23	(5)
P80 Contingency (per Table 7)	0	0	0	60	0	(58)	2
Total Business Plan Impact	40	28	(12)	(34)	10	(35)	(3)

8.3.5. The variance over the business plan will be accommodated within the business plan prioritisation process (further details are provided in the paper on Part 2 of the agenda).

8.4. ATC Procurement Authority

8.4.1. Details of ATC Procurement Authority requirements are provided in the paper on Part 2 of the agenda.

9 Other Commercial

9.1. A number of other procurement authorities are required which relate to the ATC Contract.

9.2. Trains Contract

9.2.1. The provision of new rolling stock for the four lines is by Bombardier Transportation UK (BTUK). The ATC signalling system will require signalling equipment to be fitted to the S Stock. An additional S Stock train is also required for the Croxley Rail Link project. Both of these are planned to be delivered through the BTUK contract and increased Procurement Authority will be required for this. Further details are provided in the paper on Part 2 of the agenda. It is proposed that increased Procurement Authority be delegated to the Commissioner; approval for which may be requested at the same time as seeking approval to enter into the ATC Contract.

9.3. Programme Support Partner

9.3.1. As detailed in paragraph 5.3, LU intends to appoint a PSP to be part of the integrated LU Programme team.

9.3.2. The procurement of this support will be in the form of a Call-Off contract from the TfL Project & Programme Management and Commercial Services Framework. The opportunity will be open to TfL Framework suppliers appointed for Portfolio, Programme and Project Management and Project Office and Project Controls.

9.3.3. The PSP will undertake key roles and will be incentivised through the opportunity to develop the scope and scale of its involvement within the Programme based on how successfully it meets the needs of the Programme.

9.3.4. It is intended to award the PSP Contract in summer 2015 in accordance with the levels of authority in Standing Orders.

10 External Assurance Reviews

10.1. The Programme has actively engaged in a number of external assurance reviews to ensure the suitability of the ATC solution and support the rebaselining exercise. These activities have helped to refine the price, scope and approach of the Programme. Further details are included in the paper on Part 2 of this agenda.

11 View of the Finance and Policy Committee

11.1. On 17 June 2015, the Finance and Policy Committee endorsed the recommendations in this paper.

11.2. The IIPAG gave its broad support to the recommendations and acknowledged the work to date. It raised issues around the capability and capacity of the in-house resource, whilst acknowledging it was a good team, that would require strict control and monitoring. It also identified two issues on the scope of the project. The Managing Director Rail and Underground agreed with the assessment and would meet with the IIPAG to address the skills gaps in the in-

house team to ensure it was properly resourced. He also confirmed that the two scope issues were under review.

12 Next steps

- 12.1. Following Board approval of the rebaselined Project Authority and approval of Procurement Authority for the ATC Contract by the Commissioner, LU intends to award the ATC Contract in July.

List of appendices to this report:

A paper on Part 2 of the agenda contains exempt supplemental information.

List of Background Papers:

None

Contact Officer: David Hughes, Director of Major Programme Sponsorship, London Underground
Number: 020 3054 8221
Email: DavidHughes03@tfl.gov.uk