

Programmes and Investment Committee

Date: 13 October 2017



Item: Four Lines Modernisation Update

This paper will be considered in public

1 Summary

- 1.1 This paper provides an update on the progress in delivering the Four Lines Modernisation (4LM) Programme.

FOUR LINES MODERNISATION PROGRAMME				
*Existing Financial Authority	Estimated Final Cost (EFC)	Existing Programme and Project Authority	Additional Authority Requested	Total Programme and Project Authority
£5,155m	£5,268m	£5,412m	£0m	£5,412m

*Note: Existing Financial Authority is prior year actual costs, 2017/18 Budget and the 2016 Business Plan to 2021/22. This is lower than EFC due to £129m planned beyond 2021/22.

- 1.2 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 Recommendation

- 2.1 **The Committee is asked to note the paper and the paper on Part 2 of the agenda.**

3 Background

- 3.1 The Sub-surface Railway (SSR) consists of four lines – Metropolitan, District, Hammersmith & City and Circle. It carries 1.3 million passengers per day which is 25 per cent of the overall Underground ridership.
- 3.2 The 4LM Programme is in the process of replacing, modernising and integrating life-expired assets (Signalling, Rolling Stock, Track, Power and Depots) on the SSR. This will add capacity and improve both journey time and customer experience.
- 3.3 In July 2015 the Board approved Project Authority of £5.4bn to undertake the 4LM Programme, with full benefit realisation in 2023. The authority consists of £2.2 billion for new signalling and associated works. The remainder of the funding is for new trains, infrastructure changes and upgrade to three depots to allow maintenance of the new trains. Most of this work is now complete.
- 3.4 A contract was awarded in July 2015 to Thales Rail Signalling Solutions to signal the SSR with an automatic, modern signalling system. The 4LM Programme is

the largest single upgrade in the history of the network and due to its scale and interoperation with other Underground lines, Train Operating Companies and Network Rail has a high level of complexity. Appendix 1 shows a pictorial view of the sequence of installation known as Signalling Migration Areas (SMAs).

3.5 Work is well advanced in the design and installation of the signalling system and the delivery of the supporting infrastructure.

3.6 The table below shows timetable uplifts approved in July 2015. Current service levels are between 22.5 and 27 trains per hour on the central area of the SSR.

Description	Planned Timetable Date
Runtime improvements on central area sections	May 2021
30tph in central area for 90 minute peaks	December 2021
32tph in central area for 90 minute peaks	May 2022
32tph in central area for three hour peaks	December 2022
32tph in central area and 28tph on Metropolitan trunk for three hour peaks	May 2023
Off peak enhancements	Dec 2023

3.7 The rationale for the timetable changes is to take advantage of the installation sequence of the new signalling equipment. Appendix 1 shows an installation map of the 14 signal migration areas. The installation and commissioning begins at Hammersmith, then the delivery of the central London area, followed by the District Line and Metropolitan line branches. The early SMAs (1-6) release the greatest benefits as they enhance the service in the central, busiest sections.

4 Benefits

4.1 The introduction of the new trains delivers 25 per cent of the programme benefits which include:

- (a) the first step up in capacity while maintaining the current train service frequency as the new trains are longer and can carry more passengers;
- (b) an improved customer experience with walk through gangways, in-car CCTV, air conditioning, a Rail Vehicle Accessibility Regulations (RVAR) compliant saloon and improved Customer Information Systems; and
- (c) the opportunity to recover energy through regenerative braking.

4.2 The introduction of the new signalling delivers 75 per cent of the programme benefits which include:

- (a) the ability to run trains closer together increasing service frequency; and
- (b) speed increases which reduce journey times.

5 Achievements to date and current status

5.1 On 26 July 2017, Thales successfully demonstrated that both the production train and signalling work together to control a train in Automatic Train Operation (Milestone GO-T). This is a significant achievement for the programme and provides high confidence in the technical solution allowing the train fitment programme to continue.

- 5.2 Thales design and installation of the signalling system is progressing well. Installation is complete on SMA1 and designs are complete to SMA8. New signalling equipment fitment to trains at the Bombardier factory is underway. To date, 24 trains have been fitted, returned to London and are in normal passenger service with the new signalling system isolated.
- 5.3 We are designing and building 46 signalling equipment rooms complete with dual power supplies and installing 146km of a cable route management system. To date in 2017, eight rooms have been handed over to Thales, 28 are under construction and 47km of the cable route management system has been installed.
- 5.4 Eight major track locations have now been rebuilt. These sites provide a combination of performance improvements, operational improvements and maintenance savings critical to the success of 4LM. The works have included significant layout changes at Earl's Court, Tower Hill, Putney Bridge and Mansion House as well as a new reversing facility at King's Cross.
- 5.5 The power system has also been substantially upgraded to allow the trains to run faster and more often.
- 5.6 There are a number of related operational readiness activities to bring the 4LM assets into service. The budget for these activities are funded from operational expenditure (OPEX) budgets and are not within the 4LM programme authority. Future operational and maintenance costs are assumed to continue at a similar level to the 2017/18 forecast which includes the impact of S stock trains, however a detailed assessment of the implications on maintenance of the additional mileage is to be undertaken.
- (a) recruitment of additional operations staff is underway and on target. Training is underway for Service Control staff where there are long lead times and it is also about to start for Train Operators. There is also a staff migration programme for Service Control staff which is well advanced. This work will move staff from a large number of small signal cabins across London to a single new facility at Hammersmith where they will control the train service. Trade Union consultation is also progressing well,; and
- (b) recruitment planning is underway for Control Centre Staff, Signalling Managers and Train Technicians. The most critical Maintenance readiness activity is staff training. Training for the new trains and signalling equipment is underway but has been delayed by later than planned provision of training facilities. A plan has been developed to ensure staff are trained and ready when the new signalling system goes live next year. Trade Union consultation is underway.
- 5.7 In July 2015, timetable uplifts were expected to be implemented between May 2021 and December 2023. The 4LM programme is continuing to seek opportunities to enable us to introduce new timetables well ahead of the dates provided at the time of authority in July 2015. Paragraph 6.1 outlines expected progress of several early enabling activities over the next 12 months. This includes the first introduction into passenger operation of the new signalling system on parts of the Hammersmith & City and Circle lines at existing train frequencies.
- 5.8 We carefully monitor the use of closures in order to ensure that each closure is

used as efficiently as possible. Where business benefits can be achieved the programme will seek further closures but these will be subject to the approval by the London Underground Executive. Closures will only be proposed if the need is demonstrated and clearly linked to business benefits.

5.9 Key programme targets met since July 2015.

Milestone	Target	Achieved
DfT S Stock introduction	March 2017	December 2016
S Stock reliability	40,000km between failures	90,000km between failures

6 12 month look-ahead

6.1 Detailed below are the significant events which are planned within the next 12 months.

System testing is scheduled to commence in October 2017 with a view of going live date between April and August 2018. Service Line control migrates from Baker Street to the new Hammersmith Control Centre.
A total of 130 of the 192 S Stock trains will have been fitted with new signalling equipment.
A total of 18 Engineering Trains will have been fitted with new signalling equipment out of a total fleet of 29.
Subject to successful testing, the first three Signal Migration Areas referred to in Appendix 1 as SMA0.5, SMA01 and SMA02 should be in operational use. This means the new signalling system will be in operation from Hammersmith to Euston Square.
The new 10 berth stabling facility between Farringdon and Moorgate will be under construction bringing much needed stabling capacity to a central location.

7 Finance

Project Description (£m)	Existing Financial Authority	Estimated Final Cost (EFC)	Existing Programme and Project Authority	Additional Authority Requested	Total Programme and Project Authority	Future Authority Requests
ATC Programme	£2,068m	£2,188m	£2,268m	£0m	£2,268m	£0m
Train Roll-out	£3,086m	£3,081m	£3,144m	£0m	£3,144m	£0m
Total Programme	£5,155m	£5,268m	£5,412m	£0m	£5,412m	£0m

(figures are rounded)

7.1 Existing Financial Authority is prior year actual costs plus 2017/18 Budget plus Business Plan to 2021/22. This is lower than EFC due to £129m planned outside the Business Plan years.

7.2 Of the £5,412m Project Authority granted in July 2015, £4,034m had been spent

by period 4 2017, £144m had been identified as savings leaving an estimate to complete of £1,234m.

7.3 The savings have primarily come through identification of scope not required to deliver the planned benefits; value engineering the delivery scope; and innovation.

Costs and Funding (£m)	Prior Years	2017/18	2018/19	2019/20	2020/21	2021/22	Future Years	Total
Period 4 FORECAST	£3,933m	£327m	£333m	£192m	£186m	£196m	£101m	£5,268m
ACTUALS + BUDGET + PLAN	£3,933m	£311m	£287m	£185m	£207m	£232m	£129m	£5,284m
Variance	£0m	(£16m)	(£46m)	(£8m)	£21m	£36m	£28m	£15m

(figures are rounded)

7.4 The table demonstrates that the latest 4LM Programme EFC remains within funded authority. The variance to Budget and Plan between 2017/18 and 2019/20 is driven by actions intended to mitigate future costs associated with programme delays.

8 External views

8.1 An internal Project Assurance and Independent Investment Programme Advisory Group Assurance Review of the Programme have been completed. Actions and management responses have been prepared for all recommendations.

9 Conclusions

9.1 When compared to the July 2015 authority paper the 4LM Programme is expected to deliver benefits earlier than planned at a cost £144m less than planned. The Programme continues to drive hard to the target of £200m savings, though this is recognised as increasingly challenging.

List of appendices to this report:

Appendix 1 Signalling Migration Areas

Background Papers:

None

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SSR Migration Areas



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