

Date: 18 May 2023

Item: Elizabeth Line Programme Assurance Update

This paper will be considered in public

1 Summary

- 1.1 This paper reports on progress with programme assurance activity across the Elizabeth line since the last report.
- 1.2 A paper is included on the Part 2 agenda which contains supplementary information that is exempt from publication 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 exempt supplementary information on Part 2 of the agenda.**

3 Background

- 3.1 The Elizabeth line Integrated Assurance Framework is based on a Three Lines of Defence model comprising:
 - (a) Line 1 – Management functions of Crossrail Limited (CRL), Rail for London (Infrastructure) Limited (RfL(I)) and key interfaces;
 - (b) Line 2 – Project and Programme Assurance Elizabeth line (PPA-EL); and
 - (c) Line 3 – TfL Internal Audit and a sub-group of the Independent Investment Programme Advisory Group (IIPAG-EL).
- 3.2 This paper reports specifically on Line 2 (PPA-EL), Line 3 (Internal Audit) and Line 3 (IIPAG-EL) assurance progress.
- 3.3 The teams meet periodically with a panel of advisers to ensure that assurance is carried out by the right team, at the right time and to avoid duplication and minimise overlap of effort.

4 Line of Defence 2 (LoD2) Assurance

- 4.1 The Elizabeth line has demonstrated a consistent level of good performance (as measured by the public performance measure (PPM)) in the central operating section (COS) since opening on 24 May 2022. The successful introduction on 6 November 2022 of train services running directly from Reading and Heathrow to Abbey Wood, and from Shenfield to Paddington, using Network Rail (NR)

infrastructure on the Great Western lines and Great Eastern lines has added a further degree of infrastructure complexity which has resulted in occasional days of reduced PPM below that required to maintain a resilient 24 trains per hour (tph) service in May 2023. The continuing operating challenge going forward is to improve the reliability and resilience of the end-to-end railway to achieve the required tph.

- 4.2 The resilience of the Great Western infrastructure and the impacts on performance on the overall end-to-end train service continue to be a concern. There have been significant improvements in the visibility of the NR data on infrastructure failures, and the improvement plans being implemented to mitigate the issues.
- 4.3 Work has continued on a continuous assurance basis with formal reporting via the LoD2 Periodic Assurance Review (PAR) Reports. Of particular focus has been the overall system and fleet reliability and availability, and the quality of the service response to issues arising during service operation.
- 4.4 Since the last meeting of the Committee, LoD2 PAR Reports have provided input to the periodic Integrated Assurance Report to the Elizabeth Line Delivery Group (ELDAG) and to the Audit and Assurance Committee.
- 4.5 Regarding cost to complete, although any potential new cost pressures are being prudently recognised in the Anticipated Final Crossrail Direct Cost (AFDC) as they arise, the programme continues to maintain provision and contingency budgets. Actions are ongoing across all areas to identify opportunities to reduce the AFDC and minimise funding requirements.
- 4.6 The baseline programme for the remaining works to deliver the whole end-to-end railway continues to be used to monitor progress.
- 4.7 Deterministic dates are being held and are as follows:
 - (a) Stage 5c is 21 May 2023 (24tph full end-to-end service), dictated by the national railway timetable changes. The key drivers continue to be confidence in achieving the required fleet availability and whole systems reliability to support the enhanced intensity of service. The maintenance of the programme is being led by the Elizabeth line Operations team, with support from CRL for those elements of work it is responsible for.
- 4.8 The programme has continued to make significant progress since the last report, key highlights include:
 - (a) commissioning of Siemens software ELR400 over Easter 2023;
 - (b) the Employers Completion Process (ECP) completed at Bond Street station. All station ECPs are now complete with defects responsibilities transferred to London Underground and RfL(I);
 - (c) continued engagement, planning and the implementation of improvement initiatives with NR on the Great Western Main Line to support the continued reliability performance improvements since merging the three railways at Stage 5b minus and with the run up to full 24tph service in May 2023; and

(d) further software development, testing and upgrades to signalling, fleet and infrastructure software, improving performance resilience further.

4.9 The maintenance programme continues to implement improvements to support the enhanced utilisation of resources and the introduction of automation, thereby delivering a more efficient maintenance service. Experience during operational service in the COS is helping to shape the improvements required in terms of response and fix times and root cause analysis to support a 24tph service.

4.10 Fleet availability consistently achieves 65 train units per day, which is the requirement for Stage 5c. Alstom are actively working on train hardware failures, particularly door units and brakes which have been the largest areas of service affecting failures, with improvements to reliability being realised. This is a prime focus as improved reliability and performance are key to the successful implementation of the 24tph timetable in Stage 5c.

4.11 Following our risk based continuous assurance approach, concerns and recommendations are identified throughout each reporting period. Management responses for those items are provided in the following table and have been provided during Periods 9 to 13 of 2022/23 (13 November 2022 to 31 March 2023) (P9 to P13).

Periods 9 to 13	LoD2 Concerns	Management Response
P9/1	Great Western (GW) – Continued heightened focus and support recommended for GW and Great Eastern (GE) infrastructure and improvement plans due to their criticality to the success of Stage 5c running. Regular attendance of Rail for London (RfL) and Mass Transit Railway (MTR) at the weekly NR visualisation meetings will help to understand and influence decision priorities that will affect the end-to-end resilience and reliability e.g. Right Time at COS.	The focus and support for GW and GE remains an ongoing process. We have our Concession MTR in regular attendance of Western Route's performance meetings along with the Network Performance and Strategy Manager. It remains a concern, but recent performance has been very encouraging.
P9/2	Auto-Reverse at Westbourne Park (WBP) – The current programme for the delivery and commissioning of the interim Auto-Reverse solution at WBP should be held, allowing time for the Operation to test and bring into use Auto-Reverse at the earliest possible opportunity, simplifying and enhancing operational efficiency and flexibility.	Delivery progress is on-time against the new target baseline. Availability of Auto-Reverse at WBP will enable improved service recovery and increase timetable capability.

Periods 9 to 13	LoD2 Concerns	Management Response
P9/3	<p>Fleet Reliability – The successful implementation of Stage 5c is dependent upon achieving significantly higher levels of fleet reliability than currently available. The planned software interventions and continued integrated “one team” approach to reporting, problem sharing and resolution are critical to delivering improved fleet reliability.</p>	<p>As noted at Period 8, the Project Manager has not had it confirmed what the minimum required miles per technical incident (MTIN) is from the Stage 5c modelling work. Current fleet MTIN performance is 9.9k and is forecast to rise to circa 14.5k after the next Train Control and Management System software upgrade (March 2023) and delivery of modified components and maintenance regimes for the brake and door systems by May 2023. Both the subject of collaborative technical workshops between the Original Equipment Manufacturer (KRBS) and Alstom to determine root causes and improvements.</p>
P9/4	<p>Transition of Siemens Scope of Works to RfL(I) – We recommend that an urgent handover / transition plan should be developed showing the transfer of responsibility from CRL to TfL / RfL for the works to be delivered by Siemens beyond ELR400. There is a risk that key resources and knowledge in both CRL and Siemens may be lost. A transition plan to be developed by RfL(I) and agreed with all parties.</p>	<p>As part of the Siemens transition and critical resource handover / knowledge transfer the following actions are ongoing:</p> <ul style="list-style-type: none"> • Agreeing delivery approach post May 2023, likely to be via TfL Capital delivery. • Confirming scope for post Easter 2023 works by end January 2023. • Siemens to be instructed to secure resource (planned for late January 2023). <p>Once the resources are agreed, shadowing shall commence (expected by early February 2023).</p> <p>A weekly steering group has been established to work through the detailed planning for the transition. Conversations within TfL Capital delivery also underway to ensure smooth transition.</p>
P10/1	<p>GW Performance – While improvement plans, support and monitoring are now in place on GW, risks remain for late eastbound Right Time handovers at WBP, which could become critical to performance and reputation in the May 2023 timetable. It is recommended that focus is placed on minimising these risks and the development of a detailed Train Regulation plan to</p>	<p>MTR Elizabeth Line (MTREL) engage with NR Western at various levels. A joint, industry weekly Tactical Operations Group takes place at Thames Valley Signalling Centre, discussing the previous week’s performance challenges, including regulation and incident management. The Western, Anglia and MTREL Performance teams are meeting on a weekly basis to discuss the cause of performance loss on the Anglia route and</p>

Periods 9 to 13	LoD2 Concerns	Management Response
	<p>minimise knock-on delays in the COS from May 2023.</p>	<p>the NR National Team are undertaking analysis into the causation of PPM loss. A weekly Western Route visualisation session is chaired by the Western Route Director and attended by the industry, including MTREL's Head of Performance & Operations Delivery and RfL(I) representatives, where medium term action plans, such as the recommendations from September's dewirement, works to resolve issues with the critical points works and trespass mitigations are discussed.</p> <p>A regular forum is now in place, attended by MTREL, MTR United Kingdom and NR Western Executive teams, where Western challenges are discussed.</p>
P10/2	<p>Turn backs outside the COS – Arrangements should be put in place with the GW and Anglia NR route to ensure that spare platforms can be made available at short notice at both Paddington and Liverpool Street mainline stations from the May 2023 timetable change if trains have to be diverted from the COS.</p>	<p>The CRL Operations team have reviewed the workforce plan and ensured where critical resources are needed to complete the CRL programme that funding, and extensions are obtained for these roles.</p> <p>More general resilience of the roles confirmed in the plan particularly in the context of a fairly rapid demobilisation of CRL resources is being reviewed with further resilience actions to be identified in January 2023.</p>
P8/2	<p>Fleet Resilience and Reliability – While Auto-Reverse commissioning is well advanced, a detailed Contingency Plan is recommended for any unforeseen delay or periods of unavailability. Options could include reducing the 24tph in the high peak to 22tph or less in the May 2023 timetable (i.e. temporarily suspending 2tph) or making more drivers available to achieve the 24tph turnback times.</p>	<p>Auto-Reverse Go / No Go decision is on 20 January. Although we are not anticipating any issues, we have contingency arrangements in place if the infrastructure and or modelling of current Stage 5c is not achieved. This is updated weekly as part of the T minus process.</p>
P11/1	<p>Key Resources During Transition – Key resources required to manage the Siemens contracts should be in place during a "shadowing period" to ensure effective transfer of knowledge from CRL.</p>	<p>The delivery approach post May 2023 was agreed by TfL Chief Capital Officer (CCO) and confirmed at ELDG on 12 January. Scope options for C620 complete and quotes progressing, scope options for C660 finalised by Siemens.</p>

Periods 9 to 13	LoD2 Concerns	Management Response
		The current plan is for Siemens to be instructed to secure resource by early March 2023 after ELDG agreement. Once resources agreed, shadowing between CRL and TfL CCO shall commence at a date to be agreed.
P11/2	Service Recovery – Important to ensure there are agile responses to service impacting incidents with involvement of all stakeholders working together to minimise period of perturbation.	<p>There are several business-as-usual processes in place as well as a number of workstreams underway to learn, mitigate and improve service recovery for now and as we move towards May 2023.</p> <p>Examples include cross organisational Serious Performance Incident Reviews, Train Service Model Strategy meetings / desktop exercises, the updating of the Concept of Operations (includes service recovery, delivery principles, contingency plans etc.). We also have an increased focus on our emergency service response, particularly London Ambulance Service and how we improve our reaction to and recovery from a protracted incident.</p>
P11/3	Transition to Business as Usual – A clear plan is required for the proposed RfL(I) Operating Model (at strategic and tactical levels) to be agreed and implemented prior to the completion of the CRL obligations.	The Elizabeth Line Operations Team, RfL(I) has a transition roadmap and plan to ensure that CRL closes down in a controlled way. There is the use of handshake agreements to ensure any changes are agreed between the giver and receiver of the change between CRL and TfL / RfL(I). The CRL agreements, undertakings and Project Delivery Agreement are part of the transition plan.
P11/4	Auto-Reverse – A priority focus by all key stakeholders is required to ensure robust plans are in place for 24tph running in May 2023 including contingency options and resolution of issues.	Auto-Reverse plans and implementation reviews for both WBP and tunnels at crossovers and unplanned are in place and discussed as part of the Stage 5 Mobilisation and Blockers meeting. This includes any issues resolution with key stakeholders from the developmental and implementation reviews.
P12/1	Fleet Performance – Recent fleet software performance has raised concerns on the methods and approach by Alstom in their software upgrade testing and assurance process prior to fleet introduction. It is recommended that RfL(I) provide	<p>Revised approach supported by RfL.</p> <ul style="list-style-type: none"> Review by Alstom of each change to the Train Control Management System (TCMS) software made since configuration H5.9 to identify risk of ‘collateral damage’ from the change to other areas of the TCMS code.

Periods 9 to 13	LoD2 Concerns	Management Response
	<p>verification of the revised approach proposed by Alstom on software version H5.26, and mitigation options in the event of regression impacts.</p>	<ul style="list-style-type: none"> • The output used to generate a deeper rig test specification. • That deeper test run on the baseline H5.21 config to identify any more undetected defects before running the revised test scripts on the new H5.26 config with the fixes included. • Earlier static testing on a train, in parallel with completion of rig tests. • Confidence tests with a train on the infrastructure at an earlier stage in the assurance cycle.
P12/2	<p>Plumstead Sidings – It is recommended that a study is undertaken into the impacts and consequences on the resilience of the Stage 5c timetable without the alternative power supply at Plumstead sidings for up to three years, and to develop appropriate mitigations. This should include impacts on any trains stabled overnight, particularly the delocalisation of the communications-based train control (CBTC) system on each train and the need to localise trains prior to the commencement of passenger service the following morning.</p>	<p>A study / benefits case review is underway.</p> <p>In light of the delay, a further review is being undertaken of previously considered, but discounted, mitigation measures for keeping CBTC on the trains energised during Plumstead siding isolations.</p>
P13/1	<p>Fleet Performance – RfL to be satisfied that the plans from Alstom to improve rolling stock reliability (as measured by the four week mean distance between failure, from 10,000 to 17,000 miles) following upload of software H5.26, are robust in order to provide resilience for the Stage 5c timetable.</p>	<p>Alstom have a reliability programme that uses feedback from in-service performance to derive prioritised modifications to resolve failure modes. The planned interventions are reviewed by Alstom and client technical teams on a weekly basis.</p> <p>The planned intervention implementation dates and assumed success factors are used to construct a reliability growth curve, refreshed each period for updated current fleet performance data and the latest intervention plan. Actual fleet performance is tracked weekly against this forecast curve.</p> <p>A reliability growth programme, and management of it remains in place until the required reliability has been achieved.</p>

5 Line of Defence 3 (LoD3 - TfL Internal Audit) Assurance

- 5.1 This section covers the Internal Audit activities that were agreed in the Integrated Audit and Assurance schedule.
- 5.2 There were two audit reports issued in Quarter 4 of 2022/23 (11 December 2022 to 31 March 2023) (Q4).

Audit Delivery

- 5.3 Summary information of the reports issued in Q4 is set out below, all actions have been accepted and are being actioned on both audits.
- 5.4 The 'Obsolescence of Critical Operational Systems on the Elizabeth line' audit was rated as 'Requires Improvement'. Three high priority issues and one medium priority issue were raised. The high priority issues related to no end-to-end view of obsolescence risk across the Elizabeth line, the need to implement the obsolescence standard for all critical assets and ensure obsolescence plans are in place for all critical systems.
- 5.5 The audit on 'Information Management and Transfer – Hardcopy Documents' was rated as 'Requires Improvement' with two high priority issues raised. The two issues relate to the lack of an agreed transfer plan for hardcopy documents and the monitoring arrangements in place to track progress.
- 5.6 There were no audits in progress at the end of Period 13 but there was one audit in planning. This audit will start in Quarter 1 of 2023/24 (1 April to 24 June 2023) and details are provided in Appendix 1.

Management Actions

- 5.7 The team monitors the implementation of all Internal Audit management actions and confirms whether they have been adequately addressed before closing them. There are no overdue actions at the end of Period 13.

Changes to the Audit Plan

- 5.8 TfL Internal Audit regularly review and update the audit elements of the Integrated Audit and Assurance Audit Plan throughout the year, in liaison with management, to reflect changing business priorities. No changes to the plan have been made to date.

6 Line of Defence 3 (LoD3 - IIPAG-EL) Assurance

- 6.1 The terms of reference of the IIPAG-EL sub-group continue to provide "look ahead" overview and areas of interest highlighted as part of the revised Integrated Audit and Assurance Schedule in February 2022. We also support the assessment conducted by LoD2 to ensure adequacy and consistency. This schedule is maintained and reviewed regularly with the Elizabeth Line Programme Assurance Group which is co-ordinated by LoD2.

- 6.2 The focus by LoD3 over the reporting period has been on the performance of the enhanced service level of Stage 5b minus in terms of service and fleet reliability as well as software upgrade implementation. At the same time, also ensuring the process in place for transition to Stage 5c 24tph service is adequately managed and progressed.
- 6.3 In general, the overall assurance framework for the Elizabeth line has continued to operate effectively.

List of Appendices

Appendix 1: Line 3 (TfL Internal Audit) Work due to start in Quarter 1 2023/24.

Exempt supplementary information.

List of Background Papers:

None

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