

RSE Programme Remaining Scope elements

Northern Line Capacity

- 1.1 This includes final Northern line signalling software updates to resolve emerging post-delivery reliability issues and remove temporary speed restrictions.

Northern Line Power

- 1.2 The Programme includes power works required to address asset condition concerns and provide additional system resilience on the Northern line. Upgrade works will also provide enhanced network power capacity to support future increases in service levels on the Sub-Surface lines (District, Circle, Hammersmith & City and Metropolitan) following delivery of the Four Lines Modernisation (4LM) Programme.
- 1.3 Since 2014 the Northern line power system has been non-compliant with LU standards and an Engineering concession is in place. There is sufficient power capability for Northern line services during normal circumstances (including the introduction of Working Timetable 58 and the NLE) but not under contingency scenarios (i.e. planned or unplanned outages). This requires a reduction of service levels in the event of some asset failures – on the Northern line and on other lines due to the integrated nature of the LU power network.
- 1.4 There are two main packages of works.
- 1.5 Power Package 1 to address poor asset condition remaining scope, comprising:
 - (a) replacement of life expired coupling transformers at Stockwell substation; the condition of these assets is poor with no residual life remaining. This is 70 per cent complete and remaining work will be completed by April 2022.
 - (b) works at Whitechapel and Mile End Substations to reduce existing loads on the coupling transformers at Mansell Street and release capacity for future load growth associated with the service improvements to be delivered on the Sub-Surface lines. This work is 95 per cent complete; and
 - (c) an upgrade to the High Voltage network between Stockwell and Clapham Common substations to support service levels on the Northern line. This is in progress and will be completed by March 2022.

- 1.6 Power Package 2 to restore power system resilience on the Northern line to achieve compliance with LU Standard S1972, comprising:
- (a) two HV panels at Hendon to extend the existing HV panels, 2.2km of HV cable, the rephasing of Finchley Intake, DC cabling reinforcement of up to 20 track feeders at 14 sites totalling over 4.8km of cable. This work is required to provide the firm capacity to deliver a reliable service during planned or unplanned outages; and
 - (b) improved ventilation and temperature monitoring at West Ham Bulk Supply Point (BSP), new forced ventilation schemes at 3 sites, a ventilation upgrade at 1 site and overhaul of ventilation systems at 6 sites to ensure optimum operational performance of power supply equipment.



Image 1: New HV Coupling Transformer installation at Stockwell sub-station

Northern and Jubilee Line Rolling Stock

- 1.7 This is a programme of fleet modifications to improve reliability and performance, remove redundant signalling equipment and alleviate a capacity constraint at Neasden depot. This includes following projects:
- (a) updates to the Northern line fleet (95 Tube Stock) Train Management System (TMS) software to reflect the removal of legacy signalling and train protection equipment as part of the earlier signalling upgrades. This work is planned to compete in early 2023;
 - (b) software modifications for Jubilee and Northern line trains to improve the optimisation of regenerative and friction braking performance. This work

is planned to complete in early 2024; and

- (c) modifications to enable trains to operate at increased speeds (up to 10mph) in the Jubilee line Neasden and Stratford Market depots. The Neasden Depot Injection Rate project will improve train entry/exit performance to support a timetable uplift on the Metropolitan line to be delivered under the 4LM programme. This work is on target to complete by September 2022 in line with planned delivery schedule for 4LM uplifts.

Jubilee line Signalling software update

- 1.8 Jubilee line signalling system requires a software updates by the supplier to ensure consistency of operational functionality. This will improve degraded performance on the Jubilee line and maintain software consistency across Jubilee, Northern and Sub surface lines.





Images 2 and 3 - Mobile wheel lathe installation at Stratford Market depot Jubilee line





Images 4 and 5 - Mobile wheel lathe in use on 95 TS train at Morden depot Northern line