

NEW TRAIN FOR LONDON UNDERGROUND

THE STORY SO FAR

by John Hawkins

The 1938 Tube Stock was the first fleet to introduce a new train layout with under-floor equipment, and most cars having two double-doors per side with single end doors. This can still be seen on the new trains for the Victoria Line, the 2009 Tube Stock. After 80 years, a revolutionary new tube train design is at last intended to replace the oldest fleets on four lines, starting with the Piccadilly Line in 2023.

The story of these radical plans really starts 20 years back, with renewal of the Jubilee and Northern Line fleets underway, and Victoria Line train replacement not due for some years. This left time for development of a new high-capacity design, the Space Train, to relieve the overcrowded line. It was to feature only double-doors in shorter cars with walk-through car ends, and bogies shared between adjoining cars. It was envisaged that this would then come to the Bakerloo and to other deep-level lines over a 30-year period. But then plans to allow commercial firms to provide and maintain assets for London Underground led to a slow introduction of the PPP scheme. As a result, Metronet ordered conventional trains for the Victoria Line, avoiding the costs and risks of innovation but using greater power and heavier braking, causing more tunnel heating and carbon pollution – these were not penalised in the PPP contracts.

Moving along ten years, the collapse of Metronet in July 2007 ultimately left LU with responsibility for providing new trains on the Bakerloo Line by 2020, and it seems prior ideas were revived. It was soon decided to add replacement of the troublesome Central Line trains to this project to obtain a larger order size to absorb development costs. The Waterloo & City Line trains were added to the plans later, to avoid a remnant fleet of non-standard trains.

At this time, the first production train was expected in 2018, with a prototype Bakerloo Line train to be delivered by 2015 according to grant milestones. This was later varied to only require delivery of a demonstrator, not necessarily a full length train, but in the 2013-14 Underground plan, this milestone was further varied to only require an invitation to tender for the first phase to be issued by the end of 2015.

Around this time it was found that passenger demand was outgrowing forecasts, and the PPP upgrades would no longer be sufficient to meet expected needs, especially on the north/south lines. Whilst the Victoria and Piccadilly lines were planning 30 trains per hour (tph), considered the maximum achievable at that time, the Northern Line stood out with only 24tph planned north of Kennington on both branches. A second upgrade could perhaps achieve 30tph if inter-working at Kennington and Camden Town were abandoned. This became known as Upgrade 2, or NLU2, and would require more of the new articulated trains. There was also then talk of an extension to Battersea, which would require a further five trains. Soon after, the acquisition of the remaining PPP company (Tube Lines in May 2010) led to a more urgent need for new trains for the Piccadilly Line, scheduled for 2012-14. So the new trains were now envisaged for all legacy deep-level lines, which could lead to efficiencies in design and procurement, rather than persisting with recent practice of individual designs for each line. In 2009 this was labelled the EVO train by TfL, and in 2011 Siemens released a proposed design. By 2013 plans for additional trains for the Northern Line had changed (see below).

Over the years, the order for conversion of the four lines has varied in almost all possible permutations, although the Piccadilly Line has never been last and the Central Line has never been first. In 2014 an exhibition for the New Tube for London (NTfL) – see *Underground News* No.636, pages 609-611 – revealed that beyond 250 new trains, plans now involved platform edge doors and raised platforms to provide level access throughout. These trains could be fully automatic, and would not require a driver's cab, although the (current) Mayor pledged that a member of staff would remain on each train. However, as plans developed for implementation of the upgrades, it was found that a temporary cab would be required, at least until all old trains had been replaced and new signalling could then be commissioned.

By early 2016 the plans called for the Piccadilly Line to receive the first of the new trains with new signalling, to be followed by the Bakerloo Line. Only after the Central Line was fully re-equipped would plans for fully automatic operation be implemented there. The Piccadilly Line would then also be adapted for fully automatic operation. The Bakerloo Line was never planned to receive such adaptation. In 2017, the Waterloo & City Line was moved to the end of the programme.

A TEMPORARY DIVERSION

The PPP contracts were based on the provision of a specified uplift in both journey times and capacity on each line. No train frequency was stated, since a capacity uplift could be partly achieved through use of larger trains, at the discretion of the contractor. The Jubilee Line was to achieve a 22% improvement in journey times and capacity. The Victoria Line would deliver a 15% improvement in passenger journey times and capacity. As the new equipment settled down, it was discovered that the new signalling could achieve far more than the original targets. The Victoria Line had sufficient trains to eventually achieve 36tph after a further upgrade to power, track, ventilation, and signalling systems (VLU2). A further upgrade for the Piccadilly Line was also envisaged at this time, but was incorporated into the initial upgrade requirements when LU became responsible, with the incorporation of Tube Lines.

A similar upgrade to the Jubilee Line (JLU2) would require additional trains, eventually settled upon ten. However, the new train design for the Piccadilly and other lines would be incompatible with the platform-edge door spacing on the underground extension stations. What was needed was a further build of the 1996 Tube Stock, but its outdated equipment was no longer available. Instead, a modern equivalent train was envisaged, with a similar cab layout to minimise staff training. It was realised that this could also suit the extra trains required on the Northern Line, where similar 1995 Tube Stock operates. By joining together, an order for the two lines additional trains (JNAT) might also achieve an economic order size.

In 2014 potential suppliers were advised to expect an order for between 11 and 63 trains, with a likely size of 35. This became a planned order for 27, which only came to an end in October 2017. Budgetary restrictions finally meant that the new trains were not expected to arrive until 2023 to 2026. This was too late for the Battersea extension, expected to open in 2020, and was closing in on the current intention to replace both fleets after 40 years, in 2037 to 2041.

The cancellation of this order leaves the longest period without new LU train deliveries since the hiatus caused by the implementation of the PPP in 2000 to 2004. Before then, new LU trains arrived almost every year (see Rolling Stock Deliveries, *Underground News* issue 649 for January 2016). The last S Stock trains were delivered to LU in 2016, and the first of this new generation of trains are not expected until 2023.

Experience with the new signalling on the Northern Line seems to have convinced LU that NLU2 could now be achieved without separation of the branch services, but also raised the possibility of a 36tph service with separation. This has sometimes been considered as a further upgrade NLU3, and sometimes considered as part of the NLU2 project. The order of 17 modern equivalent trains would only have provided for an upgrade to 30tph, but a further order was under consideration. An alternative plan for additional trains will now be necessary when demand grows and the budget becomes available. Given the age of the current trains, it would be no surprise to see a return to the original scheme to operate a mixed fleet on the Northern Line with a number of the new standard deep-level trains. This could also release some trains to be used to boost the Jubilee Line service after suitable conversion.