Next steps for Delhi's Regional Rapid Transit System

The first tenders are being prepared for the second and third lines of the Regional Rapid Transit System (RRTS) serving the Indian capital Delhi, as ridership continues to grow on the first line to Meerut where the final two sections are due to open shortly. Robert Preston speaks exclusively to Shalabh Goel, managing director of the National Capital Region Transport Corporation, which is delivering the RRTS project.

Most of the first RRTS line from Delhi to Meerut runs on elevated infrastructure.

Photo Credit: NCRTC

MOMENTUM is building for the next stages of the Regional Rapid Transit System (RRTS) or Namo Bharat programme in the National Capital Region (NCR) of India. The Ministry of Housing and Urban Affairs has given its approval to proceed with the construction of the remaining two lines in Phase 1 of RRTS, totalling 311.4km, although final approval has yet to be obtained from the Indian cabinet. New 1435mm-gauge lines providing a high-frequency commuter service will be built from Delhi southwest to Bawal (93.1km), and from Delhi north to Karnal (136.3km), building on the success of the first line which will run for a total of 82.1km from Delhi northeast to Meerut when its final two sections are completed.

RRTS is being delivered by the National Capital Region Transport Corporation (NCRTC), a joint venture between the Indian government and the states of Delhi, Haryana, Rajasthan and Uttar Pradesh that reports to the national Ministry of Housing and Urban Affairs. NCRTC managing director, Shalabh Goel, says that following government sign-off, tendering will start for the two projects which will be taken forward in parallel. Goel reports that NCRTC is in the process of preparing tender documentation so that contracts for general consultancy, detailed design and utility relocation can go out to tender as soon as final government approval is forthcoming, with contract award expected within three to four months.

Civil works contracts are expected to go out to tender approximately seven to nine months after the cabinet gives the green light. Goel says that construction will be divided into packages

covering 10-15km for sections in tunnel or around 25km of elevated alignment, with depots to be tendered separately. Following the start of construction, the first section is expected to open on the Delhi - Karnal line within five years and on the Delhi - Bawal line within six years, as the latter will require more tunnelling with 37.9km of the alignment underground compared with 11.5km on the Delhi - Karnal line. The remainder of both lines will be elevated, with rolling stock depots the only at-grade sections on RRTS. There will be two depots on the Delhi - Karnal line, at Murthal and Ganjbar, and one on the Delhi - Bawal line at Dharuhera/Panchgaon.

Lessons learned

Construction costs for the next two RRTS lines are expected to be around 10% lower than for the first line from Delhi to Meerut, while maintaining the same design speed of 180km/h, thanks in part to using smaller tunnel boring machines (TBM) with a diameter of 5.8m rather than 6.5m on Delhi - Meerut. Other value engineering strategies include reducing the width of viaducts and planning fewer station entrances. Reflecting on the lessons that NCRTC has learned from building the first RRTS line, Goel places great emphasis on thorough planning and design. Expensive and time-consuming utility diversion work can be avoided by moving a station by as little as 100m, he notes.

Equally important is selecting “the latest and the best” in railway technology, while ensuring interoperability between all three lines of RRTS Phase 1. The Delhi - Meerut line features the world’s first deployment of ETCS Hybrid Level 3 on an LTE (4G) radio communications network, but 5G will be adopted for the next lines, which will also feature other RRTS innovations pioneered on Delhi - Meerut, such as platform screen doors at stations, developed with Bharat Electronics (BEL), and an automatic fare collection (AFC) system that enables passengers to use QR code ticketing or contactless card payment.

Under the “very successful” transit-oriented development (TOD) policy developed with the Uttar Pradesh state government, NCRTC has sought to maximise non-fare revenue on the Delhi - Meerut project, undertaking property development and leasing commercial space at stations, where new public spaces are being used for community events such as concerts and art exhibitions. “These ideas are going to continue,” Goel says. Uttar Pradesh has agreed to share development proceeds with NCRTC, and Goel reports that an initial tranche of Rs 10m ($US 110,418) has been made available. He is hopeful that similar agreements to equally share development proceeds can be negotiated for the RRTS lines to Karnal and Bawal, both running through the states of Delhi and Haryana.

NCRTC says that the arrival of RRTS has stimulated growth around its new stations in the residential, commercial and service sectors, with self-sustaining urban centres emerging along the line. Business activity is growing in Ghaziabad, while Meerut is experiencing a boom in the residential sector. NCRTC also notes that Meerut is one of the first cities in India to include TOD zones in its 2031 masterplan, while the Uttar Pradesh state government has approved an integrated 2031 masterplan for Ghaziabad, Loni, Modinagar and Muradnagar, based on sustainable urban development and improved transport links.

Building capability

The Delhi - Meerut line is operated and maintained by DB ECO under a 12-year contract, and Goel expects that a similar contract will be tendered for Delhi - Bawal. In contrast, NCRTC intends to operate the new Delhi - Karmal RRTS line itself. “We would like to build our operations and maintenance capability to become self-sufficient,” Goel says. NCRTC will also undertake

fleet maintenance on the Karmal line, while the new fleet on the Bawal line will be maintained by the manufacturer. Under a 15-year agreement, Alstom maintains the fleet of 40 EMUs that it built for the Delhi - Meerut line at its Savli plant in Gujarat.

Of the 82km Delhi - Meerut line, 55km is now in service between New Ashok Nagar and Meerut South and work has been completed on the final two sections. At its northern end, the line will be extended by a further 21km from Meerut South to Modipuram, while at its southern end what Goel describes as a "very complex" 6km elevated section with two river crossings will take the line from New Ashok Nagar to Sarai Kale Khan in the centre of Delhi, the future terminus for all three lines being built under Phase 1 of the RRTS programme. Goel says that the last two sections have received all the necessary approvals, and are expected to be officially opened within a month.

Alstom has supplied a fleet of 40 EMUs for the Delhi - Meerut RRTS line. Photo: NCRTC

NCRTC says that over 20 million passenger journeys have been made in the first two years of operations on the Delhi - Meerut line, where the first 17km section from Sahibabad to Duhai depot was officially opened by the prime minister of India, Narendra Modi, on October 20 2023. Over 72,000 passengers were carried in the first month of operation, and ridership continued to rise steadily with the opening of the next section from Duhai to Modinagar North in March 2024, and on to Meerut South in August of that year. By December 2024, with 42km and nine stations in service, monthly ridership had increased to 700,000.

A further significant increase was recorded after the opening of the 13km section from Sahibabad to New Ashok Nagar in January 2025, with two new stations in the centre of Delhi, including the major interchange at Anand Vihar, which is also served by the Delhi Metro and mainline services operated by Indian Railways (IR). By mid-July, ridership was nearing 1.5 million passengers a month, with the first RRTS line recording its highest-ever daily ridership figure of 81,550 passengers.

Goel says that ridership is presently averaging between 55,000 and 60,000 passengers a day, sometimes reaching 70,000 during festivals and often rising when visibility is poor on the roads due to fog, when RRTS trains can continue to operate up to their maximum speed of 160km/h

under ATO with predictable journey times. Anecdotal evidence for the success of the first RRTS line is provided by the popularity of its station car parks, which Goel says are usually full. With the steady rise in traffic driven by shorter journey times, a reliable service and a more comfortable travelling environment, NCRTC has increased the service frequency from a train every 15 minutes to 10 minutes, with potential to run trains every 3 minutes at peak times.

The first RRTS line is expected to substantially increase public transport's modal share from 37% to 63% in the Delhi - Meerut corridor. This is forecast to remove over 100,000 private vehicles from the roads, reducing CO_2 emissions by 250,000 tonnes a year. Building the RRTS network forms part of a comprehensive action plan for controlling air pollution in the NCR, one of the most densely populated regions in the world which also has some of the worst levels of air pollution. NCRTC hopes that RRTS can help meet growing demand, while fostering sustainable urban development.

Project costs and funding

NCRTC says that the Delhi - Meerut RRTS line will cost Rs 302.7bn ($US 3.3bn). Multilateral lending agencies have provided 60% of the cost, comprising $US 1bn from the Asian Development Bank (ADB), $US 500m from the New Development Bank (NDB) and $US 500m from the Asian Infrastructure Investment Bank (AIIB). The Indian government covered 20% of the total project cost, with the state of Delhi covering 3.22% and Uttar Pradesh 16.78%.

A similar funding structure will be adopted for the Delhi - Bawal and Delhi - Karnal projects, costed at Rs 323.3bn and Rs 330.5bn respectively. In both cases, lending agencies are expected to provide 60% of total project finance, with the balance divided between the Indian government (20%), Delhi (6.04%) and the state of Haryana (13.96%). NCRTC says that the Delhi - Bawal project has an estimated internal rate of return (IRR) of 20.13%.