

RIYADH Development



Riyadh metro work marches on

Rolling stock deliveries and tunnelling breakthroughs are visible markers of progress on the Riyadh metro megaproject. **Ryszard Piech** and **Karol Zemek** report.

Trains from all three rolling stock suppliers involved in the Riyadh metro project have now arrived in the Saudi capital. The last to get going was Alstom, which shipped its first completed trainset from its Katowice factory in Poland on January 10.

Deliveries of the 69 two-car Metropolis trainsets are due to be completed in 2018. Destined to operate lines 4, 5 and 6, they have external liveries that match the colours of the lines: yellow for Line 4, green for Line 5 and purple for Line 6. This is intended to make the metro easier to use for residents who are not used to this mode of transport.

As with trains for the other lines, there are three classes of accommodation. First class features transverse seating; family class has transverse, longitudinal and tip-up seats; single class has longitudinal and tip-up seats. All three classes have wheelchair spaces. Trains for lines 5 and 6 have capacity

The first of Alstom's Metropolis trainsets has arrived in Riyadh.

for 231 passengers including 69 seated, whereas those for Line 4, which will serve King Khaled International Airport, have capacity for 228 passengers including 57 seated. The seat moquette design is inspired by traditional Arabian architecture and the handrails are shaped like palm trees.

Adaptations for the local desert climate include air-conditioning and door seals to prevent sand ingress. All axles are powered, giving a maximum speed of 90 km/h and ability to climb gradients of up to 6%. The 36 m long, 2 710 mm wide trainsets will draw power at 750 V DC from a third rail. Lines 4 and 6 will share a depot.

Alstom is supplying rolling stock as part of the FAST consortium, which has a €6bn turnkey contract to build and

fit out lines 4, 5 and 6. The scope covers 64.5 route-km, which includes 33 km of elevated alignment, 29 stations and two depots. The Riyadh Advanced Metro Project Execution & Delivery joint venture of Louis Berger and Hill International is providing project management services under a US\$264m contract.

FAST is led by FCC and also includes Samsung C&T, Strukton, Freyssinet, Atkins, Tyspa and Setec. Alstom's €1.2bn share of the contract includes not only rolling stock, but also the supply of Urbalis CBTC signalling, power supplies and its HESoP energy recovery system.

Several Alstom sites in France are involved in the manufacture of the



Alstom is building 69 two-car trains at its Katowice factory.



trainsets. Bogies are coming from Le Creusot, control systems from Vileurbanne, traction motors from Ormans and onboard signalling equipment from Saint-Ouen. Traction subsystems and auxiliary converters are being supplied from Charleroi in Belgium, with passenger information and security systems from Madrid in Spain. The aluminium car bodies are being made in Katowice, where fit out and final assembly is taking place. Assembly of a Riyadh metro trainset takes four days.

Tunnelling progress

All three rolling stock suppliers are building trains to a unified design. Siemens is supplying 45 four-car trainsets for Line 1 and 29 two-car sets for Line 2 from its Inspiro family. The first was unveiled at its Simmering plant in Wien in February 2016 (MR 6.16 p38), and was presented at InnoTrans later that year.

Siemens is part of the BACS consortium led by Bechtel and including Altabani General Contractors and Consolidated Contractors Company. The consortium's contract to build Lines 1 and 2, totalling 63.3 km, is valued at US\$9.45bn. Lines 1 and 2, along with Line 3, are being project managed by the Riyadh Metro Transit Consultants joint venture of Parsons, Egis and Systra under a US\$556m contract.

The third rolling stock supplier is Bombardier, whose first train for Line 3 arrived in Riyadh on November 29. Testing of the train was completed at Bombardier's Kingston site in Canada in September, but the vehicles for Riyadh are being assembled at its Sahagun plant in Mexico.

Incorporating Mitrac traction equipment, Flexx Eco bogies and aluminium bodysells, the 47 two-car Innovia 300 trainsets are being supplied as part of



Tunnelling on Line 3 was completed in January.

Bombardier's US\$383m share of a US\$5.2bn contract awarded to the Arriyadh New Mobility consortium. Bombardier is part of the E&M team, led by Ansaldo STS with a US\$680m share; the consortium also includes an infrastructure team of Salini-Impregilo, Larsen & Toubro and Nesma. Idom and Worley Parsons are also part of the consortium.

Also known as the Orange Line, the 40.7 km Line 3 with 22 stations will be the longest of the six lines being built. In January Riyadh Governor Prince Faisal bin Bandar Al Saud attended a ceremony at the future Qasr Al Hokm Downtown station to mark the completion of tunnelling. The station, which will provide interchange with Line 1, is being built by ANM, and has been designed by Snohetta with One Works.

The 11 km of tunnels on Line 3 have been partly excavated using the cut-and-cover method, with 5.8 km bored using 10 m diameter tunnel boring machine Jazlah supplied by NFM Technologies, which started work in July 2015.

Work on the whole network is now 47% complete. When it opens in 2019 it will bring a much needed mobility boost to a city that is forecast to grow from 6.5 million to 8.3 million people by 2030. The number of vehicle trips is set to grow from 7.4 million to 15 million per day in the same period. Initial ridership on the metro is expected to be 1.16 million passengers per day, with a design capacity of 3.6 million passengers per day.

KATOWICE

An expanding presence

Alstom's Katowice factory employs 1 100 staff on a 215000 m² site that includes 64500 m² of production halls. In 2014 an engineering department was established to support industrial processes. Alstom plans to expand the department's staff of 53 engineers to 100.

Alstom also has links with the local Silesian University of Technology, from which it has taken on 100 students for postgraduate training programmes. In October a dedicated railway department was opened at the university.

All products from Katowice are destined for export markets. The main activity is production of car bodies from aluminium, steel or stainless steel, in addition to the manufacture of smaller components.

The facility is currently producing bodysells for X'Trapolis electric multiple-units for Melbourne, as well as car bodies for Coradia Lint diesel multipleunits that are being assembled at Salzgitter in Germany; more than 570 finished and painted shells have already been delivered. Katowice also undertakes final assembly of vehicles, such as the 37 Citadis trams delivered to Istanbul in 2011 and the 22 five-car and 15 four-car Metropolis trainsets delivered to Budapest in August 2013.

The latest build to be completed, in September 2015, was of 28 six-car trainsets for the Amsterdam metro. Alstom is currently preparing the factory for the production of 50 five-car Metropolis trainsets for the Expo 2020 extension of the Dubai metro Red Line (p31), which are to be delivered by December 2019.

The Katowice facility has four tracks for static testing, in addition to a 1.5 km dynamic test track. These are equipped with 750 V and 1.5 kV DC overhead wires that allows testing at up to 50 km/h with a temporary pantograph fitted to the metro trains.

A recent order for 79 Coradia Regional EM Us for Dutch national passenger operator NS has led to plans for an upgrade of the test facilities. This would add 3 kV DC and 25 kV 50 Hz AC power supplies.

Alstom is also in talks with Polish infrastructure manager PKP PLK regarding the purchase of additional tracks to extend its test track, so as to enable testing to take place at higher speeds.

