

THE INTERNATIONAL LIGHT RAIL MAGAZINE

TRAMWAYS & URBAN TRANSIT



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OUT WITH THE OLD, IN WITH THE NEW



Vienna's grand plans for growth and fleet replacement



Prague's revival

Tramway resurgence underway in Czechia



Elbląg's vision

Small town, small budget: big ideas...

- > Edmonton Valley Line inaugurated
- > Bremen readies for tram-train service
- > New Siemens Tube train revealed



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CONTENTS



NEWS 3
Review of services threatens Manx line; New trams for Prague; Milwaukee Hop line opens.

NEWS FOCUS: LIGHT RAIL DAY 8
David Walmsley reports on Light Rail Day, this year held in Odense.

GREAT THINGS FOR PRAGUE... 9
Filip Jifík talks to *TAUT* about the all-encompassing plans underway for the city's public transport system.

A NEW WAY FOR TRACKFORM 15
Simon Holden explains the details of a novel trackform for light rail that promises a low upfront cost and savings on renewal.

ELBLĄG 18
Andrew Thompson reports on a small city with a tight budget... but enough willpower to push its LRT plans to fruition.

AWARDS: THE WINNERS 22
TAUT talks to some of the 2023 Global Light Rail Awards winners.

SYSTEMS FACTFILE: WIEN 26
Already with a rich history and dense public transport network, Vienna is set to expand yet further in coming years.

WORLDWIDE REVIEW 31
New Škoda order placed for Brno; Transdev awarded Reims contract; Trial runs begin in Mannheim; Den Haag prepares for new depot; Bangkok runs free monorail trial.

MAILBOX 35
What is essential for safe operation?; Can social factors affect light rail take-up?

CLASSIC TRAMS: BYTOM 36
Mike Russell is on hand to celebrate the re-opening of Bytom's iconic Line 38.

A greener future needs a united approach



Delegates to the latest world summit on climate change in Dubai in December were inevitably distracted by the conflicts in the Middle East and Ukraine, and in the shadows of those tragedies it's easy to overlook a concern that some nations are not committed to addressing climate change. That's despite increasing evidence that the extremes of weather are man-made.

Such gatherings only have value if all nations can agree a way forward. While we have always been unsure where China stands, there is now worrying evidence of dissent in the Netherlands, a country with hitherto leading 'green' credentials.

The results of the Dutch general election at the end of November shocked environmentalists because, without delving too much into internal politics, the country's likely new leader Geert Wilders advocates a shift back to fossil fuels and a roll-back of the environmental agenda by extracting more oil and gas from the North Sea and halting wind power.

The next opportunity to bang heads together is a gathering sponsored by the World Bank in Washington in spring 2023, to discuss the importance of better, greener travel, to which urban transport is inextricably linked. Economies can only prosper if it is easier to gain access to jobs, education and health care, and the electric car is by no means the solution because it does nothing to solve congestion or road building.

While readers of *TAUT* will be pleased to read how many countries continue to expand their urban transit systems, it can be justifiably asked whether the core reasons are just economic, supported of course by the significant benefits brought by the implementation of low-cost technological innovation. Is there really a true will to pursue the climate change agenda as well? The world is waiting – and that question needs a positive answer.

Matt Johnston, Editor

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COVER: Short and long *ULF* trams meet at Josefstädter Strasse west of Vienna's city centre. The overground U6 is an historic remnant of the original *Stadtbahn* from the 19th Century. Andrew Thompson

Edmonton's 13km Valley Line opens

Dozens of riders use first early morning service to celebrate line's inauguration

Edmonton's 13.1km (8.1-mile) Valley Line tramway opened to passengers on 4 November. Services started at 05.15 from Mill Woods to 102 St in the city centre, with interchange with the light rail subway at Churchill. Witnesses reported that the early morning departures attracted dozens of riders.

An initial ten-minute peak headway will improve to five minutes once the system has been established. Final departures are at 01.00 on Monday-Saturday and 00.30 on Sundays. Currently, bus line 73 continues to cover the same route.

City manager Andre Corbould said: "Valley Line is the first completely new transit line to

open in western Canada in a generation and will transform the way we move and experience our city."

Although there was an impromptu ribbon-cutting on 4 November, a formal grand opening ceremony will take place this year (2024).

Edmonton was one of the first cities in North America to embrace light rail, and its system has grown from 6.9km (4.2 miles) in 1978 to 24.3km (15 miles).

The Valley Line project has suffered from myriad delays. First mooted in 2009, construction started in 2016 and it was originally due to open in 2020. The most recent delays were caused by the discovery of cracks in bridge piers as well as the need to



▲ ABOVE: ETS 2020 on the Valley Line in the city centre. W. Snowden

replace 140km (86 miles) of signalling cables.

A 14km (8.6-mile) western extension to Lewis Farms is under construction and is due to open by 2027.

An order for 40 low-floor cars has been placed with HyundaiRotem, which will complement the 26 Bombardier Flexity Freedom 42m double-ended low-floor trams now in use.



▲ ABOVE: The mock-up of the next generation Melbourne tram. Alstom

Melbourne tram mock-up delivered

Alstom has unveiled a full-scale mock-up of its new *G class* for Melbourne, to obtain feedback from staff and passengers. The order for 100 Flexity 2 trams is the largest in Australia to date for what is the world's largest tramway system.

The contract was placed with the ex-Bombardier factory at Dandenong, a suburb to the southeast of Melbourne, in April 2022. If all 100 trams are built, the deal (which includes 15

years of maintenance), is worth AUD1.1bn (EUR700m).

The double-ended trams will be three-section 25m vehicles that can carry 150 passengers. The new fleet will replace high-floor trams on lines 57, 59 and 82, and meet the requirement for projected population growth needing expansion of the network.

Some 65% of the vehicles' content will be sourced locally. Delivery is due to start in 2025.

Tramlinks start duties in Bern

The first of 27 new Stadler Tramlink vehicles took to the rails of the Swiss capital on 28 October.

Municipal operator Bernmobil deployed the double-ended 912 variant on a shuttle between the depot, the exhibition centre at Gusanplatz and the Line 9 terminus at Wankdorf Bahnhof as part of an open day at the Bolligenstrasse depot.

Regular Tramlink use started on Line 7 on 1 November between

Bümpliz and Ostring.

Bernmobil has an option for up to 23 more Tramlink cars.

These 42.5m-long seven-section trams (20 of which are bi-directional and seven unidirectional) will replace the 12 Vevey cars and nine RBS Tram 2000 LRVs in 2024 and 2025. These displaced cars are to be gifted to Lviv in western Ukraine. To prepare for this, a Swiss team was on site in Lviv in October.

Midland Metro's temporary terminus

An extra GPB18m (EUR20m) has been required to build a temporary terminus on West Midlands Metro's Birmingham Eastside city centre extension in order to enable it to open early. The new facility will be located next to Moor Street Queensway.

The full line through to Digbeth cannot open because track-laying through Curzon Street station is not able to begin until the site is handed back by contractors building HS2, the UK's controversial high-

speed London-Birmingham railway line. This is not likely to take place until 2026 at the earliest. An interim stop at the Clayton Hotel will provide an interchange between tram, train (via Moor Street station) and bus (via Bus Mall) services.

Lower Bull Street's delta junction has been completed and the section along Digbeth High Street is nearly finished. Preliminary works, including building demolition, are underway on the Dale End - Park Street section.

Bremen prepares for tram-train services

Final *Avenio* deliveries mean that Bremen can finally plan ahead for 2024

Bremen's public transport operator BSAG is preparing for big changes in 2024, now that the last of 77 Siemens *Avenio* 100% low-floor trams have been delivered.

Tram-trains will start work on Line 8, which has been extended by 9.3km (5.8 miles) from Huchting to Weyhe-Leeste. This will be followed by a 3.7km (2.3-mile) extension of Line 1 from Huchting to Mittelschuchting (Brüsseler Strasse).

Tram-trains will operate over the Kirchhuchting – Thedinghausen freight-only railway, with train-control components to permit track-sharing. Siemens has used its own in-house pulse generator to function alongside Trainguard MT on-board software using sensors supplied by Lenord+Bauer.

The *Avenio* vehicles are split into two batches; 3201-42 were designated for normal tramway operation, whereas 3401-35 are for tram-train operation.



▲ ABOVE: Bremen *Avenio* 3432 in front of St Petri Dom. O. Güttler

Dubai's Blue Line

Dubai's Roads & Transport Authority has invited expressions of interest from contractors who could make its proposed Blue Line a reality.

The project was first proposed in the mid-2000s with an anticipated 2012 opening date. However, deadlines were pushed back leading many observers to consider that the scheme had been dropped.

The project has now been redesigned and comprises a 30km (18.6-mile) 1435mm-gauge line to link Dubai International and Sheikh Mohammed bin Zayed airports. More than 15km (nine miles) will be underground, while the rest will be elevated. It will require 28 automated trains.

New trams for Braila

The Romanian city of Braila has ordered six more new trams from Astra Vagoane, with an option for two more. The contract, worth RON48m (EUR9m), will replace the second-hand trams from Rotterdam (Netherlands), Vienna and Graz (both Austria) across the 22.7km (25-mile) system.

Astra is already building ten new trams for Braila; the first is due to be delivered by the end of 2023. The additional six 20m two-section low-floor trams are expected by the end of 2026.

Paris tramway T12 ready

Passenger services are due to start on Paris' new T12 tram-train line on 9 December.

This 20.4km (12.7-mile) route connects Massy-Palaiseau and Evry-Courcouronnes and has 16 stops and a running time of 39 minutes. The Massy-Palaiseau to Épinay-sur-Orge section uses heavy rail, while Épinay-sur-Orge to Evry is a new tramway.

The EUR525m (GBP456m) project is expected to carry 40 000 passengers a day with a ten-minute service. Electrified at 1500V dc, it uses 25 42m Alstom *Citadis Dualis* low-floor cars.

T12 is to be extended over the heavy rail alignment from Massy-Palaiseau to Versailles-Chantiers, but the timescale for this is still uncertain.



▲ ABOVE: An Alstom *Citadis Dualis* on the tramway section of line T12. Ile-de-France Mobilités



▲ ABOVE: The Perley A. Thomas trams still use trolley poles. R. Bracegirdle

New Orleans trams celebrate 100 years

New Orleans Regional Transit Authority celebrated the 100th 'birthday' of its Perley A. Thomas trams with a party on 28 October. The celebration took place at the Carrollton Streetcar Barn where RTA CEO Lona Edwards Hankins said: "It is an honour to join our community to celebrate the legacy of the Thomas A. Perley

Streetcar, St Charles Streetcar line and the RTA workforce that has maintained the system for generations."

The cars have been used on the 9.7km (six-mile) St Charles Streetcar line since 1923-24. As horse trams started on this line in 1835, it has a claim as the oldest continuously operating tramline in the world.

Alexandria metro is go

Egypt's second city of Alexandria signed an EGP43bn (EUR1.3bn) contract on 30 October to build the 21.7km (13.4-mile) Metro Line 1.

A consortium of Orascom Construction/Colas Rail will build the line from Abu Qir to Misr. This will involve upgrading a suburban railway to metro standards and a new 15.2km (9.4-mile) viaduct into the city centre.

Financed by four different sources, capacity is expected to reach 60 000 passengers per hour in each direction. Later extensions could take the line to 43km (26.7 miles).

Antwerp fears two-year 'mobility disaster'

Antwerpen (Antwerp) faces months of travel disruption when the underground Pre-Metro lines of the city's tram network close for major repairs. The tunnels that form the Belgian system are 50 years old and some of the rails have been in place for a quarter of a century.

Phase one of the project will start in 2026 and will last for between five and eight months, four months of which will involve total closure of the Pre-Metro system. Major work will also take place in 2027, which could last for most of the year.

While operator De Lijn is investing millions of euros in the project, some commentators worry about the disruption that will be caused. Dirk Lauwers, a professor of mobility at the University of Antwerp, said: "Every effort must be made to prevent a mobility disaster."

Time for Liverpool trams?

Liverpool Mayor Steve Rotheram has said that the city's transport bosses should "look again" at trams if the Labour Party wins the next UK general election. Plans for a tram system around the city were unveiled in 2001 but were scrapped by then-Transport Secretary Alistair Darling in 2007 after GBP70m (EUR80m) was spent on the project, including ordering rails.

Rotheram said in mid-October, "We had the money... for a tram. Our local authorities couldn't work together and we lost it. We ended up fighting each other and lost the opportunity to steal a march on Manchester."

The 18km (11-mile) Mersey tram would have comprised three lines and Bombardier was to have built the fleet of 21 trams. The project was officially abandoned in 2013 but Rotheram believes that a change in UK government could be the catalyst to revisit it.

Tube trains start testing

First phase of Piccadilly refurb gets underway with testing of new trains

Testing has started on London Underground's new Piccadilly Line stock at Siemens' testing facilities at Wildenrath in Germany. The vehicles are due to enter service from 2025.

A further three cars are being subjected to temperature testing in Austria.

Meanwhile, the train at Wildenrath's former Royal Air Force station will undergo braking and acceleration trials while its vibration and noise levels will be assessed.

Half of the 94 EMUs ordered will be built in Germany. The remainder will be fitted out at Siemens' new UK factory at Goole in Yorkshire, which the company hopes will then be used to build replacements for the 1972 Stock used on the Bakerloo Line.

The new trains form the first phase in a huge refurbishment programme for the Piccadilly Line. Their introduction will increase peak capacity from 24 trains per hour to 27.



▲ ABOVE: A new Piccadilly Line train arrives at Siemens' test track in Wildenrath, Germany. Siemens

The new trains can also cater for larger numbers of passengers than the 1973 Stock. Phase 2, which includes re-signalling

and 18 new trains, can only take place if the UK Government agrees its capital spending business plan.

Porto metro expansion begins

Metro do Porto, operator of the Portuguese city of Porto's metre-gauge metro system, has awarded a EUR379.5m (GBP330m) contract to a consortium to build the 6.4km (3.9-mile) Line H. The consortium, formed of Alberto Couto Alves, FCC Construcción

and Contratas y Ventas, will build the line that will link Casa da Música to Santo Ovídio in the south. It is due to open in 2026.

Meanwhile, tenders are being invited for four metro expansion projects that would increase the network by 37km (23 miles):

6.5km/four miles São Mamede (IPO - Estádio do Mar); 13km/eight miles Maia II (Roberto Frias - Parque Maia - Aeroporto); 10.2km/6.3 miles ISMAI - Muro - Trofa; 6.9km/4.3 miles Estadio do Dragão - Souto. The total cost could be EUR1bn (GBP869m).

New Lakeside 'Hop' service launched



▲ ABOVE: A Milwaukee Brookville tram operates on the wire-free Lakeside line. JSOnline

Services on Milwaukee's 'Hop' Streetcar branch to Lakeside started on 29 October. The 1.2km (0.7-mile) branch currently only operates on Sundays 07.00-22.00, but full daily service is expected in April 2024 when a new development is completed. This includes the 44-storey 'The Couture' residential tower block, which accommodates the tram tracks at ground level.

Much of the trackwork was laid in 2018 but the project was delayed because work on 'The Couture' did not start until 2021. The new branch does not have overhead wires. Instead, it is worked by battery-powered Brookville Liberty low-floor trams.

Manx Electric services to be cut after review of lines?

Plans could see Laxey to Ramsey section reduced to single-line operation

A Freedom of Information request by Isle of Man media organisation Gef has revealed a threat to the Laxey – Ramsey section of the Manx Electric Railway.

Consulting group SYSTRA has been employed by the island's Department of Infrastructure (DOI) to review the island's historic railway system, which includes the 914mm-gauge

steam railway from Douglas to Port Erin, the 914mm-gauge electric railway from Douglas to Ramsey, and the 1067mm-gauge Snaefell Mountain Railway. The report has yet to be published.

However, the FOI request reveals correspondence between the DOI and SYSTRA over the 16km (ten-mile) section of the MER between Laxey and Ramsey and that consideration is being

given to reducing this section to single-line working.

Infrastructure Minister Tim Crookall told the High Court of Tynwald, the island's parliament, that the report would be published soon and that it is "certainly not explosive". He added that discussions have been had about "taking it forward", and further talks would take place once it had been published.

New trams for Prague

Škoda Transportation is to build up to 200 new trams for the Czech capital, in a deal worth CZK16.6bn (EUR681m).

These 32m single-ended cars will feature a 100% low floor and will be the *ForCity Plus* model similar to those being delivered to Bratislava. The first 40 are due to arrive in 2025-26.

The announcement was made on 9 November and there was a 15-day period for any appeals to be lodged before the contract is signed.

Praha's (Prague's) tram system is undergoing a major expansion, with one of the highlights being that trams will return to Václavské náměstí (Wenceslas Square), the 750m boulevard in the centre of Praha (Prague).



▲ ABOVE: A 1972 view of trams passing the statue in Wenceslas Square. The 1967 Tatra T3 6692 is still in service as T3R.P 8398. M. R. Taplin

The underground metro system replaced the trams here in 1980 and the rails were lifted in 1982. Operator DPP awarded the CZK1.24bn (EUR50m) contract

to Eurovia CS on 3 November. The work will take place between spring 2024 and spring 2027.

➤ For more on Prague see page 9 of this issue.

Basel eliminating bottleneck

BLT trams on Lines 10 and 17 started using newly-installed temporary tracks in the town of Binningen from 20 November. This is the first tangible step towards reducing a 350m single-track bottleneck between Binningen Schloss and Binningen Bottmingerstraße. The whole double-track project costs CHF37.5m (EUR38.8m) and is scheduled to be completed in 2026.

Fixing the bottleneck has involved demolishing a row of houses. Until 2024, trams will use a temporary single track laid out on pavements in



▲ ABOVE: A BLT Stadler tram on the temporary single-track alignment. In the foreground is the area once occupied by now demolished houses. A. Thompson

Bottmingerstrasse. Once the Binningen project is completed, the Birsigtalbahn will benefit

from significantly greater operational flexibility and timetable resilience.

Naples restructure

Azienda Napoletana Mobilità SpA in Napoli (Naples) has changed the operating pattern of tram services to allow all-day interworking of all three routes.

Around half the trams run from San Giovanni depot to Via Colombo/Porto terminus (near Piazza Municipio), then to Poggioreale, then back to San Giovanni, repeating that sequence thereafter, while the other half of the duties do the reverse.

The southern Italian city's lines 1, 2, 4 were temporarily re-numbered 41, 42, and 44 over the summer but these were changed again on 2 October; '412' is the service that goes first to Porto, with '421' the destination for the service that runs first to Poggioreale.

The change also brings improvements on what had been route 2 to all-day service. Of the three termini, Via Colombo and Poggioreale are stubs. Consequently, all services require double-ended cars, so only *Sirio* trams are in service.

Moscow goes digital

Trials of digital ticketing technology have started in the Russian capital. A focus group of 100 people used the pilot technology to buy tickets on Moskva's (Moscow's) metro using digital roubles. It is the first such scheme to be used anywhere on Russia's public transport system.

"It is important for us to provide the citizens with all the most modern and relevant domestic payment services," said Maksim Liksutov, the Deputy Mayor of Moscow for Transport.

"Plans are in motion to expand the services offered and the currencies which the system can support, as well as the technology to 'top-up' credit at the Metro turnstiles rather than having to search for the current yellow terminals."



▲ An 891-775 (Moskva 2020) train on the metro at Michurinski Prospekt on the extension of Line 8A, which opened in 2018. Over 200 of these trains are now in service. S. Gvozdi

ODENSE LIGHT RAIL DAY



David Walmsley reports on the 2023 Light Rail Day.

In October, the annual Light Rail Day, the most important conference for tramways in the Nordic countries, returned to Odense, where the conference was founded in 2009. With a population of 200 000, Odense is one of three Danish cities, along with Aarhus and Copenhagen, to join the light rail revolution, opening its tramway in 2022.

The conference, held over two days in the Grand Hotel on 2-3 October, was attended by 130 delegates, mostly from the Nordic countries but also from Germany, Switzerland and elsewhere in Europe.

Opening the conference, Bernd Reuss, event organiser and chairman of the Nordic Light Rail Association, said Light Rail Day had steadily grown in importance, attracting participants keen to see the future of urban mobility in Europe. He commented that in Denmark the press often focuses on negative issues like accidents, unreliability and rising prices, rather than the full picture.

Transport planners should avoid engineer language, he suggested, which passengers and journalists may not understand, and focus on the more important story there is to tell. We need to get people out of their cars and onto public transport, he said, helping to meet both climate and mobility goals. If we fill diesel buses with more passengers, it is better for the climate than running empty electric buses. Exchanging fuel cars for electric cars, however, makes no difference to mobility.

Before the conference, delegates visited the new Odense Letbane tramway. Leading the visit, Letbane CEO Dan Davn said the 14km (8.7-mile) tramway was designed as a growth

generator, linking the city centre with the main railway station, football stadium, university, commercial centres, hospital development, and urban space projects. The total cost was EUR480m. Construction took place between 2015–22 under separate contracts for civil engineering, transport systems, rolling stock, and operation/maintenance. The system uses 16 200-passenger Stadler *Variobahn* vehicles.

Back at the Grand Hotel, presentations covered maintenance procedures, stray currents, management structures, SMART automation, urban development, and the contribution of women in transport.

Over dinner, NLRA Vice Chairman Tom Potter presented the Nordic Light Rail prize to Reinhold Schröter, of Stuttgarter Strassenbahnen, for his long-standing support for tramways in the Nordic countries. Tom thanked Reinhold for his outstanding contributions to the light rail community.

“Reinhold is the first non-Nordic recipient of this award,” he said, “demonstrating a pursuit of excellence which has led to the creation of safer, more efficient, and sustainable transportation systems. Reinhold has a vision, strong commitment to excellence, and an unwavering belief in the power of light rail systems to improve the quality of life of our cities.” **TRAVEL**

➤ *Thanks are due to the conference organisers, Bernd Reuss and his assistant Anastasiia Polianska, and the main sponsor Stadler Rail. The 2024 Light Rail Day will be held in Tampere, Finland, on 27-28 May; see www.lightrailday.com. Details of the NLRA can be found online at www.nlra.dk.*

▲ ABOVE: An Odense Letbane tram in the city centre. Mike Ballinger



▲ ABOVE: Reinhold Schröter accepts the Nordic Light Rail prize. Augenblick Film ApS - Light Rail Day

▼ BELOW: Odense Letbane trams at Bilka stop. David Walmsley



PRAGUE:

MASTERPLAN TURNS TO REALITY



Richard Foster talks to Filip Jiřík about the all-encompassing plans underway in the Czech Republic's capital city.

ABOVE: Praha (Prague) is embarking on a multitude of infrastructure projects, which will lead to a transformation of its Metro and tram networks. Filip Jiřík

New infrastructure projects send a message about a place. They say that this is somewhere to take notice of, that good things are happening. They create buzz and positive energy.

This is exactly the mood in the Czech capital, Praha (Prague). It's embarking on transport infrastructure projects galore, transforming its Metro and tram networks, while also replacing busy bus lines with trolleybuses and investing in a whole new fleet.

Praha is steeped in history and rich in architectural gems that reflect the influences that different cultures have had upon the city. Indeed, its medieval Old Town is a UNESCO World Heritage Site.

Water plays an important role here. The city sits astride the Vltava and the numerous water courses that feed it, while there are reservoirs and lakes aplenty.

The landscape varies too. The Vltava valley is 172m above sea level but some of the surrounding hills to the west are 400m above sea level. This undulating landscape, naturally, has an influence on its public transport system.

Praha – and the Czech Republic as a whole – has a chequered past that we don't need to delve into here. However, after emerging from Soviet control in 1989 and the split

from the Slovakian Republic in 1993, Praha has not only become a hugely popular tourist destination, attracting millions of international tourists every year, but also become a highly desirable place to live.

A sprawling tram network

If there was one silver lining to the Soviet era, it was that the city retained its tram network, although it was touch and go at times. The system dates back to 1875. New privately-owned electric lines ran alongside the original horse tramway between 1891-97, with the first city-owned electric line starting in 1897 when the city also bought the horse tramways and converted these to electric lines by 1905. The system reached its zenith before World War One.

By the mid-1960s, the standard gauge system was in a dire state and there were plans to replace sections of it in the city centre with an underground metro. Some lines did close – including those on Václavské náměstí (1980) and Na Příkopě Street (1985) – but, come the mid-1980s, it had become quickly apparent that although metro was suitable for longer trips, the tramway was missed for shorter journeys. A tramway expansion began, one that still shows no signs of abating.

There are now 148km (92 miles) of track. There are 26 day routes, ten night routes

and two historical routes. A symbol of this resurgence was that over 373m passengers used the network in 2018, which made it the world's busiest.

It's a far cry from 1974 when the first 6.6km (4.1 miles) of the standard gauge Metro Line C opened, deemed the future of Prague's urban public transport system. Today Line C spans 22.4km (14 miles). Adding to this, the first 4.7km stage of line A opened in 1978 (now 17.1km / 10.6 miles), followed by a third Line B in 1985.

The current network is 63.1km (39.2 miles) long and is operated by 53 five-car *M1* trains (built 2000-11, although some trains were ordered later for extensions) and 93 five-car *81-71Ms*, which are refurbished Soviet-era trains.

Prague Public Transit Co. Inc. (Dopravní podnik hl. m. Prahy, akciová společnost or DPP) operates both the tram and the Metro, the 0.5km (0.3-mile) Petřín funicular railway, and many bus routes. Private companies operate ferries on the Vltava river, as well as further bus/coach routes, and while heavy rail forms an integral part of the public transport system, it is largely operated by a national rail company.

DPP is a joint stock company that is part of Praha Integrated Transport (Pražská integrovaná doprava), that is owned by the city of Prague. The biggest advantage of this



is that a ticket is valid on all public transport across the city, one of the few exceptions being long-distance trains. DPP's combined operations cover some 496km² (308 sq/miles). Public transport usage is high, accounting for 59% of journeys. That said, private car ownership is high too, with DPP's research showing that there are 955 cars for every 1000 inhabitants.

A growing need

One of the downsides to Prague's desirability is a shortage of housing. The current population is 1.35m people but that's expanding. As a result, new developments are popping up in suburbs and districts within and around the city, and they all need links to public transport.

One of the biggest infrastructure projects has been one of the longest to come to fruition: the new Metro D Line.

The current Metro network forms a triangle under the city centre, with lines radiating north, east and west. There are key interchange stations between two lines at each of the three points: A Lines (green) and B (yellow) at Mustek; A and C Lines (red) at Muzeum, and B and C Lines at Florenc.

D Line (blue) will connect the city's southern districts to the Metro. From the C Line station at Pankrác, D Line heads south to the suburb of Písnice while a northern leg connects to Náměstí Miru.

The route was first proposed in 2010 and was expected to cost CZK25bn (EUR1bn); by 2020, the estimated costs had risen to CZK73bn (EUR2.9bn). That near trebling of the costs might have dissuaded some cities from building it – but not Prague.

Rather than cancel, DPP is building it and construction of the 10.6km (6.6-mile) line started on 21 April 2022. What's more significant is that DPP's investment also includes using driverless technology.

The line should open throughout in 2029. Another significant scheme that should bear fruit this year is the investment in new trolleybuses.

▲ ABOVE: The opening day of the 2.3km Dedina extension on 22 October 2023. The first day was a celebration with old trams, as usual in Prague; pictured is museum vehicle 3062 built in 1942. Filip Jiřík

Ideally, the city would build more tramways to improve connectivity but geography dictates that not all locations are suitable – or, in fact, are busy enough to support – new tramways. The city feels that trolleybuses offer the best compromise: they retain most of the tram's green credentials but require less expense to get operational.

While the city does operate conventional battery electric buses, 'trolleys' can share the tramway infrastructure (such as converter stations), which will provide the charging facilities. It is envisioned that both forms of transport will complement each other, forming a seamless surface public transport system.

Trolleybuses on Line 58 (which replaces the busy and hilly bus line 140) and Line 59 (replacing the airport line 119) will start full service at the end of 2023/early 2024. They will use SOR Libchavy SOR TNS 18 and the double-articulated Škoda-Solaris 24M trolleybuses. Further routes will be converted to trolleybus operation in the next few years.

Sweeping change for the tramway

New Metro lines and buses are just part of Prague's travel masterplan, which encompasses its tram network in a key and growing role.

Radical changes to the tram network have been underway since 2017 and, just in the space of two years (2020-22), four major infrastructure improvements have been made: new loops have opened at Zahradní Město and Depo Hostivař and extensions have been built to Holyně and Pankrác.

One of the most recent extensions, to the new developments at Libuš, a district to the south of the city, opened on 26 May 2023.

Construction of the 1.9km (1.1-mile), double-track extension only started in April 2022.

With such rapid progress, no wonder the city feels alive with positivity.

But DPP is working on a staggering 17 new projects that will take place over the next ten years and extend the system by 36km (22.3 miles). Some of those projects are still at the very early stages, others are more advanced and some are due to open imminently.

This rapid expansion of the system will require new vehicles – up to 200, in fact. Tenders have been issued for the new, low-floor trams and the city expects to be able to sign the contract by the end of 2023.

It is expected that the new trams will be delivered in batches: the first 20 should arrive in 2025, followed by another 20 in 2026. The remaining vehicles should be delivered in stages between 2027 and 2035. The whole deal is worth CZK15bn (EUR609m). The new trams will join the existing fleet, which comprises: 340 T3R.P (modernised T3), 250 15T, 55 KT8D5 (all modernised with low floor part), 55 14T, 42 T3R.PLF (modernised T3 with low-floor part), and 19 T3M2 (modernised T3). There are also some heritage and retro trams that mostly run on special lines.

But what of the lines that these new trams will run on?

The 2022 extension to Holyně was the first step in bringing the tram to the eastern district of Slivenec. A massive re-development programme is underway here with lots of new housing, which requires environmentally-friendly public transport options nearby.

A 5km (3.1-mile) extension to Barrandov opened in 2003, with a 1km extension to



◀ LEFT: In the space of two years, massive changes have been wrought on Praha's system: the new loop at Depo Hostivař is one of two, with the other loop being introduced at Zahradní Město. Filip Jiřík

“DPP is working on a staggering 17 new projects that will take place over the next ten years and extend the system by 36km.”



▲ ABOVE: The road-widening along sections of Vlastina Street helped allow for the tramway extension, as well as extensive earth and utility works. The route will be grassed while 170 trees will be planted to create a green corridor, as part of a broader greenscaping plan. These views show the 2022 outlook, compared with the greener 2024 perspective. Tree-planting is already underway. Photo and visualization © Metroprojekt Praha 2022.

▼ BELOW: A Škoda 15T on the first day of opening of the Dedina extension on 22 October, near Sídlíště na Dědině station. In the centre, trees were planted this autumn, so come springtime the street will be much greener. Filip Jiřík





▲ ABOVE: One of the latest extensions to Libuš only took 13 months to deliver - construction started in April 2022, with the route opening in May 2023. Filip Jiřík



▲ ABOVE: The opening ceremony for the Libuš extension on 26 May was marked with heritage tram rides - pictured is tram 2210, built in 1930. Filip Jiřík



▲ ABOVE: The Metro forms a triangle under the city with three lines (radiating north, east and west) across a 66km network. The new driverless Metro D Line will add a further 10.6km to this network, and should open in 2029.

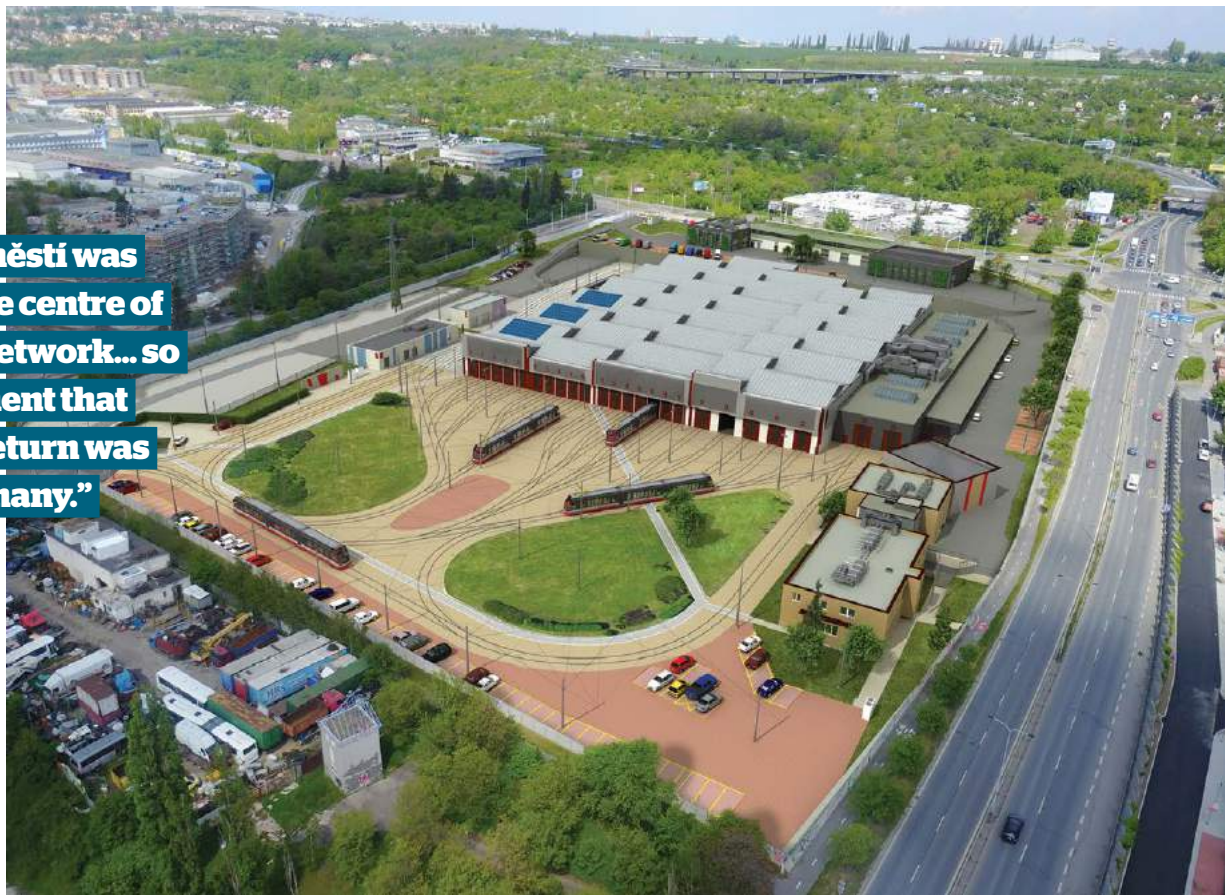


▲ ABOVE: On the first day of operation of the Slivenec loop, a Škoda 14T arrives at the loop. The line brings the tramway to the eastern development of Slivenec, where a massive - but sustainable - construction programme is underway. Pictured in the background are new-build houses, which are part of this development. Filip Jiřík

“Václavské náměstí was traditionally the centre of Prague’s tram network... so the announcement that trams were to return was a highlight for many.”

► RIGHT: Construction of the new depot at Hloubětín started in September 2022. The depot was the first to be designed for maintenance of low-floor articulated trams. Completion should be in early 2025.

Visualization © Metroprojekt Praha 2020





▲ ABOVE: The view of the future Václavské náměstí tram line from the National Museum building, after completion of a scheme that will see the return of light rail to the city centre. Visualization © Jakub Cigler Architekti 2019

Holyně in 2022 and 0.5km to Slivenec (with a turning loop, unlike the current, temporary terminus at Holyně) in 2023.

A new housing development next to the loop is sited west of the city and close to Václav Havel airport. Reaching it involves extending the existing line from Divoká Šárka, where there is a big nature reserve, by a further 2.3km (1.4 miles).

Much of this new route follows Vlastina Street, which requires widening in some sections. The route also requires extensive earth and utility works.

On completion, the Dědina extension is to become part of a green corridor with over 170 trees being planted – part of a city-wide programme to increase green spaces.

After an initial 12-year project planning period, the construction phase of the project was completed remarkably quickly. Starting in July 2022, full opening followed just 16 months later on 23 October, with extensions to lines 20 and 26.

A warm welcome

Prague's tramway expansion isn't just focused on building new lines. One of the most significant developments is the return of trams to Václavské náměstí (Wenceslas Square).

This is one of Prague's most historic thoroughfares. Dominated by the National Museum at one end, it links the New Town (founded in 1348) with Old Town.

It's a place of significance to the Czech people. The Czechoslovak declaration of independence was read here in 1918; demonstrations against Nazi and Soviet oppression also took place, as did the protests that eventually led to the end of Communism.

Václavské náměstí was traditionally the centre of Prague's tram network, too, until trams here were stopped in 1980. Two historic trams, converted to cafés and sitting on sections of exposed track, are a nod to the past.

Prague's then-mayor, Zdeněk Hřib, unveiled a CZK327m (EUR13.2) makeover plan for the square on 15 April 2021. This includes new paving, street furniture, pedestrian areas, cycle lanes and the planting of new trees, which hark back to the time when lime trees lined the square. However, the highlight for many was the announcement that trams are coming back. The construction contractor was selected in October 2023.

The reinstated line will diverge from the existing one that crosses Jindřišská and Vodičkova (used by lines 3, 9, 14 and 24) about halfway down its length. This is a rather simplistic description for what will be a complex junction, caused by wide spacing of the new tram lines. They will run up and down the extremities of the square, separated by the pedestrian area and green spaces.

These two lines will come together just beyond the 1912 statue of Saint Wenceslas in order to pass the National Museum. Here, they will join the 80m of track which was laid in 2018, before joining Vinohradská Street. The Václavské náměstí regeneration project should be completed in spring 2027.

DPP hasn't ignored the existing infrastructure either. Top of the list is re-opening Hloubětín tram depot, which closed in 2019. Reconstruction work started in September 2022 and it should be ready to receive its first vehicles in

March 2025. However, rather than simply rebuild the depot, the new structure will be the first on the network designed to maintain low-floor trams.

A new bridge is also being built across Vltava river between Podolí (Dvorce stop) and Zlíchov (Lihovaz stop), provisionally called Dvorecký most. Construction started in September 2022, with completion due in spring 2025. The bridge (with a new 1km tram line) will only be accessible to trams, buses, cyclists and pedestrians; making route changes within the tram network possible and allowing passengers a greater range of options to make their journeys and reach different destinations more directly.

Prague's tram network is one of Europe's largest and busiest. At peak times, 440 trams can be found running and some junctions can receive 170 tram movements per hour. To keep the system moving, the city is investing in new intelligent technology that gives oncoming trams priority at traffic lights. DPP hopes that this will help accelerate service times, helping the city cope with increased demand.

There are many reasons to visit Prague and you can now add seeing a pro-active approach to infrastructure projects along with everything to tempt the tourist. It's also a perfect place for a repeat visit, for you can bet that the public transport system won't be the same as the last time you saw it! **TAUT**

› Thanks to Filip Jířek for his assistance with this article. For more information on Prague's plans and for system maps, please visit: www.dpp.cz

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A NEW TRACKFORM

With low upfront cost and the promise of further savings in terms of renewals, Waybeam is attracting interest. Simon Holden explains.

Successful in-factory testing of a novel trackform for light and intermediate rail has recently been completed at British Steel's R&D facility at the Advanced Manufacturing Park (AMP) near Sheffield.

Ricardo Rail wrote and witnessed the test programme for the trackform, known as Waybeam. Several rail contractors are showing interest in Waybeam because of the low upfront cost of manufacture and installation and the substantially reduced cost of renewals.

Waybeam's trackform borrows from two existing techniques for securing rails in place and distributing load: firstly, it uses a system of blocks, which mirror the function of key blocks seen with bullhead rail. Secondly, it uses troughs, which mirror the function of beams used in bridging to distribute load. The ease of removing the blocks facilitates access for inspection and renewals.

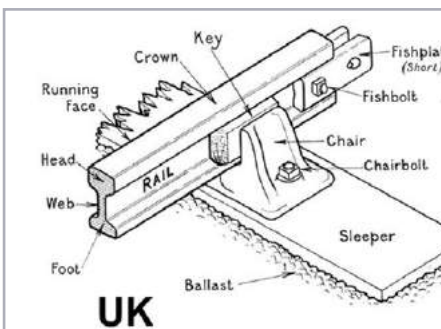
The troughs (beams), into which the rails and blocks are placed, can span voids up to 2.5m wide; this avoids the need for major ground preparation works or utilities relocation. Conventional Vignole rail is used, which is cheaper to procure than special tram profiles.

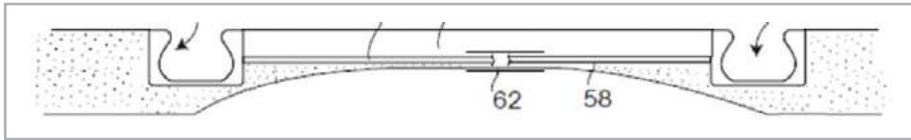


◀ LEFT AND BELOW: Testing at British Steel witnessed by Ricardo.



▼ ▲ ABOVE AND BELOW: Beams used in bridging and key blocks and chair used with bullhead rail.





▲ ABOVE: Gauge ties with turn-buckle at centre.

▼ BELOW: Full assembly of trackform with blocks and junction plates fitted.



Waybeam's design uses two troughs: the first is a curved inner trough which functions as the chair used for securing bullhead rail; the second is a rectangular outer trough into which the inner trough is placed. The total width and depth of this assembly are approximately 300mm x 75mm (about the same dimensions as a landscape-orientated A4 piece of paper), and the assembly can be easily dug in by cutting slit trenches into any surface. A material advantage of the system is the avoidance of extensive use of concrete and fixed grouting or mastic.

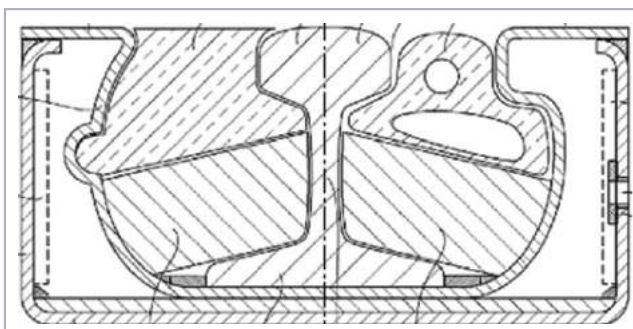
The system is held to gauge using ties incorporating turn-buckles at their centre to ensure the correct distances between rails are maintained.

The void above Waybeam's key blocks, and between the head of the rail and the upright

“As well as demonstrating the stiffness of the troughs and junction plates, the tests proved that the rail did not move within the troughs during load application.”

▶ RIGHT: Loading Waybeam for transportation from Arc Laser to British Steel for testing.

▼ BELOW: Many iterations in design of key blocks and inner trough curve have occurred to achieve required securing of rail yet ease of block removal.



of the inner trough, is filled by compressible rubber to prevent trip hazards or ingress of material, while at the same time allowing wheel flanges to pass along the rail.

The geometries of the key blocks and inner curve have undergone multiple iterations during the design phase to achieve the optimum results for sufficient securing of the rail, ease of block and rail removal for inspection or renewal, and feasibility of manufacture.

From prototype to manufacture

The Waybeam Track System is the design of Kit Holden, a former Assistant Chief Inspector of Her Majesty's Railway Inspectorate. Holden played a significant role in the approval of many UK light rail schemes and in retirement began developing a more cost-effective trackform, working closely with Pre Metro Operations (operator of the Stourbridge line), the Ultra-Light Rail Partnership and the late-John Parry of Parry People Movers. All these were early backers of Waybeam.

In 2022, Waybeam received grant funding from Innovate UK to develop its prototype. This was manufactured at Cramlington in the north east of England by specialist fabricators, Arc Laser Cutting and Fabrication. The fabrication of Waybeam's troughs requires high levels of accuracy to ensure correct fitting of the block system, and Arc Laser was able to form the troughs within the tolerances needed. Arc Laser describes forming the shape of the inner trough 'like origami for plate-bending'.

The metal plate is formed into the correct shape using heavy presses. Making the shape requires ten sequential and highly-accurate bends. The complex process requires attention to multiple factors such as the temperature of the brake-press oil and the design and location of risers and blocks to prevent the gradually forming curve from knocking onto parts of the brake-press tooling. Other forming processes were investigated during prototyping (such as milling and casting) but were rejected for reasons such as waste, compromising strength and, above all, precision.





◀ LEFT: Brake-press being used at Arc Laser Cutting and Fabrication, and ensuring accurate forming of inner trough bends.

▼ BELOW: Junction plates being tested at British Steel.

“The majority of the load is taken by the stiffness of the rail and even at loads of 600kN, only about a millimetre of deflection was recorded along the horizontal plane.”


Successful testing of Waybeam at British Steel’s R&D facility at AMP Sheffield involved measuring the deflection of the troughs under loads representing the basis of the design (15-ton axle weights over a void of 2.5m). The static three-point load for the bending moment tests was devised by Ricardo on an 835mm section of Waybeam over a 760mm void.

As expected, the majority of the load is taken by the stiffness of the rail and even at loads of 600kN, only about a millimetre of deflection was recorded along the horizontal plane of the topside length of the Waybeam trough. Similar results were recorded when the junction plates that join two sections of Waybeam trough together were tested. As well as demonstrating the stiffness of the troughs and junction plates, the tests also proved that the rail did not move within the troughs during the application of the loads because the key blocks successfully held it in place.

Following these static tests, planning is taking place for dynamic testing of the gauge ties and longitudinal forces in a field trial. Discussions are underway with several rail contractors for the lease of up to 500m of land on which to lay track and operate vehicles over the system.

The aim for full production is to develop the manufacturing base near Arc Laser in the north east of England. Waybeam’s target is to service proposals for branch lines and on-street running, and it has the flexibility to meet both requirements in one trackform design. **TAUT**





Passing through the central track triangle at Sąd, Tramicus 405 is framed by the representative district court building as it runs eastbound to Saperów with a line 3 service. The size and capacity of this three-section LRV is ideal for the needs of Elbląg's tram system.

ELBLĄG: FIT FOR THE FUTURE

It's paradigm for smaller cities on a tight budget but with grand ideas and willpower; Andrew Thompson visits the Polish city that can now boast its own high quality LRT.

About one hour southeast of Gdansk in northern Poland sits the city of Elbląg. With a population of roughly 118 000, it features one of the country's smaller tram systems. The metre gauge network currently has a size of about 16.5km (10.3 miles) and its last extension dates back to November 2017, when the 1km (0.6-mile) link between Grota Roweckiego and Lutego opened. This created a second trunk route through the city centre and ensured better operational resilience, while allowing lines 4 and 5 to serve one new stop.

The city's electric tramway originally dates back to 1895, making it the second oldest in today's territory of Poland, opening two years after Wrocław in 1893. Just like Wrocław (Breslau), Elbląg (Elbing) was a part of Germany in the late 19th Century and formed an important manufacturing and logistics centre in East Prussia. Chief among

industries were the iron works of Ferdinand Schichau (1814-96), established in 1837 and which produced steam locomotives, stationary steam engines, and – after 1854 – passenger ships and military vessels. Because of the city's direct access to the Baltic Sea through the namesake Elbląg Canal (known as the Oberländer Kanal during the German era), the Schichau works also produced torpedo boats and light cruisers, as well as U-boats during the two world wars.

After the city became Polish in 1945 and a Communist government was installed by the Soviet overlords in Poland, the Schichau works were nationalised and rebranded as Zamech. Power generation equipment, mechanical gear and shipbuilding components became the primary product lines. Since the end of the Cold War and subsequent privatisation, the works has been used for the production of steam turbines and owned by such multinational corporations

as ABB and Alstom, passing to its current owner General Electric in 2015. After more than 180 years, the works remains one of the most important employers in the city and is conveniently connected to the tramway system, being served by lines 1, 2 and 3 at Robotnicza.

Along the important north-south tram line 1, a further four tram stops north of Robotnicza also serve industry, including the historic brewery, which has been owned by Heineken since 1998 and is used to produce a variety of local Polish brands including Żywiec, Warka and Tatra. Near the brewery is also the site of the city's lone tram depot.

In the post-war era, Elbląg took receipt of its first Polish-built 'Enka' type 5N trams and matching 5ND trailers in 1957. While built by Konstal in Chorzów, they were actually based on the older German wartime austerity design *Kriegsstrassenbahnwagen* (KSW) from 1943. The 'Enkas' would shape the face of Elbląg's tramway for several decades, until the more modern Konstal 805Na arrived in 1980.

More importantly, the city's small tram system was able to avoid the fate of similarly-sized networks in Bielsko-Biała, Legnica and Olsztyn, which all closed in the 1960s or early 1970s due to life-expired infrastructure and the lack of funds to ensure renewal.

Nevertheless, the tram tracks were removed from the historic Old Town in 1968, as a pedestrianised zone was favoured. Since then, the closest tram stop to the medieval core has been Plac Słowiański. An important network extension was implemented in 1986



▲ ABOVE: Showcasing its low-floor centre module, *Moderus Beta MF 09 AC*, car 073 passes the central track triangle at Sąd while running with a southbound line 4 service to Druska. To the rear is the tower of Elbląg's historic city hall building, which dates from 1912. All pictures from 14 July 2023, by Andrew Thompson



▲ ABOVE: Running on line 3 eastbound to Saperów, the single-ended *Pesa Tramicus 401* arrives at the city centre stop Plac Słowiański, which serves the nearby Old Town. The red brick building to the rear is the main post office.

“The city’s small tram system was able to avoid the fate of similarly-sized networks which were all closed in the 1960s/70s due to life-expired infrastructure and lack of funds.”



▲ ABOVE: The single-ended *Moderus Beta MF 09 AC 070* idles at the Druska double-track turning loop, which is served by lines 1, 2 and 4 and is the southernmost point of the city's tram network. The low-floor centre section is visibly outlined by the vehicle's clever colour pattern.

▼ BELOW: An interior view of the simple yet clean and well organised *Moderus Beta MF 09 AC*, Elbląg's newest LRVs with partial low-floor access. This is how modern, barrier-free rolling stock also becomes affordable for smaller systems.



Konstal type 805Na single car O58 is seen at the Elbląg railway station stop (Dworzec) while running with a line 2 service southbound to Druska. The station's double track tram stop is laid out as an island in the middle of the busy Aleja Grunwaldzka.



in the north of the city with the extension of line 1 to the new terminus at Ogólna, thereby connecting the growing residential district of Zabawa. At the same time the new line 3 was launched.

In the mid 1990s, the municipal operator Tramwaje Elbląskie sought to maximise limited financial resources by renewing the fleet through the acquisition of second-hand vehicles from Germany. After the classic 5N trams were withdrawn in 1996, they were replaced with six cascaded Duewag GT6 from Mainz. These would soldier on in Elbląg until

2013, when they were replaced by newer cascaded vehicles from Germany in the form of three modernised and partially low-floor MAN type M8C from Augsburg. Three more non-modernised high-floor Duewag M8C from Mülheim an der Ruhr followed in 2016.

Thanks to EU-funding, the modernised MAN M8C with retrofitted low-floor centre modules were not the first barrier-free LRVs in Elbląg, as in late 2006/early 2007 a total of six fully low-floor type 121N *Tramicus* were supplied by domestic producer Pesa from Bydgoszcz. These are a shorter three-section

variant of the longer five-section *Tramicus* that Pesa supplied to other Polish tram networks in Bydgoszcz, Łódź and Warszawa (Warsaw) between 2006-08. Later, Pesa superseded the *Tramicus* model with the updated *Class 120N/122N Swing*.

By 2017, Tramwaje Elbląskie once again had funding and subsidies in place to acquire more modern rolling stock, opting for three short *Moderus Beta MF 09 AC* single-ended bogie cars from Poznań-based Modertrans. Successive orders for two more units were placed in 2019 and 2020, with the whole series of five cars being delivered between January 2020 and April 2021. These economical and efficient vehicles are very similar to the Pragoimex *VarioLF* bogie cars that are operated on various Czech light rail networks.

The timetable frequency and tram operating pattern for the five different lines in Elbląg is unusual as it does not follow a fixed headway, and is designed to correspond with demand during different daytime hours. While during the morning and late afternoon rush hour there might be four departures per hour, during midday off-peak times some lines only run once an hour. Roughly speaking, the tram lines run from about 05:00-23:00. Ticket prices are comparatively cheap, with a one-hour ticket only costing PLN4 (EUR0.90) and 24-hour rover PLN16 (EUR3.60).

Aside from rolling stock renewal, tracks have also continuously been modernised or in some instances double-tracked during the past two decades. Thanks to all of these measures and planned projects, Elbląg's tramway is fit for the future and is a prime example of how with political will, and skilful management of limited resources, smaller cities can enjoy high quality public transport and effective light rail solutions. **TAUT**



◀ LEFT: The double-track loop at Ogólna is the northernmost point in the city's tram network and lines 1, 3, 4 and 5 all terminate there. As the two drivers have a chat while their vehicles idle, the modernised Konstal type 'Enka' is seen in the foreground. Tramwaje Elbląskie has four such vehicles with modified front-ends in its fleet. Car O63 is in the foreground, and the *Moderus Beta MF 09 AC* car O74 is behind it.



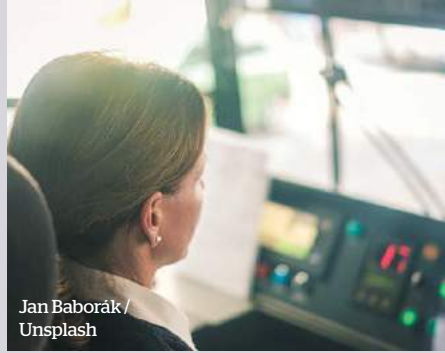
◀ LEFT: Car O61 is one of the non-modernised Konstals and still has printed destination boards rather than electronic dot-matrix displays. While running southbound on line 1 to Druska, the single-ended tram calls at Plac Grunwaldzki. Due to their angular design and large panel windows, these still ubiquitous trams are known as 'Aquariums' all over Poland.

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BERN, SWITZERLAND

Withdrawing its 1980s stock, the city welcomes its new Stadler *Tramlink* LRVs while also making plans for two network extensions.



Jan Baborák / Unsplash

ASSISTANCE FOR DRIVER FATIGUE

Richard Foster looks at how modern technology is being used to monitor driver fatigue to improve their wellbeing and to make tramways safer.



SYSTEMS FACTFILE: GRANADA

Works for the first extension of the Metro are now in hand. Neil Pulling reports on this largely surface-running tramway in one of Spain's most visited cities.

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There were many entries at this year's Global Light Rail Awards that are worthy of a closer look. Here, *TAUT* focuses on just a few of the winners to find out more about what made them prizewinners on the night...

METRO DE SEVILLA: INNOVATION FOR SUSTAINABLE MOBILITY

▼ BELOW: Metro de Sevilla's construction of a photovoltaic solar park for self-consumption, which supplies energy to both trains and stations, won the team the Best Environmental and Sustainability at the 2023 Global Light Rail Awards. Metro de Sevilla



Representing a milestone in public rail transport and in Metro de Sevilla's sustainable consumption strategy, 'The energy of the sun that moves our trains' project won a key accolade at the 2023 Global Light Rail Awards.

Metro de Sevilla was considered a worthy winner of the Best Environmental and Sustainability Initiative Award for its pioneering role in the construction of a photovoltaic solar park for self-consumption. Supplying energy to both trains and stations, it contributes 15% of the total energy consumed annually by the underground system. This puts it in line with the Globalvia group's Strategic Sustainability Plan 2021-24 and with the 'Green Revolution' strategy led by the Andalusian Regional Government at national level, which (among other things) promotes the use of renewable energies.

Innovation in infrastructure

Metro de Sevilla, a concession of Globalvia for the Junta de Andalucía regional government, is committed to innovation and sustainable mobility focused on the user.

Operating a high-capacity, carbon-neutral transport system that is increasingly efficient in terms of energy (which is obtained entirely from renewable sources), Metro de Sevilla

aims to set an example of sustainability, contributing to the reduction of traffic, pollution, and CO₂ emissions.

It has worked to optimise the use of electrical energy, achieving a 37% reduction in consumption since 2014. This success results from equipment upgrades and implementation of efficiency measures including: power supply improvements to maximise recovery of energy produced during train braking; software enhancements for smoother train traction; adoption of LED lighting; and installation of frequency converters in rotary machines. It also fosters intermodal and 'last-mile' mobility solutions, with user-friendly passenger offerings, such as parking for bicycles and electric scooters at stations.

Metro de Sevilla was Spain's first subway to develop an EMV ticketing system (open loop), which enables passengers to access the subway using their smartphone or bank card. It was also the first public transport network to implement a smart post-payment account-based system to allow passengers to pay at the end of the month, with the best fare available applied.

The sun and Seville's trains

In November 2022, Metro de Sevilla went a step further and built a solar photovoltaic

plant to power trains and stations.

With 2000 panels spread across the roofs of buildings over a total area of 5800m², the plant produces around two million kWh per year. It started producing energy in November 2022, supplying a total of 1.3mW. The distribution of the photovoltaic park on stations makes it possible to optimise use of the energy generated by minimising the waste in its transport from the production source. Now, the sun moves Seville's trains.

Hosted in London on 4 October, the Global Light Rail Awards ceremony marked an evening of excitement for Metro de Sevilla's team, who had the opportunity to exchange experiences with representatives from across the light and urban rail sector.

"We are deeply honoured to have received the award and to be recognised for our innovative character, which leads us to seek solutions that make us even more sustainable," said Jorge Maroto, Managing Director of Metro de Sevilla.

"We are committed to offering a quality and sustainable metropolitan transport service. Metro de Sevilla and Globalvia invest in innovation and technology, taking another step forward in our goal of improving the user experience at all stages of their journey."

KEOLIS NOTTINGHAM TO RELAUNCH AWARD-WINNING ZERO TOLERANCE CAMPAIGN

Ensuring fair revenue collection is a top priority for the sustainability of the tramway industry. Since the introduction of the Zero Tolerance campaign – awarded The Richard Brown Best Customer Initiative Award at the Global Light Rail Awards 2023 – Keolis Nottingham has been actively working on a series of revised initiatives to address and mitigate fare evasion on its network.

In March 2022, the Revenue Protection team, also known as Customer Experience (CX), introduced several initiatives under the Zero Tolerance campaign. Trialled over a four-month period, these were:

- **Blitz:** High visibility of staff and additional security
- **Gateways:** Trams held at stops whilst Customer Experience Agents (CXAs) check passengers onboard as well as those leaving the vehicle
- **Plain clothed operations:** CXAs working in plain clothes whilst conducting onboard revenue checks
- **Early bird operations:** CXAs boarding the first trams leaving the depot

More than 442 500 passengers were checked during the trial, with over 22 000 fare evaders identified. The initiatives were deemed successful, contributing to keeping fare evasion consistently at 5% or below.

This success, and winning the Customer Initiative Award, has motivated the team to continue their efforts. Following a recent review, the decision was made to relaunch the campaign, partnering with Tramlink as a joint initiative, to further reduce fare evasion.

While Keolis Nottingham's current fare evasion detection rate stands at approximately 5%, a closer look reveals that plain-clothed operations and gateways exhibit higher rates of 9.78% and 8.81%, respectively. These operations provide a more accurate reflection of fare evasion, prompting Keolis Nottingham to focus its efforts on reducing the rate in these areas to 5% within the next 12 months.

It begins with education

The first area of focus involves educating passengers on ticket types, payment methods, and the consequences of fare evasion. Keolis Nottingham has started campaigns targeting specific communities, schools, colleges, and universities.

Notably, over 60% of verbal warnings issued on the network pertain to concessionary passes. As part of the education strategy, Keolis Nottingham will focus on informing and educating concessionary pass holders about the importance of pass validation. A targeted approach will be implemented, with CXAs

requesting that unvalidated concession passes be tapped on a validator, and informational stickers handed out to serve as a reminder.

It has also been proposed that handheld machines will be upgraded to enable CXAs to validate passes in cases of genuine mistakes, to streamline the fare validation process and ensure payments are received for each journey.

A 'buy before you board' campaign was to be relaunched in December 2023, followed by quarterly campaigns throughout 2024. Collaborating with Nottinghamshire Police, Keolis Nottingham aims to increase the security presence during these campaigns, strengthening enforcement powers and supporting CXAs in their efforts.

CXAs will be deployed to tram stops at which a high number of school pupils board, and pupils attempting to board without a valid ticket will be refused travel. Keolis Nottingham will collaborate with its Quality, Health, Safety and Environment (QHSE) team to ensure schools with high levels of fare evasion receive visits, employing CCTV as a tool to present evidence of students breaking the law.

To sustain the momentum generated by the campaign, Keolis Nottingham plans include ongoing efforts to deter fare evaders for the long term. The focus remains on plain-clothed and gateway operations, with weekly changes in focus areas across different parts of the network.

In addition to increased enforcement, Keolis Nottingham aims to maximise customer communication. Public announcements will be intensified, with specific scripts for different scenarios.

It is anticipated that there may be an increase in Penalty Fare Notices (PFNs) during this time, and the management team is prepared to handle PFN payments and appeals through existing structures.

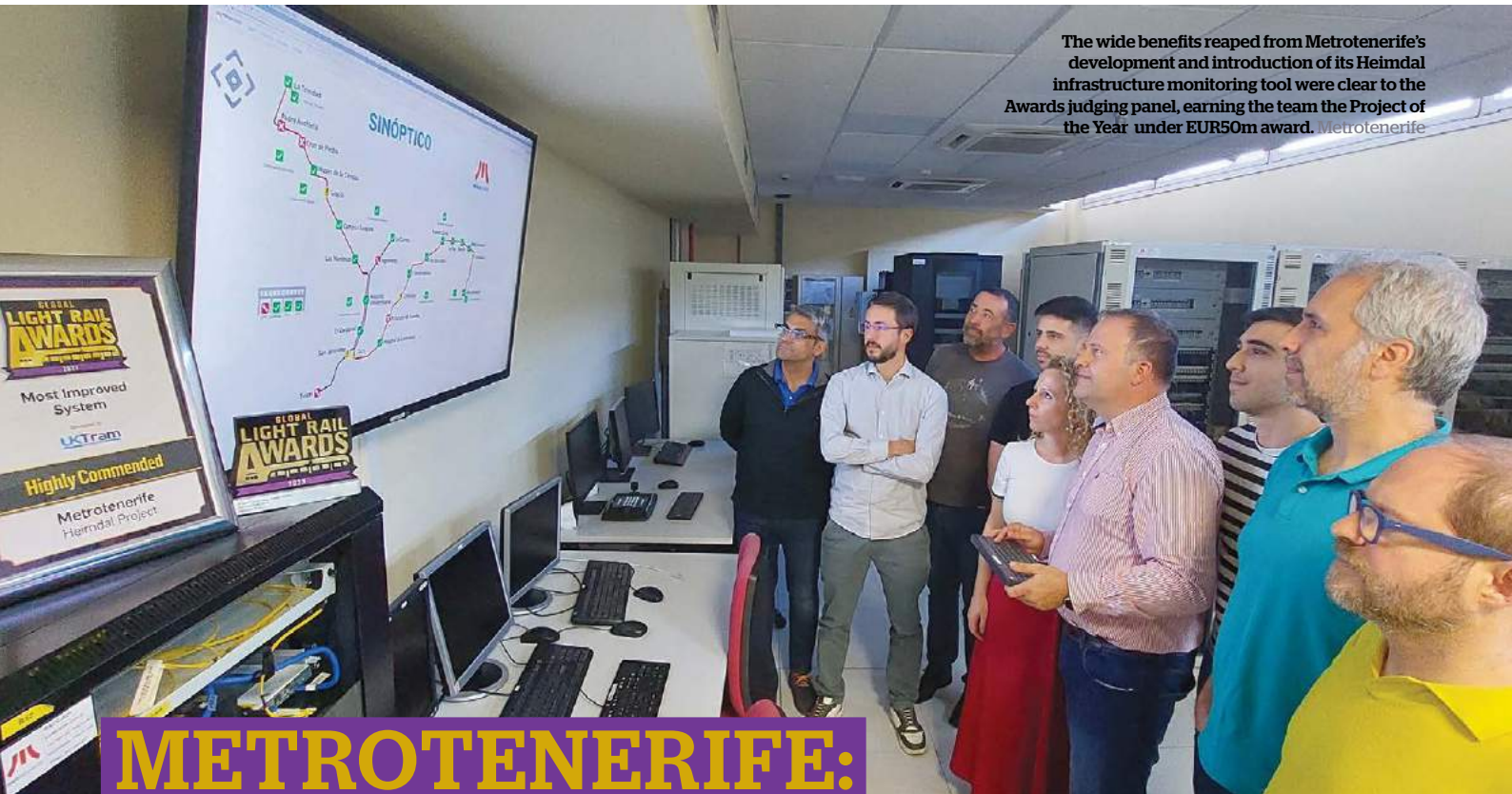
Clear milestones and key performance indicators (KPIs) will track the success of the revenue plan. A survey in Autumn 2024 will validate the numbers and assess the plan's success.

It is important to recognise the crucial role of the CX team and give them opportunities to develop. Keolis Nottingham will provide a 'What good looks like' guide, offering a clear understanding of performance expectations. Individual training needs will be analysed to address skills gaps through a training plan.

KPIs will be shared with the team to foster ownership and celebrate success, and CXAs' time management will be monitored to ensure optimal performance. Performance reviews, coaching, and management processes, will be refreshed. Shift briefings and debriefs will enhance communication, serving as a platform for CXAs to share their experiences, best practices, and any challenges faced during shifts.

Keolis Nottingham's zero tolerance campaign represents a holistic approach to fighting fare evasion, combining education, enforcement, and deterrence. By focusing on specific operations, engaging with the community, and developing its team, Keolis Nottingham aims not only to reduce fare evasion but also to enhance overall revenue and the passenger experience. The success of this initiative will undoubtedly contribute to the long-term sustainability of Nottingham's public transport system. ➤





The wide benefits reaped from Metrotenerife's development and introduction of its Heimdall infrastructure monitoring tool were clear to the Awards judging panel, earning the team the Project of the Year under EUR50m award. Metrotenerife

METROTENERIFE: THE BENEFITS OF HEIMDAL

The Global Light Rail Awards ceremony 2023 marked a milestone for Metrotenerife's team. The company's Heimdall scheme was awarded the Project of the Year (under EUR50m) trophy, and was highly commended in the Most Improved System category. These prizes recognised the huge effort Metrotenerife has made to successfully deliver the infrastructure and onboard monitoring project.

Jacobo Pérez, one of the attendees at the Awards night on 4 October, described himself as being "on the moon" – a sentiment shared by the whole team.

Heimdall: From many, into one

The aim of the Heimdall project was to deliver improved monitoring of infrastructure and onboard subsystems, thereby making more in-depth information available and resulting in reduced incident response times. Among other benefits, this has led to increased availability.

Before implementation of the Heimdall project, infrastructure monitoring was performed by a single piece of software. However, not all staff involved in maintenance activities were able to interpret the information it provided effectively.

For onboard subsystems the situation was very different. Some subsystems were monitored by their own sets of software, resulting in the use of multiple monitoring tools. Other subsystems were not being continuously monitored at all.

So the aim was a single monitoring system for all Metrotenerife's infrastructure and

on-board subsystems. With this objective, it was decided to:

- Integrate on-board subsystems monitoring in the infrastructure subsystems' monitoring software
- Incorporate monitoring of subsystems that were not being previously monitored at all
- Add new layers of customised information, to make the monitoring task more intuitive and easier to interpret for any member of the teams involved in those activities: information technology, signalling and systems, maintenance, and so on.

Delivery of the project involved staff from three different departments, working closely together for more than a year to establish communication between subsystems, collect and customise information, create a full tramway fleet monitoring communication system, connect warnings and failures with geographical locations, create a summary of the systems in the network, and improve alarm management.

The project was completed in September 2022, and its benefits proved to be even greater than anticipated. They include:

- Availability of information on warning and failures in on-board systems that were not previously being constantly monitored
- Performance of predictive maintenance on on-board systems
- Reduction in response time for incident

resolution, based on the ability of the system to issue alarms in real time to the relevant teams

- Reduction in time locating failing systems
- Reduction in repair costs
- Reduction in costs of on-board systems corrective maintenance; improvement of the systems' lifetime due to the predictive maintenance carried out
- Higher availability for on-board systems, avoiding disruption of services

Even if the original situation experienced by Metrotenerife is common for many tramway operators, the company took steps to improve it, increasing its effectiveness and efficiency. An enormous effort has been made by each member of the team to achieve this goal, with long hours and many challenges overcome along the way.

The future with Heimdall seems bright. Metrotenerife will be able to continue upgrading the performance of predictive, preventative and corrective maintenance, based in Heimdall's functionalities such as: generating automatic maintenance work orders for corrective actions; producing and distributing automatic reports on activities; monitoring consumables supplies; activating warnings when running low.

It can certainly now be concluded that the results are worth it. For this reason, Metrotenerife strongly believes that the benefits must be promoted, so that other operators are aware of the possibilities that exist for such huge improvements without making significant investments.

STARS ALL ROUND FOR ŠKODA

Alexandra Sjöholm talks about her Global Light Rail Awards experience.

Prior to this year's awards we had never heard of the Global Light Rail Awards, but by impulse we decided that entering sounded fun, despite us not really standing much chance in such a prestige event.

We quickly gathered our Region North engineering team and knew exactly what to apply for: Technical Innovation of the year (Rolling Stock) for our *ForCitySmart Artic X54 Jokeri* tram. This tram that has been jointly engineered in the middle of nowhere in cold Finland, by superb engineering and design experts. Why was this so important for us as the Škoda Group? Because this revolutionary tram introduces an unparalleled level of comfort and passenger experience that is set to redefine standards in the light rail industry.

What sets *Jokeri X54* apart is its innovative integration of pivoting bogies and a multi-articulated structure, creating an unprecedented combination that offers passengers the best of both worlds. The symmetrical car-body control system (SCCS), a fully mechanical system placed on the tram's roof, ensures the seamless coordination of car-body sections, resulting in a consistently defined position. One of the tram's most remarkable features is its spacious and comfortable passenger environment, with up to 40% more flat floor space compared with traditional bogie trams. The innovative multi-articulated design also introduces a supported centre module featuring a state-of-the-art pivot-kneeling system, enabling threshold-free boarding for passengers with limited mobility.

"Škoda Group's *ForCitySmart Artic X54 Jokeri* tram was conceived out of the necessity to extend the length of a bogie tram without encroaching on valuable customer floor space. Throughout the engineering journey, I faced the challenge of implementing a



▲ ABOVE: Alexandra Sjöholm, winner of the Rising Star Award for 2023, pictured here with Ollipekka Heikkilä, was able to return to Finland with a heavy haul of awards.

threshold-free boarding solution. These challenges led to innovative solutions that have been patented. Today, we proudly offer a remarkable product, boasting nearly double the floor space when compared to other bogie trams. Moreover, it graciously lowers itself to platform level, ensuring accessibility for all customers with limited mobility. To me, this LRV represents the epitome of tram design. I extend heartfelt thanks to The Global Light Rail Awards and Mainspring for the prestigious award," commented Ollipekka Heikkilä, father of the *Artic* trams and the man behind the *Jokeri* tram's innovations.

In conclusion, submitting our *Jokeri* tram for Technical Innovation of the Year in Rolling Stock was a no-brainer. We sought recognition to showcase the groundbreaking design and manufacturing expertise rooted in Finland, expressing our deep pride in this exceptional project. Sharing the *ForCitySmart Artic X54 Jokeri* tram with the world was an opportunity to highlight innovation at its finest. Škoda Group is beyond thankful that industry professionals have recognised the game-changing impact of our solutions. The judges were able to see a vehicle innovated and engineered with passion and love. This tram is a testament for the whole industry.

Škoda Group also applied for Manufacturer of the Year due to our unwavering commitment and hard work within our entire organisation. We take immense pride in our innovative technical solutions, and are grateful for the trust bestowed upon us by our valued customers. Our pride extends to the hardworking employees who contribute tirelessly to our success, embodying the essence of our achievements. The Highly Commended award for Manufacturer of the Year brings us great joy and is a commitment to maintaining the high standards of our products.

"Being able to participate in the Global Light Rail Awards representing the Škoda Group, our solutions and team work was simply life-changing", said Alexandra Sjöholm, winner of the Rising Star Award for 2023. "The glamorous event felt like the Oscars of light rail, and the chances to network on an international level were vast".

"Winning the Rising Star Award for my achievements in light rail sales and marketing, for my passion for trams and my efforts for both the customer as well as advocating female power in the industry is truly special. Despite countless times being told 'no' and facing scepticism about a woman's role in selling trams and handling technical aspects, this recognition challenges stereotypes. It proves that gender should never limit one's capabilities, and I'm proud to break through such barriers.

"I have always thrived in pushing boundaries, aiming to set an example for young talents, particularly women, in the industry. We are many – often in the shadows – yet you equally find us working in engineering, maintenance, fleet management, operations, sales and business development – you name it. Projects, titles and pay raises were never handed to me easily, and being a woman it feels that I always had to put in an extra effort, 200%, to receive a seat at the table.

"I can recommend the Global Light Rail Awards warmly to everyone working in light rail. Be it light rail system construction in alliance models, sustainable city planning, solutions and material choices supporting carbon footprint optimisation, smart depot or production innovations – go for it and dare to share your story for the Global Light Rail Awards 2024. Dare to dream. Never in a million years had I expected winning, but I was proven wrong.

"With this fresh boost of confidence I obviously still have high aims for my future: after having sold Finnish trams to Germany, my next goal is to sell them to the Scandinavian market. Wish me luck.

"I would like to dedicate this win to all fellow women who work just as hard in this industry, and offer my thanks to the judging panel and everyone at Mainspring, and everyone from all over the world who told me that I put Škoda Group on the map for them. And finally, thank you from the bottom of my heart for making me feel like Kate Winslet at the Oscars".



▲ ABOVE: The Technical Innovation of the Year (Rolling Stock) category was won by the *ForCitySmart Artic X54 Jokeri* – a tram which Škoda says represents "innovation at its finest.."

SYSTEMS FACTFILE

No. 195 Wien,
Austria

Rich in history, the dense public transport system in Austria's capital city is poised for significant growth during the coming years, as Andrew Thompson reports.



Dating back to its very first horse tramway in 1865, Wien (Vienna) has one of the world's great light rail systems, steeped in tradition and innovation.

Currently the standard gauge network has a size of roughly 178km (110.6 miles), making it one of the largest in the world. The image of the red and white trams circling the civic landmarks along the famed Ringstrasse transcends transport and enjoys global recognition, having featured in countless films and television programmes over the course of several decades, while being a favourite postcard image for visitors.

Since 1959, the iconic *Type E* articulated Duweg cars have shaped the face of the city. While the last *Type E1* (produced 1966-1976) were formally withdrawn in July 2022,

the slightly more modern *E2* (built 1978-90) are still expected to soldier on until 2030, though in continuously decreasing numbers, as more of the locally-assembled *Flexity* enter revenue service on a rolling basis. The municipal operator Wiener Linien (WL) currently has 119 of these 34m, five-section LRVs on order from Alstom, with deliveries having commenced in 2017 and being expected to continue until 2026.

The *Flexity* fleet supplements the 332 Siemens *ULF (Ultra Low Floor)*, which were also locally produced in two series from 1997-2005 and then again from 2009-17, although the prototype was presented in 1995 and developed by the domestic consortium of SGP and ELIN, prior to the takeover by Siemens. Unlike the *Flexity*, the *ULF* exist in both a short 24m version and a longer 35m variant.

▲ In 2022, over 1.17 million people owned a public transport annual pass in Vienna. This is not only a new record and eclipses the previous best from the pre-pandemic year 2019 by about 20 000, but it is actually higher than the number of people who own a car in the city. This shows the popularity that public transport enjoys in the Austrian capital and the overwhelming modal shift in favour of easy and sustainable public transportation.

Their unique feature is that they do not have bogies and offer a particularly low entry height of 197mm (7.8 inches) above the rail head, making them well-suited for a system where street-boarding without the use of platforms is common.

WL's large active fleet is housed and maintained in no fewer than ten different depots, plus the central workshop at Kaiserebersdorf in the south-east of the city. Indeed, many of Wien's architecturally attractive depots are listed landmarks and illustrate the tramway's long history. Correspondingly, much of the city's heritage fleet has been well preserved and is displayed at the *Verkehrsmuseum Remise* at Ludwig-Koessler-Platz, located in the old Erdberg depot built in 1901. With over 1800m of track to display 100 vehicles, it is one of the largest tram

➤ **RIGHT:** Running with a southbound U6 service to Siebenhirten, car 2714 is about to leave the elevated Josefstädter Strasse station. This elegant Art Nouveau building was designed by Otto Wagner and opened in 1898. Originally steam-powered trains ran over this early commuter railway with overground alignment. Since 1989 the former *Stadtbahn* tracks have been used by the underground line U6. As a distinct feature in the city's underground network, U6 is operated using light-profile *type T* and *TI* trains, which were supplied by Bombardier from 1993 to 2000 and then again from 2008-14.



▲ **ABOVE:** In late May 2023 ULF 30 is on an inbound line O service on the city's newest tramway extension between Nordbahnstraße and Bruno-Marek-Allee, which opened in October 2020. The single-ended LRV without bogies is about to call at Nordbahnstrasse and has just passed under the main railway line from Wien Praterstern to Floridsdorf. To the rear is a purpose-built residential complex.

▼ **BELOW:** Standing at Karlsplatz, the bogie car 408 was originally built by Ringhoffer in Prague in 1900, but completely rebuilt in Vienna in 1954, giving it the more characteristic mid-century appearance. The vehicle is owned and operated by the preservation society *Verband der Eisenbahnfreunde (VEF)*.

museums in the world. Its oldest exhibit is a horse-drawn carriage from 1868. More preserved cars are also based at the remote storage site of Wiener Tramwaymuseum (WTM) in Traiskirchen, which is open to the public on Saturdays.

Even at the heritage tramway in Mariazell, located in the mountains west of Vienna, a number of operational Viennese cars have been preserved and are used on the scenic line that connects the narrow-gauge Mariazellerbahn terminus with the town of Mariazell.

As the capital of the Austrian and then the enlarged Austro-Hungarian empire, Vienna was the economic hub of Central Europe throughout the 19th Century, thereby benefiting from consistent growth and remarkable prosperity, while also being at the forefront of technological

development and new transport innovations.

Indeed the city's first, albeit short-lived horse tramway ran from 1840-42 between Donaukanal and Zrinyigasse in the Brigittenau district and was therefore known as *Brigittenuer Eisenbahn*. The first permanent horse tramway was opened by private investors in autumn 1865, a year before the first horse tramway in Pest, Hungary. While the network of Vienna's first horse tramway enjoyed consistent growth, in 1873 a rival company launched operations and just four years later served a 42km (27-mile) network.

In 1883 the steam locomotive producer Krauss backed the opening of a steam tramway serving the suburbs of Hietzing and Perchtoldsdorf south of the centre. In 1887 this was extended further south to Mödling,

with additional steam routes opening around the entire conurbation in the ensuing years. Even though electrification was first introduced in 1897 and the last horse tram operated in 1903, some of the steam trams would run in the more peripheral districts until 1922.

By 1903, the city's sprawling system of numerous private operators was ready for consolidation and amalgamation under municipal management.

In 1907, line numbers replaced alphabetical letters, some of which are still valid today.

From 1914 to 1955, dramatic historical events greatly affected the development of both Vienna and Austria, as the nation played a role in two world wars, changed from large empire to small republic in 1918, was occupied through Hitler's *Anschluss*

THE FLEET

While Wiener Linien (WL) deploys only single-ended LRVs on its urban lines, Wiener Lokalbahnen (WLB) only uses double-ended stock for the interurban service between Oper and Baden Josefplatz, partly because the latter is not fitted with a turning loop. Incidentally, both WL and WLB are integrated into the holding structure of the municipal utilities company Wiener Stadtwerke GmbH.

From the 332 Siemens *Ultra Low Floor (ULF)*, the 80 *type A1* short variants and 100 *type B1* long variants are fitted with air-conditioning. These are the later series produced in different batches from 2007-17. All of the new *Flexity* are also air-conditioned. Although the original order for 117 of these LRVs (with options for 37 more) was placed with Bombardier in 2014, Alstom has since taken over this contract and also the former Bombardier plant in the Leopoldau district. The gradually decreasing number of high-floor Duewag *E2* and matching bogie trailers are not air-conditioned but still used on a variety of different lines, including important trunk routes.

With the introduction of the newest *Type 500* low-floor *Flexity*, WLB started withdrawing and scrapping the first of its *Type 100* high-floor Duewags in 2023. The *Type 100* are designed to run in multiple with the more modern low-floor *Type 400*, from which only the latest vehicles delivered feature air-conditioning.

▼ **BELOW LEFT:** Posed before the portal entrance of the *Remise* tramway museum at Erdberg depot are two vintage vehicles available for charter hire, as the 'Rent a Bim' advertising panel on the roof denotes. Due to the distinctive sound of their warning bells, trams in Vienna have always been locally nicknamed as 'Bim' and this moniker remains valid.





Passing the victory column dedicated to Admiral Tegetthoff and his achievements in the 1866 naval battle at Lissa, DUEWAG 4076 arrives at the major Praterstern interchange with a line 5 service. Line 5 provides a vital cross-town link between the Praterstern and Westbahnhof main line stations, calling at Franz-Josefs-Bahnhof along the way as well.

NETWORK FACTS

- > **Opened:** 1865 (electrification from 1897)
- > **Lines:** 29 (including WLB)
- > **Size:** 178km / 110.6 miles (without WLB interurban line)
- > **Depots:** 10
- > **Approx. weekday hours:** 05.00-00.30
- > **Line frequency:** Wide variations
- > **Gauge:** 1435mm
- > **Power:** 600V dc overhead supply on WL, 600V, 750V and 850V dc on separate sections of WLB
- > **City network/operator:** Wiener Linien (WL)
- > **Interurban operator:** Wiener Lokalbahnen (WLB)

INFORMATION

- > **City network:** www.wienerlinien.at (including system map)
- > **Wiener Lokalbahn:** www.wlb.at
- > **Regional transport:** www.vor.at
- > **Civic information:** www.wien.gv.at
- > **Tourist information:** www.wien.info

in 1938 and was severely damaged through the Vienna Offensive of the Red Army in March and April 1945. This was followed by a decade of Soviet occupation.

The tramway was utterly indispensable during this time and, remarkably, continued to grow steadily, though wartime limitations or damages affected it during both global conflicts. By 1930 the network reached its largest-ever extent and during 1943 it transported the still-unmatched record number of almost 732 million passengers, while employing 18 000 members of staff. At the same time the track width was regauged from 1440mm to the 'proper' standard gauge value of 1435mm in 1942-43.

While, at the start of the war in 1939, the tramway operated a fleet of 3665 cars, by the conclusion of the conflict 567 cars had been destroyed and 1536 damaged. Just like Germany and Berlin, Austria and Vienna were divided into four different Allied occupation zones at the conclusion of World War Two, and thanks to the influence of the Western Allies, both the city and the country were also able to benefit from the Marshall Plan. Correspondingly, Vienna was given 42 *Peter Witt* streetcars from New York in 1948-49. These were fairly new, having only been built in the late 1930s and previously used on the Third Avenue Railway System in Manhattan and the Bronx. In Vienna they required minor technical adaptations and were then classified as *Type Z*. Colloquially referred to as 'Amerikaner' (Americans) by the local population, they would last in revenue service until 1969.

After the four Allied powers agreed to leave Austria in 1955 in exchange for neutrality, the foundation was laid for autonomous economic development and independent transport planning. City authorities started preparing the first acquisition of articulated cars in 1956, which would make it possible to introduce one-man operation and end conductor services.

By the 1960s, the widespread advent of the car and growing individual mobility also put pressure on Vienna's more peripheral tram lines, with several eventually being closed in favour of bus operations. This included the former steam tramway routes to Mödling (Line 360) and Gross-Enzersdorf (Line 317). At the same time, tram lines in the historic centre, which either ran through tight, narrow streets or did not feature a high degree of reserved track, were also abandoned in favour of buses, including line 13 from Südbahnhof to Alser Strasse.

As was modern at the time, the construction of an underground network started to take political precedence, yet efforts not only focused on developing a bespoke metro network, but in 1966 a first tram tunnel opened and in 1969 an even longer southern orbital tram tunnel was inaugurated with its X-like shape featuring four different spurs. This Südgürtel (Southern Belt) helped create an accelerated fast link between the major railway stations Westbahnhof and Südbahnhof (today Hauptbahnhof), which otherwise don't have a direct heavy rail link. This major trunk with longer tunnel is currently used



▲ ABOVE: On 19 May 2023, WLB's new *Type 500 Flexity* runs outbound from Oper, as it passes the central library building. Eventually these double-ended low-floor LRVs will replace the remaining high-floor *Type 100 Duewags*.

"The widespread advent of the car put pressure on Vienna's more peripheral tram lines."



▲ ABOVE: Vienna's *S-Bahn* commuter railway is operated by the state railway company ÖBB using a variety of single-deck and double-deck trains. Pictured here are two coupled sets of the newer *Class 4746 Siemens-built CityJet* EMUs on their approach to Wien Praterstern. Development of the system started in the early 1960s and currently ten lines are in operation. The core section is the 11.3km (seven-mile) *Stammstrecke* (trunk route) from Wien Meidling to Wien Floridsdorf via Wien Hauptbahnhof, Wien Mitte and Wien Praterstern. The centrepiece of the *S-Bahn* trunk route is formed by several underground tunnel sections between Wien Hauptbahnhof and Wien Radetzykplatz. Around 640 trains and over 270 000 passengers travel on *S-Bahn* trains over this core artery every day.

➤ **RIGHT:** Departing from the Schottentor interchange with an outbound line 43 service to Neuwaldegg, the long ULF variant 675 passes the university campus and the construction site of the major underground network extension.



by lines 1, 6, 18, 62 and Wiener Lokalbahn on the interurban service to Baden.

The official go-ahead for Vienna's actual *U-Bahn* system was given in 1968, and the first section of line U4 opened for trial operations in 1976 on the short above-ground stretch of track from the northwestern terminus Heiligenstadt to Friedensbrücke. Much of Vienna's new underground system was actually designed to incorporate extensive elevated sections from the previous *Stadtbahn*, which opened in stages between 1898 and 1901 and featured arched overground viaducts and elegant stations designed by the famed Art Nouveau architect Otto Wagner.

The *Stadtbahn* initially carried steam-hauled urban stopping trains but was electrified in 1925. In the late 1970s and early 1980s two of the old *Stadtbahn's* arteries located west and south of the city centre were combined with purpose-built tunnel sections and used to form the backbone of the new underground lines U4 and U6.

The first tunnel section of the new *U-Bahn* system was inaugurated along line U1 in early 1978 between Reumannplatz und Karlsplatz. This was followed by the opening of three more route sections along line U1 and U4 that same year. From 1979 to 2017 a further 21 underground sections were opened as part of the original rolling programme and later network extensions. Since the most recent 4.6km (2.9-mile) extension of U1 in September 2017 from Reumannplatz to Oberlaa, the Vienna underground network now has a size of about 84km (52 miles) with 109 stations.

➤ **RIGHT:** The Siemens ULF 783 features a special livery promoting Austrian-American friendship. In late May 2023 the low-floor unit passes near Hlawkagasse on the 1.1km (0.7-mile) extension from Hauptbahnhof to Absberggasse, which opened in December 2019.



▼ **BELOW:** Vienna's large heritage fleet is often used for sightseeing around the Ringstrasse or for private charters. In April 2017, car 6857 and the matching trailer 1620 depart from Schwarzenbergplatz as the Fieldmarshall Schwarzenberg looks on from his mounted statue.



▲ **ABOVE:** The Duewag type E2 articulated trams haul type C5 bogie trailers in order to provide sufficient capacity. Here, car 4324 and trailer 1473 have just turned onto Ringstrasse and are now running on line D towards the Opera.



Since 2018 another major underground project has been underway, aiming to extend line U2 by five stops from Schottentor via the Rathaus, Neubaugasse and Pilgramgasse to Matzleindsdorferplatz by 2028.

In a second project phase lasting up to 2035, U2 will then be prolonged by two more stops to Wienerberg, bringing underground service to a previously unserved district in the south of the city. As part of this second stage, bus line 15A will be converted to a new orbital tram route in order to link up with the new U2 terminus at Wienerberg, while running from Bahnhof Meidling in the west to the U1 junction Altes Landgut in the east.

The new, fully-automated line U5 is also being built. It will initially follow the former alignment of line U2 from Karlsplatz to Rathaus before continuing from Rathaus through new bored tunnels in a northwestern direction to the *S-Bahn* junction at Hernals, serving four new intermediate stops between Rathaus and Hernals. The entire U2/U5 project has an X-shaped alignment, will add about 10km (6.2 miles) of new track to the underground network and is budgeted at EUR2.1bn. It is expected that U5 will commence operations on its first section from Karlsplatz via Rathaus to Frankplatz in 2026.

Once both phases of the U2/U5 project are running, up to 300 million users are expected per year, including a significant portion of modal shift to new and faster public transport connections. Authorities have also calculated that the new/extended underground lines should help save 75 000 tons of CO² per annum.

ESSENTIAL FACTS

Local travel: Central Wiener Linien information points and ticket offices include Hauptbahnhof, Stephansplatz, Schottentor and Karlsplatz metro stations; VOR Kernzone 100 tickets cover Wiener Linien and other operators' modes but not the City Airport Train (CAT) nor airport express buses. WLB is outside zone 100 south of Vösendorf-Siebenbrunn.

City zone 100 rover tickets are available for 24, 48 or 72 hours, plus there is a seven-day pass. All represent excellent value for money. The best introductory sightseeing tram lines are 1, 2 and 5, as well as the alphabetically-numbered trunk routes D and O. The overland interurban to Baden is also well worth the trip and zonal ticket extension, as Baden is an elegant 19th Century resort town and the line passes through vineyards along the way.

Vienna as a destination really needs no introduction, since it is one of the most popular cities in Europe and offers something for every taste.



Unlike the previous, ambitious underground extension project of line U2 to the northeastern periphery at Seestadt Aspern, which was implemented in stages from 2010-13 and served as an aggregator to developing entire housing districts on greenfield sites, the U2/U5 scheme will focus on the urban core and optimise underground connectivity to neighbourhoods closer to the centre but previously underserved.

The far-reaching tramway network is not at a standstill either and is destined to grow extensively in the coming years, with eight concrete schemes at an advanced planning stage and primed for implementation.

Most recently the tram network was extended in December 2019 when line D was extended from Hauptbahnhof Ost by 1.1km (0.7 miles) to Absberggasse, serving a new residential district along the way with intermediate stops at Hlawkagasse. This was followed by the 800m extension of line O from Nordbahnstraße to Bruno-Marek-Allee in October 2020, once again serving a purpose-built residential and office district along the way, which occupies the footprint of the former Wien Nord railway yard.

At the current terminus Bruno-Marek-Allee, the turning loop circles around a number of new buildings. This branch is to be extended from its present endpoint by another 2.2km (1.4 miles) and three stops to Hillerstrasse, providing interchange onto underground line U1 at Vorgartenstrasse. Beyond Hillerstrasse, there is potential to extend the route even further to the national stadium at Prater, linking up with U6. This scheme is currently scheduled for 2025 and the extension

is intended to be served by line 12.

Another new tramway route in the urban core pipeline is the 3km (1.9-mile) extension of the busy line 18 by seven stops from its current terminus Schlachthausgasse through the Prater leisure area to the stadium by 2026.

North of the city centre another orbital route is planned with the construction of line 27, which will run between Aspern Nord in the northeast and Strebersdorf in the north, providing enhanced connectivity for the populous Seestadt and Floridsdorf districts. For much of the way the new line 27 will use the tracks of the existing line 26, before branching off at Prinzgasse and serving four new stops before terminating at the current U2 interchange Aspern Nord. Part of this project also involves the extension of the adjacent tram line 25 from Aspern Oberdorfstrasse via the U2 terminus Aspern Seestadt to the S-Bahn interchange Aspern Nord. These projects should be completed by late 2025.

South-east of the centre, another interurban extension is planned by taking line 72 across municipal and state borders from Zentralfriedhof to Schwechat, site of Vienna's international airport. The line is currently not planned to reach the airport, but instead the town centre at Schwechat Europaplatz. A total of 4.5km (2.8 miles) of new track will be required, including about 1.8km (1.1 miles) in Lower Austria (Niederösterreich), making the project truly federal in scope and adding to the complexity of finance with contributions split between the city, the state and the federal government. Originally intended to be in service by 2025, ongoing financial negotiations have pushed this timescale back.

▲ ABOVE: Running through the turning loop at Oper, the Wiener Lokalbahn (WLB) high-floor Type 100 Duewag 118 leads a trailing Type 400 LRV that provides these coupled sets with adequate low-floor access. Prior to the launch of the newest Type 500 Alstom trains on the interurban route to Baden, these mixed sets formed the backbone of the service.

Modernisation has also been a constant for the 27km (16.8-mile) interurban light rail line to Baden, which is operated by Wiener Lokalbahn (WLB) and has been operated using electric trams over the full length of the route from Oper to Baden Josefsplatz since 1907.

In late March 2018 WLB's new maintenance centre opened at Inzersdorf. Just a few days later the long-planned closure of the depot and yard at Wien Wolfganggasse was carried out, with WLB trains also ceasing to use the track via Wolfganggasse and instead being permanently rerouted over the route of WL tramline 62 between Bahnhof Meidling and Matzleinsdorfer Platz.

Starting in December 2022, with some delay due to the pandemic and then technical teething problems, WLB launched its next generation of low-floor rolling stock, with the first of 18 locally-built Type 500 Alstom Flexity entering revenue service between Wien and Baden. These double-ended 28m LRVs are air-conditioned and will help increase the ratio of low-floor accessibility on the entire line.

In addition to the first batch, numbered 501-18, WLB also has options for 16 more. They supplement the 26 older Type 100 high-floor Duewags delivered in batches from 1979-93, and are normally paired with the 14 Type 400 low-floor vehicles that Bombardier provided in incremental deliveries in 2000, 2006 and 2009-10.

Vienna is consistently ranked as one of the most liveable cities in the world and its quality of life has much to do with its seamless and extensive public transport network. By investing in the system, local, state and federal authorities are ensuring that it remains fit for the future. **FAUT**

Worldwide Review

AUSTRIA

GRAZ. Line 7 started to use the new double-track turning circle at Wetzelsdorf from 9 September. *EB*
WIEN (Vienna). The city's winter timetable requires a maximum of 390 tram sets, compared with the 406 needed in 2022-23. Closure of line U2Z has accounted for part of the difference. Some 61 E2+c5 high-floor sets are used for the morning peak services on various lines, and the type is in service all day on lines 25 and 26. *EB*

WIEN-BADEN (WLB). The line carried 11.8m passengers by the end of September 2023, exceeding the pre-pandemic 2019 total of 13.4m passengers. *BS*

BELGIUM

ANTWERPEN (Antwerp). The order for double-ended CAF trams has been increased from 18 to 20. The peak run-out of all trams from 30 October is 163 (out of 270).
BRUXELLES (Brussels). Tram 3208 became the newest low-floor vehicle to be delivered by mid-November; testing without passengers was still in progress.

New electrical cabling is to be fitted to ten 7900-series eight-axle cars in order to extend their service life, but 7961 has been scrapped.

Rogier underground terminus is to be adapted to cope with multiple 40m trams on one track. *T-2000*
CHARLEROI. The ground-breaking ceremony for the renovation of the light rail line to Grand Hôpital de Charleroi took place at Montignies-sur-Sambre on 15 November. The EUR60m project should open in 2026. *telesambre.be*

GENT (Ghent). Network alterations come into force from 6 January: T1 is Flanders Expo - Muide; T2 is Evergem - Melle Leeuw; T3 is Zwijnaarde - Moscou; T4 is UZ - Muide.

OOSTENDE (Ostend). The Coastal Tramway will operate ten *Hermelijn* trams next summer: 7246, stored at Oostende depot since June 2022, is being joined by 7229/36 from Antwerpen and 6339 from Gent. Driver training will start in advance of the summer timetable. *T-2000*

CANADA

CALGARY. Reconstruction of Victoria Park/Stampede station has required a nine-day closure of the Red Line between City Hall/Bow Valley College and Chinook from 24 November to 4 December. *Calgary Herald*

TORONTO. The first of the new batch of 60 trams entered service on the King Line on 17 November. *J.May*



▲ The new street tramway to Franklin in the German city of Mannheim opened on 10 December. Škoda tram 1409 is on a trial run. *Erbssenzähler89*

CHINA

QINGDAO. Suburban Metro line 13 was extended by 2.8km (1.7 miles) from Jinggangshan Rd to Jialingjiang West Rd on 26 October. *urbanrail.net*

CZECH REPUBLIC

BRNO. A firm order has been placed with Škoda for 15 more 31m 45T double-ended trams to replace the remaining Tatra KT8s used on line 8. They will be delivered in 2024-25. There is an option for 20 more.

A tender was issued on 7 November for a technical study for a 2.8km (1.7-mile) tramway extension from Staré Lískovce to Bosoňoh, where a new depot would be built. *EVO2* trams 1848-50 have entered service on line 2. A further four have been ordered from DPMB with an option for another eight. *BS*

PRAHA (Prague). Ex-Miskolc KT8 214 has entered service as 9106, carrying the new livery. Metro station Jiřího z Poděbrad re-opened on 2 November after a two-year refurbishment, which required complete closure for ten months. A EUR5.6m order has been placed with Doppelmayr for two replacement cars for the Petřín funicular. *skyscrapercity, BS*

DENMARK

AALBORG. The 12km (7.5-mile) Bus Rapid Transit line to the university opened on 23 September using 14 *Solaris* double-articulated electric buses.

Original plans were for a tram line, but this was cancelled on cost grounds in 2020. *UTM*

KØBENHAVN (Copenhagen). Dating from 2001, 34 AnsaldoBreda metro trains are being shipped to Rotterdam over a three-year period, where they will undergo mid-life refurbishment by Alstom under a EUR30m programme. *RCI*

FINLAND

HELSINKI. Tenders have been issued for 30 single-ended and 33 double-ended trams. It is understood that some of the double-ended trams are intended for the new tramway in Vaanta. *BS*

FRANCE

CLERMONT-FERRAND. Delays have hit Alstom's overhaul programme of the first 25 *Translohr* rubber-tyred guided vehicles. It should have been completed by December, but only three had been dealt with by November. The programme is now to be completed in December 2026. *T-2000*

GRENOBLE. It is planned to order 38 new trams (with an option for a further nine) to replace the original *TFS-2* low-floor cars. *BS*
NANTES. The new Alstom *Citadis* had still not entered passenger service by the end of November while Alstom tries to fix technical difficulties revealed during testing. *T-2000*

PARIS. Subsidence led to the collapse of a staircase serving Meuson-sur-Seine light rail station on 14 October. Line T2

was operated in two parts (Pont de Bezons - Parc de St-Cloud and Les Moulineaux - Porte de Versailles) until the problem was fixed. The first of 255 Alstom *REN NG (Z58000)* six-car trains entered passenger service on line E on 13 November. *skyscrapercity*

REIMS. Transdev was awarded a EUR360m (GBP313m) contract on 23 October to operate the network for the next seven years. It starts in January 2024. *RCI*

GERMANY

AUGSBURG. Stadler *Tramlink* 901 was unveiled to the public during the 125 years of tramway operation celebrations on 22 September. A farewell tour ran on 3 October with *M8C 8006*, which is being converted to a works car. *BS*

BERLIN. Fares are due to rise on 1 January by 6.7%. An ABC 24-hour ticket becomes EUR11.40 while a seven-day ticket costs EUR33. Infrastructure work in Friedrichstrasse was completed in time to permit trams to return to Am Kupfergraben (lines M1 and 12) from 2 October. The last 485 *S-Bahn* train, built by LEW Hennigsdorf in the DDR in 1987-1990, was withdrawn from passenger service on 12 November. *BS*

DARMSTADT. Delivery of Stadler *TINA* trams 22101-114 was completed in November, leading to the withdrawal of museum tram 31 on school workings. It is expected that an option for



▲ A German city that will take delivery of Stadler TINA cars is Halle in Sachsen-Anhalt, where the traditional red and silver livery will be retained. Stadler

11 more TINAs will be taken up. Operator HEAG is receiving funding of EUR11m from the federal government and the state of Hesse to carry out 13 infrastructure renovations over the next 2.5 years. This will permit the use of low-floor trams across the network. *UTM*

DESSAU. Ex-Duisburg Duweg tram 012 has been scrapped. Preserved two-axle tram 30 was to be used for special tours on 10 and 17 December. *BS*

DORTMUND. *Stadtbahn* cars 369/70 were delivered in September and October. None of the six new *HeiterBlick* cars has yet entered passenger service. *BS*

DRESDEN. Alstom's first double-ended NGTDXDD cars, 2981-83, entered service in mid-October. Single-ended 2910-21 are in service on lines 2 and 3. The last Gotha-built works trams, 201 011 and 201 113, were withdrawn for scrapping on 14 November. *BS*

DÜSSELDORF. The last 18 GT8SUs in service are 3201/2/8/10/4/6-21/4/6/9/30/3-5. They will remain on lines U75 and U77 until delays with the new HF6 cars are resolved.

Winter works car 5113, built from *Verbandstyp* 393 of 1951, has returned to Rheinbahn tracks for the first time since 1999. It has joined the collection of historic cars at Steinberg depot. *BS*

ERFURT. Plans have been revealed for the future *Stadtbahn* line 9 from Schillerstrasse/Windthorstrasse via the old Hbf subway to Leipziger Platz and Steinplatz to Ilversgehofen Platz and then to Zoopark or Rieth. The EUR100m (GBP87m) cost should be subsidised by a 75% federal grant. *BS*

ESSEN. Tram 1077, the first of six more Alstom NF4 vehicles, entered service on 16 October; 1078-1082 will follow. *BS*

FRANKFURT/Main. The opening of the extension to Europaviertel has been postponed

until 2027 due to cost and other problems. The *U-Bahn* extension to Bad Homburg is also affected. *BS*

GOTHA. RNV (Mannheim) Škoda tram 1408 ran demonstration journeys on the system from 1 November. *DS*

HAMBURG. The conversion of the AKN to electrified *S-Bahn* line S5 has had to be postponed from 2025 until 2028 due to supply chain issues. It has been decided to re-open the Bergedorf branch from Geesthacht; battery electric vehicles will provide a 20-minute service. *BS*

HANNOVER. The first tram on the new 3.1km (1.9-mile) line from Wallensteinstrasse to Hemmingen was rail grinder 808, loaned from the Wehmingen tram museum. An opening ceremony is planned for 9 December; regular services should start from 10 December. *DS*

KARLSRUHE. Two hitherto private service tramlines for the Europäische Schule (European School) were opened to all passengers from 11 September: Line 17 runs Europäische Schule - Tullastrasse - Hbf - Rheinhafen, while 18 links Europäische Schule - Tullastrasse - Durlach Turmberg. *BS*

LUDWIGSBURG. The first part of Ludwigsburg's new tram system is due to open in 2028 but provincial assemblies have agreed to fund a feasibility study examining an 11km (6.8-mile) eastwards extension to the city of Waiblingen via Remseck. The extension would meet the northernmost terminus of the Stuttgart LRT network. *M.Pabst*

MAGDEBURG. The first Alstom *Flexity* started testing at the Bautzen factory in December but is unlikely to arrive in Magdeburg until the summer.

MAINZ. Tram operation returned to Finthen terminus from 30 October following completion of infrastructure work in Gonsenheim. *BS*



▲ The Class 485s of the German capital's *S-Bahn* have been a regular sight since 1987 - but no longer (see story). In February 2022 a 485 waits at Birkenwerder with an S8 service to Zeuthen. Tony Streeter

MANNHEIM (RNV). Trial runs on the new 1.8km (1.1-mile) line from Bensheimer Strasse to Franklin were held on 2 November. Passenger services on the new line 16, which replaces bus line 67, is planned for 10 December. *DS*

MÜNCHEN (Munich). The EUR160.4m project to build the 2.2km (1.4-mile) Tram-Nordtangente from Elisabethplatz to Tivolistrasse will receive final consideration by the city council in December. It is due to be built in 2026-28. The 1200m (0.7 miles) of overhead-free infrastructure will require 26 battery trams.

A planning application for a new 100-car tram depot at the former central workshop (Ständlerstrasse) was submitted on 6 October.

Four-section Siemens *Avenio* 2511-17 have been used on line 19 since 19 October. *BS*

NÜRNBERG (Nuremberg). Lines 10 and 11 are to be re-organised as follows from 10 December: 10 Am Wegfeld - Plärer - Aufsessplatz - Dutzendteich; 11, Gibitzenhof - Aufsessplatz - Hbf - Tiergarten. *BS*

STUTTGART. The new *Stadtbahn* subway between Staatsgalerie and Hbf was to be opened on 10 December for line U9. Lines U1 and U14 will then exchange their southern termini.

The ground-breaking ceremony for the new 4km (2.5-mile) *S-Bahn* line to Neuhausen took place on 26 September. *BS*

WÜRZBURG. All 20 LHB GT-N trams (250-69) were withdrawn on 6 November after bogie defects were discovered. This left just 19 Duweg trams to operate the system, so buses temporarily replaced services on lines 1, 2 and 3. The full fleet of 1975-built trams was used on lines 4 and 5. *DS*

HUNGARY

DEBRECEN. CAF tram 523 has

been cannibalised for spares after sustaining accident damage. *BS*

INDIA

NAVIMUMBAL. An 11.1km (6.9-mile) standard-gauge, elevated metro operation started in this new town on 17 November. Line 1 links Belapur and Pendhar, using CRRC Zhuzhou 25kV EMUs. There is interchange with the Harbour Line suburban railway. *urbanrail.net*

INDONESIA

BALI. A feasibility study into a 9.5km (5.9-mile) metro link from the airport is being carried out by South Korean contractors. The line could carry 24m passengers a year. *RGI*

ISLE OF MAN

DOUGLAS. A new engineering study has found that Tramway Terrace, part of the 1877 Douglas horse tram complex, can be repaired. It was originally believed that the structure was in such a poor state that demolition was the only option, which drew criticism from campaign groups.

JAPAN

UTSUNOMIYA. The line has been carrying 12 000-13 000 passengers/day since August (*TAUT* 1029). The timetable has been adjusted to schedule more trips. A JPY1000 (EUR6.16) day ticket was introduced on 3 November. *BS*

LATVIA

DAUGAVPILS. Route 1 was restored between Butlerova iela and the railway station from 18 November, partly on temporary single track. *J.Carpenter*

RIGA. Work has started to extend line 7 by 2.3km (1.4 miles) from Dole to Maskayas/Visku. The first extension to the network since 1983, it is due to open in 2026. *J.Carpenter*



▲ The Polish city of Kraków still runs special cemetery services on 1 November (All Saints Day); 405 on line 85 is a modernised former Wien (Vienna) tram. E. Plefka



▲ The EnergieTram in Zürich is Alstom Flexity 4003. VBZ

MEXICO

MEXICO CITY. LRV 041, the first of nine from CRRC, arrived at STE's Xochimilco depot on 2 November. *S. J. Morgan*

NETHERLANDS

AMSTERDAM. The city's new winter timetable has been affected by staff shortages on its metro, trams and buses, leading to frequent cancellations. Consultation with manufacturers has taken place on the potential delivery of 100 new trams as an alternative to refurbishing the Siemens *Combino* fleet. *OR*

DEN HAAG (The Hague). The 20-track Scheveningen depot has been demolished in preparation for building a new 15-track building that can house 42 wider trams and a small workshop.

The depot's *GTL* tram have been transferred to Lijsterbesstraat. *T-2000*

ROTTERDAM. Line 23 resumed operation to Beverwaard park-and-ride from 2 October via re-laid track in Laan op Zuid. Route 2 resumed its normal route on the same day. Restaurant tram 1609 ran for the last time on 1 October. *OR*

POLAND

BYDGOSZCZ. The 600m tramway extension across the Brda river from Most Kazimierza Wielkiego to Torunska opened on 6 November. The PLN170m (EUR38m) project was partly financed by the EU. Lines 7 and 8 were temporarily cut back to Babia Wies for a month to permit overhead renewal. *TP*

GORZÓW WLKP. Trams will resume running to the railway station in January when line 4 is introduced from Dworzec to Fieldorfer-Nila. *DS*

KATOWICE. The 125th anniversary of the electric tram network was marked on

1 October when two preserved cars – 4N 1167 with 4ND trailer 1263, and 102Na articulated car 183 – worked line 13 (Chorzow Batory depot – Siemianowice). This route incorporates the original electric line, which opened on 1 October 1894. *M. J. Russell*

ŁÓDŹ. All remaining eight-axle Duewag trams (ex-Mannheim and ex-Helsinki) were withdrawn on 3 November. Car 166 will be retained as a party tram.

Line 18 was extended to the University and Telefoniczna on the same day. *TP*

POZNAŃ. The first Stadler *Tango NF3* trams for Sarajevo will be tested on the Poznań system from Franowo depot before they ship to Bosnia in February. *cs-dopravak*

WARSZAWA (Warsaw). A market consultation for up to 160 new trams has been launched following delivery of the last of 123 Hyundai Rotem cars. *cs-dopravak*

PORTUGAL

LISBOA (Lisbon). The city is to order 24 three-car metro trains (with an option for another 12) in 2024-27. *BS*

ROMANIA

BUCURESTI (Bucharest). Metro line M2 was extended south by 1.6km (one mile) from Bertceni to a park-and-ride facility at Tudor Argehezi on 6 November. *urbanrail.net*

IASI. An ex-Bern *Swiss Standard* (627) and trailer (340) have been modified to provide an electronic waste recycling service. Now numbered 152+156, the set leaves Gara depot at 09.00 and visits various terminal loops. *DS*

RUSSIA

KALININGRAD. Track lifting has taken place on the former tramline to Telmana, which closed ten years ago. *J. Carpenter*

NOVOTROISK. The first of 13 *PKTS 71-911EM Lyonok* low-floor bogie trams arrived on 13 November. *transphoto.org*

TOMSK. UKVZ (Ust Katav) has won a contract for five 71-628 100% low-floor bogie trams. It was the only bidder. *transphoto.ru*

SINGAPORE

MASS TRANSIT RAILWAY. The Land Transport Authority has opened its Rail Test Centre to commission the first two of 23 metro trains from Alstom. *RGI*

SPAIN

BARCELONA. The Diagonal link between the two tramway systems should open in the second quarter of 2024. It will feature APS surface current collection. *europapress.es*

SWEDEN

STOCKHOLM. SL has awarded a contract to SJ to take over the local commuter rail network from 3 March 2024. This follows MTR Nordic's decision to hand back its contract, which was due to expire in 2026, because of reliability issues and a driver shortage.

The first of 22 Stadler three-car *X15p* EMUs entered service on the 891mm-gauge Roslagsbanan on 31 October. *RGI*

SWITZERLAND

BASEL. Work is in progress on new piers for the Margarethenbrücke and it is hoped to restore tram service in March. *BS*

ST.GALLEN-APPENZEL(AB). 1994 Stadler locomotive *Ge4/4 1* has been sold to the Rhätische Bahnen and is being rebuilt to that organisation's requirements at Landquart works. *EA*

ZERMATT - DISENTIS (MGB). A CHF260m (EUR270m) option for 25 more three-car Stadler *Orion* EMUs has been taken up, with delivery due in 2026-29. Already in service are 12 from the original contract.

CHF95m (EUR98m) is being invested in rebuilding Brig MGB station; work is to start in 2027. *bahnonline.ch, EA*

ZÜRICH. A 15-minute headway on line 15 was to be introduced from 10 December to cope with a staff shortage. *Be4/6 2095* is to be converted to a restaurant tram. A cableway from Stettbach to Zoo is to be built by 2028. *BS*

THAILAND

BANGKOK. A one month free trial on the 34.5km (21.4-mile) Pink Line monorail from Khae Rai to Min Buri started on 21 November. Revenue-earning services are to start on 18 December. Fares cost THB15 (EUR0.39). There is a Skywalk connection with the Purple Line metro at Nonthaburi Government Center. *Skyscrapercity*

TURKEY

ANTALYA. Bozankaya has delivered the first of 15 low-floor trams: 301 and 302 arrived in September. Consideration is being given to replacing the ex-Nürnberg bogie trams used on heritage line 2. *BS*

KAYSERI. Line T4 started operating over the 5km (3.1-mile) branch from Sehit Mustafa Simsek to Izzet Bayraktar Camil on 28 October. Bozankaya delivered 11 new trams (3872-82) in 2023. *urbanrail.net*

UKRAINE

KYIV. The first of ten ex-Warsaw six-car metro trains entered service on the Green Line on 1 November. *cs-dopravak*

UNITED KINGDOM

BIRMINGHAM. Midland Metro Limited (MML) has appointed Sophie Allison as its Managing Director. Ms Allison has carried out the role on an interim basis for the last two years.



▲ The city of Tacoma has extended its tram line. Brookville tram 2002 is at First and E streets with Commencement Bay in the background. S. J. Morgan

EDINBURGH. Edinburgh Trams has donated GBP500 (EUR575) to the Scotland Poppy Appeal, which aims to ensure veterans and serving members of the army, navy, and air force receive the support they need.

MACHYNLETH. The Centre for Alternative Technology Railway, a 1676mm-gauge water-balance funicular, closed to the public on 9 November, along with the rest of the Centre for Alternative Technology. Built around the former Llwyngwern slate quarry in 1975, the centre opened the same year; the railway was built in 1992.

TYNE AND WEAR. A theatre in Newcastle has built a replica *Metrocar* as part of its production of Gerry and Sewell, based on Jonathan Tulloch's book *The Season Ticket*.

Meanwhile, musician Sting used the Metro to travel to North Shields in November, where he was presented with the Freedom of North Tyneside. The former 'Police' bassist admitted that he'd originally got on the wrong train.

WISBECH. Network Rail is examining four options for restoring services on the mothballed railway to the town of March. They include heavy rail, tram-train, light rail, and very light rail operations.

USA

BOSTON, MA. Services on the Ashmont – Mattapan line resumed on 30 October after a 16-day shutdown for track work. MBTA has launched a track improvement programme to eliminate all 191 existing speed restrictions on Green, Orange, Red and Blue lines by the end of 2024. *R. Barrows*

CHICAGO, IL. A Yellow Linetrain, led by 5599, hit a rail snowplough near Howard station in November,

injuring 38 passengers, three of them critically. *J. May*

DALLAS, TX. Alstom is to refurbish the automated *Skylink* people-mover at Dallas-Fort Worth airport in a deal worth USD72.2m (EUR66m). *RGI*

MINNEAPOLIS-ST. PAUL, MN. Three people received minor injuries when a Green Line LRV derailed near Warehouse District/Hennepin on 18 November. Service resumed the following morning. *J. May*

OMAHA, NB. A Request for Proposals has been issued for the supply of six trams for the planned 16-stop Streetcar, including off-wire operation. A decision is expected in the first part of 2024. *S.J. Morgan*

PORTLAND, OR. MAX 216 and Portland Streetcar 024 collided on 15 November. The incident took place at the Holladay St/NE 7th St crossing and both cars derailed. The driver of the MAX car had to be freed by firefighters and two passengers were hospitalised. Service was disrupted for most of the day. An investigation was still underway at the time of writing. This is believed to be the first ever collision between the systems.

Portland Streetcar has postponed its Request for Proposals for new trams until spring. *Oregon Live*

SACRAMENTO, CA. Construction has started on a new passing loop at Glenn that will permit a 15-minute service to be operated on the Folsom light rail line. *J. May*

SEATTLE, WA. Siemens has completed delivery of 152 S700 LRVs and Sound Transit is considering whether to order a further ten for delivery in 2027. This would permit four-car trains to run on the new extensions.



▲ Bangkok's Pink monorail line has been carrying passengers since 21 November. mrt

On 3 November testing started between South Bellevue and Redmond Technology (both with park-and-ride facilities), with simulated service planned for January. Service across Lake Washington to downtown Seattle will not start until 2025. *J. May*

WASHINGTON, DC. WMATA opened its Integrated Command and Communications Center at Alexandria on 27 October, consolidating ten office locations.

There will be no Red Line metro service between Farragut North and Metro Center from 18-30 December to permit repair work. *R. Barrows*

WILMINGTON, DE. Private sector company AmeriStarRail is proposing a 3.2km (two-mile) Streetcar loop to link the city's downtown with the Amtrak station, using battery-electric trams. There are also plans for a RiverFront loop with park-and-ride. *J. May*

MUSEUM NEWS

BIRKENHEAD (UK). Wirral Council has transferred the Wirral Transport Museum to Big Heritage Community Interest Company (CIC). Big Heritage will operate the museum, which closed in spring 2023 to enable vital maintenance work to take place, on a 28-year lease.

BLACKPOOL (UK). The first GBP800 000 (EUR918 000) phase of Rigby Road depot's transformation into the Tramtown visitor centre has been approved by the local authority. The work covers a new roof and doors, glass frontage, mezzanine first floor, and a new workshop. *Balloon 718* will be used on the 25-minute 'Mini Festive Tours' that are to run every evening until 29 December.

BRAUNSCHWEIG (DE). Six-axle articulated museum tram

41 (Duewag 1973) has entered the workshop to be restored to running condition. *BS*

CREWE (UK). Ex-Manchester tram 1023 is set to leave Crewe Heritage Centre before it reopens at Easter 2024. The tram arrived in 2020 for what was originally to be a six-month temporary display.

EBREICHSDORF (AT). The alignment of the former ÖBB railway has been designated as a natural park. A new café is to be built by the site of the former station building on a section of track using ex-WLB eight-axle trams 101 and 121. *BS*

FRANKFURT-AM-MAIN (DE). The tram museum at Schwanheim has been closed because of fire safety regulations. A EUR4.5m (GBP3.9m) project is underway to bring it up to standard, which is due to be complete in 2027. *BS*

CONTRIBUTORS

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MAILBOX *Get your views into print*

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Letters submitted by post should be clearly typed and preferably not handwritten. We reserve the right to edit contributions for publication.

The difference between essential and nicety

A report in the October 2023 issue of *TAUT* (1030) that Nottingham trams did not run at all on 17 August because a “communication fault prevented vehicles liaising with the control room” raises a question for me.

For well over 100 years, tramways and railways operated without the nicety of radio communication between tram or train drivers and the control room. Tramways generally operate on line of sight principles, maybe supplemented with signals in tunnels where there is inadequate forward vision, while railways have always operated with some form of signalling. As far as communication was concerned, occasional trackside telephones

were about the limit. Nevertheless both modes worked perfectly satisfactorily.

Nowadays operators often panic when something minor goes wrong and shut down entire tramways. In its earlier days, the Australian Gold Coast line was prone to being shut down for several hours, once because an overhead span wire broke, at least once because traffic lights were blacked out by a lightning strike. One entire weekend the whole lot was shut down because of some glitch with just one substation.

In November in Melbourne, no suburban trains ran until about 06.00 because one mobile phone company collapsed.

In Sydney in March, the entire network was stopped for over an hour at the start of the afternoon/evening peak, again because: “The breakdown occurred in the digital radio system that signallers and train controllers use to stay in contact with crews”, according to Transport Management Centre spokesman Derrick Peterson. With daily patronage around one million, at that time 100 000 people could well have been train-less.

I think it about time that transport operators were given a refresher course on what is essential for safe rail operation, and what are handy tools which nevertheless are not essential.

Richard Youl, by e-mail

The LA experience

Vic Simons' article in *TAUT* 1032 talks about the Los Angeles area's achievements in creating a successful rail-based transport network in the home of the automobile.

I am very impressed at what has been achieved and the plans to improve on this further in time for the 2028 Olympics. However, LA's freeways are still clogged and likely to remain so, unless more attention is given to the passenger experience in the city.

I was there on the weekend that the Regional Connector opened and saw how it improved the city's public transit offering. I rode on most of the Metro rail network and generally found the routes to be first class. However, one journey in particular showed that the detail of the experience could well inhibit results in getting those car drivers onto the rails.

A journey from Union Station to North Hollywood on line B (one that might easily be taken by 2028 visitors) was undertaken on what must be the oldest cars on the system. My car had flaking paint and an overall uncared-for appearance. Several of the passengers were obviously homeless and taking a chance to get some sleep, but the threatening aspect of the experience was a man in personal difficulty, who shouted all through the journey and at one point walked up and down the car still shouting incoherently.

This is a fairly common occurrence on US public transit as very often ‘care in the community’ consists of leaving such people out in the community with very little care apparent. I imagine that most LA residents would prefer to endure sitting in their cars in a traffic jam on the freeway, rather than subject themselves to that kind of experience, and those 2028 tourists who travelled on the metro would come away



▲ ABOVE: The new Regional Connector in LA makes an excellent addition to the city's transport offering, says reader Simon Brown - but he wonders if social oversights mean take-up will be limited. Vic Simons

with a very jaundiced view of the city of dreams. Until solutions are found to these sorts of social problems, transfer from car to rail is likely to be far below its potential.

Simon Brown, by e-mail

French aspirations

With the recent conclusion of the Rugby World Cup matches in France, it is pleasing to note that in his final comments, Stephen Jones, *The Times* rugby correspondent, offers this view of the local transport serving the various locations at which the game was played: “One of the wonders of so many of the gorgeous stadiums

in French cities is that they are served by trams, so that you come gliding out of the stadiums and into the city – such a contrast to the horrible fan exits available on public transport from Twickenham and the Principality Stadium (Cardiff).”

While this criticism is amply justified in the case of England and Wales, Scotland can surely be said to have already led the way for the UK with its fine stadium at Murrayfield served by Edinburgh's excellent tram system. Would it be that the rest of the UK speedily follows this example.

Geoffrey Claydon, Duffield

BYTOM'S ICONIC LINE REOPENS

Any reader inclined to think that route 38's reopening is a small matter is invited to read to the end of this feature – and hopefully be disabused of such a notion.
Mike Russell reports from southern Poland.



Readers interested in the classic form of tramways are apt to view them from the perspective of the enthusiast, downplaying their importance to sections of the community they serve.

In the case of a few lines – route 38 in Bytom is a good example – the tramway is a real lifeline to those it serves. Hence the inscription on the slipboard carried by one of two trams that took part in the inaugural event of the revitalised Bytom line 38, simply translated as “We’re back!”.

Over the next couple of days, many local inhabitants could be heard uttering comments such as “we’ve got our tram back” – note the possessive adjective. For, at a single-track length of just 1.35km (0.84 miles), line 38 is much more than just the shortest tram route in Poland (and one of the shortest in Europe) but has a worldwide fan club.

Dating from the opening of the *Städtische Strassenbahn Beuthen* (Beuthen municipal tramways) system in November 1913, the line was built to connect the depot to the town centre terminus of its *Miechowicz* (Miechowice) line. An initial passenger service proved insufficiently viable and not until 1941 was a regular service reintroduced, being retained with various cross-town links until 1956, but closed completely in 1979.

Vociferous local protests forced the authorities from February 1982 to reinstate a shuttle operation between *Św. Trójcy* (Trinity Church) and the northern terminus at *Powstańców Śląskich*. That prevailed until 23 March 2020 when operation was suspended owing to unavailability of suitable rolling stock for use during the pandemic. The provision of a stub terminus at the northern end, and a southern terminal at the church operated as a stub, had resulted in retention of classic Polish *N-class* double-ended four-wheel cars with their open-plan interior layout to work the line. Line 38 was the last in the country with this form of operation.

Complete reconstruction

Well before then, the tramway company (Tramwaje Śląskie) had acknowledged the need to keep the line in operation in future, and ordered two low-floor double-ended *Modertrans Beta* bogie cars (a third was later added). These maintained the service from 9 July 2020 until 23 July 2022, when operation was suspended for reconstruction of *ul. Piekarska*, to include relaying of the line, during which there was a temporary minibus service. A highly professional firm, the tramway company is also conscious of

its place in conurbation history. During the last fortnight of the old operation, the line was again operated with *N-class* cars that had been laid up since 2020.

Line 38 has two very important features. A high percentage of its clientele is elderly, inhabiting a series of German-era tenement buildings flanking its northern end. The other is that it also serves four cemeteries, of which the *Mater Dolorosa* midway along the route is the largest. These bring high volumes of visiting traffic on All Saints’ Day (1 November), an important date in the national calendar and one on which travel by public transport is free to all.

Viewing progress of the reconstruction works during the second half of 2023, the Bytom authorities wished to see the tramway reopened before the All Saints’ holiday. So it was that on the morning of 27 October, two tramcars (*N type* 1118 and *Moderus Beta* 1019) travelled over relaid tracks to the *Mater Dolorosa* cemetery, where a press conference and official inauguration took place.

The line had previously been tested by two double-articulated *Moderus* cars on Tuesday 24 October. The arrangements, originally planned for Monday 30 October, had the date changed at very short notice to accommodate the Mayoral diary. After speeches by the Mayor of Bytom (Mariusz Wołosz), Bolesław Knapik (President of Tramwaje Śląskie) and others, the guests boarded the trams to sample the relaid line. Full passenger service commenced next day.

Improved timetables

The new timetable and revised itinerary represent vast improvements. There is now a daily evening service until 23.00, whilst Saturday and Sunday have gained an early morning service. These features may be experimental, to gauge demand at times the tramway has not operated for many years.

Basic daytime service is every 20 minutes, requiring two cars – on Mondays to Fridays two low-floor *Moderus Beta* bogie cars, whilst at weekends the service is one such car plus one heritage tram, namely an *N-class* vehicle traditionally associated with the route.

The most significant change is that the line no longer terminates at *Św. Trójcy* church but has been extended via *Sądowa* and *Moniuszki* to the central tram station at *plac Sikorskiego*, returning via *Katowicka* to *Św. Trójcy*. To facilitate this extension two additional curves have been laid for use by southbound journeys, from *Piekarska* into *Sądowa* and another from *Sądowa* into *Powstańców Warszawskich*, the latter reinstating one

removed in 1971 on introduction of a new track layout in central Bytom. At the time of writing, the track between Bytom and *Stroszek* is out of service for reconstruction, so Bytom depot is not operational and line 38 is served by cars based at *Gliwice* depot some 48 minutes away. In traditional Tramwaje Śląskie manner, depot journeys carry intermediate passengers throughout and passengers in the *Zabrze – Gliwice* corridor can travel on a two-axle car in normal passenger service for the first time since 1986.

In *Piekarska*, the single-track centre-road layout has been retained but a clear delineation of the tramway zone has been created by top-surfacing with block paving (city end) or concrete. Staggered speed tables have been provided at the important *Mater Dolorosa* stops, whilst other intermediate stops are protected by zig-zag markings. The stop at *Św. Trójcy* has been rebuilt with a single raised platform on the eastern side.

The biggest change is at the outer terminus, where the former single line stub has been removed and a new twin-stub terminus with common central island provided adjacent to the cemetery wall on the east side.

Tradition, imagination

Bytom City Hall and the tramway company jointly managed the project, and each entered into separate contracts with Eurovia, the contractor. Eurovia’s performance has reportedly been excellent – even allowing tram service through a construction site whilst finishing works were completed.

The improved timetable and extension into central Bytom may just provide the fillip that this line needs. Impressive passenger loadings were achieved in the first three days of operation, and locals realise that for the first time in over 60 years they now have a tram service which takes them to and from the city centre, not depositing them an inconvenient walk away. Future plans include a projection to Bytom station, on the reserve list of tramway investments for implementation with EU funds between 2021–28.

That this renovation and improvement scheme has come about reflects great credit upon Tramwaje Śląskie and the Bytom city authority. This scheme, comprising improvements for passengers whilst acknowledging the historic status of the line, is a rare example of imagination being employed in the service of real tramway preservation. Congratulations to all! **TRAVEL**

› With thanks to Tramwaje Śląskie, Bytom City Hall press office and Jakub Drogoś.



2

1. The official inauguration event on 27 October, with (from right) Bolesław Knapik (President, Tramwaje Śląskie); Mariusz Wołosz, Mayor of Bytom, and his Deputy, Michał Bieda; Przemysław Wrona, Director of the Municipal Road and Bridge Administration in Bytom, and his Deputy; and Ireneusz Janik, Director of Eurovia, the contractor's representative.

2. N1118 and Moderus Beta 1019 on parade at Mater Dolorosa cemetery for the inaugural ceremony. Note the rebuilt stop with raised speed table and zig-zag markings.

3. Three-section Moderus Beta articulated cars were used to test the newly-re-laid route on 24 October and also employed on the special All Saints' Day service, once the preserve of N-class cars in tandem. Car 856 is seen at Kościół Św. Trójcy.
Ernst Plefka

4. Weekends see joint operation alternately by new and old cars on the new timetable. Here are 1019 and 1118 at the remodelled outer terminus.



3

5. N1118, pressed into Monday service to cover a breakdown, in ul. Piekarska, showing temporary general traffic restrictions and delineation of the centre-road tramway zone.



4

6. The gaunt lines of Bytom prison, built in 1861, form a forbidding background as N1118 negotiates the newly-laid curve from Sądowa into Powstańców Warszawskich. There was previously an identical curve here from 1930-71.



5

7. Great co-operation with the engineering contractor resulted in the first days of service operating through what was effectively a building site; 1018 is in ul. Piekarska.



6

8. Moderus Beta 1018 at the redesigned stop at Kościół Św. Trójcy with raised platform used in both directions. The tram has arrived on a short-working journey to keep the essential 20-minute service running between the former termini during a breakdown.



7

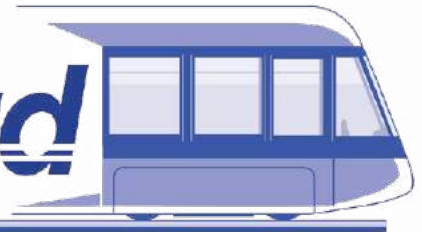


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All photography by Mike Russell on 27-30 October 2023 except where stated.



TramForward



NEWS FROM THE LIGHT RAIL TRANSIT ASSOCIATION

Why the rate increase?

Why have non-UK membership rates risen so much? That may be a question you are asking when we have been able to hold the UK rates. The answer lies with the shipping costs that we are charged for postage outside the UK.

The postage rate normally rises in April by a small percentage, however, this last year the overseas rates have risen by an unprecedented amount of around 65% on average, compared with UK rises of 6% and then another 14% from October. Shipping represents about 58% of our costs overseas and now 67% of our costs to the USA, compared with 27% of UK costs, and so the increase in postage has a disproportionate effect on overseas membership rates. We have discussed the increases with our shipping agent and were able to make some savings for the USA rates which had risen the most and looked at other options, but none proved practical.

Our membership rates for 2024 have been set as low as we can to keep our magazine sustainable with enough to cover a modest increase in postage this coming year, administration and some campaigning.

There is, however, a much cheaper option available, which is to read the digital magazine. Our worldwide digital membership rate remains the same at GBP37.50 (roughly EUR43.55/USD50), and you'll receive *Tramways and Urban Transit* by e-mail.

A digital version of *Tramway Review* is also available at a supplement of GBP13.50 (EUR15.67/USD12.39), which is again distributed by e-mail.

All members can download last year's *TAUT* from the Members' Page online at <https://membermojo.co.uk/lrta/membershome>. No password is needed, just follow the sign-in instructions using your registered e-mail.

AGM '24 set for Charleroi

Arrangements are now being finalised for the 2024 AGM weekend, which will be held in Charleroi, Belgium.

Organised in conjunction with an Ian Longworth tour, the AGM weekend starts with the AGM itself on Friday 27 September in the Novotel hotel, followed by a reception in the evening.

On Saturday there will be a visit to the TTA line, recently featured in *TAUT*. This uses a Vicinal *Autorail* and only runs on a Saturday. There will be the usual AGM dinner on the Saturday night.

On Sunday a visit to the ASVI line, which runs from Lobbes to Thium, is planned.

Further details about the event will follow in the new year.

A report on the 2023 AGM in Sunderland, UK, featured in the December 2023 issue of *TAUT* (1032).

To keep up to date with announcements for the 2024 AGM, please see: <https://www.lrta.org/>

A ride to Newhaven

Following the AGM meeting in Sunderland, several members travelled north to Edinburgh to ride the tramway's new extension to Newhaven.

Our pictures show Jim Harkins (second left) and companions about to board a tram in Central Edinburgh (below); also (right) the trams heading to Newhaven.



Images by
Tim Kendall

MEETINGS & EVENTS

Compiled by the LRTA. For a full list of the year's events and meeting places, including online meetings, visit www.lrta.org

JANUARY

- **Tuesday 2.** Southampton, 19.30. Mike Russell: A recent tour of US light rail systems and museums. Eastleigh Railway Institute, £3. (LRTA/SEG)
- **Monday 8.** Leeds, 19.30, LTHS archives: Blackpool trams 1960s on

- cine films. The Engine House, Leeds LS10 2JG. Contact leeds@lrta.org, £1 inc. light refreshments. (LRTA/LTHS)
- **Wednesday 17.** 19.30. Zoom meeting. Brian Yates: Trolleybuses. Contact: alo@tirs.info (TLRS)
- **Saturday 20.** Taunton, 14.00, AGM followed by members' 'show and tell'.

- West Monkton Village Hall, Monkton Heathfield, TA2 8NE. Contact westofengland@tirs.info. £2 inc. light refreshments. (TLRS)
- **Saturday 27.** Nottingham 14.00. Local AGM. Beeston Scout Hut, Middle Street, Beeston, NG9 1GA. Contact: alo@tirs.info (TLRS)

FEBRUARY

- **Tuesday 6.** Southampton, 19.30. Stephen Bingley: Railways of the West Country. Eastleigh Railway Institute, £3. (LRTA/SEG)

More dates for 2024 coming soon...

For more information on the Association and its activities visit www.lrta.org

Order online from www.lrta.info/shop - or by post from:

LRTA Publications, 38 Wolseley Road, SALE, M33 7AU

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Bluebird Reborn



This book celebrates the return to original condition of the 1931 experimental London County Council tram, telling its story from outline drawings through operation in London and Leeds, to display in the first British Transport Museum and a new life at Crich Tramway Village.

➤ A4 hardback; 224 pages, 330 colour and black & white pictures, four maps.

£38.50 (UK addresses); £49.50 (outside UK); £58.50 (Airmail Z1); £63.50 (Airmail Z 2/3); LRTA Members: £3.50 discount

Japan Tram Atlas

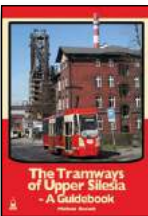


A comprehensive review of the tramways and trolleybuses of Japan with superb track maps for every system. Details of the car types operated and the routes on which they run are covered. English and German text.

➤ A4 softback; 272 pages, 423 colour and black & white pictures, 48 track maps.

£36.50 (UK addresses); £46.50 (outside UK); £56.50 (Airmail Z1); £61.50 (Airmail Z2/3); LRTA Members: £3.25 discount

The Tramways of Upper Silesia A Guidebook

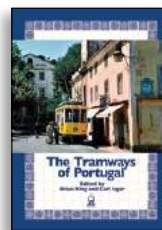


Tells the story of a truly remarkable network in a region of Poland rich in mineral resources, which has survived the risk of closure and become an important player in the regional transport infrastructure.

➤ A4 softback, 240 pages, 300+ black & white and colour pictures plus large-scale folding track plan.

£38.50 (UK); £45.00 (outside UK); £49.50 (Airmail Z1); £55.00 (Airmail Z2/3); LRTA Members: £3.50 discount

The Tramways of Portugal



This new fifth edition of the popular LRTA handbook has been expanded to include the new installations in Lisboa and Porto. It also provides wider coverage of the trolleybuses, providing a comprehensive overview of electric street traction in Portugal.

➤ A4 softback, 328 pages, 400+ black & white and colour pictures and 57 maps.

£48.50 (UK); £55.00 (outside UK); £59.50 (Airmail Z1); £65.00 (Airmail Z2/3); LRTA Members: £4.50 discount

Trams 2024



The popular annual review of developments in the Low Countries and the rest of Europe, covering all network and rolling stock changes with superb photographs. Extra section on 50 years of the *Stadtbahn M* and *N* car types. Dutch text.

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U-Bahn, S-Bahn & Tram in New York

Urban Rail Transit in New York and its Metropolitan Area



A new volume in the series of Robert Schwandl books. Includes details of all subway, light rail and commuter networks, with brief historical and rolling stock information. German and English text.

➤ B5 softback, 160 pages, 300+ colour pictures, 10 maps.

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For further details of all these books go to our website.

Order direct from the website shown (not from the LRTA)

Hong Kong Buses and Trams 1976-1997

The Final British Years



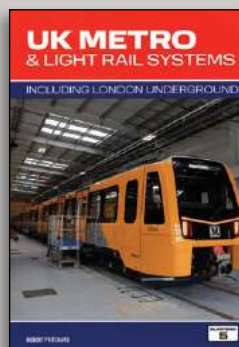
A fine collection of images covering the eclectic mix of heavily-used public transport systems on HK island and in the New Territories. A brief history of the former UK colony is complemented by photographs of the huge variety of vehicle types from eleven different operators.

➤ B5 softback; 96 pages, 180 colour and black & white pictures.

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European Light Rail Congress



TWO days of **interactive debates**... EIGHT hours of **dedicated networking**... ONE place to be

Hotel Melia Lebreros – Seville, Spain

13-14 March 2024

The **European Light Rail Congress** brings together key decision makers and leading professionals from across Europe for two days of debate covering the role of technology in the development of sustainable urban travel.

With presentations and exhibitions from some of the industry's most innovative suppliers and service providers, this congress also includes a technical visit and over eight hours of networking sessions.

For 2024 we are taking the congress to the beautiful Spanish city of Seville, home of the Metro de Sevilla system. Both metro and trams run throughout the city providing modern and efficient public transport, with safety and the environment being key factors which contribute to improving the quality of life of the citizens of Seville and the surrounding areas.

The event will be held at the Hotel Melia Lebreros, which provides a superb conference centre that offers everything under one roof for everyone to enjoy. We will be working with our partners once again to offer a superb behind-the-scenes depot visit for delegates; and have also arranged an evening reception with some fantastic food and drinks to allow for maximum networking opportunities.



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