

TRAMWAYS & URBAN TRANSIT



www.lrta.org
www.tautonline.com

SEPTEMBER 2020 No. 993

A LIGHTER FUTURE? VLR TO TRIAL IN 2021



Coventry's vision for affordable, accessible LRT



Vienna

A Euro a day to battle climate change



Russia

Reversing decline one used tram at a time...

- > Regulators agree Bombardier takeover
- > Dismay as Sutton extension is 'paused'
- > Berlin approves 15-year transport plan



£4.60

GLOBAL LIGHT RAIL AWARDS



2020

*Do you know of a project, product or person
worthy of recognition on the global stage?*

LAST CHANCE TO ENTER!

SUPPORTED BY

First  Tram Operations

 northstar

 UK
Tram

 MPT

 M
M
MOTT
MACDONALD

 COLAS RAIL

 TramForward

 TRAMWAYS &
URBAN TRANSIT

 mainspring

 ColTram

www.lightrailawards.com

CONTENTS



NEWS 332

EC approves Alstom-Bombardier takeover; Sutton extension paused as TfL crisis bites; Further UK emergency funding confirmed; Berlin announces EUR19bn award for BVG.

VIENNA FIGHTS CLIMATE CHANGE 337

Wiener Linien's Karin Schwarz on how Austria's capital is bouncing back from lockdown and 'building back better'.

COVENTRY'S MOBILITY VISION 340

Nicola Small and Dr Nick Mallinson share the vision of a UK city that hopes to radically change the way it moves.

RENEWAL IN RUSSIA 345

Luc Koenet explores the growing role of Russia's private sector – and how Moscow's gifts are keeping other city tramways alive.

SYSTEMS FACTFILE: ULM 351

How the metre-gauge tramway in a southern German city expanded from a small survivor through popular support.

WORLDWIDE REVIEW 356

Athens opens metro line 3 extension; Cyclone devastates Kolkata network; tramways extended in Gdańsk and Szczecin; UK Parliament petitioned on climate law; Work begins on Los Angeles' Gold line extension.

MAILBOX 362

More background on Tramlink; memories of Curt Elmer; and... without passengers, how long can we last?

CLASSICS TRAMS: DUNEDIN 364

How a New Zealand city plans to bring back its cable-worked cars. Mac Gardner explains.

Without heritage and wise experience we are all poorer



Rather than talking about the politics, finances or other high-level effects of the coronavirus crisis, let's kick off this month by considering a less obvious consequence of the pandemic that has the very real prospect of hitting us all hard without us even realising – our heritage and skills.

I know many astonishing older people who still dedicate themselves to our industry, not because they are paid the same as when they worked full-time – but because they are passionate and have 'been there, done that'. Often, there won't be an obvious solution when fixing a system that was installed 100, 50 or even 25 years ago: knowing how best to respond requires instinct and experience. So without Fred, Claire, Dieter or Juan around, just how much institutional knowledge are we at risk of losing? Documents can be produced, manuals written (although sometimes they aren't or haven't been, and can never cover every possibility – just remember where we are now). So how is this crucial information being captured and fed through the system? After all, experience lives in people's heads.

Such wise heads have contributed much to the continued operation of transport systems during these past few months. These are people who have lived through crises before and can offer valuable guidance on how to 'keep calm and carry on'. They share their time and learning, offer practical engineering or operational solutions, or even just act as a sounding board. Such resource is invaluable – but with shielding and other restrictions many have recently been removed from circulation. Safety and well-being must come first of course, but there is no substitute for in-person interactions. And while there are some very, very good people 'coming up' through our industry, there really is no replacement for real-world education.

This vital knowledge – and often volunteer labour! – is similarly key to keeping our own transport heritage alive. I fear for the continued existence of such important institutions if the doors remain closed, visitors aren't attending, and willing and capable individuals are not allowed to indulge their passions. As we have said before, please consider supporting your nearest museum or working heritage tramline: without celebrating and maintaining our heritage we are all so much poorer.

Simon Johnston, Editor

TRAMWAYS & URBAN TRANSIT

The official journal of the Light Rail Transit Association



SEPTEMBER 2020 Vol. 83 No. 993
www.tautonline.com

EDITORIAL

EDITOR - **Simon Johnston**
simon@mainspring.co.uk

ASSOCIATE EDITOR - **Tony Streeter**
tony.streeter@mainspring.co.uk

WORLDWIDE EDITOR - **Michael Taplin**
miketap@mainspring.co.uk

NEWS EDITOR - **John Symons**
johnsymons@mainspring.co.uk

SENIOR CONTRIBUTOR - **Neil Pulling**

WORLDWIDE CONTRIBUTORS

Richard Felski, Ed Havens, Andrew Moglestue, Paul Nicholson, Herbert Pence, Mike Russell, Nikolai Semyonov, Alain Senut, Vic Simons, Witold Urbanowicz, Bill Viggrass, Francis Wagner, Thomas Wagner, Philip Webb, Rick Wilson

PRODUCTION - **Lanna Blyth**

Tel: +44 (0)1733 367604

production@mainspring.co.uk

DESIGN - **Debbie Nolan**

ADVERTISING

COMMERCIAL MANAGER - **Geoff Butler**

Tel: +44 (0)1733 367610

geoff@mainspring.co.uk

PUBLISHER - **Matt Johnston**

Tramways & Urban Transit

13 Orton Enterprise Centre, Bakewell Road, Peterborough PE2 6XU, UK

Tramways & Urban Transit is published by Mainspring on behalf of the LRTA on the third Friday of each month preceding the cover date.

mainspring

PRINT AND DISTRIBUTION

Warners (Midlands), Bourne, Lincs PE10 9PH, UK

LRTA MEMBERSHIP (with TAUT subscription)

Tramways & Urban Transit is sent free to all paid-up members of the Light Rail Transit Association.

LRTA WEBSITE AND DIARY

Brian Lomas

webmaster@lrta.org meetings@lrta.org

SUBSCRIPTIONS, MEMBERSHIP AND BACK ISSUES

LRTA Membership Secretary (Dept T06), 38 Wolseley Road, Sale M33 7AU, UK. Tel: +44 (0)117 951 7785
membership@lrta.org Website: www.lrta.info

FOR CORPORATE SUBSCRIPTIONS VISIT

www.mainspring.co.uk

LRTA REGISTERED OFFICE

8 Berwick Place, Welwyn Garden City, Herts, AL7 4TU, UK.
Private company limited by guarantee, No. 5072319 in England and Wales.

LRTA CHAIRMAN - **Paul Rowen**

chair@lrta.org

© LRTA 2020

Articles are submitted on the understanding they may also later be used on our websites or other media. A contribution is accepted on the basis that its author is responsible for the opinions expressed in it, and such opinions are not those of the LRTA or Mainspring. All rights reserved.

No part of this magazine may be reproduced or transmitted in any form by any means, electronic or mechanical, including photocopying, recording or by any information storage and retrieval system, without prior permission in writing from the copyright owner. Multiple copying of the contents of the magazine without prior written approval is not permitted.

COVER: Coventry's innovative Very Light Rail vehicle technology is expected to hit the tracks for trials during 2021. Courtesy of WMG

EC approves Alstom-Bombardier deal

Concessions on high-speed trains, signalling and production facilities ease the path of takeover

On 31 July the European Commission gave conditional approval to Alstom's proposed acquisition of Bombardier Transportation (BT), a decision welcomed by both companies.

Two weeks previously, Alstom announced its response to the EC's questions about the planned EUR6.2bn takeover, offering commitments designed to overcome concerns over reduced competition, in particular around railway rolling stock and signalling. These were: the transfer of the Bombardier V300 Zefiro high-speed train (built in Italy) to a third party (Hitachi) as well as an IP licence for Hitachi to use the Zefiro in future UK tenders; the sale of Alstom's Coradia Polyvalent EMU and its French factory at Reichshoffen; divestment of the Bombardier Talent 3 EMU and dedicated production facilities at Berlin Hennigsdorf; access for third parties to interfaces for some of BT's onboard signalling units and train control systems.

These concessions were only briefed to staff and unions on the same day, and did not win universal approval, with French unions concerned about the



▲ Amongst Alstom's trams are the short Citadis for the French city of Avignon, seen running on this traditional street tramway in Avenue St Ruf. P. Haseldine

sale of the Reichshoffen factory, which employs around 800.

The EC has accepted these conditions as part of its approval. "Alstom and Bombardier are leading providers of state-of-the-art trains used every day by millions of passengers across the European Union," said Margrethe Vestager, Vice-President of the EU Competition Commission. "Thanks to the comprehensive remedies offered to solve the competition concerns in the areas of very high-speed,

main line trains and main line signalling, the Commission has been able to speedily review and approve this transaction."

Completion of the acquisition is expected in the first half of 2021, giving Alstom access to the largest train fleet in the world, although Chinese conglomerate CRRC is still the largest vehicle manufacturer. It is understood that concerns were not raised in respect of the urban rail market.

Alstom announced its plan to acquire 100% of BT shares in

February. Under the deal, CDPQ (Caisse de dépôt et placement du Québec), which currently holds a 32.5% stake in BT, will become Alstom's largest shareholder with around 18% of capital. CDPQ will reinvest EUR2bn in Alstom as well as investing an additional EUR700m. Bouygues will remain a 10% shareholder in Alstom.

The takeover will reshape the worldwide rail market, with some commentators suggesting that the need for approval was driven by a need to secure long-term employment given the economic instability caused by the coronavirus pandemic.

Maria Leenen, Managing Director of industry analyst SCI-Verkehr, said: "The approval is surprising given the strong market presence of the new company in important vehicle segments and countries, and the critical stance that the EU Competition Commission had taken during the attempted Alstom-Siemens deal.

"To what extent the European railways will be pleased with the new champion, who today supplies 70% of the multiple units in Germany and almost 100% of the market in France, remains to be seen."

Schwebebahn closure results in new lawsuit

Weekday service on Wuppertal's Schwebebahn was suspended from 12 August to permit urgent repairs, due to excessive wear from the wheels on the 31 new GTW15 trains delivered over the last five years. As well as damage to the wheels, rail breaks and damage have been found on the 119-year-old suspended railway's support structures.

Service is to continue at weekends, with test runs scheduled on weekdays to evaluate different wheel profiles. The problem is unlikely to be fully resolved until summer 2021; bus replacement services will help to fill in the gaps.

Operator WSW Mobil says it has identified around 200 issues with the new vehicles, including problems with door mechanisms, air-conditioning and software malfunctions.

It is now preparing a lawsuit against manufacturer Vossloh-Kiepe, seeking damages related to loss of income, increased expenditure for repairs, expert reports and consequential costs due to damage to the structure.

"The lawsuit is our last resort, but after four years of suffering for us and our passengers, we see no other option," said WSW Supervisory Board Chairman Dietmar Bell.



▲ Deliveries of Wuppertal's new GTW15 cars began in late 2015. N. Pulling

București confirms tram orders

Societatea de Transport București (STB) has awarded Electroputere VFU the contract to supply 40 18m low-floor trams for the Romanian capital, with an option for a further 60 cars. The Craiova-based company beat a rival bid lodged by a joint venture of Astra Vagoane Calatori and CRRC Qingdao Sifang.

This is separate to the RON845.7m (EUR177m) deal for a new fleet of 36m articulated low-floor trams, also confirmed in July following the overturning of

an initial award to Turkish manufacturer Durmazlar by the National Council for the Settlement of Appeals (CNSC).

A re-examination of Durmazlar's submission revealed that its Panorama did not meet the technical specification. The city will now receive 100 Astra Imperio low-floor trams; the company is again working in partnership with CRRC Qingdao Sifang.

> For a detailed review of the city's tramway and metro networks, see TAUT 987.

Ekova Electric joins the Škoda family

Ostrava undertaking Dopravní podnik Ostrava has sold tram and bus maintenance division Ekova Electric to Škoda Transportation for CZK416.3m (EUR15.8m).

Škoda will develop Ostrava as a centre for competence

for trams, trolleybuses and buses, including new vehicles, investing CZK300m (EUR11.5m) in expansion and modernisation of the facilities, including additional stabling tracks and adding a further 100 employees.

Sutton tram extension plan paused

TfL funding crisis bites with DLR expansion and Croydon tram replacement also on hold

Work on the Sutton extension of Croydon's tramway (UK) has been put on hold, with uncertainty also raised over potential fleet replacement, as Transport for London (TfL) reviews its current projects to ensure it returns to a stable long-term financial footing.

Other future projects for the UK capital under threat include the extension of the Docklands Light Railway to Thamesmead and of the Bakerloo Underground line. Together with Crossrail 2 and West London Orbital Rail, these are among schemes identified by the authority as currently lacking funding in its draft revised budget, presented on 29 July. The report stated: "We need to be realistic in discussions with Government about what will be affordable over the next decade and we cannot currently afford to progress them all."

However, in an indication that the Sutton tram extension may never now be delivered, TfL explained development work had been paused as the "transport case is poor and there remains a significant funding gap".

In the short-term, TfL was granted GBP1.6bn (EUR1.77bn) in government grants and loans in May to keep services running until October. However, the authority estimates it will need up to GBP3.5bn (EUR3.87bn) to cover its needs for a full financial year. With estimated debts of GBP12bn (EUR13.3bn), parallel reviews into TfL's future sustainability

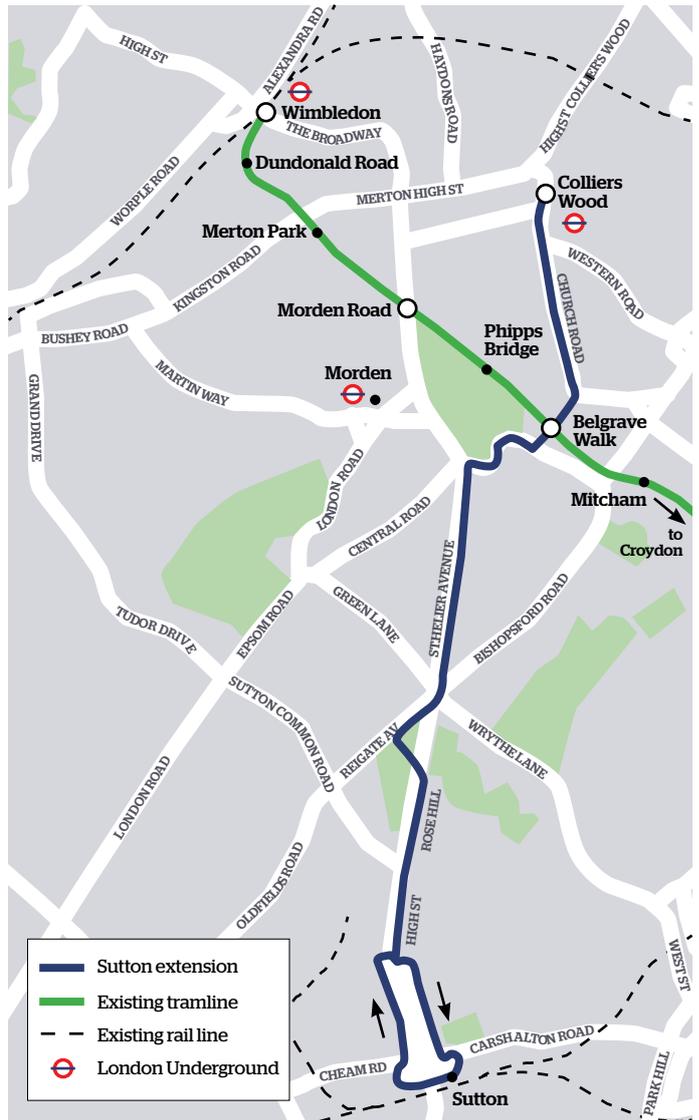
are underway - the first of which is being undertaken by the Department for Transport (DfT) with consultant KPMG, and the second by the city's Mayor.

At the time the coronavirus emergency package was unveiled in May, Mayor Sadiq Khan said the following months would have to see negotiation of "a new funding model with government" involving either central government funding, local taxes, or both (TAUT991).

In a sign of the scale of TfL's challenges, non-urgent infrastructure work has been deferred, and the Central and Bakerloo line fleet renewal programmes as well as Piccadilly line resignalling scheme slowed. However, completing Crossrail remains a priority, and work is continuing on the Northern line Tube extension to Battersea, design work for new Piccadilly line and DLR rolling stock, and the Bank station upgrade.

The DfT review is expected to offer options on how to strengthen TfL's finances over the remainder of 2020-21 and 2021-22. However, it will also consider more radical options intended to achieve a sustainable position by the end of the current business plan period in 2024-25:

- Options for maximising revenue and non-fare based income; revenue yield choices; and changes to road user charging schemes as foreshadowed in the Mayor's transport strategy
- Further operational efficiencies, including extending driverless operation



- Reviewing the balance sheet and financing structure of TfL
 - Reviewing the prioritisation of capital spending
 - Reviewing the current operating model
- TfL's draft revised budget is available at <http://content.tfl.gov.uk/board-20200729-item09-finance-report-revised-budget.pdf>

Broadway Subway consortium confirmed

Vancouver's 5.7km (3.5-mile) Millennium line metro extension from VCC-Clark to Broadway and Arbutus will be built mostly underground on Broadway by an Acciona-led consortium for CAD2.83bn (EUR1.79bn), it was announced 17 July.

Financed by the Government of British Columbia, with contributions from both the city and Canadian governments, the Broadway Subway project is being

delivered through a Design-Build-Finance model, with the Transportation Investment Corp. leading delivery on behalf of the Ministry of Transportation and Infrastructure. Construction is to begin later this year.

Once open in 2025, the commute from VCC-Clark Station to Arbutus Station will take 11 minutes, it is claimed, also relieving traffic congestion along Broadway.

NEWS IN PICTURES

Dubai inaugurates Expo 2020 link

The 15km (9.3-mile) Red line metro branch to the Expo 2020 site via the airport was formally inaugurated by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, on 8 July. The AED11bn (EUR2.5bn) expansion is due to open for revenue service in September. The project, a continuation of the existing Jebel Ali station, includes 11.8km (7.3 miles) of elevated tracks and a 3.2km (two-mile) underground section, with six intermediate stations.

Alstom has supplied 50 five-car *Metropolis* trains to supplement the existing fleet of 79 Kinki Sharyo trains. With the opening of Route 2020, the total length of the Dubai Metro will increase to 90km (56 miles).



More emergency funds for UK LRT

Announcements in England and Scotland to support systems badly hit by pandemic-related losses

A further GBP37.4m (EUR41.5m) in emergency funding for light rail systems in England was confirmed on 8 August, supporting services for another 12 weeks. The Department for Transport (DfT) announcement is part of a package that includes up to GBP218.4m (EUR242.5m) for bus operators over the next eight weeks as public transport services are ramped up in the expectation of increased ridership in September.

Passenger numbers across all modes have fallen dramatically due to the coronavirus pandemic that began in March, with most services still at less than 20% of normal levels.

COVID-19 funds are paid from central government sources, in arrears and on a four-weekly basis. The previous tranche was due to expire on 28 August. The financing packages from the DfT only cover systems in England, with the government

agency explaining: "The latest round of funding – key to safely getting young people back in education settings and workers back to their offices – means total support during the pandemic for bus and tram services will reach at least GBP700m [EUR777m]."

The total allocations for each system, including the new grants, are as follows, and will be paid directly to operators: Greater Manchester Metrolink: GBP44m (EUR48.9m); Tyne and Wear Metro GBP24.7m (EUR27.4m); Nottingham Express Transit GBP12.1m (EUR13.4m); Sheffield Supertram GBP6.8m (EUR7.6m); West Midlands Metro GBP5.7m (EUR6.3m).

Following much criticism of the lack of an equivalent scheme in Scotland (TAUT 992), the devolved administration there has announced support of up to GBP9m (EUR10m) for Strathclyde Partnership for Transport (which runs the Glasgow Subway) and Edinburgh Trams. That money is to cover

the period from July to the end of September.

SPT has however said the grant is unlikely to be enough to avert significant public transport cuts and there is concern that no allowance has been made for the period from March to June when traffic levels were as much as 97% lower than pre-lockdown levels. SPT had previously highlighted a potential deficit of between GBP5.6-9m (EUR6.2-10m) to Transport Scotland in the first 12 weeks of lockdown. There is currently no known structure in place post-September.

Also subject to a separate funding deal is Transport for London (TfL). A GBP1.6bn (EUR1.77bn) emergency grant and loan package was agreed with the DfT in May to keep the UK capital's services operating until October.

The longer-term implications of the pandemic on public transport services are to be considered by the Transport Select Committee of the UK

Parliament's House of Commons. The deadline for submissions is 24 September and the committee is particularly interested in considering the potential effects of the pandemic for:

- The use of public transport and the way that people choose to travel, both locally and for longer journeys
- Central and local governmental priorities and funding for transport
- Devolution of transport policy-making responsibilities and powers
- Resilience of the transport system for future crises
- Decarbonisation and the capability to meet net zero emissions targets by 2050
- Innovation and technological reform.

➤ From 22 June, the Scottish Government made it mandatory to wear a face covering on public transport; the measure is now in place across all the UK's light rail systems.

Hannover 601 returns to its home metals

Fifty years ago, on 10 July 1970, the German city of Hannover put two prototype six-axle articulated *Stadtbahn* cars on its tracks, car 600 from Linke-Hofmann-Busch (LHB) and car 601 from Duewag.

As with the *U2* design in Frankfurt-am-Main, the two Hannover cars were a consequence of the 1965 decision to upgrade the conventional tramway with subways in the city centre that would feature high platforms for level boarding, but require folding steps to use low-level surface stops. They were double-ended to permit turn-backs without loops, 19.5m-long and 2.4m-wide, 150mm wider than the existing tram fleet.

Car 600 was scrapped after being returned to LHB, but 601 has crossed the Atlantic twice; now, on its 50th anniversary it could be seen on Hannover tracks again.

Car 601, which features the Simatic control system (600 had Geamatic), did not carry passengers in Hannover for many years; it could be seen on line 14 between Oberricklingen and Kirchrode until 1975. The

reason was that the first subway opened in 1975, and used a fleet of Duewag *Stadtbahn* cars that were high-floor with folding steps. The decision to adopt 2.4m rather than 2.5m minimised rebuilding to upgrade the surface network to *Stadtbahn* standards.

So 601 was sent to Canada by Duewag to act as a demonstrator in the city of Vancouver, at the time debating how to introduce an LRT network in time for the Expo '86 World Fair. In the end, a decision was made to go for an Intermediate Capacity Transit System (ICTS), the proprietary Urban Transit Development Corporation's automated Linear Induction Motor mini-metro that was christened Skytrain.

As a result 601 was stored in a BC Hydro shed until 1988 when it was sold to the Edmonton Radial Railway Society (ERRS), an organisation created to restore and operate historic trams in Fort Edmonton Park. The society had a project to operate a public service across the former Canadian Pacific Railway High Level Bridge over the Saskatchewan



▲ On 3 July 2020 car 601 ran outside the depot on the Hannover system, in readiness for its Golden Jubilee a few days later. A. Fischer

River from Strathcona to Jasper Plaza. Operation started with a preserved Osaka tram in October 1979, while sponsorship was obtained from Siemens Canada to restore 601.

In September 1998 car 601 ran for the first time in 23 years, being tested on the Edmonton Transit LRT line (ironically operated with Frankfurt-style *U2* cars) between Clareview and University.

In 2005, it then carried passengers over the High Level Bridge for the first time. By this time ERRS had a restored Edmonton tram

and an ex-Melbourne *W2*, and was receptive to an enquiry expressing interest in repatriating the car to complete the historical collection of Förderverein Strassenbahn Hannover (FSH).

ERRS sold it to FSH for CAD1, and in October 2016 it was shipped back to Germany and posed in front of Hannover's Döhren workshop. Further restoration has taken place, with assistance from Üstra, including modifying the original Simatic system to permit usage under the current *Stadtbahn* safety systems.

Berlin approves EUR19bn BVG award

New 15-year direct contract award includes provisions for over EUR5bn in new investment

The Berlin Senate has approved a 15-year EUR19bn direct contract award to Berliner Verkehrsbetriebe (BVG) to provide public transit services for the German capital from 1 September.

The majority of the contract (EUR12.7bn) is allocated to operations and subsidised services for students and passengers with limited mobility. The tariff compensation totals EUR3.1bn. Also included are EUR2bn for the construction of new tramlines, to provide for a 40% expansion of the network, EUR1.7bn for maintenance and renovation projects, and EUR600m for ongoing projects such as the 2.2km (1.4-mile) U5 U-Bahn extension from Alexanderplatz to Brandenburg Gate.

A further EUR2bn is to support transport decarbonisation efforts, including the introduction of 227 electric buses and associated



▲ BVG's latest U-Bahn rolling stock is currently being delivered; new IK20 trains from Stadler Pankow entered service on U5 in June. UndergroundBerlin

charging infrastructure. Federal grants are expected to bolster these investments, but exact contributions are still to be confirmed.

The announcement is designed to help remedy years of under-investment in the capital's transport network. Over the last decade, BVG has invested an

average of EUR300m per year on vehicles and infrastructure; this is set to rise to EUR800m/year with new trams and metro trains to both renew and expand its respective fleets.

In response to the coronavirus pandemic, the contract includes a financing guarantee whereby the state will cover all pandemic-related losses until the first revision in 2024. In a related move, responsibility for enforcing mandatory face covering rules is transferring to BVG from the city's police department.

"This transport contract marks the beginning of a new era of investment," said Berlin Senator for the environment, transport and climate protection, Regine Günther. "This is exactly the right way to make public transport so attractive that Berliners and their guests will make the switch from private cars."

Praha's new identity

On 3 August, a new unified identity for public transport in Praha (Prague) and the surrounding regions was unveiled. The Czech capital region's integrated transport network (known as PID)



▲ The striking new three-colour design, modelled here by one of the city's Škoda 14T trams. Superlative.works

currently includes 27 operators, 67 types of vehicle and at least 12 different liveries.

The new red, white and light grey livery will be applied to all new vehicles. To reduce costs it will only be applied to existing trams, metro cars, buses and regional rail trains when they are overhauled or require repair. Introduction of the branding will begin this year and is expected to take 15 years to complete.

Addressing concerns of a loss of the city's transport heritage, it has been confirmed that the iconic red of the city's Tatra T3 trams and their modernised sub-types will remain.

NEWS IN PICTURES



PK TS unveils new tram cab with extra safety features

Russia's PK Transportnye Systemy (PK Transportnye Systemy) has revealed details of a new tram driver's cab format that includes advanced driver assistance systems, a single emergency shutdown button, and automatic braking functions that can detect if the driver's seat isn't occupied.

"We plan to install the new cabin into trams that will be operated both in Russia and abroad. As the cabin and tram body are manufactured separately and integrated during the final assembly, no additional body changes are needed. This modular approach allows for the production of various tram modifications, depending on the order," said Felix Vinokur, PK Transport Systems President.

The first modular cabs are due to be completed later this year.

'World first' biomethane ULR car on test

A demonstration Ultra Light Rail Vehicle using a mixture of biomethane and kinetic energy storage was demonstrated at the Motorail test track facility in Long Marston (UK) on 22 July.

The 'Bristol Biomethane' project, claimed to be the first of its kind, has been made possible via a DfT/SBRI Innovate UK research and development grant to Ultra Light Rail Partners. It uses an adapted Parry People

Movers Class 139 railcar with a new bogie frame, driveline, powertrain and fuelling system; other project partners include Alternattech, Biomethane Ltd, Severn Lamb, Pre Metro Operations and the Dudley College of Technology, as well as support from IDEA Institute at Birmingham City University.

It is claimed that the new railcar could be produced for GBP2m (EUR2.2m) per vehicle.



▲ The UK designed and built 'Bristol Biomethane' railcar was demonstrated to the press and industry in July. P Abell

US associations publish free new safety guides

A comprehensive list of suppliers of safety and protective equipment to help the US public transport sector respond to and recover from the coronavirus crisis has been published by the American Public Transportation Association (APTA) and the Community Transportation Association of America (CTAA). It is free to view and will be updated bi-weekly - www.apta.com and www.ctaa.org.

Details emerge of two new Chinese tramways

On 22 July construction began on a 27.3km (17-mile) tramway in the Chinese city of Turpan (population 700 000, Xinjiang Uyghur autonomous region). The CNY1.87bn (EUR230m) project consists of two lines - a 23km (14.3-mile) city loop and a 4.3km (2.7-mile) branch to connect to the city's high-speed railway station. Completion is forecast for 2023.

Meanwhile, construction is to begin shortly on the Jinan - Jiyang tramway (Shandong province) with the first 17km (11-mile) section expected to be completed within 18 months. Starting at Jinan East Station in the south of the city, the full 35.5km (22-mile) route will serve the Yang, Pioneer and Licheng Districts with 16 stations.

Rolling stock will be provided by 35m LRVs with a maximum speed of 70km/h (44mph).

Edinburgh develops 'alertness' wristband

Edinburgh Trams (UK) is leading development of a wristband to monitor and analyse tram driver fatigue and well-being, with trials planned for later this year. Data would be analysed in real time, triggering alerts at the operational control centre if the biometrics indicate a risk such as microsleep or a health condition.

The aim is to identify a future loss of consciousness, rather than a reactive system which would intervene to stop the tram.

The technology is being developed in conjunction with UKTram and consultancy IHF Ltd.

The first stage of development will be the creation of functionality to identify if a user is exhibiting symptoms of COVID-19. It is expected that initial trials will start in late summer.

Siemens rebadges North American low-floor cars

Redesignation confirmed for all post-2014 *S70* cars, now called the *S700*

Siemens Mobility USA is currently the most successful of Siemens' divisions when it comes to winning orders for trams and LRVs, offering both high-floor and low-floor vehicles to cities across North America. Our analysis of the worldwide tram and LRV market earlier in the year (*TAUT* 988) showed the Sacramento, CA, factories had orders for 239 cars (plus options for another 294).

The company is building high-floor cars for Calgary and San Francisco under the *S200* designation, while customers for its low-floor cars include Houston, Orange County, Phoenix, Portland, Sacramento (20 since our April article was published) and Seattle.

Since 2007 the low-floor car for the North American market has been the *S70*, originally for Atlanta (4), Norfolk (9) and Salt Lake City (77), updated since 2018 to the *S700*, with a redesigned central bogie adapted from the Portland *SD660* design of the mid-1990s to permit longitudinal seats in the centre section of the three-section vehicle.

Now Siemens has retroactively applied the *S700* designation to all *S70* cars built since 2014. Consequently all *S70* cars built



▲ The first Siemens *S700* for Seattle (WA) was delivered in July 2019.
B. Englehardt / CC-BY-SA 4.0

in 2014 or later for Portland (18 TriMet *Type 5*), Houston (37 plus 14 on order), Minneapolis-St Paul (63), Charlotte (36), Seattle (152, still being delivered) and San Diego (121), or on order for Phoenix (11), Orange County (8), Portland (26 TriMet *Type 6*) and Sacramento (20) are now designated *S700*.

These vehicles range in length from 24.69 to 29.26m (81-96ft) and most are double-ended, though Portland has single-ended cars with doors on both sides that operate coupled back-

to-back. None of the vehicles are 100% low-floor; there is a step up to reach seating situated over the end bogies.

With around 600 cars delivered or on order, the *S700* and its predecessors are a familiar sight on North American systems.

► Michael Peter has become Siemens Mobility's sole CEO from 10 July. Sabrina Soussan, his former co-CEO, is to remain in an advisory capacity until her contract ends at the end of the year.

IN YOUR NEXT TRAMWAYS & URBAN TRANSIT



HAPPY BIRTHDAY METRO!

The Tyne and Wear Metro holds a very special place in the hearts and minds of the millions of people it serves. *TAUT* pays a special tribute on its 40th birthday - and looks forward to an exciting future.



HOW TO MAXIMISE RAIL LIFE

In the third part of our urban rail masterclass, Daniel Pyke contrasts grooved rail maintenance philosophies, examining some of the solutions that could reduce the need for costly renewals.

PLUS...

- + **Systems Factfile: Nottingham.** Neil Pulling reports from England's East Midlands.
- + **Mike Russell begins a personal multi-part tribute to the venerable Tatra T2**
- + **All the latest news, analysis, rolling stock orders and system developments from around the world**

OCTOBER 2020 ISSUE
On sale 18 September

A EURO A DAY KEEPS THE CLIMATE CRISIS AT BAY

Wiener Linien's Karin Schwarz describes how the Austrian capital is bouncing back after its pandemic lockdown.

Vienna has been recently named the "World's Greenest City". In the latest index published by Resonance Consultancy on Earth Day 2020 (22 April), the Austrian capital beat the German cities of Munich (second) and Berlin (third).

The criteria defining this ranking included analysis of the percentages of public green space, total energy needs served by renewable sources, population who use public transportation to go to work, the level of air pollution, per capita water consumption, walkability, availability of city-wide recycling and composting, as well as the number of farmer's markets providing sustainable produce.

With almost half of Vienna's residents holding an annual travel pass, paying a Euro a day, the city is currently regarded by many as 'the European benchmark for public transit'.

Prior to COVID-19, 2.6m journeys were made on the capital's extensive public transport network each day. Wiener Linien (WL) has followed a multi-modal approach for residents and visitors alike, seeking pragmatic ways to cover the 'first and last mile' issue within its WienMobil initiative. WienMobil stations connect public transport hubs with environmentally-friendly onward travel modes like citybikes, car-sharing, and e-scooters. WienMobil is also the name of the mobility app which combines this portfolio into a single app, offering a convenient way to plan and pay for journeys – no matter whether you want to buy a tram or metro ticket, reserve a car, or order a taxi.

Around 50% of residents have the annual ticket that costs EUR365 and offers unlimited travel. This initiative was introduced in 2012 and has further increased the use of public transport; in 2019, 852 000 such tickets were sold (a record high), an increase of 30 000 over the previous year. More people in Vienna therefore now have an annual public transport ticket than own a car.

The statistics are striking: 38% of all journeys in Vienna are now made using public transport, corresponding to 29% by car, 26% on foot, with the rest (7%) by bicycle. It is hardly surprising then that the model has drawn a great deal of attention from other cities keen on driving a similar modal shift.

'Greener Linien'

Alongside the obvious cost-effectiveness of public transport, another key reason for its popularity is convenience – around 90% of the population have a tram, bus or underground stop within walking distance.



A Wiener Linien CEO Günter Steinbauer (left) and CFO Alexandra Reinagl, seen in front of one of the city's latest Flexity Wien low-floor trams (this image was taken before the national requirement for social distancing and face coverings was introduced). All images courtesy of Wiener Linien

Environmental benefits are a further key driver as each person using public transportation helps to reduce the city's CO₂ emissions every year. Wiener Linien prides itself on its reputation as 'Greener Linien', continually looking at initiatives to further improve its environmental performance.

Several recent initiatives are noteworthy. One that has gathered a lot of interest is a programme to reduce urban heat build-up through the implementation of 'green-roofed' tramstops. This is ongoing, with the next installation being setup in July in front of the Austrian Houses of Parliament.

At the Spittelau *U-Bahn* station (served by lines U4 and U6, also offering interchange with tramway, bus and regional rail services), 'green islands' will be created as well as the covering of the walls of the station itself with more than 4600 different plants. Elsewhere on the metro, photovoltaic films have been installed recently to generate clean electricity

at the U3 station in Ottakring. This is used to operate escalators, elevators and lighting; in peak times, up to 50% of the energy required to operate the station now comes from solar energy.

In a more visible demonstration of the city's environmental credentials, green light rail tracks are installed on many parts of the network to help redevelop biodiversity. The RemiHub project also enables the delivering of packages by freight bicycles directly from WL depots in the inner city.

By 2030 over two million people will live and work in Vienna. In order to keep pace with this growth, services have to be further expanded and modernised. As part of this programme, *U-Bahn* line U2 will be extended from Rathaus by 6km (3.7 miles) to Wienerberg – with six new stations, making it the longest line in the city. The driverless U5 line, that incorporates part of the existing U2 alongside 3km (1.9 miles) of new tracks, will also mark a first for the city. ➤

ONE OF THE WORLD'S GREAT TRAMWAYS

The most easterly of Austria's tramways, the capital's network covers 220km (137 miles), making it one of the most comprehensive in the world. It is joined by 83km (51.5 miles) of *U-Bahn* lines and bus routes covering almost 850km (530 miles).

Represented across the 23 municipal districts, coverage is less extensive in the east, but west of the central area trams provide intricate street coverage of a type long-gone from most cities.

Electrified in 1897 (at 600V dc), the system's longest line is around 14.5km (nine miles), the shortest 3.4km (2.1 miles). Most routes run on surface alignments, although tunnels in the south of the city are still used by city and interurban trams.

Viennese transport is covered by the regional timetable and fare co-ordination body, Verkehrsverbund Ost-Region.

Both tramway and metro rolling stock have been locally

produced for decades. Three variants of the high-floor *E* class (motor and trailer units) trams were delivered in the three decades to 1990, and low-floor variants from Siemens (the *ULF*, developed specifically for Vienna) and more recently Bombardier (*Flexity Wien* – 119 vehicles on order, with an option for a further 37) should see the remaining high-floor cars withdrawn within the next five years.

Recovering from COVID-19

With the nationally-imposed lockdown measures to prevent the spread of COVID-19 and ‘flatten the curve’ starting in mid-March, WL’s ridership decreased by as much as 80%. Even with such a dramatic reduction in patronage, the priority remained for safe and efficient seamless journeys for essential workers.

Vehicles are regularly and thoroughly cleaned and disinfected, face masks are compulsory for travel, rear door boarding is required on buses and trams and doors open automatically. For all employees, WL has provided reusable fabric face masks and 3D-printed protective face shields (designed and produced in-house) to make work on construction sites and in workshops more bearable under these challenging conditions. Thousands of these protective items have been produced.

As well as safeguarding employees, operational and security staff across the WL network inform passengers about the regulations to keep everyone safe.

This range of measures has proved very effective in eliminating transmission of the novel coronavirus. A study conducted by the Austrian Agency of Food Safety indicates that no registered infections can be traced back to public transport. Passengers have adapted to the new measures well and the vast majority of riders voluntarily comply.

“We managed to keep essential services running, knowing that we had an obligation to the community. We were extremely quick to implement measures to keep both our employees and passengers safe. Urban mobility needs to be safeguarded and public transport plays an essential role here,” said WL CFO Alexandra Reinagl.

In an effort to reduce some of its revenue losses and in a gesture of goodwill towards customers, WL has extended the validity of student passes for the spring-summer semester throughout the summer holiday period until 30 September.

Restoring confidence and modal share

Austria was one of the first European countries to relax confinement measures and travel restrictions; since 18 May, operations have returned to pre-COVID service levels and passengers are gradually returning; more than 70% of passengers have now returned to the network.



▲ ABOVE: Reducing the need for delivery lorries in the inner city, the RemiHub cargo bike scheme uses bus and tram depots as transhipment points.



▲ ABOVE: Installation of the photovoltaic panels at Ottakring U-Bahn station; the panels can provide up to 50% of the station’s energy needs.



◀ LEFT: The ‘green walls’ at the Spittelau U-Bahn and multi-modal interchange.

“Prior to the pandemic public transport was more popular than ever... Now cars are getting more popular again everything we have achieved to date is put at peril.”



▲ ABOVE: The interior of one of the new X-type metro trains – produced by Siemens – for the future driverless U5 U-bahn line, due to open in 2024.

Although service frequencies cannot be increased further without a long procurement process for new vehicle orders, overcrowding has so far not been an issue. “The pandemic has hit us all hard, but we should never forget that we have an even bigger crisis that we need to tackle: the climate catastrophe. Public transport will play a key role in overcoming this challenge,” says CEO Günter Steinbauer.

Greenpeace Austria recently conducted a survey to gauge opinions surrounding climate change: 90% stated that they felt climate change already affected their daily lives, while 84% believe that tax revenues should be used to boost the economy following the pandemic as well as to mitigate climate change.

“Prior to the pandemic we had reached a peak and public transport was more popular than ever. Over 852 000 customers hold an annual ticket, and modal share amounts to 38%. Now cars are getting more popular again and everything we have achieved to date is put at peril,” explains Ms Reinagl.

With this mind, the focus is now on getting passengers back to using public transport. “Every person in Vienna has a public transport stop within roughly 300m of their home. The main challenge now consists of restoring trust in public transport, as well as overcoming the challenge around the famous ‘last mile’”, concludes Mr Steinbauer. **TAUT**

TDI: LEADING THE FUTURE OF VERY LIGHT RAIL

Transport Design International Ltd. (TDI), founded in 1987, is a world-leading, innovative transport systems provider based in Stratford-upon-Avon (UK). The company specialises in the design, engineering and supply of low-cost, sustainable solutions for both road and rail.

Working with strategic partners, TDI is developing a number of Very Light Rail (VLR) vehicles, leading the field in the design with composite bodyshells using recycled materials.

As part of a consortium that includes WMG, Eversholt Rail, RDM, Cummins and Transcal – TDI has developed the 18m diesel-electric hybrid *Revolution*, designed for use on branch lines and other segregated railways. The company has also fully designed the more urban-orientated ‘shuttle’ for the Coventry VLR scheme (see page 340 more detail on this project). This vehicle, due for delivery in 2021, is 100% battery-powered and will be capable of 70 passengers, 20 seated.

Alongside its VLR commitments, TDI is also commissioned to undertake feasibility studies, concept styling and interior design projects, and production engineering assignments, for high-speed, metro and light rail vehicles, monorails, automated peplemovers, buses and commercial vehicles.

The company is able to visualise potential solutions via a multitude of different and platforms: this expertise includes all aspects of development, starting with the definition of vehicle performance, styling and ergonomics, right through to detailed body structures, driver’s cabs, saloon interiors and powertrain development. Its design services include 3D modelling, human factors, interior design, liveries and branding, mock-ups and prototypes and vehicle styling.



▲ A computer-generated image of the award-winning *Revolution* VLR concept. TDI

In 2016, TDI won the Global Light Rail Award for ‘Outstanding Engineering Achievement’ for its own *ULR Express* diesel-electric railcar, enjoying further success at last year’s ceremony winning the ‘Technical Innovation of the Year for Rolling Stock’ category in collaboration with partners FAR Composites, Composite Braiding Limited (CBL) and WMG. **TALU**

FIND OUT MORE

James Taylor, Commercial Director - james.t@tdi.uk.com



INNER PANEL **ELIMINATING** THE FLANGE GROOVE

veloSTRAIL - extremely safe crossing for cyclists, wheelchair users, inline-skaters, baby carriages and trolley bags.

→ **veloSTRAIL** inner panels are available in 600 mm and 1,200 mm and are designed for train speeds up to a **max. of 70mph for the UK with full Network Rail Product Acceptance.**

→ excellent compression of “flange groove”, even at very low temperatures (tested down to - 25 °C) coupled with high load capacity in road direction for safe crossing of individual users.

STRAIL (UK) Ltd. - Richard Whatley

Tannery Lane // Send // Woking // GU23 7EF // Great Britain // Phone +44 (14 83) 22 20 90 // Fax + 44 (14 83) 22 20 95 // richard@srsrailuk.co.uk





A virtual representation of the future Coventry railway station, complete with VLR connection. Coventry CC

VLR: COVENTRY'S VISION FOR FUTURE MOBILITY

Nicola Small of Coventry City Council and Dr Nick Mallinson of WMG update *TAUT* on the latest progress with the UK city's radical new lightweight urban rail concept.

Imagine a city where residents, workers and tourists alike have a number of attractive, emissions-free and sustainable transport options, all connected within a network that allows for seamless door-to-door journeys. E-bikes and scooters, electric taxis, autonomous pods and urban rail solutions all offer improved alternatives to private car usage, encouraging modal shift and new travel behaviours.

This vision is being embraced by the 2021 UK City of Culture, Coventry, seeking to build upon its proud heritage of innovative transport solutions by creating a new model of mobility. At its heart, Coventry City Council (CCC) is developing a new, affordable, environmentally-friendly concept in urban mass transit – Very Light Rail (VLR). Using proven concepts derived from world-beating local automotive expertise, allied to cutting-edge materials and construction methodologies, the city's VLR pilot seeks to establish the wider West Midlands within which it sits as a centre of excellence for Very Light Rail design and manufacture.

It is envisaged that this 'new industry' will utilise a regional supply chain to create jobs and prosperity, while at the same time having the potential to revolutionise urban mass transit for smaller cities and towns who may currently struggle to make the business case stack up for a traditional LRT system with its average costs of upwards of GBP25m/km (EUR27.5m/km).

Although the genesis of VLR dates back to early 2000, it now sits within a wider regional framework as the West Midlands

was named as the UK's first 'Future Transport Zone' in October 2018. This title came with GBP20m (EUR22m) in funding for the West Midlands Combined Authority (WMCA) and its transport arm Transport for West Midlands (TfWM) to develop innovative new solutions to make journeys quicker, cheaper and more environmentally-friendly.

The VLR R&D programme is being funded jointly by the WMCA and the Coventry and Warwickshire Local Enterprise Partnership (CWLEP) with GBP14.6m (EUR16.2m)

“The initial proposed route serves a key corridor, making VLR an attractive, affordable and accessible option.”

derived from Growth Deal and Devolution Deal sources. On 4 August a further GBP1.8m (EUR2m) in grant funding was confirmed from the UK Government's Get Building Fund. This is part of a wider GBP66m (EUR73.2m) package that is to be shared amongst projects across the West Midlands.

As well as new modal concepts such as VLR, TfWM is working closely with technology providers to trial new ideas such as Mobility as a Service, car sharing programmes, e-bike and scooter initiatives, as well as using advanced data analytics to reduce congestion on the region's roads.

The importance of collaboration

Analysis of existing policy, plans, and strategies has demonstrated that the introduction of VLR in Coventry (population 365 000) will help to deliver several critical policy objectives.

A number of challenges have been identified that are holding back the city's potential. Like most cities in the UK, we have a heavy reliance on the private car; prior to this year's COVID-19 pandemic, around two-thirds of work-related journeys in the city were by car, leading to high levels of both road congestion and tailpipe emissions. These problems have contributed to poor air quality in the city and restricted economic development and growth.

Ambitious targets in terms of housing and employment growth are already in place to help the city grow, but without co-development within an integrated transport framework these would add further pressure onto the already congested road network if they were developed in isolation.

Establishing a working partnership with the neighbouring Dudley Metropolitan Borough Council (DMBC), CCC is collaborating with WMG (based at the University of Warwick) and TfWM to establish the West Midlands as a world-class investment location. To fulfil their ambitions, the region requires world-class transportation to maximise its potential, and this is a key driver behind the establishment of a VLR 'backbone' that will dramatically improve urban connectivity, and drive up skill levels through a focus on the development of the associated technologies for future commercialisation.

Some of the city's challenges – and how Urban VLR will help – include:

Challenge 1: Constraining infrastructure in the city centre, leading to congestion and under-capacity on the road network.

Urban VLR solution: Frequent headways, especially during peak times when commuter demand is greatest, and a high quality and highly reliable service, will lead to high passenger confidence and remove the need – and desire – for independent journeys.

Challenge 2: Above average unemployment and areas of high deprivation and inequality (Coventry's unemployment rate was 4.7% in 2019, compared to a UK average of 3.8%).

Urban VLR solution: New development projects and employment sites will emerge along the rapid transit corridor – the 'regeneration effect' – due to the improved connectivity. This is reflected in the Coventry City Council Local Plan (2017) which makes provisions for a minimum of 24 600 additional dwellings between 2011 and 2031.

Such developments will help to make Coventry a more attractive place to live and do business. Proposed growth and employment sites expected to be established by 2031 will benefit directly from VLR connectivity.

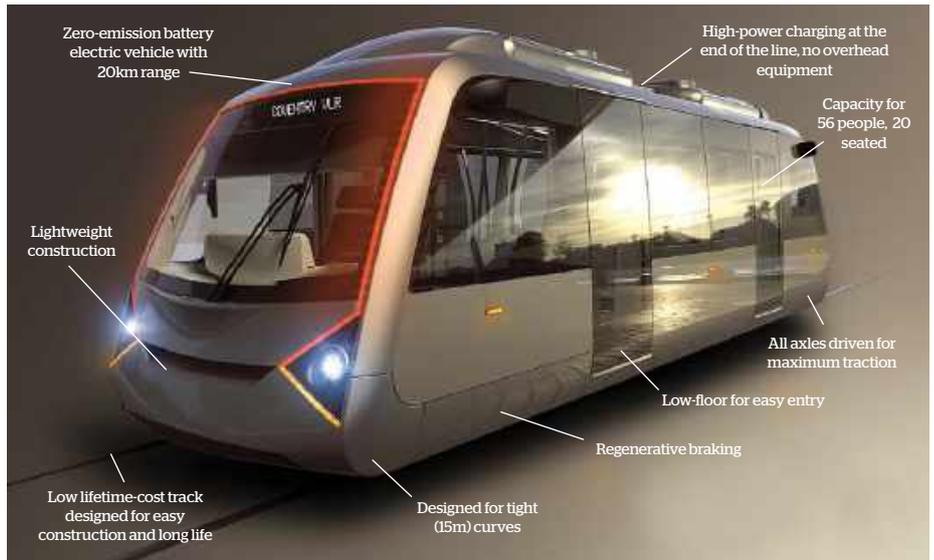
Challenge 3: Poor connectivity between key locations and varying levels of access to a car.

Urban VLR solution: The initial proposed route serves a key city corridor, making VLR an attractive, affordable and fully-accessible option for those with no private means of travel around the city.

Secondly, for those who currently use the highway network to travel within the city, VLR will be an option as part of a full or multi-modal journey. It is also likely that commuters into Coventry by car (31 483)¹ who are also able to use the national rail network will choose to travel to the city by rail and finish their journey via VLR due to its fast and frequent service.

Challenge 4: Poor air quality – and one that is only getting worse.

Urban VLR solution: As we enter a post-COVID world, the need to offer attractive, safe public transport that meets the needs of the 'new normal' whilst addressing the ever-present challenge of climate change will be essential.



▲ ◀ ABOVE and LEFT: The future VLR Shuttle vehicle is being designed, engineered and manufactured within the UK's West Midlands. Courtesy of TDI

Urban VLR has been identified as a significant intervention to combat these issues, at the same time helping to 'future-proof' the city's mobility network.

Environmentally, VLR will improve air quality within the Coventry Air Quality Management Area and assist CCC in achieving its challenging Climate Change and Air Quality targets, due to the expected modal shift from cars which will reduce carbon and other damaging emissions.

Due to its state-of-the-art vehicle technologies and innovative track system, VLR offers a lightweight, rail-based mass transit solution that is relatively simple, quick and cost-effective to construct. The target cost is GBP10m/km (EUR11m/km).

Once proof of concept is achieved, a first route is planned to be built in Coventry. Once proven in service, smaller cities

and towns will have a new, attractive and affordable option for rail-based transit as part of their integrated public transport offer.

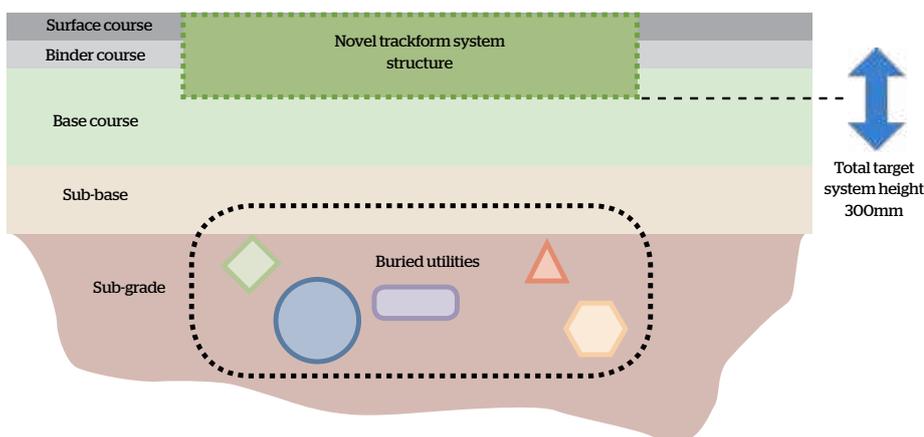
R&D already well underway...

Thanks to the GBP14.6m from CWLEP and WMCA, the R&D phase is well underway.

Engineers from WMG have worked with their subcontractor, Transport Design International, on the design of a battery-powered VLR vehicle, with the first prototype due to be delivered in late 2020 ahead of initial performance trials starting in February 2021. To avoid any confusion with traditional trams, we refer to this as a shuttle.

The longer-term objective is that the shuttle will be autonomous – removing the operational cost of drivers – with the capacity to carry over 50 passengers on a high-quality 'turn up and go' service much like a modern metro, and with reliable journey times competitive to the private car. The vehicle has been designed to be very lightweight using a multi-material approach to achieve a stiff structure at an economic cost. Using a steel chassis, there is widespread use of aluminium components and glass fibre composite panels. The body design is modular to minimise the number of panel types and maximise any economies of scale that can be achieved in manufacture. Onboard battery power coupled with rapid charging removes the need for overhead catenary, which is both costly and unsightly, especially in the historic street environments that remain in Coventry.

In parallel, a R&D programme is underway to deliver a shallow low-cost trackform which can be easily installed into the city's roads. WMG is working with CCC and French civil engineering company Ingerop Conseil et Ingénierie to deliver this novel track solution; ▶



▲ ABOVE: A simplified side profile of the novel trackform, currently under development.

RE-ESTABLISHING A PROUD HERITAGE

Coventry operated steam-powered double-deck trams on a 3ft 6in-gauge system from 1884, with electrification coming in 1895. The network grew steadily in the early years of the 20th Century, being taken over by Coventry Corporation on 1 January 1912 and reaching its fullest extent in 1930.

Increasing road congestion saw the tramway shrink route by route from 1932 onwards, although the system's fate was ultimately sealed by the devastating bombing raids of October and November 1940 which made much of the tramway's infrastructure unusable.

The final three routes were formally abandoned in February 1941, with the remaining trams and equipment sold for scrap or to other systems. Motor buses (some of which had to be

hired from other undertakings) were brought in to take over operation of services.

Re-establishing an urban rail service to the city from 2025, the basic principles of the future VLR operation are:

- A five-minute peak frequency
- Service flexibility by running vehicles in multiple
- Junction priority to achieve high commercial speeds
- Reliable journey times which are competitive with the private car
- High quality passenger experience (smooth ride, level boarding access, real-time information and high levels of wireless connectivity).

the ultimate aim being an affordable modular system that can be quickly and easily removed if necessary to allow access to utilities. This will reduce the need for under-street apparatus to be relocated at significant cost (often multi-millions of pounds) during the route's construction; such costs and the associated disruption have proved significant barriers for traditional tramway systems.

The integrated system (vehicle and novel trackform) will be tested at the Dudley Very Light Rail National Innovation Centre (VLRNIC), which is currently under construction and due to formally open in Autumn 2021. However, a 2.7km (1.7-mile) test track is scheduled to be ready for use in January 2021, with testing of the demonstrator vehicle commencing in February 2021 and continuing throughout the year. A prototype of the trackform is planned to be ready for testing in Summer 2022; this will be achieved through the construction of a second test track which will allow the trackform, vehicle performance and integrated testing to be carried out by December 2022.

The VLRNIC is intended to be a one-stop-shop for R&D in VLR technology, working collaboratively with the industry and public sector to deliver low-cost rail solutions relevant to traditional railways and urban tram systems as well as encouraging the development of better connected public transport services.

The VLRNIC will not be connected to the rail network (vehicles will be transported in and out on low-loaders) but it will be adjacent to a West Midlands Metro tramstop when the new route from Wednesbury to Brierley Hill opens, making the centre easily accessible.

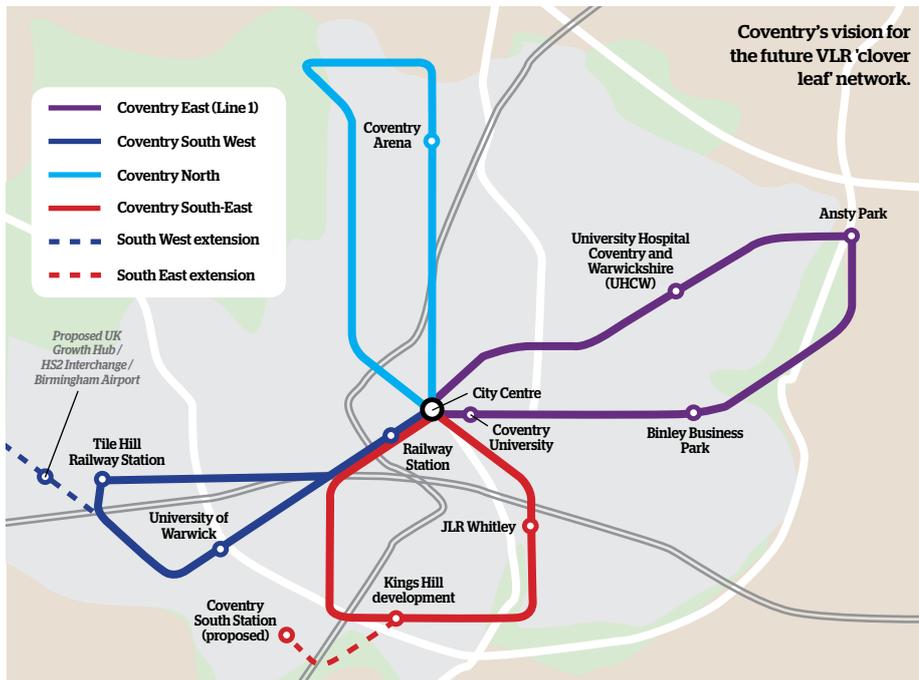
The first route

CCC is working with its framework consultants, WSP, to develop the business case for the first route across Coventry and beyond. A Strategic Outline Business Case is already in place.

The data used by WSP for the assessment included information on the method of journey to work, traffic delay, queuing and bus reliability data. Based upon the queuing assessment, the initial issues identified include:

- High car usage within the city centre
- Lower than national average walking and cycling modal share for short distance trips
- Longer than scheduled journey times during peak periods on public transport corridors into the city from the east and west
- Poor journey time reliability on key corridors such as the Eastern Bypass
- High traffic volumes on the A46, A45, Ring Road and main radial routes into and out of the city
- Housing & employment growth in areas away from key public transport corridors
- Large delays at the UHCW access junction
- The M6 motorway, A429 south and A4600 Ansty Road are forecast to have the largest traffic increases within the study area.

◀ LEFT: Using onboard battery power, rapid charging will take place at the termini using commercially-available chargers developed for electric buses. Courtesy of TDI





▲ ABOVE: The future VLR National Innovation Centre, under construction in Dudley and due to open in late 2021. Courtesy of Dudley Metropolitan Borough Council

The first viable Coventry VLR route therefore aims to provide enhanced connectivity across the city, running for approximately 6.5km (four miles) from the railway station, through the city and out to the University Hospital Coventry and Warwickshire (UHCW). There is further potential to extend to a new park-and-ride site near M6 Junction 2 north east of the city centre.

The University Hospital is a major travel generator, offering a full range of healthcare services and also being a major employer. The city centre includes four large academic institutions, while Coventry's railway station is located to the south of the city centre, providing inter-urban rail connectivity to key national cities, such as London and Birmingham. Along the route there is a range of major employers and business sites, further helping the creation of a robust business case.

Work has just begun on a major GBP82m (EUR91m) project to rebuild Coventry's railway station. One of the fastest growing stations outside London in terms of year-on-year passenger numbers, a new seven-storey station building is under construction between Station Square and Warwick Road. This is planned for completion in Spring 2021 as the city takes on the role of UK City of Culture.

Once finished, the station building will be home to a range of new retail units, waiting

rooms and bathroom facilities, alongside a new 633-space multi-storey car park.

The ultimate goal is to have a series of routes in a 'clover leaf' VLR network that will add further strategic locations such as the large Jaguar Land Rover campus, the University of Warwick, and of course the proposed HS2 interchange near Birmingham Airport.

It is hoped that once proven the system will be made available to other cities. Interest in the project has already been generated, both from within the UK and around the world.

Why VLR?

With passenger demand for a new mass transit corridor established, WSP hosted a collaborative workshop to generate objectives for such a corridor. Following the identification of a range of issues, the potential opportunities to achieve improved transport connectivity were set out.

An Options Appraisal Framework (OAF) was developed, using four assessment stages to identify the best performing options against four specific criteria: WMCA objectives; scheme objectives; deliverability; and location.

This process sifted through a long and diverse list of transport interventions, including Bus Rapid Transit, cycling and walking infrastructure improvements and traffic speed reductions in high accident areas.

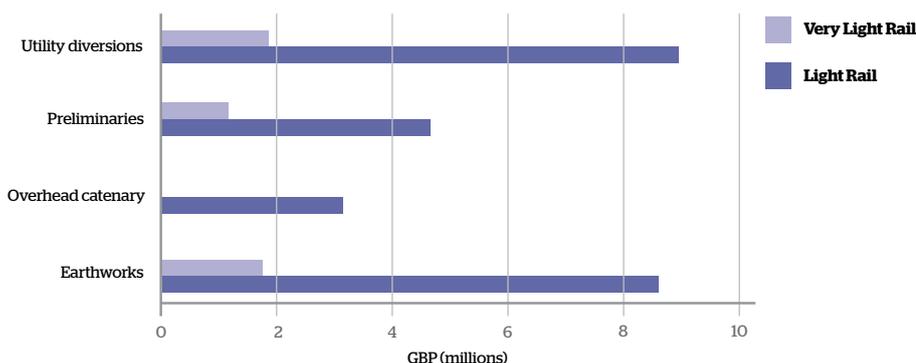
The VLR option performed better than the alternatives on its potential to better connect communities and employment sites along the corridor, along with its political acceptability and contribution to local job creation. Ranking highest overall, it has therefore been taken forward as the preferred solution.

As a new class of rail technology, focused on vehicles which are both lightweight and self-propelled, allied to lighter weight infrastructure, VLR's primary objective is to reduce the cost of light rail systems. Providing a frequent passenger service, it was agreed that smaller vehicles would be appropriate, alongside high-quality modal interchanges.

The shuttle will be 11m long and 2.65m-wide, meaning it would be able to operate on the West Midlands Metro network in the future, with a maximum laden axle weight of 3 tonnes and weighing just one tonne per linear metre. This allows for a lightweight shallow trackform to create an affordable integrated system. One challenge for the trackform will be to also withstand the high axle loads of Heavy Goods Vehicle loads – this and the utilities issue form the crux of the current R&D programme.

Given our likely 'new normal', the team needs to ensure that VLR offers a contactless transport choice, using materials that do not hold bacteria or microbes, allowing airflow within the vehicle to minimise the risk of infection, and autonomy, to enable larger fleets to operate to reduce crowding.

With the significant investment in the VLRNIC, all future technologies can be developed, designed and tested in the heart of the West Midlands, retaining know-how and creating future jobs in the region. **TAUT**



▲ ABOVE: Cost comparison of VLR and traditional LRT per km. Courtesy of RLB (quantity surveyors)

REFERENCES

- 1 – 2016 West Midlands Travel Trends

POWERING INNOVATION

Furrer+Frey is delivering both the charging infrastructure and the vehicle-mounted OppCharge connector rails for the Very Light Rail R&D project, which is using the latest automotive battery expertise developed in the UK's West Midlands region to deliver an innovative and affordable light rail system.

Repositioning public transport to make it a real alternative to the car, and helping to improve air quality and reduce congestion will prove to be a game-changer, supporting Coventry's green ambitions.

These ambitions attracted Furrer+Frey to the project, fitting with the company's vision of a new generation of low-cost, sustainable transportation systems. A key goal was also to create a charging system that will be interoperable with future battery buses in the city.

Working closely with project manager WMG and vehicle designer and manufacturer TDI International, Furrer+Frey has developed the charging technology using the All-In-One (AIO) Charger that can charge the VLR shuttle in a short period of time by delivering high power through its patented technology. A key feature is the integrated electronics; removing the need for a separate rectifier unit and charger box simplifies on-street installations. Other advantages include modular build, a small footprint (0.72m²), and plug-and-play technology with easily replaceable power modules for upgrades.

Furrer+Frey's GB Engineering Manager Ankur explains: "We have worked hard to develop a charging unit that is reliable, but also one that is easy to maintain and upgrade. We need to take lessons from the car industry to reduce costs and increase reliability in public transport – that is why it has been great to work on this project".

Opportunity charging (OppCharge)

The AIO and vehicle both use the OppCharge technology platform, providing for interoperability for many different vehicle types. For example, single- and double-deck buses, trams, LRVs and lorries can all use the same charger, reducing the amount of units required in each town or city.



▲ Furrer+Frey's All-In-One (AIO) Charging Station is compliant to OppCharge a range of vehicles. WMG

Furrer+Frey has been developing ultra-rapid charging technology for public transport systems for over ten years. The VLR project marks a key milestone however, as while the company has already successfully deployed ultra-rapid charging technology in Spain, Sweden, Netherlands, Canada and Switzerland, this will be the first UK installation.

The VLR will be tested at a brand-new facility in Dudley, and the AIO charger will be deployed at the site from February 2021. Noel Dolphin, eMobility Director at Furrer+Frey GB, said: "It has been a great challenge to work towards Spring 2021 deployment during lockdown. A high level of collaboration has been required between all the parties involved."

It is hoped that successful tests will give the green light to further implementation, improving air quality and helping to get people out of their cars and onto new generations of public transport. [TAUT](#)

Pioneers of High Power Charge Stations

➔ Furrer+Frey are delivering the charging infrastructure for the Coventry Very Light Rail Project.

ALL-IN-ONE CHARGING STATION
 INTEROPERABLE / OPP-CHARGE
 OPP-CHARGE COMPLIANT / SIN
 SINGLE & DOUBLE DECK / PLU
 PLUG & PLAY / MODULAR
 0.72M² FOOTPRINT / 150KW
 150KW / 300KW / 450KW



Vehicle design by
Transport Design International



RUSSIA: INVESTMENT AND RENEWAL

▲ *Tschizhik* 010 and 009 pass at the junction of Prospekt Nastavnikov and Irinovskiy Prospekt on Saint-Petersburg line 59 on 27 January 2020.

The rigorous timetable, fully synchronised with the city's traffic signals, allows impressive commercial speeds of around 22km/h (14mph).

PART 2

Luc Koenot concludes his study of Russian tramways, exploring the movement of second-hand vehicles to the regions and the growing role of the private sector in system development.

The billions of roubles that the city authorities in Moscow have invested, and continue to invest, in new trams, are part of a much wider city plan. Improvements to the city's transport systems will primarily benefit the image of the city, and of the government amongst the local populace.

At the same time, such investments strengthen the capital's influence across the entire Russian Federation. The 'old' trams – all between ten and 20 years old and generally in very good working order – are being donated to cities in the regions, which only pay for their transportation. Who gets these trams, and how many, is subject to a discussion between Moscow Mayor Sergey Sobyanin and his colleagues. Those with strong ties to the capital can send their application and make their case to the mayor, who will then give the necessary instructions to Mosgortrans.

This practice is typical of Russian society, where backroom discussions are more important than formal procedures. Provincial mayors can boast of their power and connections with the distant capital, and this is very important for their image and popularity. It is also a 'win-win' situation



▲ Moscow is moving towards a unified fleet of modern 100% low-floor cars by the end of 2023, with the 'old' trams donated to cities in the regions. Car 1284 (ex-Moscow 4918, 5907), built in 2010 by the Peterburg Tramway-Mechanical Plant (ex-VARZ) in Saint-Petersburg as model 71-153 (also known as *LM2008*), has operated in the city of Ulyanovsk since July 2018; seen on Ulitsa Rozy Lyuksemburg on 4 February 2020.



▲ Novosibirsk is the third-most populous city in Russia. Twenty 71-619K cars from Moscow, built 2001-05, were donated to this Siberian city in 2019; 3133 (ex-Moscow 5089, 4336, 2073, are repainted in Novosibirsk colours) and 3127 (ex-5270, still in Moscow colours) at the tramstop Teatr opery i baleta on Ulitsa Ordzhonikidze on 2 February 2020.

for Moscow, as such generosity is generally cheaper than sending trams to the scrapyard.

Through measures such as this, Moscow's tramway will therefore help to secure the future of several smaller tram undertakings across the nation, saving them from otherwise inevitable closure.

A good example is Vladivostok, a network near to collapse that is located approximately 9000km (5600 miles) from the capital in Russia's Far East. In December 2019, Moscow donated ten 71-619 trams to the city; the oldest sub-type from 2001-02 was deliberately chosen, the technology of which does not deviate greatly from the KTM8 cars from the 1990s that would be familiar to the Vladivostok workshop.

The city was so grateful that it immediately sent ten low-loader lorries – during New Year's week, when everything normally

remains idle for ten days – to make the long drive to pick up the gift of the 'new' trams. Road transport is deemed safer than using the railway for such purposes; Trans-Siberian freight transport has a reputation for being looted during the often long wait times at remote stations along the route.

The number of recipient cities as Moscow replaces its tramway rolling stock is substantial and it will be interesting to see who will get the 60 fairly new low-floor 71-623 cars in the coming years. One city is already known: Ulan-Ude.

Further support from the Federation

The Federal Ministry of Transport is not standing still either. In October 2019, a budget of RUB20bn (approximately EUR250m) was committed for public transport equipment over the next five years.

AN EVER-DWINDLING SECOND-HAND MARKET

The 1524mm track gauge does not make it easy to repurpose second-hand western trams for operation on Russian systems, although Tatra cars are the most suitable as their bogies are designed in such a way that adjustment is not difficult, and new car bodies can also be easily placed on existing bogies.

Many German cars have found a new home in Russia: KTM8 trams from Berlin run in Izhevsk and Novosibirsk; Ufa has T3 cars from Chemnitz, Vladikavkaz has received T3D/T4D units from Schwerin (now out of service), Magdeburg and Dresden. The narrow-gauge undertakings in Kaliningrad and Pyatigorsk have also benefitted from KTM8 cars from Cottbus, Erfurt and Gera and T4s from Halle.

An important change in the rules from 1 January 2015 means that Russian public companies are obliged to procure anything they buy from within the Eurasian Economic Union. Consequently, they cannot acquire even second-hand units from western undertakings, and trams can only now be supplied from factories in Russia and Belarus.



▲ Federal regulations in force since 1 January 2015 forbid the acquisition of western equipment. Just before the ban, Izhevsk purchased ten cars from Berlin: Tatra KT4DM 6153 (built in 1986) is now modernised and running as Izhevsk 2409; seen on Ulitsa L'va Tolstogo - 7 February 2020.



▲ The tramway in Krasnoturyinsk (347km/216 miles north of Yekaterinburg) receives no support from the city administration. The population is declining rapidly and is currently less than 55 000, down from 67 000 in 1989. The last tramline narrowly avoided closure thanks to the transfer of two 71-605 (KTM-5) cars from Nizhny Tagil in June 2019, ensuring its survival for a few more years – seen on Ulitsa Popova, 27 February 2020. Dmitry Grishchuk



▲ Many cities are sending their older cars to local manufacturers for modernisation. The outcome in some cases is unique models such as Magnitogorsk car 2250. It is the first of 14 *KTMS* cars modernised by the factory NPP OOO 'Gorizont' from 2016. Seen on Ulitsa Sovetskaya at the junction with Ulitsa Truda, 10 February 2018.



▲ Another example of local modernisation is the transformation of this *KTMS* car in Zlatoust. The model dates from the early 1970s, with a small low-floor section at the rear; the new ramp is motorised and can be operated from the driver's cab. Seen on Prospekt Mira on 5 February 2018.

This funding is applicable to 104 cities, including the regional capitals and all those counting more than 100 000 inhabitants, excepting Moscow and Saint-Petersburg.

The ministry will cover 60% of the cost of any order, with the other 40% as a local contribution guaranteed by the local authorities. Vehicles will be purchased by the federal transportation leasing company, with the only condition being that they must be of a minimum length of ten metres and for use on main lines that run 06.00-23.00 with a frequency of at least six journeys per hour during peak hours and four journeys per hour in off-peak periods. Applications will be scored against a series of criteria, such as development of the electric or gas-powered public transport network over the previous ten years, the number of vehicles equipped with cashless payment systems, the length of private right-of-way routes, traffic-safe and accessible stops, capacity standards and so on.

The extent to which the transport network is compliant with the social standards for public transport that were set in 2017 is also decisive: a maximum distance between homes and stops of 500m (for high-rise neighbourhoods) or 800m (elsewhere) and the existence of a monthly pass that is valid on both public and privately-operated routes. The cost of these passes may not exceed 7% of the average income in the given city – a criterion that helps to combat the proliferation of private shared minibuses (*marshrutkas*).

Those cities with the most points will qualify; about 20 are expected to benefit from this federal aid. Such a funding envelope is equivalent to 347 *Vityaz-M* or 733 *Lvyonok* trams or 2750 buses. It is expected that it will cover a combination of both trams and buses, with 40-50% of the budget related to plans that include new tramway stock.

Furthermore, experts are advising the Ministry of Transport on the creation of a more consistent approach with regular federal support for public transport infrastructure. Only time will tell whether this approach is adopted, although the future seems promising as the government is not currently favourable to metro expansion. As an example, a recent demand for support for a new metro line from Yekaterinburg was answered by the Russian Deputy Prime Minister with a negative reply, explaining that it is better to invest in trams instead.

Welcome gifts from Moscow

One city that has re-embraced the tramway is Ulan-Ude, the capital of the republic of Buryatia, located between Lake Baikal and Mongolia. At the end of 2018, this republic transitioned from Siberia to the Far East Federal District and as a welcome gift the city received 15 new low-floor trams, a dramatic improvement to its 75-strong fleet. Ulan-Ude is very proud of its new trams and now enjoys a greater profile in this otherwise forgotten area.

The new vehicles are from the PK-TS factory and are of the *Lvyonok* (or 'small lion') type, model 71-911EM. Ulan-Ude is the first customer for this 100% low-floor four-axle car, successor to the *City Star* that was the first vehicle that PK-TS built (in 2014) for its home city of Tver. Incidentally, these eight *City Star* cars are currently lying dormant in the Tver depot as the city's tramway has been closed pending track renewal. Five vehicles of the same type have also been delivered to Kazan, as have 30 others on standard-gauge (1435mm) bogies to Rostov-na-Donu.

The new *Lvyonok* will undoubtedly appear in other Russian cities, with Perm already taking delivery of eight cars. There is also a 'big lion' variant – the *Lev* (model 71-934) is a double-articulated, double-ended car, which at 34.7m is the longest vehicle in the PK-TS

catalogue. The first of these units, tested for a year in Moscow, is now in service in Perm.

A new model of efficiency

It is well-established that tramway development can play a major role in revitalising a city. This model is now being applied in a unique construction in the Krasnogvardejskij district, a large residential area in Saint-Petersburg. Located on the right bank of the River Neva, this area offers plenty of space for urban development and already features a rail connection as the Ladozhskaja metro station (line 4) is just a few stations away from the city centre. It is therefore an ideal commuter location, other than for the fact that the four tramlines with interchange at this metro station previously offered the same service as elsewhere in the city: unreliable, slow and dirty.

The return on investment for the private enterprise which has leased the tramlines lies not only in their improved operation, but also in the added value derived from both private and commercial properties located along the route. Never before has a public-private partnership been so promising for passengers, because ultimately their appreciation of the service will determine the sale or rental price of apartments and offices in the area.



▲ Fifteen PK-TS *Lvyonok* trams were donated by the Far East Federal District to the city of Ulan-Ude, capital of the Republic of Buryatia. Car 09 is on route 1 in the Gagarina ulitsa, 30 February 2020.



▲ ABOVE: Since March 2018, four tramlines in the Saint-Petersburg district of Krasnogvardejskij have been operated by the private concession Transportnaja Konzessionnaja Kompanija (TKK). Car 013, a *Metelitsa* low-floor tram built by Stadler Minsk, enters ulitsa Kovalevskaya stop on Ryabovskoye shosse, 27 January 2020.

➤ RIGHT: The four *Tschizhik* lines operate a high-quality service far above that normally seen in Russia. For such a precise operation, a screen (right, above the main dashboard) shows any deviation from the timetable.



Concessionaire Transportnaja Konzessionnaja Kompanija (TKK) has made maximum efforts to guarantee an attractive, comfortable and fast ride on its four lines – 8, 59, 63 and 64. The lines total 12.3km/ 7.6 miles (excluding terminus loops), including 1.8km (1.1 miles) of new tracks as an extension of route 59 to the TKK depot; the other 10.5km (6.5 miles) comprises upgrades to lines previously part of the original city network.

Presenting a unique commercial approach in Russia, the service runs under the name *Tschizhik*, a small green bird with a strong reputation in the traditions of Saint-Petersburg. The appropriate bright green livery of the trams stands out in the otherwise grey cityscape and the youthful staff are friendly and presented in neat uniforms. Clear, and most importantly correct, digital information is ubiquitous and ticket sales are undertaken via onboard vending machines or digitally on the *Tschizhik* app. Stop infrastructure is modern and fully-accessible, and through-ticketing is provided with other city tram and metro services. Unlike other city tram operations, there are no conductors, although inspectors do have a noticeable presence.

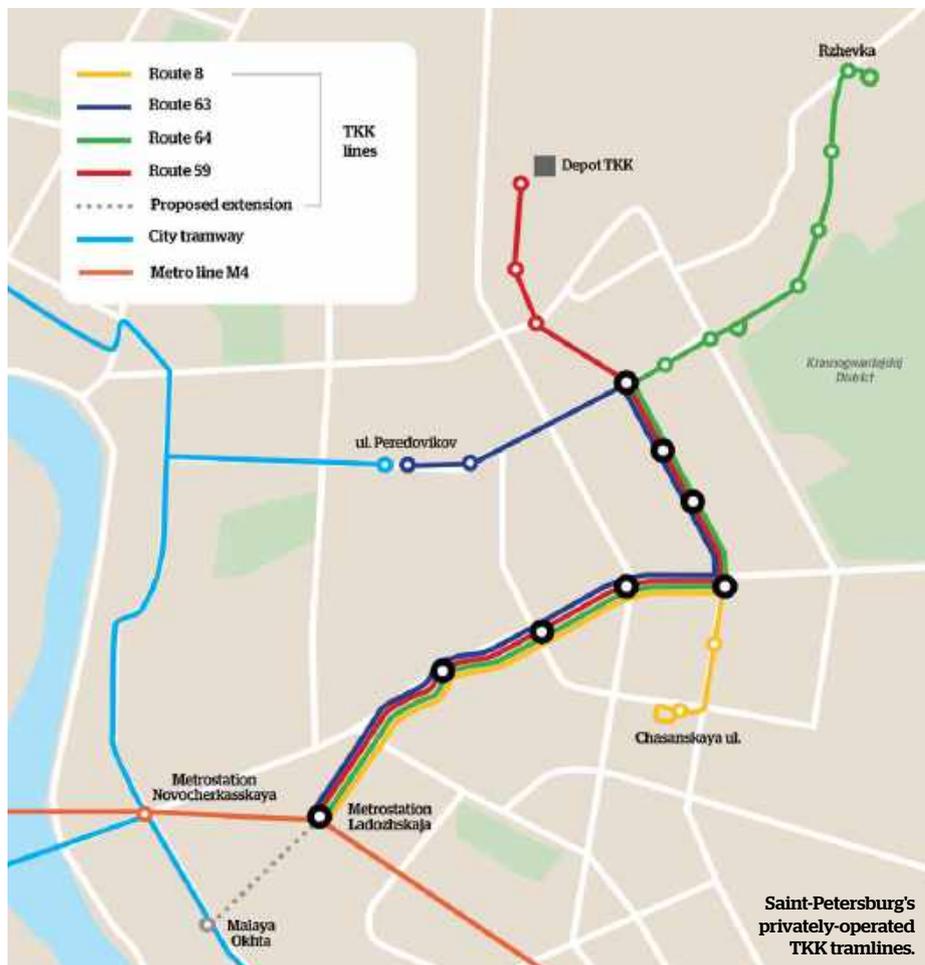
While the presentation is good, the operations are even better with a punctual, fast and frequent service. The main lines 8 and 64 operate a six-minute peak headway, and a nine-minute service at other times. Travel times have more than halved – a journey on line 8 used to take more than half an hour with the city tram; the *Tschizhik*

“Travel times have more than halved - a line 8 journey used to take more than half an hour; the *Tschizhik* takes just 13 minutes at a commercial speed of 22km/h (14mph).”

takes just 13 minutes at a commercial speed just above 22km/h (14mph).

The track was completely renovated for this purpose, railway crossings were limited and fences have been placed along large sections of the routes. Traffic lights are adapted to the timetable and vice-versa; by having trams pass in both directions simultaneously at the large busy intersections, exactly at the time provided for the tight timetable, a frequent tram service with four lines can be offered whilst keeping road traffic flowing smoothly. Any deviation from the anticipated journey time, to the second, is indicated to the driver on a clear screen in the cab.

To operate the new service, 23 *Metelitsa* trams (type B85600M) were purchased from Stadler's factory in Minsk (*Metelitsa* means little snowstorm). The first was delivered in November 2017, the final car in April 2019. They are of a three-section 100% low-floor design, 34m long and 2.5m wide, with room for 376 passengers, 66 seated. Customer comfort is also unprecedented by Russian



standards: air conditioning, 220v and USB charging points and free Wi-Fi. To limit the impact of any disruption to the overhead power supply, they can also run using onboard battery power for up to 500m. The depot is similarly high-tech, contrasting sharply with other facilities in the city.

The *Tschizhik* lines are currently isolated, but two connections with the city network will soon be available. On the one hand, the now-shortened city line 10 will be extended by one stop along its original route to meet the terminus of line 63, and on the other side work is being completed on a 1.5km (0.9-mile) extension of the TTK routes across the Granitnaya Ulitsa from the Ladozhskaja metro station to the existing loop of the city network on Novocherkasskiy Prospekt.

This new concept opened on 7 March 2018, with the entire operation running since 1 September 2019. Early figures indicate a doubling of ridership in a few months. This success has led to the development of plans for a similar scheme in the industrial south-west of the city. The area between the new Shushary terminus of metro line M5, opened on 3 October 2019, and the district of Kolpino offers many opportunities. A 13.5km (8.4mile) tramline is proposed, similarly without a connection to the existing network.

A new tourist attraction

Many Russian companies in one way or another pay tribute to the heroes of the past and tramways also participate in this fine tradition. Specifically, this translates into a museum tram (either real or replica) displayed as a monument or within a small museum in the depot. Larger cities have a true fleet of museum vehicles, with Moscow, Saint-Petersburg and Nizhny Novgorod



▲ Moscow is proud of its tramway heritage, organising a parade in April/May each year (although cancelled in 2020). Mosgortrans keeps a remarkable fleet of historic cars, which can also be hired for private tours; bogie car 2170 (model KM, 1930) and trailer 2556 (model KP, 1932) are followed by two-axle BF 932 (1927) on Ulitsa Sel'skokhozyaystvennaya on 23 March 2013.

having the largest collections. These cars can generally be operated on request.

In Saint-Petersburg, for several years the museum operated a tourist tram during the summer months (April-October) and the city is now taking this a step further. Since 7 November 2019 this service runs daily as line T1, including in the winter (except for the first Monday of the month). The starting point is the tram museum in Prospekt Sredniy on Vasilevsky island, at 10.00, 13.00, 16.00 and 19.00. Since 22 February, two trams run each weekend (although this has been suspended since 19 March due to the pandemic), with additional departures at 11.00, 14.00 and 17.00.

The 17.2km (10.7-mile) tour, with 16 stops, takes over 90 minutes and passes successively the Tuchkov most, Sampsonievskii most, Liteinii most, Ploshchad' Belinskogo, Troickii most and Tuchkov most – an interesting route through the city centre. On the section between the Finlandsky Voksal loop and the ulitsa Sadovaya, the line runs through streets without a regular service. For this purpose, two LM-99 cars from 2007-08 were converted into replicas of the 1930s LM-33 in 2019, now bearing the numbers 0001 and 0002. The interiors feature wooden, partly longitudinal, partly transverse benches. **TAUT**

› Grateful acknowledgement to Mike Russell.



▲ As the first initiative of its kind in Russia, Saint-Petersburg offers a regular tourist tram service; from November 2019 this also runs during the winter. Two LM-99 cars from 2007-08 were converted into replicas of the venerable LM-33 for this operation; 0001 (ex-3916, ex-1324) enters Sadovaya ulitsa on 28 January 2020.

PC TS: READY FOR EUROPE

PC Transport Systems (PK Transportnye Systemy) is the leader in the Russian tram engineering market. Our entire range is based upon a patented low-floor rotating bogie, a unique product that underpins eight tram models, between 16m and 34m, designed for cities with different passenger traffic and easily adaptable for track gauges of both 1435mm and 1534mm.

In 2019, we completed the delivery of 300 *Vityaz M* trams (model 71-931M) to Moscow and have since signed a contract for a further 90 trams of this type. Today, the *Vityaz M* accounts for half of Moscow's tram fleet, and also operates in another seven Russian cities. In the same year, we also completed our first export order: eight single-section 71-911 *City Star* trams for the Latvian city of Daugavpils.

This autumn we will launch the first ever Russian tram to feature an aluminium body: "The use of aluminium in the body and interior significantly reduces the fire load; ensuring the safety of passengers is our top priority. Aluminium is also lightweight, making it possible to equip the tram with additional safety elements and batteries to boost the autonomous travel range. I am confident that these products will be in high demand both in the Russian and European markets," explained Feliks Vinokur, President of PC Transport Systems.

PC Transport Systems has three production sites in Russia – in St Petersburg, Engels and

Tver. The Tver Mechanical Plant of Electric Transport is unique in Russia as a full-cycle site for the production of aluminium bodies for urban electric transport; with the capacity to produce more than 150 vehicle bodies and over 450 tram bogies annually, it uses state-of-the-art equipment to process aluminium profiles, welding, painting and the assembly of tramcars. Nevsky Plant of Electric Transport is in charge of railcar assembly, from the installation of electrical equipment to setup.

New for 2020 is the 71-921, codenamed *Corsair*, designed for narrow-gauge (1000mm) tramways. "We decided to introduce a new product that will address the issue of rolling stock renewal not only in Russian cities, but in Europe as well. A fully low-floor body is able to speed up passenger traffic, also making journeys both more comfortable and accessible for people with disabilities.

"Most of the *Corsair* interior will be made of aluminium alloys, and it will also feature the best options from our other models – such as uprated air-conditioning, advanced multimedia systems, road traffic monitoring system – and at a price that will make our narrow-gauge tram competitive on the world market," explained Mr Vinokur.

The production of rubber-tyred electric vehicles is another promising area, with PC Transport Systems also producing the *Pioneer* electric bus (with a trailer-based mobile battery system) and the *Admiral 6281* trolleybus. **TAUT**



▲ ABOVE: The *Vityaz M* (model 71-931M) in Moscow.
▼ BELOW: A *Lionet* tram (model 71-911EM) in Ulan-Ude.



FIND OUT MORE

E-mail: info@pk-ts.org
Website: www.pk-ts.org



10 10th INTERNATIONAL EXHIBITION
ELECTRIC URBAN MOBILITY, PRODUCTS
AND TECHNOLOGIES FOR ELECTRIC
TRANSPORT AND SUBWAYS



ELECTROTRANS

2020

**GET A FREE TICKET TO RUSSIAN
ELECTRIC TRANSPORT WORLD!**



www.electrotrans-expo.ru

22-24 SEPTEMBER 2020 / MOSCOW / RUSSIA



SYSTEMS FACTFILE

No. **155** Ulm,
Germany

Popular support helped Ulm's much-reduced tramway survive the 20th Century - Neil Pulling finds a modern accessible service that has grown from what was saved.



Located on a convergence of railway routes, Ulm in Baden-Württemberg state is about 75km (47 miles) from Stuttgart and 120km (75 miles) from München (Munich). Many visitors will arrive at the city's main railway station, which in recent times has also been an arrival amongst a building site. A roadway with tram and bus platforms threads through the re-development zone on the station's city centre side.

Hauptbahnhof is one of three stops shared by the uni-directional metre-gauge system's two lines, designated as 1 and 2. They diverge at junctions just beyond the stops either side of Hauptbahnhof, Ehinger Tor and Theater.

Ulm had a population of 126 790 at the start of 2020. Partly growing through the incorporation of neighbouring communities, it gained city status in 1980 upon reaching 100 000 residents. The urban spread includes neighbouring Neu-Ulm in Bayern state (Bavaria) with a population of 63 000. They are separated by the

▲ **Siemens Avenio M62 leaves Ehinger Tor on 17 April 2019. Giving the name to the transport interchange, the gateway (left) was part of the 19th Century Ulm fortress.**

All images by Neil Pulling, except André Knoerr as credited.

Donau (Danube) river, forming the state boundary. Embracing Ulm and Neu-Ulm, there are remnants of a fortress which was the largest in the 19th Century German Confederation. A lengthy presence of American forces after 1945 and a continuing NATO presence also attest to the area's military significance.

SWU Mobilität provides public transport over about 220km (138 miles) of route - about a tenth of which are tram services - in the two municipalities. SWU Mobilität is part of Stadtwerke Ulm/Neu-Ulm GmbH which became a municipally-owned limited liability company in 1982. Its transport network has an average 93 000 daily journeys. Heavy rail provision by Deutsche Bahn and other contractors are amongst the operators who extend provision beyond these communities. All are covered by the regional body, Donau Iller Nahverkehrsverbund GmbH (DING), since January 2003

including aspects such as planning, service and fares co-ordination.

Ulm's tramway opened with two electrically-powered lines in May 1897, with one extending to Neu-Ulm, using an island - locally 'Insel' - as a stepping stone across the Danube. Vehicle factories, a strategic railway presence and military installations brought bombing raids in 1944-45 that destroyed over 80% of Ulm's central area. Inevitably tram operations were affected by the devastation. A trolleybus system partly filled the role from 1947 (including the Neu-Ulm link via Insel) until 1963, with motor buses overall becoming the main form of local public transport.

A four-line system from 1927 had, by the 1990 German reunification, become a single-line operation. No longer serving the heart of the city around the landmark Ulm Minster, it passed west and north of that area. Re-routed and reduced in stages, it had become the former West Germany's shortest tramway at 5.6km (3.5 miles).

In 1999 a project for a five-line, 1435mm-gauge system with potential

➤ **RIGHT:** Siemens *Combino* 46 climbs from central Ulm on Kienlesbergbrücke on 25 October 2019. With pedestrian and cyclepaths, the bridge can also be used by city buses. André Knoerr



▼ **BELOW:** Track to the depot (in the background) is from the former Westplatz, re-named Theodor Heuss Platz in 2013 to commemorate the Federal Republic of Germany's first president.



➤ **RIGHT:** Wohnpark Friedrichsau stop is between a housing district and parkland which extends to the banks of the Danube.

◀ **LEFT:** Traffic on Böffinger Steige is halted by city-bound *Combino* 41 with a driver training run.

▼ **BELOW:** At line 2's northern end in the Eselberg district, Hochschule on Albert Einstein Allee is located amongst research and education premises. André Knoerr



▼ **BELOW:** Ostpreussenweg terminus on the Böffingen extension, opened in 2009.



▲ **ABOVE:** Science Park II terminus in April 2019, with buses replacing line 2 trams due to remaining works on the newly-opened route.

for main line connections was rejected. Limited expansion of the remaining line 1 section and a new tram fleet was however to proceed. Low-floor Siemens *Combino* vehicles took over from Maschinenfabrik Esslingen *GT4* cars, these former Stuttgart vehicles having replaced *GRW4* that were new to Ulm in 1957. Both types are represented in the SWU heritage fleet, used for hire and special services.

Re-growth of tram operations was from a remnant approximating to today's line 1 section between Söflingen and Donauhalle. The latter stop was relocated to better serve the entertainments venue, as was the turning loop. Intended to serve Böffingen district (terminus Ostpreussenweg) which was zoned for residential growth, a northern extension with seven stops opened in March 2009. The extra 4.6km (2.9 miles) included a long climb with views over the Danube valley. This follows the weaving route of Böffinger Steige between Eugen Bolz Strasse and Egertweg. As well as having tram connections with local buses, Egertweg is the location of Ulm's long-distance bus station. Steeper although much shorter inclines than Böffinger Steige already existed on the system at the railway underpass near Ehingertor, a re-routing which opened in 1967.

Line 1 has 22 stops and is scheduled for 30 minutes for the approximately 10km (6.3 miles) journey between termini. The 9.3km (5.8-mile) line 2 with 21 stops has a slightly shorter running time. A reminder of the service's early days, the line 1 southern terminus at Söflingen is on a single-track loop



◀ LEFT: Introduced in 1967, short ramps for the railway underpass between Hauptbahnhof and EHINGER TOR have the system's steepest gradients.

THE FLEET

The first eight of the ten Siemens *Combino NGT 6 UL* (41-48) were received in 2003, with 2008-built 49 and 50 added for the Böfingen extension. Fully low-floor, they have five sections over 31m and are 2.4m-wide. Each has capacity for 175 passengers with 72 fixed and six folding seats.

For the projected line 2 and to increase services overall, 12 Vienna-built Siemens *Avenio M* were ordered in 2015. The first of the series numbered 51-62 was received in January 2018, the last in November that year. All are fitted with the Siemens Tram Assistant collision warning system. They have space for 185 passengers, 69 seated.

Unlike the 1435mm *Avenio M* derived from the *Combino Plus* which has all sections supported by a bogie (as used in München and Den Haag), Ulm's 31.5m *Avenio M* trams have the same configuration as its *Combinos*. Both types are used interchangeably on the two lines; each carries the name of a person with significant local connections.

NETWORK FACTS

- > **Opened:** 1897
- > **Lines:** 2
- > **Depots:** 1
- > **Approx. weekday hours:** 04.45-00.15
- > **Main line frequency:** 10 minutes
- > **Gauge:** 1000mm
- > **Power:** 750V dc, overhead supply
- > **Fleet:** 22
- > **City network/operator:** Stadtwerke Ulm, SWU Mobilität - www.swu.de
- > **Regional network:** DING - www.ding.eu
- > **Civic and tourist information:** www.ulm.de
- > **Tourist information:** <https://tourismus.ulm.de>

> **RIGHT:** On a single-track return loop, Söflingen is the most confined of the termini. Söflingen gained its tram connection in 1906, the year following incorporation with Ulm.

▼ **BELOW LEFT:** An Ulm Avenio M: the upholstery includes the SWU identity.



around buildings. It is approached by a short section of road shared with other traffic; otherwise the system is mainly laid as twin-track within dedicated space on roads (also for bus use) or in separate rights of way. There are intermediate loops to handle extra services for events at Donauhalle and Donaustadion.

A mainly ten-minute interval is enhanced during morning and evening peaks on lines 1 and 2, also the bus lines 4 and 5. The depot and works site is connected by non-revenue tracks from a delta junction near Theodor Heuss Platz (formerly Westplatz) stop. The depot's location accounts for services running as early as 04.07 from this stop. Renewal on the site in 1997 was followed by an extension for the line 2 project.

A significant factor in the case for the line 2 project, for which construction began in October 2015, was the demand generated by the educational establishments lining the route. The names of many line 2 stops attest to this, most evident in the upper Eselberg (Donkey Mountain) district. This is the main location for the University of Ulm, founded in 1967, home to many research and technology-based facilities in the 'Science City', requiring the tramway's power supply not to interfere with such activities.

Another location with a turning loop, Botanischer Garten at almost

▲ **ABOVE:** Building works have become a long-standing feature of the route near Ulm Hauptbahnhof.

◀ **LEFT:** Tram 60 leaves Donaustadion, with Ulm Münster in the background.

▼ **BELOW:** Just beyond the left of this view, Ulm's long-distance bus station is part of the Egertweg interchange.





The Böfinger extension was from a re-sited Donauhalle stop, here just over a year after the 2009 opening. The Donauhalle and trade fair complex includes a park-and-ride site.

619m above sea level is regarded as Germany's highest tram stop. Line 2's south-western arm, which leaves the line 1 route just west of Ehinger Tor, serves several schools amongst the residential surroundings. The southern terminus, Kuhberg Schulzentrum, includes a park-and-ride with close access from Ulm's ring-road.

In the line 2 project, the 270m Kienlesberg bridge is on the climb west of central Ulm towards Eselberg. Designed by London-based Knight Architects, the bridge incorporates pedestrian and cycleways, also providing panoramic views to the south. It spans part of the railway junction north of Ulm Hbf, including the southern portal of the Albstieg tunnel for the future high-speed Stuttgart-Ulm rail line. Line 2 termini follow the layout of a double platform at the end of a single-track return loop, as used for line 1's Ostpreussenweg.

Line 2 had a ceremonial opening on 8 December 2018 and normal services began within a revised network timetable the following day. The works were incomplete however, requiring some service suspensions during 2019. At almost EUR236.9m, the outturn cost of line 2 was around

40% higher than the 2015 estimate. Continuing Science City developments may prompt a short extension. Space in the Otl Aicher Allee median was designed for extended coverage in Böfingeren.

A project to take tram services to Ulm's Wiblingen district has been considered by the city council. The option of routing via Ludwigsfeld in Neu-Ulm would potentially attract more users and broaden the scope of funding. **TAUT**

▼ **BELOW:** Almost a year after opening, Lise Meitner Strasse on the line 2 route shows signs of continuing works in October 2019. André Knoerr



▲ **ABOVE:** Line 2 is characterised by many educational establishments along the route: Kuhberg Schulzentrum terminus on the south-western arm of the line. André Knoerr



▲ **ABOVE:** Heritage fleet Maschinentabrik Esslingen trams GRW4 car 1 and former Baden-Baden Lindner T2 16 at the depot on 12 September 2011. André Knoerr

ESSENTIAL FACTS

Local travel: SWU's staffed information centre is at 79 Neue Strasse, just south of the Minster. For zones 10/20 covering Ulm and Neu-Ulm, the single adult fare is EUR2.40; a day ticket (*Tageskarte Single*) EUR4.40 - fare details on DING website from January 2020. The system is also covered by DB Länder-Tickets for both Baden-Württemberg and Bayern, respectively EUR24 and EUR25, primarily day tickets for local and regional rail services.

What is there to see? Born in Ulm in March 1879 and only briefly a resident, Albert Einstein developed little affection for his birthplace but is commemorated in several locations - and on tram 43. An 1890 addition made Ulm Minster - not a cathedral - for a time the world's tallest building at 161.5m; a tiring but rewarding exercise, steps give access to viewpoints and the lattice spire. The picturesque restored 'Fishermen's Quarter' extends south from the Minster towards the Danube and features a variety of hotels, restaurants and bars. The Friedrichsau riverside parklands are east of line 1 between Donastadion and Donauhalle.



▲ **ABOVE:** Hauptbahnhof, Theater (pictured) and Justizgebäude are the nearest stops to the city centre. Theater was re-sited to serve both lines: the junction is just beyond tram 51, operating a test run.

Worldwide Review

ARGENTINA

BUENOS AIRES. Siemens has been chosen to install CBTC train control and digital passenger systems on metro line D. *RGI*

AUSTRALIA

GOLD COAST. Cubic has begun the installation of contactless payment equipment on the light rail system under an AUD371m (EUR226m) contract awarded by regional agency TransLink.

MELBOURNE. With the re-imposition of the coronavirus lockdown, temporary route changes were introduced to run from 14 July to 1 November. Line 30 was withdrawn and line 12 was diverted via La Trobe Street between St Vincent's Plaza and Batman Park. Line 11A shuttles operate between New Preston depot and Victoria Harbour at peak periods Monday-Friday. *R.Youl*

SYDNEY. A 12m section of the future Parramatta Light Rail route has been planted with different types of grass in a 12-month trial to assess durability and growth rates.

The light rail project, which will connect Westmead to Carlingford via Parramatta in 2023, includes a kilometre of grass track in the Cumberland Hospital heritage precinct, Robin Thomas Reserve and Tramway Avenue.

AUSTRIA

GRAZ. From 12 September lines 3 and 4 will swap termini.

The extension of line 6 to Smart City is due to open on 26 November 2021. *BS*

WIEN (Vienna). Plans have been unveiled for three regional tramlines that would cross the city boundaries: Aspern – Essling – Gross-Enzersdorf; Simmering Hauptstrasse – Schwechat – Rannersdorf and a tram-train operation based on the Wien – Baden *Lokalbahn* reaching Perchtoldsdorf and Klatenleutgeben.

On 23 June tracklaying began on the 700m branch for line O to Taborstrasse. It is hoped it will be ready before the city elections on 11 October, but work was delayed by the coronavirus pandemic.

Bombardier *Flexity* trams up to 312 had been delivered by the end of July. Withdrawn are E1 4539/45 and 4855 plus c4 trailers 1301/55; 4855+1301 will be retained for museum purposes. *BS, EB*

BELGIUM

BRUSSEL/BRUXELLES. The resumption of line 39 service to Ban Eik in August after infrastructure works was not achieved; early 2021 is now the expectation.

Onboard contactless payment was introduced from 30 July.

The first of 43 six-car M7 metro trains was delivered by CAF on 13 July. The driverless trains are due to be used on line 3 (using the rebuilt north-south tram subway), but can be used elsewhere on the network in manual mode, and will appear on lines 1 and 5 from early 2021. *T-2000*

OOSTENDE. The summer transfer of *Hermelijn* trams from Gent and Antwerpen to the coastal tramway did take place this year, involving cars 6332-6/8/41 and 7225/9/36/46/66/70/1. With delivery of new CAF *Urbos* trams underway, this is likely to be the last year these transfers need to take place. *T-2000*

BULGARIA

SOFIA. Bids for 25 new trams were received from Durmazlar, Pesa and Skoda, with Pesa making the best offer at BGN81.46m (EUR41.6m). The city already has 38 Pesa *Swing* trams, delivered in three tranches (2013, 2016 and 2019). *Transport Publiczny*

CANADA

OTTAWA. Service on the Confederation line was reduced to seven active sets during July after cracks were found in the wheels of three Alstom *Citadis Spirit* LRVs. An investigation is in progress by the Transportation Safety Board.

OCTranspo had its full fleet of 17 LRVs available for the first time from the start of August, although additional daily wheel inspections reduced this to 13. *J.Hayward*

TORONTO. The TTC has postponed a decision on buying a further 20-60 new trams for a third time, and will now consider it at its October board meeting.

A reliability improvement project for the 204 Bombardier low-floor LRVs has identified a seven-point programme to address failures, including train and cab controls, train management systems, vehicle doors, communications, high-voltage power system, brakes and inter-car dampers and articulations.

The last *CLRV* on TTC property (4187) left for a private buyer at the end of July; 4001 and 4089 are designated museum pieces, while 4081 and 4124 are being converted for works duties.

It is reported that opening of the first section of the Eglinton Crosstown line is provisionally scheduled for 6 May 2022. Thirty of the 74 Bombardier cars have been delivered. *D.Drum, P.Webb*



A Delivery of a new generation of metro car to Brussels has started. As prominently advertised here, the new design is the M7 series. *STTB*

CHINA

HARBIN. CRRC Nanjing Puzhen has delivered the first train for metro line 2, a 28.7km (17.8-mile) route that is expected to open in June 2021. *IRJ*

CROATIA

ZAGREB. Tram service through the city centre returned to normal from 2 July after the completion of safety work following the 22 March earthquake. *R.Holiday*

CZECH REPUBLIC

BRNO. The last two ex-Praha T6 for passenger service are 1225/6 (ex-8664/6); 8656 of this type has become the depot shunter at Medlanky and is numbered 4922.

More Alliance TW Team *EVO2* trams are 1824-8; eventually there will be 41 cars, replacing all K2 articulated trams. *BS*

PRAHA (Prague). Eighteen trams are running a shuttle service (32), between Hlubocepy and Barrandov from 1 June until the end of October during track works at Nadrazni.

The last T6 trams (dating from 1995-97) will be withdrawn by the end of the year; until then they can be seen mostly on line 32 from Motol; 8702 will be retained for museum purposes. *BS, UTM*

FRANCE

NANTES. The Pays de la Loire region is to publish tenders for the operation of the Clisson – Châteaubriant tram-train and regional rail services. Under the draft terms, the region would provide suitable rolling stock, with the operator(s) responsible for maintenance. Subject to further discussion, the ten-year contracts could be awarded either individually or as a package, to take effect from the December 2023 timetable change. *RGI*

PARIS. The 6.4km (four-mile) northern extension of metro line 14 to Marie de St-Ouen will open in December as scheduled. *IRJ*

TOURS. The new city council, led by a Green mayor, is to proceed with a second tramline, 13km (eight miles) from La Papoterie to Prieuré de St-Cosme de la Riche, estimated to cost EUR330m and to open in September 2025. Also on the agenda is the 700m extension of line A to the airport at a cost of EUR21.5m. *Lineoz.net*

GERMANY

BERLIN. BVG has announced that it intends to rename Mohrenstrasse *U-Bahn* station in December because of racist connotations, possibly to Glinkastrasse (although this too has its detractors). The station opened in 1908 as Kaiserhof, and was subsequently renamed Thälmannplatz and then Otto-Grotewohl-Strasse (names associated with the former East German regime), before becoming Mohrenstrasse in 1991.

The first Stadler *IK20 U-Bahn* train, 5065+5066, was delivered on 25 May and entered service on line U5 on 27 June. The first test train on the new link between U5 and the former U55 ran on 22 June.

The first ten trains of the new air-conditioned Siemens/Stadler *S-Bahn* stock will enter service on lines S47 with the December timetable change. Eventually there will be 21 two-car trains (type 483) and 85 four-car trains (type 484). The builders are providing a 30-year guarantee. *BS*

BÖBLINGEN – DETTENHAUSEN. On 26 June CAF delivered the first of 12 three-car EMUs to the newly-electrified 17km (10.6-mile) *Schönbuchbahn*. The new trains should start carrying passengers on 13 December, with a train every 15 minutes, boosting ridership to 14 000/day.

BREMEN. Planning consent has finally come through for the extension of line 8 beyond the city boundary to Stur and Weyhe. The new route could open in late 2023. *Kreiszeitung*

CHEMNITZ. With the entry into service of the last of 14 new Škoda ForCity Classic trams, the remaining Tatra cars were withdrawn from service in mid-July. Three sets remain in reserve; 523+524 have been displayed on temporary track at Stadtpark. *DS*

DESSAU. Tramway service resumed on 6 June after ten weeks suspension. Tram and bus travel will be free on 19 September to mark European Mobility Week. *BS*

ERFURT. City tours by museum tram restarted on 13 June, with Saturday departures at 11.00 and 14.00 from Domplatz, and a fare of EUR10. *BS*

FRANKFURT-AM-MAIN. The delivery of the first T class trams, being built by Alstom in Spain, has been delayed until May 2021.

Plans are being laid to celebrate 150 years of the city's trams in 2022: two-axle set F 411+ f 1508 are being overhauled to carry passengers again. The tramway museum re-opened on 5 July. *BS*

GERA. The city council decision to finance just six new trams (achieved by a CDU/AfD coalition), is being challenged because it does not permit the undertaking to achieve the targets in the adopted traffic plan for 2021-26. *BS*

GOTHA. The first test run with one of the modernised ex-Basel trams homologated for German regulations took place on 8 June. It is hoped they will be carrying passengers in October. *BS*

HANNOVER. The last of the current batch of new *Stadtbahn* cars, 3153, was delivered to Hannover on 2 July.

KARLSRUHE. Studies are underway in preparation for the 2022 launch of a prototype freight service. The *regioKargo* pilot will demonstrate the concept, using LRVs to transport freight between suburban consolidation centres and central city hubs. From there goods would be forwarded to their final destination using emission-free modes such as cargo bikes. *RGI*

KÖLN (Cologne). The city council and transport undertaking KVB have reached an out-of-court settlement with the builders of the north-south *Stadtbahn* tunnel where the city archive building collapsed on the site in March 2009. The contractors will pay EUR600m to settle all claims and carry out structural reinforcement work to permit the Heumarkt-Severinstrasse line to be competed.

Services were disrupted on 1-2 July when vandals smeared a lubricant on steps leading to subway stations, and later on tracks in outer suburban areas. The culprits wore masks and hooded tops, so CCTV could not be used to identify them. *Express*

LEIPZIG. NGT10 trams are being delivered to a three-week rhythm, with 1024-7 entering service in May and June. Despite this, Tatra T4D 2107/10/3/6/20/2/5 have been refitted so they can operate in three-car sets.

The rebuilt Plagwitz Brücke has been used by trams again since 5 June, initially on temporary line 32, but from the end of August the regular line 14. *BT*

LUDWIGSHAFEN. Demolition of the 'concrete cancer'-affected highway viaduct started on 11 June, and it is hoped the tram network can return to its normal routing on 14 September, after nearly a year of disruption. *BS*

MAGDEBURG. Tenders have been invited for the delivery of 35 new NGT10D trams from 2023.

The Land of Sachsen-Anhalt has offered EUR61m towards the cost of around EUR130m that will replace both older vehicles and cater for capacity improvements across the network. The tender specifies 38m-long vehicles, around 9m longer than the existing cars.

MANNHEIM. Work will start in 2021 on a 1.6km (one-mile) branch from the tracks of line 5 at Bensheimer Strasse to the new development Benjamin-Franklin-Village (on the site of the former US Army base). From 2023 there will be a one-car shuttle service connecting with line 5, but once Käfertal tram station is rebuilt in 2027 a new line 16 will link BFV and Rheinau-Nord via Mannheim city centre. *BS*

MÜNCHEN (Munich). The second and final option for 22 C2 six-car U-Bahn trains from Siemens has been exercised. This will bring the total to 67 trains by 2022.

PLAUEN. The tramway route network was changed from 8 August as follows: 1, Neundorf – Preisselpöhl (this direction only); 2, Preisselpöhl – Waldfrieden (this direction only); 3, Waldfrieden – Neundorf (this direction only); 4, Reusa – Obere Bahnhof; 5, Südvorstadt – Plamag; 6, Reusa – Plamag (only Saturdays until 07.45). *BS*

RHEIN-NECKAR (RNV). This year will see the delivery of 38 class 463 Siemens *Mireo* three-car EMUs for S-Bahn service, with 19 more due in 2021. *IRJ*

SCHWERIN. Tram 824 introduced a new livery on 16 June: white with a medium-blue skirt, black window surrounds, grey roof and yellow cantrail and door surrounds. The tram was named Alexandrine. *BS*

WIESBADEN. A referendum to approve plans for the Citybahn light rail link to Mainz will be held in November. *BS*



▲ In Chemnitz, Germany, the Tatra T3D trams have been replaced by Škoda 35T low-floor cars. V.Dornheim

GREECE

ATHINA (Athens). The 4km (2.5-mile) extension of metro line 3 to Nikaia was inaugurated on 6 July with revenue service from the following day. Work continues on a further 3.6km (2.2 miles) to Dimotiko Theatro, in Piraeus, due for completion in 2022. *RGI*

HUNGARY

DEBRECEN. The launch of the 'Debrecen 2030' plans in June revealed plans for the creation of a new tramline to link the city centre and Tócsokert in the west.

Reconstruction work on tramline 1 has already been confirmed under the plans, which will receive HUF48.3bn (EUR140.1m) in government support between 2021 and 2023.

A further line to the airport and southern industrial development zones is also planned. *Dehir.hu*

INDIA

AGRA/KANPUR. Uttar Pradesh Metro Rail Corporation has ordered 67 three-car trains from Bombardier for the projects in these two cities. *IRJ*

HARIDWAR – RISHIKESH. The Unified Metropolitan Transport Authority in the state of Uttarakhand has approved construction of a 73km (45-mile) light metro, with 32km (20 miles) to be completed by 2024. *Hindustan Times*

KOLKATA. Super-cyclone Amphan on 20-21 May caused 19 deaths and widespread devastation in the city, including extensive damage to the tramway system, with much overhead brought down and traction poles uprooted; all services were suspended. Most of the city was without power for 14 hours.

Tram service 24/29 between Tollygunge and Ballygunge resumed on 15 June, and it was hoped to have three more lines running by 22 June, but this was postponed to just the Rajabazar

– Howrah Bridge line from 3 July. Line 25 Esplanade-Gariahat re-opened on 21 July.

There are concerns that the West Bengal government, which keeps publishing plans to reduce the tramway network to a rump that can be operated by air-conditioned trams, will use the damage as an excuse to implement these plans. *DS*

IRELAND

DUBLIN. Public consultation has opened for the 4km (2.5-mile) extension of the Luas Green line from Broombridge to Finglas and Charlestown. There will be three other stops at Mellows Park, Finglas Village and St. Helena's.

Two new bridges are required, one across the Royal Canal and railway line, and the other over the River Tolka valley. The line will also run through three public parks and Finglas village; to mitigate these effects as much of the extension as feasible will be grass track with cycle and pedestrian routes alongside. No costs have yet been announced. Consultation runs until mid-September.

Opening could be in 2030, following a three-year consultation and design process, one year for tendering, and construction.

ISLE OF MAN

GENERAL. Limited operation of the Isle of Man Railway and the Manx Electric Railway restarted in late July. From 23 July-13 September the IMR will operate Thursdays-Sundays. The MER is open Saturdays-Tuesdays, 25 July-13 September. A basic service on each line will cater for residents plus visitors from Guernsey, the only part of the British Isles currently with free access to the Isle of Man.

The Snaefell Mountain Railway celebrates its 125th Anniversary this year, but apart from a special in June no service is operating. Any anniversary event is likely to be transferred to 2021.



▲ After 37 years of service, the SIG-built trams on the Utrecht-Nieuwegein line carried their last passengers on 3 July. E. de Jong

The Douglas Bay Horse Tramway will also not operate on a regular basis this summer. The Groudle Glen Railway re-opened on 5 July operating Sunday daytimes and Wednesday evenings.

A virtual Manx Heritage Transport Festival was held online from 29 July-2 August.

ITALY

MILANO. The Limbiate tramway is replaced by bus route 165 from 20 July to 3 September, to permit further upgrading work to be carried out. *DS*

PALERMO. AMAT has selected a joint venture of CAF Italia and EDS Infrastrutture as maintenance partner for its tramway vehicles and infrastructure in a new four-year deal announced in late July.

NETHERLANDS

AMSTERDAM. CAF trams up to 3011 had arrived by late July, but they had still not entered passenger service. *OR*

DEN HAAG. Metropoolregio Rotterdam Den Haag has allocated EUR462m to cover the purchase of a further 60 low-floor trams, and changes to track infrastructure and workshops to permit wider vehicles. The new trams will replace the remaining high-floor *GTL* trams by 2026. *DS*

ROTTERDAM. The rebuilt Rotterdam Alexander station, providing interchange between train, metro and buses, opened on 10 July. A 1000-space bicycle shed will be provided shortly.

Tourist tram line 10 will not operate this year.

The 75th anniversary of the city's liberation was marked on 8 June by the operation of museum tram set 556 + 1355 on the network. *IRJ, OR*

PHILIPPINES

MANILA. Operations were suspended on the LRT-1 and LRT-2 light rail lines between 4 and 18 August in compliance

with the enhanced quarantine conditions imposed by the local government. *Manila Times*

POLAND

GDAŃSK. The 3.2km (two-mile) PLN243m (EUR55.3m) extension of tramline 12 from Migowo to Lawendowe Wzgórze was opened on 30 June.

The contract for the modernisation of N8C trams has been placed with Modertrans. *urbanrail.net*

KATOWICE. The first of two Modertrans double-ended bogie trams (1019-20) entered service on the 1.35km (0.8-mile) Bytom shuttle tramline 38 from 9 July. This restores passenger service to the line, suspended in March due to the inability of the two-axle N trams to permit social distancing. The single-ended cars of this type are 1001-1008.

The first Pesa 2017N low-floor air-conditioned tram from the 2018 order (27 25m cars and 8 32m cars) was delivered in the early hours of 12 July. *infotram.pl*

KRAKÓW. Services were extensively revised, on a temporary basis, from 27 July due to roadworks in the city centre. A new line 0 was created.

Eight (840-847) of the 50 Stadler *Lajkonik* 100% low-floor trams had been delivered by the end of July. *infotram.pl*

ŁÓDŹ. Some work has been completed on a 2.8km (1.7-mile) extension of line 43 from Brus depot to Plac Wolności. This could be the first stage in the re-introduction of tram service to Lutomiersk. *TR*

SZCZECIN. On 25 July the 1.5km (0.9-mile) extension of line 3 from Las Arkonski to Rondo Olszewskiego opened.

Modertrans was the only bidder to respond to a tender for delivery of two low-floor articulated trams and assistance with further assembly in the undertaking's workshops. *urbanrail.net*

TORUŃ. Only one bid was received for five new 30m trams, from Pesa for PLN46.4m (EUR10.6m), and this has been accepted with delivery of the *Swing* cars to be completed by summer 2022. The city already has 17 vehicles of the same type, from an order placed in 2013. *infotram.pl*

WROCŁAW. The PLN204.6m (EUR46.5m) contract for 25 32m Modertrans *Moderus Gamma* trams was signed in August; the order includes spares and an option for a further 21 trams. Pesa was the only other bidder.

Car 3001, the first of the 17 Škoda 16T low-floor trams (dating from 2007), departed for refurbishment on 20 July. The PLN60m (EUR13.6m) contract for the whole batch was awarded to Spaatz sp. and should be completed within 24 months.

Modernisation of tram tracks along ul. Olszewski and the Biskupin loop began on 25 July. The PLN20m (EUR4.6m) project includes rebuilding the stops along a 2km (1.2-mile) section.

Modertrans is readying to refurbish the 20 Protram *WrAs205* trams for PLN73.8m (EUR16.8m), adopting a new blue livery chosen by passengers in an online survey. *infotram.pl*

WARSZAWA (Warsaw). Metro Warszawskie has launched a tender for a new ticketing system for metro line 2 that also supports QR ticketing. *infotram.pl*

PORTUGAL

LISBOA. All services, including the Bica and Gloria funiculars, returned from 1 June. The Lavra funicular resumed on 15 June.

The EU has allocated EUR50m towards the modernisation of the Cascais commuter rail line, including upgrading the electrification from 1500V dc to 25kV ac by the end of 2023. *BS, RGI*

PORTO. A consortium of Ferrovial and Alberto Couto Alves has been awarded a 42-month EUR288m contract to build two light rail extensions, for lines D (3.15km/1.95 miles) and G (3.1km/1.9 miles), from Santo Ovído to Vila d'Este and from Casa da Música to São Bento railway station. *IRJ*

ROMANIA

CRAIOVA. Tatra-Jug has won the contract to supply 17 new 25m *K1* trams. The Ukrainian manufacturer's EUR28.9m bid beat rival offers from Pesa, Durmazlar and Bozankaya. The new 27m trams will have a capacity for 190 passengers and are to be delivered from late 2021. *Club Feroviar*

TIMIȘOARA. The short tramway branch to Shopping City Timișoara was brought into use on 15 June; the 100m line is served by route 2. *UTM*

RUSSIA

INDUSTRY. Sinara Transport Machines has acquired a 49% stake in rolling stock manufacturer Vagonmash, giving it a controlling interest; other shareholders are Kirovsky Zavod and Škoda Transportation. Investment of RUB1.5-2bn (EUR17.4-23.1m) in the Sankt Peterburg factory is promised, making it a key production facility for the Sinara-Škoda joint venture formed in December 2019. *IRJ*

MOSKVA. On 19 July the route changes resulting from the completion of track reconstruction at Pavletsky Vokzal took effect. Lines A and 38 were re-routed, line 35 withdrawn, and line 49 retained its temporary route from Nagatina to Novodanilovsky Passage on a permanent basis. Lines A, 1, 39, 47 and 49 are now worked by low-floor *Vityaz-M* cars.

Mayor Sergei Sobyanin has announced a city festival for 12-13 September, but it is still uncertain if the tram parade will be revived. *N.Semyonov*

OMSK. Tenders have been invited for 24 16m trams with a 34% low-floor area, which could be second-hand as long as they were built in 2019 or later.

The third of four batches of 71-619A trams arrived from Moskva on 11 July, the final batch (making ten in total) was expected in early August. *transphoto.ru*

SANKT PETERBURG. Novokrestovskaya metro station is to be renamed Zenit to mark the 95th anniversary of the local football club. *Fontanka*

VITEBSK. On 15 July the rebuilt Polotsky viaduct was opened, permitting tramlines 6, 8 and 9 to return to their normal routes. Line 4 is withdrawn.

On 21 July Ulitsa Gagarina was closed for reconstruction with lines 1 and 3 cut back to the depot. Line 5 is withdrawn. *transphoto.ru*

SINGAPORE

MASS RAPID TRANSIT. The Singapore - Johor Bahru Rapid Transit Link project was relaunched on 30 July. It will now be a standalone 4km (2.5-mile) international light rail link to Malaysia by a new bridge rather than an extension of the Thomson-East Coast metro line. Completion has slipped to the end of 2026.

Four contracts worth SGD682.5m (EUR421m) have been awarded to a Daewoo-led consortium for the construction

and equipment of stage 2 of the Jurong Region metro. *IRJ*

SERBIA

BEOGRAD. The French Government is funding an 18-month metro feasibility study, based on two lines totalling 42km (26 miles). The study, to be carried out by engineering specialist Egis, is in preparation for the first phase of the planned EUR6bn network. *SeeNews*

SLOVAKIA

STRBA - STRBSKE PLESO. Sunday 5 July marked the last day of operation for the 50-year old SLM metre-gauge rack trams. The line is now closed for rebuilding and will be equipped with new rolling stock in 2021. *traphoto.ru*

SPAIN

CERCEDILLA - COTOS. RENEFE has awarded CAF a contract for six metre-gauge two-car trains to replace the existing stock dating from the late 1970s on the 18.2km (11.3-mile) line C-9. *IRJ*
MADRID. Plans have been approved to extend metro line 8 north-east from Aeropuerto to Valdebebas and line 5 from Alameda de Osuna to Aeropuerto. *RGI*
MÁLAGA. Metro de Málaga has extended its maintenance contract with CAF for the system's 14 *Urbos* trams for a further five years.

SRI LANKA

COLOMBO. The planned 15.7km (9.8-mile) light rail line between Colombo Fort and Malabe is reported to be going ahead for completion in 2026, thanks to a 40-year Japanese loan. *RGI*

SWEDEN

LUND. The first of seven CAF trams was delivered on 29 July and was on test from 17 August. Passenger service is now scheduled for 13 December. *SVT nyheter*

SWITZERLAND

BASEL. The 5-6 September events to mark the 125th anniversary of electric tramways have been cancelled. Some may be rescheduled for 2021.

The new tramway museum at Dreispitz opened on 19 July, opening every third Sunday until the end of October, although feeder heritage tramline 7 is not operating. *M.J. Russell*

BERN. The 4.45km (2.8-mile) Ostermundigen extension will be built in 2024-28.

On 18 May a road vehicle accident damaged a point at Siloah. Until a replacement was installed on 20 June, only *RBS*

double-ended trams 81-89 could be operated, which meant the line was cut back to Zytglogge. Bern trams ran between HB and Fischermätteli. *Tram, BS*

CHUR - DISENTIS (RhB). The first *Abe4/16 Capricorn* set entered service on a Lanquart - Filisur working on 17 June. The order with Stadler for these sets (which cost CHF865 000/EUR802 848 each) has been increased from 36 to 56. *EA*

GENÈVE. The extension of line 14 from P+R Bernex to Vailly is unlikely to open as planned on 13 December due to delays caused by the coronavirus pandemic. *BS*

ZÜRICH. Canton Zürich has released funding for the CHF280m (EUR259.8m) tram link from Affoltern to Bucheggplatz, with building due to start in 2024. *BS*

TAIWAN

TAIPEI. An Alstom-led consortium has been awarded the EUR424m contract to supply automation and rolling stock (16 four-car *Metropolis*) for the automated light metro line 7, due to open in 2025-28. *RGI*

UNITED KINGDOM

BLACKPOOL. The tramway re-opened on 19 July with a daytime 20-minute service terminating at 19.30, the route then being covered by bus service 1 operating to 22.15.

Heritage Trams will begin running over the August Bank Holiday weekend (29-31 August) with a limited service and all seats requiring advance booking. Two tours will be provided, both with North Pier as the pick-up point. Four Promenade Tours will run each day covering the North Pier - Little Bispham - Pleasure Beach - North Pier circuit in an hour, plus a single Coastal Tour at 13.00 which includes the Little Bispham to Fleetwood section as well as the full Promenade Tour. A limited Heritage service will continue in September and then over the Illuminations period, details of which have still to be released.

The eight companies owned by Blackpool Council face losses of up to GBP18m (EUR20m) due to COVID-19, with the worst affected being Blackpool Transport Services. Although three tranches of central government support are expected to raise GBP11m (EUR12m), non-budgeted expenditure during the pandemic is GBP24m (EUR26.4m) and no specific grant has covered tram service operations, unlike most of the other UK tram and rail services. The council expects to be able to cover additional costs through its reserves.



▲ The Gorzów, Poland, tramway has re-opened after several months of closure for reconstruction and delivery of a new fleet of Pesa *Twist* trams. *naszemiasto*

EDINBURGH. A new single transport company is the favoured option of a report published in July. If carried out, the reform would bring together Lothian Buses, Edinburgh Trams and Transport for Edinburgh, although retaining the bus and tram brands.

Transport for Edinburgh was formed by the Council in 2014, with a wholly-owned subsidiary Edinburgh Trams and a 91% ownership of Lothian Buses, with East Lothian, West Lothian and Midlothian Councils as minority shareholders. The council also wants to review the Lothian Buses network.

Electrification, Supervisory Control and Data Acquisition (SCADA), telecoms and tram and road traffic signalling equipment for the 4.9km (2.9-mile) Newhaven extension will be supplied by Siemens Mobility following a contract award in July.

INDUSTRY. A new body is being established to facilitate transport projects in the North of England. The Northern Transport Acceleration Council (NTAC) will be chaired by Transport Secretary and Northern Powerhouse Minister Grant Shapps, with its membership made up of council leaders and elected mayors from across the region. Its first meeting will be in September. The NTAC will be supported by Department for Transport staff based in northern cities.

INDUSTRY. A review of system switches and crossing maintenance regimes is set to be funded by UKTram and the Light Rail Safety and Standards Board, partnering Huddersfield University. The project is being carried out in line with a push by the Office of Rail and Road, requiring those responsible for maintenance to review standards and processes and, where necessary, implement a more robust regime for maintenance and renewal.

INDUSTRY. An online petition has been set up to urge the UK Government to legislate for Clean Air. The move comes after the introduction of the Environment Bill earlier this year which had no clauses binding the UK to adopt World Health Organisation guidelines by 2030. The petition can be found at <https://petition.parliament.uk/petitions/318989>

NOTTINGHAM. Services returned between the Royal Centre and Old Market Square on 14 July, earlier than the intended 19 July, following track replacement by VolkerRail. Full service resumed on 3 August, with trams operating every seven minutes, alongside a re-opening of the NET travel centre on King Street in the city centre.

Emergency DfT funding for the tramway is likely to continue to cover the reported GBP404 000 (EUR448 000) a week losses, according to a council report quoted by the local *Nottingham Post*.

SOUTH YORKSHIRE. Supertram track reconstruction moved to Ridgeway Road in the Gleadless Townend area in Sheffield from 25 July. The works were due to continue along Ridgeway Road through Hollinsend to Manor Top and finally on to the Spring Lane Curve at the junction of City Road until 1 September.

No service is provided from Sheffield Station to Halfway, with the Purple route withdrawn and the Blue route curtailed to operate between Sheffield Station and Malin Bridge. A limited bus replacement service is provided between Fitzalan Square and Halfway. The Yellow route and Tram-Train services are unaffected.

From 2 September rail replacement will be carried out in the Crystal Peaks area, due to continue until 25 September.

THAMES GATEWAY. Thames Gateway Tramlink - proposer of the KenEx tramway between the



▲ An example of the temporary boarding ramps currently being installed on the Muni light rail system in San Francisco (US). SFTMTA

counties of Kent and Essex – is to hold a conference in Thurrock on 17 October. The event is seen as key to influence the inclusion of a tram network in the formation of a transport plan by the Association of South East Local Authorities (ASELA).

TYNE AND WEAR. Nexus, has secured GBP20m (EUR22.1m) of central government funding for additional infrastructure renewal works, including track and overhead line replacement, after the current GBP350m (EUR387.8m) upgrade programme that began in 2010 ends in 2021. The body is also working to secure additional funding for capital works through to 2025 in this year's Spending Review.

The new temporary Metro depot at Howdon is close to completion. The former landfill site has been transformed with new tracks and overhead lines and a new maintenance shed with facilities for staff. The site will be used for the cleaning and preparation of up to a quarter of the fleet while the main depot at Gosforth in Newcastle is rebuilt, with that GBP70m (EUR77.6m) project expected to begin this summer.

As part of the order for new Metro cars, Stadler has moved its new management team into Gosforth depot. The trains are to enter passenger service by 2023; the first of the original fleet to be scrapped is 4022, which was damaged in 2017 and not considered economical to repair.

VOLK'S ELECTRIC RAILWAY. The railway re-opened on 25 July. No pre-booking is required but only contactless payments are accepted. Halfway station and the main visitor centre are closed. The line will be open Wednesday-Sunday 11.00-16.00, with trains every 15 minutes from both Aquarium and Black Rock stations.

WEST MIDLANDS. Ticket machines in use with conductors on West Midlands Metro are now able to add a new fare-capped facility which guarantees commuters the

best value fare. This is available to holders of a Swift travelcard. The facility is to be extended to bus and local rail services in 2021.

Dudley's castle has inspired a name change for the proposed town centre Metro stop, from Station Drive to Dudley Castle. Midland Metro Alliance is undertaking preliminary works on the future tramline, including utility diversions and upgrades until September in Castle Hill and Trindle Road in Dudley, and the removal of a railway bridge in Tipton during August.

USA

AUSTIN, TX. The meeting on 27 July to approve Project Connect (TAUT 992) decided on an 8.75% municipal tax increase to go on the ballot in November. This will raise USD3.85bn, reduced from the original proposal of a local contribution of USD6.5bn, so the planned 9.7km (six-mile) Gold line is deleted, as are extensions of the Orange line, which will now link North Lamar Transit Center to South Congress Transit Center. The Blue line to the airport is included. A new transit agency will be created to implement the expansion programme.

CHICAGO - SOUTH BEND (IL/IN). In an attempt to restore patronage, all westbound rides (towards Chicago) on the interurban were free in July and August, and up to three children aged 13 or younger could ride free with an adult. Monthly tickets for July were also valid in August.

Contractors have been appointed for the design and construction of the West Corridor branch line, which is awaiting a federal grant. *J. Hayward*

EL PASO, TX. Further testing on the city tramway took place during the last week of July, but no resumption of service had been announced by early August.

GALVESTON, TX. Diesel trams 501-3 have been returned from GOMACO after complete refurbishment, and may re-enter

service this winter.

Galveston Island Trolleys

LOS ANGELES, CA. On 10 July work started to build the 14.6km (9.1-mile) Pomona extension of the Gold light rail line, with completion programmed for 2025. *ERA*

PHOENIX, AZ. A contract has been awarded to a joint venture of Kiewit and McCarthy to build the 2.6km (1.6-mile) northwest light rail extension to Mountain View Road, planned to open in 2023. *RGI*

PORTLAND, OR. The closure of the 1912 Steel Bridge for refurbishment of light rail tracks from 2 to 29 August led to major changes to MAX service. The Blue line operated Hillsboro – Old Town and Rose Quarter – Gresham, the Green line Rose Quarter – Clackamas, the Red line Gateway – Airport shuttle, the Yellow line Expo Center – Rose Quarter, and the Orange line Union Station – Milwaukie. Bus shuttles filled the gap.

From 2 to 22 August the Green and Yellow lines were through-routed at Rose Quarter. The nine Orange line trains had to be stored and maintained on the line overnight until 11 August, after which trains were able to run onto the bridge without passengers to reach Elmonica maintenance facility. *S. J. Morgan*

SACRAMENTO, CA. California's Department of Transportation has made a USD3.75m award under its Low Carbon Transit Operations Program to support the purchase of additional low-floor LRVs and expanded evening Gold line service. *Mass Transit*

ST LOUIS, MO. The Loop Trolley was operated at weekends in July, 11.00-19.00 with free rides.

J. Hayward

SAN DIEGO, CA. The North County Transit District has awarded Bombardier a USD43m contract for 11 double-deck commuter rail coaches to permit the Coaster service to operate every 30 minutes. *RGI*

SAN FRANCISCO, CA (Muni). Re-opening of the Muni Metro system, with consequent route changes, took place on 22 August rather than 1 August, relieving pressure on overcrowded buses. Temporary boarding ramps were erected for the inbound and outbound transfer points at West Portal and Church and Market streets. *NBC Hoodline*

TRENTON - CAMDEN, NJ. NJ Transit is trialling the use of vinyl wraps for its GTW 2/6 LRVs. It is estimated that applying the wrap to the River line's 20-strong fleet would save USD570 000, also lasting up to ten years compared to just five years for paint. *Mass Transit*

WASHINGTON, DC. Metro frequency and operational hours reverted to normal from 16 August.

MUSEUM NEWS

BALLARAT (AU). The 50th anniversary celebration for the tramway museum is being scheduled for 19 September 2021.

M. Rowe

BEAMISH (UK). The museum reopened on 23 July, with advance booking but no tram rides. Beamish has a fundraising appeal. See: <https://beamish.digitickets.co.uk/category/13841>.

CRICH (UK). The Tramway Village re-opened from 11 July for five days per week (not Mondays and Fridays, although it is to open on Bank Holiday Monday 31 August). A timed slot for a return tram trip must be obtained at the main entrance. Trams can only be boarded and alighted at Town End. September and October opening dates are still to be confirmed. Donations are being sought at <https://www.tramway.co.uk/contact/make-a-donation>.

SEATON (UK). Services resumed from 4 July, initially with a 30-minute headway that was increased to a 20-minute headway for the summer holiday period (25 July-28 September). A 30-minute service will then be provided until 1 November.

CONTRIBUTORS

Worldwide news items for inclusion should be sent to Michael Taplin at Flat 8, Roxan Villa, 33 Landguard Manor Rd, Shanklin, Isle of Wight PO37 6EA, UK. Fax: +44 (0)1983 862810 or e-mail miketap@mainspring.co.uk

UK and Ireland items are welcomed by the Home News Editor, John Symons, 17 Whitmore Avenue, Werrington, Stoke-on-Trent, ST9 0LW, UK. E-mail: uknews@lrta.org

Acknowledgements are due to *Blickpunkt Strassenbahn* (BS), *Club Feroviar*, David Richards, *Dehir.hu*, *Drehscheibe* (DS), *Edinburgh Evening News*, *Eisenbahn Amateur* (EA), *Eisenbahn* (EB), Electric Railroaders Association (ERA), *Fontanelle*, *Galveston Island Trolleys*, *Hindustan Times*, *Hoodline*, *infotram.pl*, *International Railway Journal* (IRJ), *Irish Times*, *Kreiszeitung*, *Lineoz.net*, *Manchester Evening News*, *Manila Times*, *Mass Transit*, *National Broadcasting Corporation* (US), *Nottingham Evening Post*, *Op de Rails* (OR), *Railway Gazette International* (RGI), *SeeNews*, *SVT nyheter*, *Today's Railway* (TR), *Transport Publiczny*, *transphoto.ru*, *Tram*, *Tram-2000*, *urbanrail.net*, *Urban Transport Magazine* (UTM) and *Wolverhampton Express & Star*.

MAILBOX

Get your views into print



simon@mainspring.co.uk



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

Without passengers, how long can we last?

To add to the ongoing debate about pandemic finances I would hope you will indulge a few of my personal observations.

Firstly, I would begin by saying that I am sick and tired of the comparisons being made with wartime conditions. This is totally different. During the war if anything it was the tramways and trolleys that kept our cities moving. This pandemic has no clear end. There will be likely be a 'second wave', and a third, and a fourth, and even if community transmission rates do drop, until a proven vaccine is found or we develop more effective treatments there will always be the potential for further outbreaks. And outbreaks mean lockdowns, travel restrictions and social and economic carnage.

This pandemic is devastating for transit, with buses and LRVs (trams) running at a tiny percentage of their capacity. As such private automobiles are forming the basis for our 'recovery', bringing with them congestion and environmental complications. So until the requirement for social distancing ends – and I think this will be here for some time yet – we need to rebalance the finances of transit agencies away from fare revenues and towards grant funding.

Your average LRV or subway train at two-metre distancing can carry (at best) 15% of its normal loading. At one-metre this improves to 25-30%. I note recently that the UK Transport Secretary Grant Shapps said "I think it is fairly obvious if I say that, you know, if you're not able to run your services with 100% capacity then it is of course difficult to make those services profitable." With statements such as this if you recognise the problem and do nothing to solve it, then you are indeed part of the problem.

So echoing the sentiments of your columnists in recent months, now is the time to 'pause, reflect and rethink the role of public transport'. A good start would be to pause road building schemes to free up resource to accelerate new transit schemes so we can build better cities for the future. A clean slate if you like; it just depends now on what we write on it.

With this in mind it is the responsibility of Government to maintain financial support and recognise the role that efficient public transport has in society. The current bailouts are welcome, but will only last so long. Here in the US we are pushing hard for a consistent and long-lasting 'new deal' for transit – and it is up to us all to up our efforts, no matter where we are.

P. W. Anderson, by e-mail

Now is a perfect time to rethink both the operation and ownership of public transport, not just going back to what was there before because that's what we have always done.

Firstly, it is vital that investment is kept going, and indeed increased, despite the temporary downturn in passenger numbers. It is definitely not an excuse to cut services.

Despite all the "everyone is staying at home" messages from the general media, there will still be the need to visit a central location even if only for a few hours a week – for instance for confidential briefings, medicals or interviews etc. There are also plenty of people who hate doing so or either can't work from home because of the nature of their job or miss the social aspect of being at work. This is especially true if you are single and/or don't have a garden or extra room at home to work in.

Plus of course, home working might not be so popular when the utility bills show an increase in domestic usage. Not all employers will reimburse such costs and nor are they legally obliged to. Additionally, home workers can be easily distracted by visitors, shopping trips, dogs, kids and noisy neighbours.

Leisure travel will pick up again eventually (it's difficult to e-mail yourself to your parents or a tourist attraction for the weekend!) and to avoid permanent traffic congestion it is vital that the car isn't the first or only choice. So if new housing is built then good quality public transport should be there before the first residents, subsidised either by the local authority or developers as part of planning permission if necessary, so that new owners don't get used to having a car as their only option.

When schools return fully, many of those students will need to travel by bus, coach, train and light rail. Are governments really expecting private cars to carry all those children?

Perhaps it is also time to rethink the practice of reduced timetables on Sundays and Bank Holidays to account for changing travel behaviour.

It must be strongly emphasised that public transport hasn't suddenly become dangerous overnight. It is still very safe from an accident point of view and encouraging hundreds of electric cars to flood towns and cities will do nothing to solve congestion, especially in the winter when cycling and walking might not be as attractive.

Continued government funding is therefore vital, especially at the present time to stop operators going under and leaving no alternative for millions but the car. Quieter roads are perfect for digging up streets to move utilities, lay track, install substations or traction poles etc in anticipation of planned light rail lines. This would also provide a much-needed boost to the construction industry.

Despite the above, I am still optimistic that investment in light rail (supported by electric buses where there isn't enough potential traffic) is the right long-term solution. The challenge now is to persuade the politicians, media and money men (and sadly they are still nearly all men) that service cuts, and deferring new rolling stock or upgrades is not the answer.

Colin Brazier, by e-mail

Before the coronavirus really took hold, the majority of my local journeys were made on public transport. I am lucky enough to live in a suburb of Nottingham and have generally excellent tram, bus and rail links across the Midlands. While I do own a car, I am now advancing in years and have always preferred public transport anyway. It provides a vital service in my community, as it does up and down the country.

Since lockdown measures have been eased (June) I have not used public transport and have not yet made up my mind when I would feel safe to do so again.

I have seen many local trams, buses and trains pass me near-empty. My own confidence in public transport aside – as a pensioner, I am still to remain fully convinced of my safety – I ask myself how long this situation can continue before wide-ranging and permanent cuts to services will be needed.

By the time I feel comfortable to use them again I fear it may be too late for many operators.

Name and address supplied

"It is the responsibility of Government to maintain financial support... the bailouts are welcome, but will only last so long."

Personal memories of Curt Elmberg

It was very sad to read about the death of Curt Elmberg (TAUT 992). His achievements in Gothenburg are well-known amongst tramway professionals, making it a leading example of good practice in the light rail world.

What is perhaps not so well-known is his influence on light rail developments in Britain. I first met Curt when he hosted the LRTA visit in September 1967 for 'Högertrafik', the change from left-hand to right-hand traffic. That was a masterpiece of planning and implementation in itself. Despite having his own massive responsibilities in making it all work that weekend, he still found time to put on a warm welcome for LRTA members.

Two years later he accepted my invitation to come to Salford University to present a paper to a symposium on 'Planning for Public Transport'. He was at that time Director of Planning for Göteborgs Spårvägar. Over 50 professionals and academics attended the symposium, including delegates from London, Manchester, Birmingham, Sheffield and Newcastle-upon-Tyne.

All those places went on to develop light rail projects, although it was another 30 years before some of them carried passengers. It is highly probable that Curt Elmberg sowed seeds in many minds over those two days which bore fruit years later.

We therefore owe him a great deal of gratitude, not only for being our honorary [LRTA] Vice-President, but for advancing the state of light rail in Britain and beyond.

Tony Young, Skipton, UK

Further background on Tramlink

It was a pleasure to hear from my friend and former colleague Alan Murray (*Mailbox, TAUT 992*). Our memories of events that took place 30 years ago tend to grow rusty and I am always happy to discuss errors and omissions.

The Tramlink team and our Consulting Engineers were working on a cross-platform design for Addington Interchange since early 1989. We discussed this, and the number of buses, fully-accessible minibuses and taxis that would serve the interchange with our 'friends', and were confident that we had a layout that suited our future passengers, London Borough of Croydon, local residents, potential tram and bus operators.

It was a requirement that this be presented for local consultation months before the Tramlink Bill was deposited. Members of the House of Lords Bill Committee had visited modern tramways on the European mainland, showing particular interest in bus/tram interchanges.

Alan acknowledges that the best arrangement is a 'wrap around', giving cross-platform interchange. This is what the Tramlink Bill plan achieved. The design of this was carried out in conjunction with a Steering Group consisting of LB Croydon, a civil engineering firm, a car-builder and an experienced operator, which was a privatisation of one of LRT's bus companies. It therefore came as a surprise to all those who had put so much effort into the design to find that it was discarded in favour of what Alan admits is a 'sub-optimal' arrangement.

If this change came about to suit the operating convenience of the bus operator I would ask how this stood in relation to BPI's remit to 'put... passenger interests above those



▲ Ulan-Ude is benefiting from fresh tramway investment; new trams such as this PK-TS Lvyyonok have dramatically improved the quality and attractiveness of the service. Not all Russian cities are so lucky. *Luc Koenot*

of private companies which could have acted in a discriminatory manner towards competitors.'

If the change was to reduce land costs I would ask why the LRT PFI Unit (which had not been involved in the promotion or design, nor consulted those who had six years of work on the scheme) should agree to this change, particularly as the private sector elements of the Tramlink Steering Group had submitted a BAFO to build the tramway as designed. It all seemed to be something of a jumble to those standing outwith the 'magic circle'.

"It is highly probable that Curt Elmberg sowed seeds in many minds over those two days [in 1969] which bore fruit years later."

I am also upset by Alan's attack on a long-serving public servant. Dennis Coombes has been dead now for over a decade and *De mortuis nil nisi bonum* would be a gentlemanly maxim. To call someone 'virulently anti-bus' is to question their impartiality and demonstrate an almost fanatical obsession with buses.

Dennis' major objective was to ensure the continuing economic success of Croydon, by improving its environment and supporting sustainable services. He also recognised the benefit of moving private motor traffic from main streets. Having been to pedestrianised town centres in London and the south, I took him to a number around Manchester and he was particularly impressed by the city centre manager in Chester who told him it 'was not much of a success, it weakens the case for closing the road to other traffic and once the other traffic pollution is removed people become aware that the buses are noisy, polluting and no less dangerous than they were before. When it's politically possible we will get the buses out.'

Dennis and I had long – often heated – discussions about letting the trams use

North End, but he resisted that, quoting the Chester experience. I particularly remember an argument we had on Amsterdam's Leidsestraat as the rain fell heavily and the trams glided serenely by. He had a vision that removing the traffic from North End would allow the pedestrianised shopping centres (of which Croydon then had three – all adjoining) to grow, amalgamate and prosper as one, integrated shopping area.

Denis saw transport as the lifeblood of the town and that was the purpose of most of the transport developments he delivered. Croydon was not to become a playground for bus operators, nor could it become clogged with private motor cars. He wanted to secure modal transfer – something he recognised trams can achieve, but motor buses rarely do.

If Alan thinks Dennis was 'anti-bus', can he explain the countless hours we spent, sketching on large-scale maps in his office, working until after midnight to find an alignment and a traffic management plan that would get trams from Sandilands to Reeves Corner AND produce one of the longest, mostly-segregated bus corridors in London? Hardly something cooked up by Dennis Coombes and myself if we were 'anti-bus'!

Alan concludes by saying "It is possible that earlier discussions were held pre-1990 to which we were not party and that these are what were being referred to." Yes Alan, that's what happened.

Scott McIntosh, by e-mail

Demystifying a tramway great

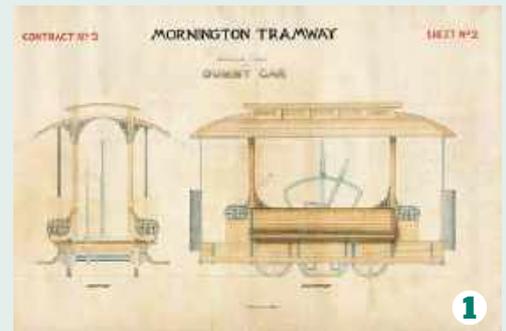
I would like to express my appreciation for the excellent first part of your survey of Russia's tramway landscape in TAUT 992. As a part of the world with so rich a tramway history, but so little English language coverage, Mr Koenot's obvious extensive knowledge and highly readable style give a really good overview of the current situation.

As well as the technical detail, the historical background and context of the decision-making processes of city authorities made this a fascinating read. I can't wait for the second part!

R. Nicholson, by e-mail

RETURN TO DUNEDIN

Mac Gardner reports on the exciting plans to bring cable cars back to the New Zealand city of Dunedin, that in 1881 was only the second in the world to introduce them.



Wemay not know what song the sirens sang, but the source of the similarly seductive sweet swishing sound between the tracks in some San Francisco streets is well understood. The endless cable, running over, under or alongside a series of pulleys, hidden in an underground conduit, and held and released by 'little cable cars, climbing halfway to the stars' (to paraphrase the Tony Bennett song), hums and strums its tune to delight those with attuned ears. To those not of a mechanical bent, as Rudyard Kipling wrote in 1889, "If it pleases Providence to make a car run up a slit in the ground for many miles, without any visible means of support, then who am I to seek an explanation of the miracle?"

Dunedin, the second city

Only eight years after Andrew Hallidie introduced the cable car to San Francisco in 1873, a second urban system came into being in Dunedin, New Zealand – a perfect fit for an equally, if not more, hilly city, with many suburbs looking down towards the city centre.

The first route, the Roslyn line, began operation in 1881. A curve in the steep street around St Joseph's cathedral presented a challenge: letting go to pick up another straight-running cable was not an option! The 'pull curve' was thus invented by local engineer George Duncan, who later established the Melbourne cable car system. Pulleys enabled the car to retain its grip on the cable as it took the curve. To offset the flexing of the gripper as it passed around the horizontally-set curve pulley drums, he set a rail in the conduit just above the cable that the gripper could slide around, obviating the flexing which could have weakened the gripper shaft. San Francisco soon followed suit.

The next route, opened in 1883, ran up High Street from the city centre to the suburb of Mornington. About a mile (1.6km) in length, with the endless cable 2½ miles (3.6km) long, the track made only one turn, at the top of High Street, again using George Duncan's pull curve. First to operate the route were locally-built 'dummy' grip cars, and enclosed trailers from the Jones Company of West Troy, New York, essentially horse-drawn vehicles modified for cable tram propulsion.

A disastrous fire in 1903 destroyed all the dummy cars and all but one trailer, 4 (later renumbered 107), now partially restored at the Museum of Transport and Technology (MOTAT) in Auckland. New grip cars were built to a local design, with enclosed cabins and open seats along each side and the gripman ensconced in the middle. New trailers

were needed: some (109, 110) were adapted from horse-drawn carriages; others (111, 112) were built in the Dunedin City Corporation workshops, to cope with traffic to the 1920s New Zealand and South Seas Exhibition.

Street-running cable cars (not to be confused with funiculars) arrived in 38 other cities around the world in the late 19th Century, between the fading days of horse-drawn and steam-driven urban rail transport, and development of the electric tram. Had that period been shorter, the cable car might never have had a role. The triumph of the electric tram was not, however, long in coming: the advantage of a single light overhead wire and a finely-controllable onboard motor, versus an under-street heavy cable needing regular replacement, and a fairly crude control mechanism, was unarguable. Except, that is, in cities with steep hills: namely, San Francisco and Dunedin.

At the peak, there were three major routes in Dunedin, all running to hill suburbs: the Roslyn and Mornington lines from the Exchange (the business area), and the Kaikorai line, commencing 1900, from the Octagon (the official city centre). Two feeder lines from Mornington served adjacent suburbs: the Maryhill and short-lived (1906-10) Elgin Road extensions. The former had a remarkable 1:3.5 (28.6%) gradient at its origin, and unwary first-time passengers might have found the initial, sudden steepness mildly terrifying.

The cable and gravity

The cable provided uphill traction; downhill, the tractive power was gravity, kept in check by gripping the cable, the main braking for most of the journey, except at stops, where track and wheel brakes were applied. Combined use of gravity and moving cable allowed for an almost theatrical performance when the set arrived at the lower High Street terminus. First, both vehicles having applied brakes, some passengers alighted and the conductor separated the trailer from the grip car.

The car then 'dropped the cable', free-wheeled along the down-track to the points joining the up-track; stopped, and the rest of the passengers got off; picked up the cable, and moved clear of the points. Now, the trailer released its brakes, coasted to the end of the line, and the grip car reversed to reconnect. This process used slippage on the cable, rather than the brakes, to maintain precise control.

The decline...

In post-war years, in Dunedin as in many places where electric tram systems suffered closure, other forms of public transport triumphed. Here these were the trolleybus and, most

rampant of all, the diesel bus, unconstrained by tracks or wires. For the little cable cars, this was an unequal battle. The Kaikorai line closed in 1947, the Roslyn line in 1951, and the Maryhill extension in 1956.

The Mornington line lasted until 1957, but eventually capitulated, its profitability undermined by the buses. It went not without a fight: pleas were made, petitions forwarded, editorials written, as was earlier the case in San Francisco. But Dunedin folk proved less able to confront 'progress' than Californians and the last car, 101, carrying two or three times its allowed load and preceded by the Dunedin Ladies' Highland Pipe Band, made its final journey up High Street on 2 March 1957.

...and the return

But is 'final' too strong a word? There is now a group whose hope is that the period between 1957 and the 2020s may prove to have been merely a temporary suspension of service. Three of the old cars have returned to Dunedin, having spent decades under the custody of the Tramway Historical Society at Ferrymead, Christchurch: Roslyn grip car 95 and trailer 111, in beautiful condition, and Roslyn car 97, less so. They are displayed at the recently-built Cable Car House by the Mornington shopping centre, where the tracks used to run. Trailer 4, at MOTAT, the only representative of the 1800s, is expected to make the trip home in due course. Another car, 105, at the Seashore Trolley Museum in Kennebunkport, USA, may be too far away.

These homeward-bound cars now serve as tangible evidence that progress is being made, and as a focus for support and fundraising for track installation and cable machinery to proceed. A registered charity, the Dunedin Heritage Light Rail Trust, has been formed.

The rails will lie exactly where they used to, and the century-old cars will all be originals observing historical authenticity so far as current regulations allow. This historic character will be an attraction for a new class of passenger – the visiting tourist – not a demographic much considered years ago. Funding and the current viral epidemic present challenges. But at least some time in the 2020s, visitors to Dunedin may once again marvel at what Kipling saw as a miracle. **TAUT**

› Those wishing to support the project can donate, or purchase a beautifully-illustrated 2021 calendar (High Street service from 1884 to 2020), for GBP15 P&P (airmail from NZ), from www.dunedincablecars.co.nz

Grateful acknowledgment is offered to Don McAra and Bill Campbell for their expert critical comment on the draft article.



2

1. The design of the first cars dating from the 1880s.

Hocken collections (MS-3801-031)

2. Trailer 111, hauled by one of the post-1903 grip cars, descending High Street on the Mornington line in the 1950s. *Photographer not recorded*

3. An atmospheric view of High Street in the 1950s, showing the topography of a route ideally suited to cable cars, with grip cars ascending and descending. *Reginald McGovern*

4. The Dunedin-invented 'pull curve' at the top of High Street, allowing the car to make a turn without letting go of the cable, in 1954. *Hugh Ballment*

5. An animated scene at the lower High Street terminus of the Mornington line; the grip car is about to back down to pick up the loaded trailer in 1950s Dunedin. *Don McAra, Tramway Historical Society*



3



4

6. Trailer 111 now restored and on its short temporary track at the Cable Car House at Mornington, alongside Car 95 (with grip handle visible), and awaiting their new lease of life. *Mac Gardner*

7. Car 108 with Trailer 112 ascending Lower High Street in the 1950s. *Graham Stewart*

8. CAD demonstration of the Mornington car infrastructure. The shank of the grip extends through the 'slot' in the middle of the track, into the under-street conduit. The two rhomboids (light grey colour) of soft iron come together to grip the cable. Note that there is no bogie, the axles being attached directly to the frame. At a maximum speed of 17km/h (10.5mph) and anticipated to be running on new heavy-grade rail, bumpiness should not be too problematic (and will in any case be authentic!).

Lawrie Cooper, Tramway Historical Society



5



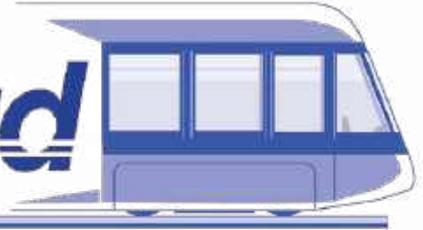
6



7



8



New study reveals global PM2.5 damage

Tyre and brake dust has been found deposited in Arctic ice. A recent report co-authored by Andreas Stohl, Professor of Meteorology from the University of Vienna (Austria), found that up to 426 000 tonnes of PM2.5 microparticles from tyres and brakes are deposited each year. Because of their size, these particles are swept up into the air and blown long distances.

The report, published in July in *Nature Communications*, provides a conclusive link that these particles are contributing to global warming. Like soot from fossil fuels and wood, they darken the surface of the ice and cause it to absorb more heat from the sun and melt more quickly. This causes the Arctic ice pack to retreat more quickly, raising sea levels globally and leaving wildlife such as polar bears at greater risk as they need to cover larger areas to hunt and mate.

Government has no plans to legislate

Last year the UK Government's Air Quality Expert Group reported that well over half of all particle pollution was caused by PM2.5 particles. Despite this, when the Government published its Environment Bill in February 2020 it included no plans to reduce the emissions of such microparticulates.

The LRTA has launched a Parliamentary Petition calling for legislation to address this serious challenge to air quality. The full text of the petition is as follows:

Action on non-exhaust emissions

The Government should adopt as legally binding the World Health Organisation guideline levels for PM2.5 of 10µg/m³ as an annual mean threshold by 2030.

The Environment Bill must include legislation on non-exhaust emissions – these are particles



▲ The presence of large amounts of tyre and brake dust in the Arctic has grave ramifications for the survival of polar bears and other native wildlife.

from tyres, the road surface and plasticisers. Also known as PM2.5, the major source of this invisible microparticulate pollution is buses and lorries. Environmentally-friendly and sustainable transport solutions must be found for our busy towns and cities which should include light rail systems.

Parliament should recognise and support in law efforts to clean up the air in our towns and cities. This should include the provision of a new local transport infrastructure fund to enable transport authorities to develop sustainable clean alternatives including light rail.

To sign the LRTA's petition, please visit <https://petition.parliament.uk/petitions/318989>
If 25 000 or more people sign up then the Government has to respond.

LRTA members' meetings go online

The LRTA, like many similar organisations, has been unable to organise its usual local and area meetings and talks during the pandemic.

However, from next month we are launching a series of online discussions and presentations using the Zoom platform. These are open to all LRTA members and will start in September on the second and fourth Wednesday of each month at 16.00 (GMT). Full details can be found at www.lrta.org

To join us, members will need to submit their e-mail address and membership number. A link will then be forwarded to join the

meeting. After each presentation there will be the usual opportunity for questions and discussion with the speakers.

Details of the first two meetings are:

9 September

Andrew Braddock – LRTA Vice- President
Golden Opportunities Missed

23 September

Simon Johnston – TAUT Editor
Transport publishing during a pandemic

We hope you can join us.

Obituary: Dieter Ludwig (1939-2020)

On 16 July the death was announced in Karlsruhe of Dr Dieter Ludwig, one day after his 81st birthday.

Dr-Ing E. H. Ludwig was General Manager of Verkehrsbetriebe Karlsruhe (VBK) and Albtal-Verkehrsgesellschaft (AVG) from 1976 to 2006, also serving as President of the Verband Deutscher Verkehrsunternehmen (VDV) public transport association from 1995 to 2003. He was made a Freeman of the city of Karlsruhe in 2006.

He was best known for the planning and implementation of the 'Karlsruhe model', the pioneering project that saw dual-voltage LRVs introduced to run through from Deutsche Bahn railway tracks on to the city's tramway, delivering passengers into the heart of the city. This was a logical follow-on from the integration of regional operator AVG with the VBK as part of the modernisation of a network that provided the backbone of public transport in a small city (population 300 000).

National and international figures from across the transport world have paid tribute to Dr Ludwig for his steadfast efforts to promote public transport in general, and tramways and light rail in particular. **MRT**



▲ Dr Ludwig at the controls of a Karlsruhe Stadtbahn LRV. U.Deck

John Cadisch

It is with great sadness that we also report the death of John Cadisch, a former LRTA Council Member and Publications Group Chair, on 2 July. We will carry a full obituary in next month's **TAUT**.

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

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

(Please provide phone contact details and quote LRTA membership number if appropriate)

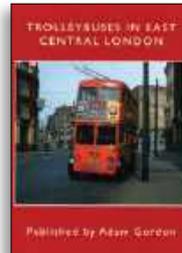
Tramways & Stadtbahnen in Hannover



Describes the pioneering nature of the extensive network in and around the city from the 19th Century, through the conversion of most routes to the light rail lines of today.

➤ A4 softback; 232 pages, 110 colour and 224 black & white pictures; 34 maps.
£35.50 (UK addresses); £42.50 (outside UK); £47.50 (Airmail beyond Europe except USA); £53.00 (Airmail USA),
LRTA Members: £3.25 discount

Trolleybuses in East Central London



Pure nostalgia from the last century! Album of bygone inner city street scenes showing the capital's trolleybuses in a variety of places they served for less than 30 years.

➤ A4 softback; 184 pages; 13 colour and 430 black & white pictures; insert map.
£33.50 (UK addresses); £39.50 (outside UK); £45.00 (Airmail beyond Europe except USA); £51.50 (Airmail USA),
LRTA Members: £3.00 discount

Order direct from the website shown

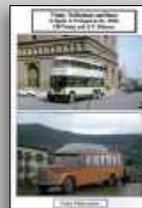
Els Troleibuses de Barcelona



A brief history of the city's trolleybuses, with mainly full-page images of the varied fleet – including double-deckers on British chassis, which operated from 1941 to 1968. Catalan text.

➤ A4 softback, landscape format; 124 pages; 19 colour and 88 black & white pictures; 11 maps.
£25.00 – www.nationaltrolleybusassociation.org

Trams, Trolleybuses and Buses in Spain & Portugal in the 1960s



Photographic record of two trips by British enthusiasts in search of ex-London Q1 trolleybuses operating in eight Spanish cities, with views of many other types of vehicle in both countries.

➤ A4 softback; 72 pages; 206 colour pictures.
£18.00 – www.nationaltrolleybusassociation.org

De Belgische kust met de tram

La côte belge en tram



A superb collection of full-page images of the coastal tram, mainly recorded during the coronavirus lockdown in ideal weather conditions. Dutch, English, French & German text.

➤ A4 softback, landscape format; 108 pages, 100 colour pictures.
EUR20.00 – www.photorail-collection.com

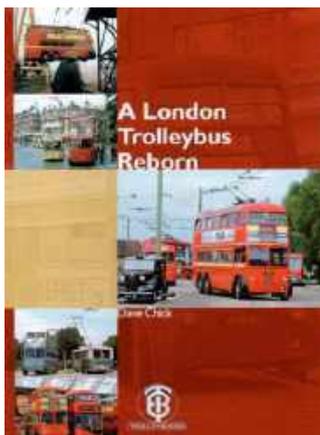
Zahnradbahnen der Welt

Die Enzyklopädie



Rack (cog-wheel) railways are associated with mountain peaks and beautiful views all around the world, and this book describes 60 still in operation and 11 that are no more. German text.

➤ 230x265mm hardback; 256 pages, 350 mainly colour pictures.
EUR29.90 – www.motorbuch-versand.de



New from Trolleybooks

The amazing story of a trolleybus returned from Spain

A seventy-two year old vehicle takes centre stage in this detailed and intriguing account of the export of 125 London trolleybuses to nine cities, their operation in eight of them and the incredible repatriation of no. 1812 by volunteer effort.

A4 hardback, 122 pages, 143 colour and 49 black & white photographs, 4 maps.

£25 + P&P from trolleybooks.co.uk or order by post from
Trolleybooks, 22 Sandfield Road, St Albans, AL1 4LA
+44 (0)7772 709563 email: info@trolleybooks.co.uk

The British Trolleybus Society and the National Trolleybus Association created *Trolleybooks* four decades ago, to publish definitive books about trolleybuses, their history and operation. All profits go towards trolleybus preservation.



The most efficient
Russian manufacturer
of urban electric transport

PCTS

PRODUCTION COMPANY
TRANSPORT SYSTEMS

CHANGING URBAN REALITY



CLICK HERE
for more
information:

