LUXTRAM: A CAPITAL IDEA

Francis Wagner reports from the opening of Luxembourg's modern tramway, the first stage of a transformational multi-modal programme for the European capital.

On 10 December 2017, the tram made a comeback to the Grand Duchy of Luxembourg and its namesake capital.

As Grand Duke Henri pushed the symbolic button on tram 102 to launch Luxtram's operations, a heavy snowstorm descended upon the assembled dignitaries, instantly providing the new tram with an ideal opportunity to prove its ability to cope with atrocious weather conditions.

The first trams were lightly patronised, but as the snow abated, services were running at capacity for the rest of the day. Services are free until the end of January.

The standard-gauge Luxtram project is Luxembourg City's third tramway. The uni-directional metre-gauge system of the *Tramways de la Ville de Luxembourg* (TVL) was preceded by a horse-drawn standard gauge network (SATL – *Société Anonyme du Tramway Luxembourgeois*) between 1875 and 1908. TVL ceased operations on 5 September 1964.

Some four decades later, the buses that replaced tramway operation had reached the limits of their capacity. Luxembourg City may only have 116 000 inhabitants, but on a typical workday an almost equal number stream into the city to occupy the 163 000 jobs found there. The capital also hosts several major EU institutions, among them the European Court of Justice, the European Investment Bank, the European Court of Auditors and the secretariat of the European Parliament. Furthermore, the city is one of Europe's major banking and finance centres.

Increasingly, during rush hour the public transportation network in "Lëtzebuerg" (as the city is known in Luxembourgish) has the requirement to move 10 000 passengers per hour, per direction over the main artery between the main railway station (Gare Centrale) and the Kirchberg (Church Hill) district where the European institutions and a large concentration of the financial sector are located. A tram can achieve such movement effortlessly whereas even the largest 24m-buses are limited to 4000 passengers/hour at best.

A service driven by need

The reintroduction of Luxembourg's tram has been a rather protracted affair. A tram-train scheme known as BTB (Bus-Tram-Bunn) collapsed in 1999 when the municipality refused to co-operate with the government's plans and the national railway company CFL (*Société Nationale des Chemins de Fer Luxembourgeois*), surprisingly, announced that its obsolete signalling system would be unable to handle the additional traffic.

But jump forward a few years and even the most heavily-affected siderodromophobes (those mysteriously stricken by anxiety or hatred at the very mention of anything that runs on rails) were forced to admit that to cope with future demands there would be no better solution than an urban rail system. In 2012, then-transport minister Claude Wiseler (a Christian-Democrat and most likely the next Prime Minister) presented the new *Mobilité durable* strategy for sustainable mobility. At long last, this new concept evolved – as far as the City was concerned – around tramway development.

On 4 December 2013, the government led by Jean-Claude Juncker (a Christian-Democrat and now President of the European Commission) made way for its successor under Xavier Bettel, a Liberal in whose cabinet for the first time a Green politician, François Bausch, was to take over the mobility portfolio.

On 4 June 2014, the bill for financing the initial tramline sailed through Parliament with the assent of almost all parties; the only insignificant exception being a small outfit of the populist right. EUR565m has been allocated to T1, including EUR83m for a first batch of 21 CAF *Urbos 3* vehicles; 33 cars will make up the fleet needed for the full T1 on

◄ **LEFT: The bus/tram interchange at the south-western terminus of Pont Rouge–Pfaffenthal on the first day of revenue service, 11 December 2017. To change tracks the tram must run wire-free; currently this is the only section where it does so until T1 opens in the spring.**

▼ **BELOW LEFT: The inaugural run on 10 December, with Luxtram 103 and 102 (nearest the camera). Car 102 was designated as the inaugural car with a small floral wreath placed around the door buttons on the third module, signifying the official opening.** M. Russell

▼ **BELOW: Hundreds of passengers disembark car 105 at Luxexpo terminus on the opening day.** M. Russell

▲ **Luxtram 101 at Philharmonie-Mudam with the European Court of Justice (left) in the background. The tramway's design blends in seamlessly with the city's modern architecture.**

completion. Eight are required for the first section, including two reserve units. The first rails were installed on 20 July 2016.

While the TVL network was municipally owned, the new system is operated by Luxtram SA, a joint-stock company in which the State of Luxembourg holds two-thirds of the shares and the City the remaining third.

Upon completion in 2021, Luxtram's first line (T1) will run over 16.2km (ten miles) of new track, serving 24 stops. Its southern terminus is located at the new national football and rugby stadium which is currently under construction in Cloche d'Or, a sprawling business district to the south of the city centre. From here it will run via Gare Centrale through the city centre to Kirchberg. The last leg will take it to Luxembourg's international airport, also known as Luxembourg Findel, which lies around 8km (five miles) to the the north-east of the centre.

The first section of T1 that opened on 10 December serves eight stations on Avenue J.F. Kennedy over a 4.6km (2.85-mile) alignment between the Luxexpo exhibition and convention centre and the so-called Red Bridge (Pont Rouge) which spans the Alzette valley, separating Kirchberg from the city centre. Initial frequencies are six minutes, although this is to be doubled to three minutes during peak time. On this first stretch, the 750V dc traction supply will be via pantograph, but between Pont Rouge and Gare Centrale operations will be wire-free over a distance of 3.6km (2.23 miles) using CAF's Greentech Freedrive hybrid battery/supercapacitor system. Between the main station and Cloche d'Or, Luxtram will again run using overhead power supply.

A new hub of multi-modality

Luxtram is at the hub of a new transportation system for Luxembourg: the tram serves nine interchange points where passengers travelling to the city can switch from main line trains, buses, aeroplanes, cycles and, of course, the private car, which remains by far the average Luxembourger's most cherished child.

Looking at this from the perspective of a commuter arriving by train over CFL's busiest line, either from the French Lorraine region or the southern part of Luxembourg, from 2021 he or she will be able to detrain at the new Howald station (which is already open but presently only offers bus connections) and take the tram to Cloche d'Or or the city centre. As another option, passengers might instead proceed to the Gare Centrale and take the tram or the bus to destinations in the urban core – or even continue their train journey one stop further to the new Pfaffenthal-Pont Rouge station where a brand new funicular, also operated by CFL, awaits to continue their journey to the tramway's current Kirchberg terminus.

Compared to the current trip from Gare Centrale to Kirchberg by bus, the travel time for the return journey has now been shortened by at least 40 minutes.

During peak hours, those time savings will become even more substantial as the buses inevitably used to get stuck in traffic jams that, ironically enough, were partly of their own making. Congestion of this kind was so common that even the bus lanes would regularly, and hopelessly, clog up. The scenes of row after row of buses – typical for systems that are near or at capacity – were among the most potent arguments used to convince reluctant politicians of the need for the trams' return.

In order to achieve these time savings, Luxtram will run entirely on segregated track, although persuading reckless motorists from ►

Luxtram's depot is situated at the end of the A1 motorway from Trier, Germany, and also at the northern entrance of Kirchberg district.

transgressing onto the tracks at intersections will be no easy task. Some punitive measures, liberally applied, will reign in such bad habits soon enough. Once T1 is completed, the city centre will be spared a staggering 2200 bus movements each day.

T1 is being implemented in several stages. In a few months, the tram will cross Pont Rouge and run via Glacis fairground to Place de l'Etoile where a new interchange point for those buses approaching the city from the west of the country or Belgium is under construction. At that point, the most difficult section begins – tracklaying through the city centre. Sometime in late 2019, Luxtram will reach Gare Centrale and in 2021 extensions to Cloche d'Or and the airport are scheduled to carry their first passengers.

Planning for additional lines to Hollerich (serving several large schools, a park-and-ride and the TVL tramway museum), to the town of Mamer (on the main access roads from the Belgian Province de Luxembourg) and to Leudelange (another emerging business

EGIS' EXPERTISE

Egis is leading the consortium responsible for the engineering, procurement and construction management of Luxembourg's light rail line.

Egis' specific assignment includes both preliminary and detailed designs and assisting Luxtram with contractor tender procedures. This includes shop drawings and construction supervision; co-ordination, scheduling and compiled drawings; and assistance with commissioning and during the warranty period. Egis is also responsible for safety aspects throughout the design, construction and test phases for the new line.

The scope of the contract covers the entire transport system and includes facade-to-facade reconstruction and development in the city centre and the stabling and maintenance facility. This excludes the maintenance building itself, for which an architect was appointed.

A particularly sensitive part of the project is within the city centre, where a 3.6km (2.23-mile) section will be implemented without overhead lines, with battery-operated vehicles that utilise fast-recharging facilities at stops.

Egis is also tasked with managing the interface with rolling stock manufacturer CAF, the architect of the stabling and maintenance buildings and with the technical services of the city and highways authority.

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▲ **ABOVE: The *Tramsschapp*, with covered stabling on the left and the main maintenance halls on the right.**

▲ **ABOVE RIGHT: Motor bogies in the maintenance hall. Each of the four independent wheels is driven by its own traction motor, sourced from Austrian manufacturer TSA.**

➤ **RIGHT: The interior of a Luxtram *Urbos*; particular care has been given to the neat design details.**

area) is already underway, but there is no timetable as yet for their implementation. Car and bus traffic from the German region around the city of Trier and from the eastern part of Luxembourg will be 'intercepted' (in official government parlance) at a large new interchange at Héienhaff, one stop before the airport terminus of T1.

As Luxtram has been broadly developed around the concept of a *tramway à la française*, its design was of great significance. Luxtram CEO André von der Marck, who also led the reintroduction of the tram in his hometown of Strasbourg – arguably the biggest success of the French tramway revolution – put it simply: "A beautiful city deserves a beautiful tramway."

The design team was headed by Eric Rhinn of Lyon-based agency Avant Première – a company well versed in tramway design, with references including the French cities of Besançon, Dijon, Nice and Saint-Étienne, as well as CAF *Urbos* designs for the Uithoflijn (Netherlands) and the Edinburgh and Midland Metro systems in the UK. He was assisted by two Belgian artists from Liège, Michel Leonardi and Isabelle Corten. The latter were mainly responsible for the inventive interior lighting.

The implementation of the line against a tight schedule was managed by international engineering consultancy Egis.

Over the first few days of operation, it became clear once more that good design enhances the public's acceptance of a new transport mode. Many passengers declared that these stylish new vehicles were indeed a very welcome addition to the cityscape.

The *Urbos 3* 100% low-floor trams (numbered 101-121) for the city are manufactured at CAF's facility in Zaragoza, Spain. At 45m long and 2.65m wide, the double-ended vehicles have a passenger capacity of 420 (at 6 passengers/m^2, 76 seated) and the design features four independent bogies, three of which are powered, and 12 motors that provide a total traction power of 840kW. Each seven-section tram weighs 64t. They are equipped with eight double-leaf doors on each side and can be lengthened to 55m if required in the future, increasing their capacity by a further 100 passengers.

Although capable of 70km/h (43.5mph), speeds are capped at 50km/h (31mph) in the city and the average commercial speed is 22km/h (14mph). The fleet is stabled at a new depot and maintenance facility located near the current northern terminus at Luxexpo that also houses the line's control room and Luxtram's headquarters.

This 33 000m^2 site features a 1km test track, eight storage tracks and three roads with pits and gantries to allow for vehicle maintenance. It has been constructed with system expansion in mind, to house the 33 trams required for the full line between Cloche d'Or and the airport.

➤ **RIGHT: The new funicular enters the cut-and-cover tunnel built to preserve a natural habitat and walking trail; this tunnel also contains passing loops. INSET: The interior of one of the CWA-built carriages.**

Another first

The world's only Grand Duchy peaks at 560m above sea level, so ropeways and funiculars did not hitherto figure among its most common features. The medieval town of Vianden runs a chairlift, whereas the iron ore mining region in the south once saw two aerial ropeways (until 1979-80) and several cable-operated inclines.

It is all the more remarkable then that a new funicular should now provide a short but key link between CFL's and Belgian SNCB's main line trains and Luxtram. Consisting of two independent and parallel arrays with two carriages each, the funicular has been built by the Austrian-Swiss Doppelmayr/Garaventa group. Its subsidiary CWA manufactured the carriages. The standard-gauge layout is of a two-rail configuration, with passing loops that are partly situated in a cut-and-cover tunnel and fitted with Abt points.

Each carriage holds 168 passengers and they offer an hourly capacity of around 6000 passengers, running at 25km/h (15.5mph) over a 200m track for a travel time of 63 seconds. Over this distance, a gradient of 19.7% allows a gain in altitude of some 39m.

Luxtram now has to win over the local and regional citizens. The experience with new networks across Europe over the past 30 years suggests this well thought-out concept will encounter real success before long.

André von der Marck concludes: "Nobody will be coerced into taking the tram. We would like to convince the public by the high quality of our services that this new mode of transportation will make their lives easier and their city more liveable." TAUT

› *Images by Francis Wagner unless stated. Find out more at* www.luxtram.lu *and* www.mobiliteit.lu *for timetables and ticket prices.*

ABOUT THE AUTHOR

Francis Wagner is a journalist working on foreign politics and transport since 1986. He is one of the editors of the Luxembourgish centre-left daily *Tageblatt* and also serves as a volunteer fireman on Luxembourg's only standard-gauge steam railway 'Train 1900'.