

Taking the opportunity

Jonathan Welch takes a closer look at how Luxembourg operator Emile Weber is electrifying its fleet, and at one of its latest Furrer+Frey OppCharge installations.

Electric buses are no longer the new, mysterious technology they were a decade ago. More and more companies are investing in electric fleets as they strive to meet their corporate goals to decarbonise and to reduce their impact on the communities they serve. But the decision on what bus to buy is not the only factor. From ADL to Yutong, from BYD to Volvo, they all have one thing in common: the need to be recharged.

That need brings with it more questions than might be obvious at first thought, and operators are finding themselves having to consider more factors before even ordering the buses: what routes will they run on, how many journeys will they realistically be able to operate, and how, where and when is best to charge them? Many companies will still be wedded to the traditional operating model, whereby the bus goes out, does a day's work, and is refuelled when it arrives back at the depot. However, as the wave of change builds, operators are starting to realise that other options are available, and that in many cases, these can bring benefits once the

initial shock of change is overcome.

There's no getting away from the fact that range anxiety as well as the cost of batteries and the often unknown variable of their lifetime both leave large question marks over e-bus purchases, not to mention the additional weight each extra battery pack adds. So what is the solution? A number of companies are turning to opportunity charging, which enables buses to be fitted with smaller battery packs, but often requires additional infrastructure at terminus points to provide a short burst of charging. One of those is Luxembourg operator Voyages Emile Weber, which has already built up a fleet of over 170 electric buses and has been successfully operating one route using a fleet of opportunity-charged Mercedes-Benz eCitaros from the Steinsel depot of subsidiary Voyages Ecker.

Charging takes place outside the depot, just a short two-minute drive from the terminus, using an unique design of all-in-one combined AC/DC rectifier and pantograph unit designed and supplied by Swiss electric bus and train charging specialist Furrer+Frey. I spoke to Emile Weber's Head of Infrastructure Charel



The charger has sufficient headroom for a double-decker. Drivers are guided by markings on the road surface. **JONATHAN WELCH**

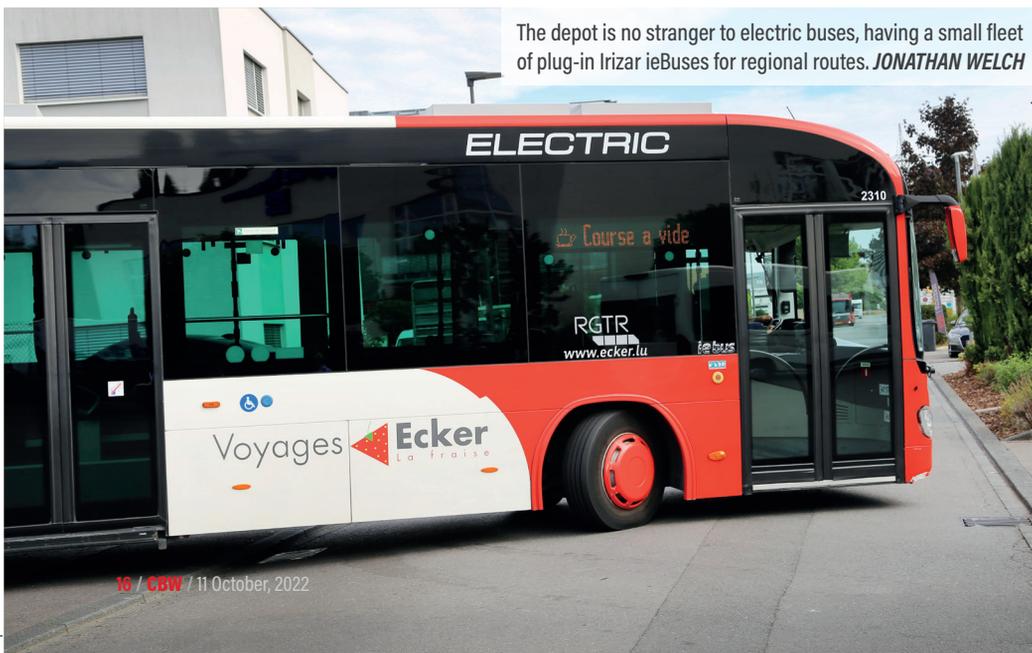


Schmit to find out more.

Empowering mobility

The Voyages Emile Weber group is no stranger to electric buses, and has already operated over 12 million electric kilometres. It's 'empoweringMobility' fleet decarbonisation programme dates back as far as 2009, and covers not just the acquisition of new vehicles but several other associated projects, as Charel explained: "In 2009, we bought Luxembourg's

The depot is no stranger to electric buses, having a small fleet of plug-in Irizar ieBuses for regional routes. **JONATHAN WELCH**





A fleet of Mercedes-Benz eCitaros is used on route 26, with opportunity charging available outside the depot. **JONATHAN WELCH**



A yellow line on the ground shows drivers where to stop. **JONATHAN WELCH**

first hybrid double-articulated buses. The next step took place in 2015 with our Urban Revolution project which included our first three plug-in double-articulated hybrids, the first in the world. They could travel four kilometres on battery power, using their in-built energy management system.

“In early 2018, we were able to launch our first fully electric bus route, based at our Bettembourg depot. This was the first route of the regional RGTR network to be electrified, and used seven

VDL Citea LLE-99 electric buses. We invested over €700,000 through our Autocars Pletschette subsidiary in charging stations, opportunity charging points and transformer stations.

“In June the same year, Voyages Ecker opened a new depot for electric buses at Bissen, from where we ran our first Irizar electric buses on a route between the city of Luxembourg and Mersch. In 2020, we worked with MAN to put four pre-series Lion’s City electric buses in service to help MAN identify any improvements

before they went on sale. Our electric fleet now includes Mercedes-Benz, MAN, Irizar, Karsan, Yutong, Sileo and VDL buses.”

Ensuring that the power supply could cope with the increased requirements at the main Canach depot was also a key consideration, and before the purchase of vehicles or training of staff, Emile Weber worked with the local electricity supplier to ensure that the existing grid could cope. The Park & Charge phase of the project ensured that there was sufficient energy available via a ‘smart grid’ system, and that it is distributed intelligently via smart charging.

Used for the first time at Emile Weber, the software constantly monitors the power supply in the grid network and predicts loads, as well as identifying times when there will be spare capacity, ensuring that up to 3MW are available to recharge the fleet and enabling the government’s goal of an all-electric RGTR network by 2030.

The next phase will see vehicles charged according to their individual needs for the following day, enabling those which don’t require a 100% charge to only receive as much as is necessary.

OppCharge opportunity

Bringing the story right up to date, Charel explained a little more about the latest project

INFRASTRUCTURE / OPPORTUNITY CHARGING



A constant stream of buses means the charger delivers around 1,300kWh per day. **JONATHAN WELCH**

at Steinsel. “We have around 40-50 buses here. We bought Voyages Ecker in 2012. In 2019, we started to look at installing a connection to the high voltage grid to supply our growing e-bus fleets. We initially had a small fleet of Irizar buses with high-capacity batteries and one Sileo bus. Our first bus to be equipped with OppCharge rails for pantograph charging was a Mercedes-Benz eCitaro.

“We looked at a number of charging options, and we first saw the Furrer+Frey solution at BusWorld in 2019. The big advantage for us here was that everything is included in the mast. There’s no additional charger or rectifier cabinet needed, so you don’t lose space. We already don’t have much space here at Steinsel – at night, buses are parked tightly in every part of the site.

“The eCitaro originally didn’t come with charging rails, so the first ones we bought have been retrofitted. They don’t have the maximum battery capacity possible, as with the current model you lose one battery pack to fit the rails. But the latest generation of batteries are much more powerful than earlier ones for the same battery size, Mercedes-Benz has put a lot of development into batteries.”

Whilst standard CCS2 charging plugs are also used for overnight charging, Charel explained that some buses are on service almost around the clock, with just a few hours of down-time in between. “Route 26 passes the end of the road here,” he continued, “so it is a good opportunity to use on-route charging. Buses arrive and charge for 12 to 15 minutes after each journey. The driver can see from the schedule on his tablet whether the bus needs to return to be charged and if the pantograph is available. If it isn’t, he can still charge using the CCS socket.”

Highlighting the difference that heating and cooling the saloon can make, Charel explained that opportunity charging is a must in the



height of summer and depth of winter, when demands on the batteries are at their highest. On the reasonably warm day of my visit, a stream of eCitaros arrived and departed as we chatted outside in the sunshine, their drivers effortlessly parking beneath the mast and taking a short break once the pantograph had connected. To aid positioning, markings have been added to the surface, although there is a small degree of leeway.

All-In-One

In this instance, the compact nature of the Furrer+Frey All-In-One design appeared to be in its element: a constrained site, and one which is on the opposite side of the road to the depot, meant that the four square metres footprint of the foundation and lack of additional equipment enabled the equipment to be mounted at the

kerbside, allowing buses to pull up with no manoeuvring required – although with the agreement of the neighbouring farmer, the front ends do overhang the adjoining field slightly in order to fit a 12-metre bus in the available space.

Opportunity charging has enabled a streamlining of the fleet: “Buses are charging here every 15 minutes, 21 hours a day,” Charel explained. “OppCharge also saves buses. If a route we need to electrify had seven diesel buses, all running 21 or 22 hours a day, we worked out that to move to plug-in electrics would need nine or 10 buses. We electrified with OppCharge and it only needed eight buses. That is a huge saving just by using OppCharge.”

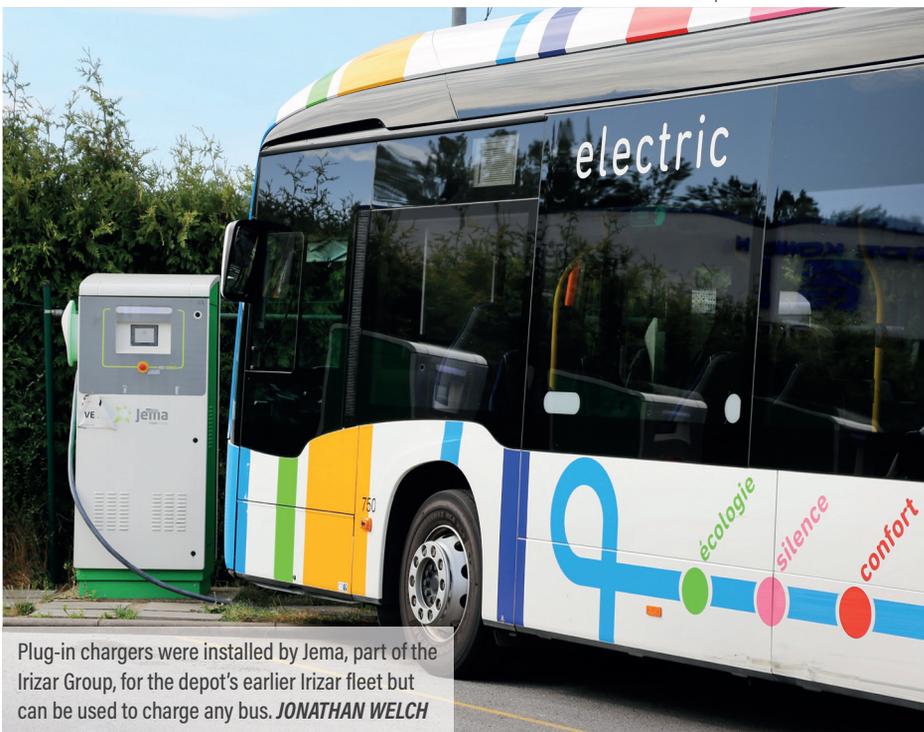
Whilst opinions may differ about the best method of charging, one thing is clear: whatever method an operator chooses must be reliable if services are not to be interrupted. Having the pantograph mounted on a stationary charging head rather than the bus roof both reduces weight and eliminates potential damage to delicate machinery from bumps and vibration, another reason that Emile Weber chose to adopt the pantograph-down, all-in-one system. Top-down is also the only practical solution when it comes to rapid charging electric double-deckers, a type of vehicle which could be coming to Luxembourg in the near future.

With many systems on the market, I asked why the unique Furrer+Frey system had been chosen. “One big advantage of Furrer+Frey is that everything is in the mast. There is no separate electrical rectifier cabinet. It is a nice solution no one else can deliver,” Charel continued. “Furrer+Frey have been great to work with. The charger is designed with high infrastructure quality in mind and is properly arranged to make maintenance simple. Out of every manufacturer we have dealt with for all our chargers, of all types, Furrer+Frey’s after-sales care is the best. Service is really good, quality is high and they offer spontaneous help.”

To emphasise the point, he recounted: “During a public holiday, when we were not running many buses, Furrer+Frey’s project leader Chris Foy phoned us to see why our charger wasn’t being used much and if there was an issue. I don’t know of any other company with proactive monitoring like that.”

Incident-free

Data supplied by Furrer+Frey showed that at the time of my visit, the charger had operated without a single failure this year, and had delivered over 10,500 charges, or around 45 per day. Once installed, it was discovered that a stronger WiFi signal was needed for communication with vehicles; adding a second antenna solved the problem, Charel said, and



Plug-in chargers were installed by Jema, part of the Irizar Group, for the depot's earlier Irizar fleet but can be used to charge any bus. **JONATHAN WELCH**

a number of extra ventilation grilles had been installed to better disperse heat in summer. Nonetheless, compared to other systems in use, he praised the combination of the all-in-one design, quality and reliable operation.

"In terms of price, we believe the system is well-positioned, and it's something we haven't seen others do," he added. He also noted that although the charging unit itself is relatively unobtrusive, its smooth flat surfaces offered an additional opportunity for advertising.

Expanding on the reasons for choosing an OppCharge solution, Charel added that whereas a good rule of thumb for a diesel bus is around one tonne per metre, electric buses are far exceeding that, with the 18.75m Irizar articulated buses operated elsewhere by the company

tipping the scales at 22 tonnes; reducing the weight of batteries carried will be essential, even alongside the promised improvements in range as battery technology develops. Using a solution which provides a fixed, single pantograph rather than individual ones on each vehicle not only cuts down on weight carried, be that in batteries or pantograph, but also means less cost and maintenance with just one set of moving parts to look after. Of course, it won't be the right answer everywhere, but from watching the process, it was hard to see how it could have been easier for everyday operations, with the advantage here of a charging unit that although clearly visible manages to hide all the components in a neat package, an important consideration in more visually-sensitive locations, especially when

it comes to installations in urban areas; at the time of my visit, a second unit had recently been installed at a site in Remich.

Has the change been a challenge, I wondered. "It has changed how we operate," Charel said, "but we're used to it now. We've been looking at generating our own electricity next too. Prices are only going to go up, so we're looking at using land that belongs to the company to create a solar farm. We'd like to use solar panels on the roof, but the depot roof at Canach isn't yet suitable for that."

Addressing the issue of range anxiety, he added: "If a bus misses one charge, it's not too bad as it can still do a second trip. Depending on the weather, a third might be difficult, but it's never really been a problem for us. The charging station has been reliable, and we've worked to optimise driver behaviour through training, although we still see differences in energy consumption between drivers."

With the roll out of Luxembourg's electrification plans for its regional and city networks, reliable, easy to use charging will only become more important, especially as the plan is to move from larger buses to smaller ones running more frequently, which has seen the delivery of 36 Atak 8.8m electric midibuses from Turkish manufacturer Karsan; whilst this brings advantages for passengers, it limits the amount of batteries which can be carried on a smaller, lighter vehicle, and means a much higher usage rate for the charging infrastructure, which must remain reliable day after day. //

A number of other routes use equipment from another manufacturer, which, although slimmer, requires additional space for an AC/DC rectifier cabinet, and leaves the moving part of the pantograph exposed to snow, rain and ice. **JONATHAN WELCH**

