

While range extenders have yet to gain traction in the UK, US-based Mack Trucks has teamed up with Wrightspeed to evaluate its hybrid electric powertrain on a refuse chassis. Brian Weatherley reports



Riding the RANGE

With TfL's (Transport for London) LoCITY scheme charged with encouraging uptake of low-emission vehicles in the capital to improve air quality, the question is what exactly constitutes a low-emission vehicle? That's something LowCVP (Low Carbon Vehicle Partnership) is working on with TfL and other industry stakeholders.

LowCVP is working with specialists at Millbrook and MIRA on a test procedure that will see conventional vehicles compared with low-emission equivalents in back-to-back exercises. Ultimately, says LowCVP, that could be used as a purchasing tool, not least when bidding for government grants.

One group of vehicles likely to fit the bill is the range-extended series hybrids. Unlike parallel hybrids that retain a diesel drivetrain, backed by an electric motor

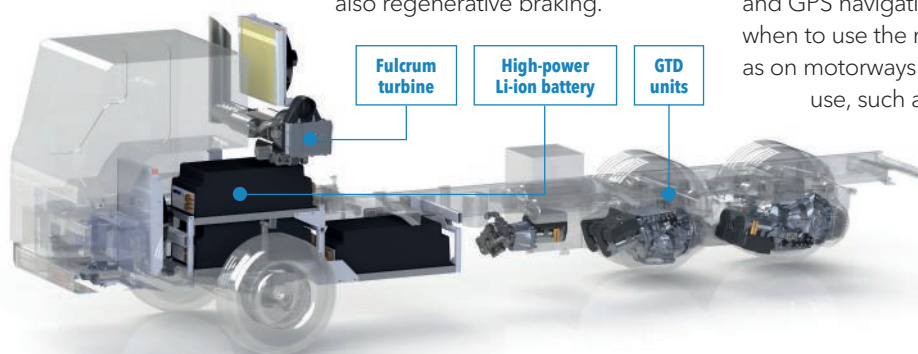
and batteries – providing limited power for launch and low-speed running – a range extender dispenses with the diesel for primary power. Instead, it employs a downsized diesel or small gas turbine to drive an electrical generator that charges a battery pack, which, in turn provides power for the electric traction motor(s).

Thus, a range extender hybrid is electrically-powered throughout its driving cycle. Its small charging engine is either running or shut down, according to the battery pack state or whether the truck is in an environmentally-sensitive or zero-emissions area. As the name suggests, the drivetrain allows for significantly greater operating distances as its batteries are continually topped up by the engine/generator and generally also regenerative braking.

In the UK, range extender trucks are still thin on the ground. One notable exception is the 7.5-tonner being launched by Tevva Motors. Based on the Chinese JAC chassis, it has a 120kW electric motor producing 1,800Nm of torque (from zero rpm) powered by 66kWh batteries. A small (100bhp 1.6-litre) Ford turbodiesel provides the battery top-up while on the move. Tevva's electric-only range is a nominal 100 miles. With range extending that increases to 370 miles.

Making that work is its PREMS (predictive range extender management system), which automatically enables the most efficient and environmentally friendly use of the electric drivetrain. With real-time access to NOx, air quality data and GPS navigation, the vehicle knows when to use the range extender – such as on motorways – and when to avoid its use, such as in towns and cities, or poor air quality areas.

This enables pure electric propulsion, says the company, delivering zero emissions wherever it matters. It also





maximises use of battery capacity on every journey. Interestingly though, as well as the JAC installation, Tevva's range extender is now being offered as a retrofit package. Among operators currently evaluating this alternative is none other than UPS.

ELECTRIC WRIGHTSPEED

Meanwhile, across the Atlantic, Mack is the first US truck manufacturer to trial similar technology. In its case, the target is a Class 8 (up to 80,000lb gcw) truck, and the range extender drivetrain is from California-based Wrightspeed, fitted to one of its LR refuse collection chassis. In place of the LR's traditional MP7 11-litre diesel engine, the range extender prototype has a Wrightspeed Route 1000 hybrid powertrain, which uses electricity to deliver propulsion.

The LR's pure electric range of up to 24 miles is significantly greater than the electric-only range of a parallel hybrid. However, as the battery charge depletes, Wrightspeed's own 80kW Fulcrum turbine generator delivers the recharge. According to Mack and Wrightspeed, this enables the Route-equipped truck "to have unlimited range with refuelling".

Additional charging is provided

by the Route's 730kW regenerative braking system, which is also claimed to reduce maintenance, because brake wear is reduced. A plug-in facility allows for overnight charging too.

Being fuel-agnostic, the Fulcrum turbine can run on L/CNG (liquefied/compressed natural gas), diesel, biodiesel or paraffin. The LR uses diesel: the size of the fuel tank then depends on the duty cycle. Mack says those with more stop-and-go work (so delivering more regenerative-braking) will require less on-board fuel storage.

In brief, the LR's lithium-ion batteries power four geared traction (GTD) electric motors driving the rear wheels. The motors can propel vehicles weighing 27.2 tonnes gcw on gradients up to 40%. With full torque available from zero rpm, Mack says the Route hybrid powertrain provides "a driving experience comparable to diesel trucks". Also, the prototype LR range extender chassis is 318kg lighter than its 6x4 diesel.

Mack's director of product strategy Roy Horton says the range extender LR will be jointly evaluated with Wrightspeed and an unnamed operator. "Questions we will answer include whether this technology is right for the refuse industry and if there is a business case. We'll also conduct reviews around the value proposition related to Wrightspeed's technology [financial, field support, technical, performance, etc]."

That said, Horton reveals that the US truck maker is already taking enquiries from operators interested in alternative fuels and electric refuse trucks. "With the ever increasing focus on reducing environmental impact, our customers are looking for alternatives," he says. "California and the major cities, such as New York, are major players in this area." **TE**

Coming of age?

Mack's and Tevva's range extenders - as well as US-based Nikola Motor's Nikola One (TE, August 2016, page 12) - come at an interesting time. They arrive just as battery technology is going through its own revolution. With energy densities increasing, while weight and prices fall far faster than forecast, full electric trucks are looking attractive. That could yet leave range extenders on the shelf.

Hence the recent launch of Mercedes-Benz's 26-tonne, 6x2 rear-steer all-electric Antos eTruck (TE, September 2016, page 25). And there is Mercedes' all-electric Fuso Canter E-Cell, as unveiled at the 2010 Hanover show and now being trialled by, among others, logistics giant Hermes, with series production planned for the end of 2017.

Looking at the 26-tonne eTruck, Mercedes claims a weight penalty of just 700kg, meaning a good 12,800kg payload potential. That's because coincidental regulatory changes proposed by Brussels should allow alternative-drive trucks one-tonne gcw grace. And note that this vehicle's battery pack presently weighs in at 2.5 tonnes, yet delivers 212kWh and a 200km range.

Nikola, Mack and Tevva believe range extenders will have their day though. So much so that the former is offering free fuel (CNG - compressed natural gas) for 1,000,000 miles for the first 5,000 trucks ordered.

