Economical with the facts

As electric vehicles come into the fleet, what metrics should operators look for in understanding the powertrains' capabilities? John Challen asks the experts

They've not yet reached the world of long-haul trucking, but electric powertrains are penetrating almost every other part of the road transport sector. The two key driving forces behind electric vehicle investments seem to be the environmental benefits and lower costs. Decisions over which truck is right for their needs, however, go much deeper than those two factors.

Fuel economy – for so long the holy grail for many CV fleet operators – seems to be less of a deal-breaker with EVs. The key numbers for most fleet managers analysing battery-powered trucks are now around vehicle range as well as charging cost and network details.

"The mpg or L/100km figures illustrate how far you can go, based on the amount of energy held in a unit of fuel. The parallel is very similar in EVs, with kiloWatt-hours per kilometre [or kilometres per kWh]; the kWh is just another unit of energy measurement," says Alexander Schey, COO at Allison Transmissions and CEO and co-founder of Vantage Power, which was sold to Allison Transmissions a year ago.

"It can be complicated for fleets, because they are dealing with new vehicles and different ways of operating them," adds Schey. "Generally speaking, they'll be looking at the lowest kWh per mile or km possible, because it signifies the most efficient vehicle.

"However, we are getting to the point where that measurement doesn't tell the whole story. You might have a very efficient vehicle because it has a lightweight small battery, but it only offers 100 miles [152km] of range. That's fine in some cases, but if your route is 150 miles, you are going to have problems."

ADAPTION REQUIRED

Customers will have to adapt, contends Mark Collins, sales engineer at Volvo Truck. "At the moment, everyone is obsessed with the number on the side of the cab, but that number won't be relevant in the future with electric vehicles," he says, referring to the horsepower rating. "It's more to do with conserving energy in the drive towards greater efficiency."

Fuel economy comparisons can be done, albeit with some effort and new calculations. "We look at Nm/kg, which analyses wheel torque per gross vehicle weight – that is the figure we are most interested in. Within this calculation, the number that everyone wants to achieve is 1Nm/kg or above," says Collins. "Everyone now might want a '500' badge on the side of their truck but, with electrics, it is the torque that people should be interested in – because that is what gets you moving. Electric passenger cars have a reasonable level of power but high torque levels; that is what we will see in trucks too."

Collins says that using the Nm/kg

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figure is possible for diesel vehicles, but adds that the market is more likely to use tried and tested methods. "As a rule of thumb, when we look into engine specification, we generally work on 10hp per tonne, so 440hp for a 44-tonne vehicle. That is a long-standing tradition, but operators are more focused on efficiency and lowering CO_2 footprints and working towards net carbon zero, so will also be looking at Nm/kg too."

EFFICIENT USE OF RESOURCES

The efficiency of diesel and electric drivelines vary greatly, and much depends on the efficiency of the motors in an electric vehicle. "For comparison, our 16-tonne electric FL has a maximum power of 200kW, and torque is 425Nm from one motor. Wheel torque is 16,000Nm, which equates to 1Nm/kg," says Collins, adding that the situation is similar with the larger electric FE.

"That's a 26-tonne vehicle with two motors, but the wheel torque is 28,000Nm, which works out at just over 1Nm/kg. The key is to analyse the operation the vehicle is undertaking, because every job is different. For electric trucks, there won't be an easy equivalent of 'this truck does 8mpg', because you are dealing with different units and energy sources completely.

Although performance could be measured, its meaning depends on an operational context driven by two different motivations: economy and efficiency, according to Collins. "In terms of efficiency you'd be looking at kWh/100km, which would be the EV equivalent to miles per gallon. The lower that figure is, the better" (that's because it measures energy demand rather than energy capacity).

There are also external factors to take into consideration, such as when it comes to the issue of acquiring energy. "Drivers might have a limited range in a diesel, but it doesn't really matter because you can stop pretty much anywhere and refuel in almost no time," says Schey. "That limitation is something that fleets will have to get used to when it comes to electric trucks. As such, we are going to move towards a 'horses for courses' mentality where, instead of buying one or two models of truck for your fleet, you might end up getting two or three electric truck models, but with different battery pack sizes to accommodate the spectrum of operations.

"When you add in complications of the charging infrastructure – and the fact you might only be able to charge in a certain way for one type of duty cycle and another way for another type of duty cycle – things get even more complicated," he adds. "There is a difference between a vehicle that returns to the depot and can charge overnight and one that is driving 400 miles in one direction. Fleets might struggle to meet all of these requirements." TE

BUS BATTERIES

Away from trucks, buses have been a real success story for electric drivetrains. With a more predictable and uniform duty cycle, buses provide a great platform for battery-powered transportation. However, like the truck market, there are a number of scenarios that operators must consider.

"On a bus, heating and cooling can use the same amount of energy again as driving – so you could have a kWh/km figure but, depending on how many passengers are on the vehicle and what temperature it is, that figure can vary dramatically," says Ian Foley, founder of Equipmake, which develops high-speed electric motors for buses, as well as hypercars and aerospace applications. Equipmake is currently working with the largest bus manufacturer in Argentina (Buenos Aires has twice as many buses as London), which is converting from diesel to electric. The company is also producing technology for manufacturers in the UK, both for new vehicles and retrofit.

"Those factors are intrinsically linked with the range, because, while you've got a certain amount of kilowatt hours of battery, if one vehicle is more efficient than another, you are going to get more range from the same amount of batteries," adds Foley, who says the biggest issue for EV bus fleets is now range, rather than economy. For example, a 250 mile [375km] range to meet all the requirements of a bus operator isn't achievable today, he states. "In reality, buses require around 130-150 miles [195-225km] of guaranteed range – and that comes at a certain cost." There then follows the conundrum of adding more batteries to get more range, but the costs go up further. "The other problem with that scenario is that the value of the bus to the operator is directly related to the number of passengers it can carry," he says. "If you use the space and weight for batteries instead of passengers, you get into a negative cycle, because it ends up being worth less to the operator."