

Electric **heavyweight**

There's no need to consult the tea leaves when tomorrow's tractor may already be alive and kicking over the pond. Brian Weatherley looks at the all-American, electrically-driven Nikola One

While getting under the skin of today's trucks is meat and drink for our readers, tomorrow's high-tech trucks matter, too – even those that have yet to appear on a road anywhere. The Nikola One (named after electrical engineer Nikola Tesla), from the US, is one such. An all-new 'from the ground-up' design of long-haul tractor, this near-zero emission range-extender hybrid was launched in May.

Novel it is, and it is also backed by a highly original pre-order agreement – the first 5,000 reserved receive free fuel (CNG – compressed natural gas) for 1,000,000 miles. That, says Nikola Motor Company (NMC), will offset the purchase price hike (\$350,000–\$415,000, depending on options) and give operators "an immediate return on investment". And judging by the response to its offer and the truck, NMC appears to be on to something.

The bare facts are as follows: the drivetrain for this three-axle 6x6 consists of a 400kW (536bhp) gas-turbine and generator, which charges a 320kWh lithium battery pack that provides power to all six electric wheel motors, said to run at 95% efficiency. Their combined output (the turbine only charges the batteries) is 2,000bhp with 5,000Nm of torque.

However, after gear reduction (each motor has its own gearbox) the truck's combined torque figure rises to a phenomenal 116,600Nm – available instantly. As an NMC spokesperson

puts it: "This truck's six electric motors produce superior horsepower, torque, acceleration, pulling and stopping power over any other Class 8 truck [the US term for a top-weight artic]."

While gas turbines have been used before to charge the battery pack in a hybrid truck (Walmart's concept artic: *TE* July 2014) they're normally run at constant speed. Not so in the Nikola One. NMC's own-design turbine operates at variable speeds, optimising efficiency to greater than 40%. This automatically charges the battery pack and shuts off when sufficient charge has been achieved. Drivers aren't required to plug in to an electrical source.

SERIOUS INNOVATION

Despite its advanced drivetrain, Nikola One is based on a traditional steel and aluminium ladder-frame chassis with a fairly conventional layout. However, because its range-extender powertrain is mounted at or below the frame rails, its centre of gravity is lower than that of a diesel-powered tractor. Steering is via an 800V electrically-driven hydraulic system.

At the front of this new beast sits a radiator and electric fans, which cool the battery pack (under the cab), turbine, wheel motors and gearboxes. Interestingly, the liquid cooling loop also allows for components to be cooled at different temperatures.

Then, immediately behind the mid-mounted turbine but ahead of the rear axles is a 100 (US) gallon CNG tank – enough to give Nikola One a range up to 1,200 miles. Refuelling time is 15–20

minutes: incidentally, NMC says the turbine can also run on petrol or diesel.

As for the body, Nikola One's curvaceous, panoramic mid-entry sleeper cab will be built using carbon-fibre – one of the reasons why NMC quotes a significant reduction in kerb weight. Also, with no diesel engine up-front, the driving position moves forward, and NMC claims 30% more cab interior space. Meanwhile the dashboard

Nikola: the background

Nikola Motor Company (NMC) is based in Salt Lake City, Utah, and designs and manufactures electric vehicles, energy storage systems and electric-vehicle drivetrain components. Prior to establishing the firm, founder Trevor Milton was CEO of dHybrid Systems, a natural gas storage technology company bought in 2014 by one of America's largest steel providers, Worthington Industries.

Along with its revolutionary near-zero emission range-extender hybrid Nikola One tractor, NMC is also developing a 520bhp 4x4 electric utility terrain vehicle dubbed Nikola Zero. "Nikola has built the truck of the future and will hold that title for quite some time," insists Milton.

To see more details and specifications, go to: nikolamotor.com/one



relies on a 15-inch touchscreen that looks after functions, including battery levels, range, wheel torque, cabin controls, navigation and vehicle data. There are also two foot pedals controlling the electric throttle and brakes, but no clutch or gear-shift.

While the majority of Nikola One's components are being developed in-house, its all-round independent suspension is based on Meritor's ProTec High Mobility range. That said, its Meritor/Wabco disc brakes get their air from an electric compressor. Regenerative braking is also incorporated into each motor, with energy fed back to the battery pack.

In fact, NMC reports that the negative torque applied by the electric motors "brings braking to a whole new level" and hence shorter stopping distances.


However, one of Nikola One's most innovative features involves torque vectoring - the ability to independently control each motor. As a result, the speed of each wheel can be adjusted during cornering, manoeuvring, braking and accelerating.

What about running costs? "While it costs 40-60 cents per mile in fuel to operate a diesel semi-truck, the Nikola One is estimated to drive at half that," boasts the firm. Details - including of leasing plans - are all on the Nikola One website. Incidentally, to make this fly, alongside existing North American CNG fuelling points, NMC has a further 50 strategically located CNG stations planned for the US and Canada.

"Over time Nikola anticipates having hundreds of CNG stations," insists NMC founder Trevor Milton. "The fuel will be

delivered through Nikola's own gas wells and fuelling stations in every state when trucks enter service. We will be the first manufacturer of Class 8 trucks that is vertically integrated from well to wheel."

Some claim. However, by far the most fascinating aspect of this story is the interest already shown in the Nikola One. With the first working prototype due to be unveiled in December this year, NMC reports \$2.3 billion in reservations within the first month of release, totalling more than 7,000 trucks - and all with their \$1,500 deposits paid up-front.

"That is unprecedented," comments Milton. "We believe we'll pass current market leaders like Daimler, Paccar, Volvo and Navistar in orders within the next 12-24 months... We have shown other OEMs why they should be nervous about Nikola Motor Company." 



The futuristic Nikola One tractor unit: already with \$2.3 billion of orders since its launch in May