**Over the past ten months or so, you’ve probably see lots of news stories discussing how the 2020 lockdowns might be helping the good citizens of this planet’s globalised human society - in other words, you and me - to learn how to rein in our consumption and live more within our means. We’ve certainly seen a massive reduction in aviation, and at least at the start of the pandemic, the air suddenly become devoid of pollution from traffic and factories too, allowing cities around the world to see the sky properly for the first time in decades.**

**But as the enforced isolations and levels of home working have increased, so people in the wealthier nations have enthusiastically embraced online shopping for their everyday needs. An increase in online shopping inevitably means an increase in the number of home deliveries. And it also drives the ever-expanding global freight industry, which brings me to the International Energy Agency.**

**They reckon that one of the climate-blind spots for global policy makers in recent years has been road freight vehicles. Their environmental impact is pretty scary, and they haven’t always been subject to the same rigorous emissions regulations as domestic vehicles.**

**Now though, it does look like, at long last, auto-manufacturers and policy makers are waking up to the urgent need for emission reductions in commercial vehicles, and alternative technologies are rapidly appearing on the horizon to speed up the transition. But there’s also a whole host of logistical challenges standing in the way of progress too. So, as we race towards twenty thirty and beyond, what does the future of trucking look like?**

**‘go on then, roll your fancy new titles...**

**Hello, and welcome to Just Have a Think**

**According to the statistics research website Our World in Data, just under thirty percent of all transport emissions in 2018 came from road freight. Road freight vehicles consume more than seventeen million barrels of oil every day which equates to nearly three billion tonnes of carbon dioxide every year. The International Energy Agency projects that unless we get significant policy changes from our governments, that seventeen million barrels of oil currently consumed every day will have increased to twenty-two million barrels a day by 2050. And that’s not a great contribution to a net-zero carbon future.**

**So, the race is on to find sustainable and economic ways to decarbonise the global fleet of trucks.**

**The IEA suggests that in the very short term, that means vehicle efficiency standards combined with improvements in logistics and operations.**

**The United States Environmental Protection Agency introduced its flagship**[**SmartWay**](https://www.epa.gov/smartway)**programme way back in 2004 combining minimum thresholds for road freight vehicle efficiency performance with technological and operational best practice. As a result of that leadership more than thirty other countries established green freight programmes of their own or joined regional or global initiatives.**

**In 2018, India introduced tougher fuel economy standards for all new trucks AND BUSES sold in that country.**

**In 2019, The European Union introduced their Vehicle Energy consumption Calculation Tool, or** [**VECTO**](https://ec.europa.eu/clima/policies/transport/vehicles/vecto_de) **and passed laws requiring all new trucks weighing more than seven and a half tonnes to report their fuel consumption and CO2 emissions, which are measured in grams of carbon dioxide per tonne kilometre. The target is a reduction of average CO2 emissions in this sector of fifteen percent by 2025 and thirty percent by 2030.**

**China has introduced what they call ‘phase three standards’ raising the fuel efficiency of all new buses and trucks sold there, and several other countries including Japan, Argentina, Brazil, Mexico and South Korea have all put in place their own efficiency policies.**

**And those policies aren’t just targeting engine emissions. Canadian and US second-phase Greenhouse Gas emissions standards are the first in the world to apply CO2 standards to truck bodies and trailers. Those high, wide boxes produce air turbulence at the rear of the vehicle that act a bit like a braking parachute, and as a truck accelerates, that air resistance increases exponentially. Not much can be done about the shape of the trailers because of course they have to optimise the amount of product that can be fitted into them, but innovative products like this one from German manufacturer Betterflow can significantly reduce that drag factor. It’s a fully automatic rear wing system that opens up once the truck hits sixty kilometres an hour without the driver having to do anything. It doesn’t look like much does it, but it improves the aerodynamic properties of the trailer, and reduces the drag coefficient by almost ten percent.**

**Fuel efficiency and emissions regulations are obviously a big step forward, but ultimately there’s only so much you can do with an internal combustion engine isn’t there? You can move from diesel to alternatives like biofuels derived from crops like corn or sugar cane of course. These have long been touted as a carbon neutral solution, because in theory you’re only emitting the CO2 that the plant itself removed from the atmosphere during photosynthesis. But when a full analysis is carried out, those claims can look pretty shaky.**

**Recent studies have found that the process of producing biofuels can generate more carbon dioxide than the fuels themselves. A 2016 report by the Guardian newspaper suggested that biodiesel from palm oil produces three times the emissions of fossil fuels, and oil from soybeans produced twice as much. And that’s not to mention the catastrophic loss of ecosystems and biodiversity that happens when huge tracts of natural habitat are ripped up to be replaced by monocrop plantations.**

**LPG and natural gas have been hailed as having a lower carbon content than petrol or diesel, but even that suggestion can be questioned. The International Energy Agency point out that when potential emissions leakages and lower efficiencies are factored in, the overall net benefit – something the industry refers to as ‘well-to-wheel emissions reductions’, varies from fifteen percent at best, to no net benefit at all depending on engine efficiency.**

**So, is there any light at the end of the tunnel?**

**Well, at this stage I know there’ll be a lot of people out there yelling that the real answer is to slash our unsustainable level of global consumption, stop shipping luxury food items and useless trinkets half way around the world and choose locally manufactured products and foods wherever possible. And if you ARE yelling that at the screen, then you are of course quite right. The trouble is there are several billion other people on the planet who haven’t quite reached your level of enlightenment yet, and they are still going to demand the stuff they want, when they want it.**

**So, given that heavy duty vehicles are likely to be a permanent fixture on our roads in the coming decades, a logical first step would seem to be getting rid of their internal combustion engines altogether and replacing them with motors powered by electric batteries or hydrogen fuel cells.**

**And at this stage I know there’ll be a lot of people out there yelling that electric vehicles are no better if they’re being charged off of a grid powered by coal, and most hydrogen is produced by steam reforming methane, which comes from fossil fuels and produces a bunch of carbon dioxide in the process.**

**I know.**

**And that’s precisely why many people argue that we need to continue accelerating the integration of renewable power and energy storage onto our national grids, and why we need to aggressively pursue and develop green hydrogen produced by electrolysis of water, with zero CO2 emissions. Both these things are already happening in many parts of the world including the big players like the US, the EU, Australia, China and India.**

**In the US, 15 states plus the District of Columbia have committed to accelerate the adoption of California’s zero- emissions-vehicle program. Some of those states are already promoting zero-emission buses and trucks using settlement funds from the Volkswagen diesel-gate prosecution.**

**In Europe the EU has adopted a super credit system that rewards manufacturers of zero- and low-emission trucks and buses.**

**But it’s China, once again, who are leading the way. According to the IEA, China accounts for sixty-five percent of the global fleet of electric light commercial vehicles, with nearly two hundred and fifty thousand on its roads. They’ve also got about six thousand battery electric trucks for garbage collection and other municipal operations.**

**And they’re at the forefront of hydrogen technology too, with a fleet of about eighteen hundred hydrogen fuel-cell light commercial vehicles and more than four thousand hydrogen powered buses. South Korea and Japan also have ambitious plans to use hydrogen fuel-cell technology in heavy-duty vehicles. In July 2020, South Korea’s best-known auto maker, Hyundai became the world’s first exporter of hydrogen powered trucks, shipping ten vehicles to Switzerland. The plan is to send another forty by the end of the year and a total of sixteen hundred by 2025.**

**Over in Arizona, Nikola Motors are developing a hydrogen powered heavy duty truck, and despite allegations of fraud from an investor who has a short position on Nikola shares, and a slightly embarrassing revelation about their latest PR video, transport journalist James Morris makes the point in this September 2020 article for Forbes that he’s visited the factory and spoken to employees and he can confirm there is a real operation there with real engineers designing and building real vehicles. And the German electronics giant Bosch are working with Nikola to provide the fuel cells and motors, and they’re not a company known for their rash investment decisions. According to Nikola, these trucks will have a one thousand horsepower peak output and a range of almost seven hundred miles.**

**Toyota are working on electric trucks in the States, Tata are doing the same in India, and over in Europe in October 2019, Daimler Trucks – the world’s largest truck maker – announced they were abandoning development of natural gas powered trucks and committing to sell only zero-emission vehicles by 2039. Better still, Volvo and Renault already started producing electric trucks in 2019, and Scania are operating a pilot scheme with two twenty seven tonne electric city delivery trucks in Norway.**

**And then of course, there’s arguably the best-known heavy- duty vehicle of them all, the battery electric Tesla semi with a claimed fully laden nought to sixty time of twenty seconds, a range of at least five hundred miles, a battery life stretching to one million miles and energy costs half those of a diesel unit. Tesla reckon their vehicle has a two-year payback time and a lifetime fuel cost saving of around two hundred thousand dollars. The trucks will be produced at Tesla’s Gigafactory in Nevada with first deliveries planned for 2021.**

**And in this modern age of eCommerce these zero emissions trucks have a ready-made customer base of very large companies, all eager to do their bit for the climate and, of course, hoover up the attractive fuel cost savings along the way. Package delivery companies, like** [**Amazon**](https://www.theverge.com/2019/9/19/20873947/amazon-electric-delivery-van-rivian-jeff-bezos-order)**,** [**DHL**](https://electrek.co/2019/02/04/dhl-adds-electric-delivery-vans/)**,**[**DB Schenker**](https://media.daimler.com/marsMediaSite/en/instance/ko/DB-Schenker-and-FUSO-expand-partnership-for-electric-trucks.xhtml?oid=42947646)**,** [**FedEx**](https://newsroom.fedex.com/newsroom/fedex-acquires-1000-chanje-electric-vehicles/)**, UPS, and even the IKEA group have all pledged to expand their electric fleets** [**through retrofits**](https://www.dbschenker.com/global/about/press/stricter-co2-targets-freight-transport-563410) **or** [**outright purchases**](https://about.van.fedex.com/newsroom/fedex-reserves-20-tesla-semi-electric-trucks/) **in the near future.**

**A recent Webinar convened in Luxemburg brought together industry leaders from the European Pentalateral Region, which is the Benelux countries plus France, Germany, Switzerland and Austria, specifically to discuss the future of heavy duty vehicles in that part of the world. They focussed heavily on the infrastructure that’ll be needed to support the mass adoption of electric trucks over the coming decade. One of the systems under consideration in Europe is a network of electric road systems, where trucks are fitted with a pantograph on their roof that can hook onto an electricity cable suspended by catenary wires above the highway. It’s essentially the same way that trams work in many city centres, but this system would be rolled out on all major trunk roads. The vehicles would also have their own on-board battery power which they would use as soon as they leave the highway to do the last stretch of the route. Energy efficiency analysis was carried out by Siemens in 2018 and it found that these electric road systems came out top of the pile with a well to wheel efficiency of 77%, a range of sixty kilometres per one hundred kilowatt hours and a cost of just nineteen eurocents per kilometre.**

**That league table may change though as the cost of lithium ion batteries continues to fall while performance and efficiency continue to increase.**

**Heavy-duty electric vehicles will generally be charged overnight at their depots, which means they can use fairly standard chargers running at something like fifty or perhaps a hundred kilowatts, but there WILL be a need for a charging network across countries and continents to accommodate very long-distance routes. Truck drivers are legally required to make regular stops of between forty minutes and three hours though, so a network of charging points at all of those regular stopping points would be an ideal solution. It just needs the right capital investment from government and commerce.**

**The Swiss-Swedish automotive technology group ABB are developing a megawatt charging system or MCS to provide ultra-high power, ultra-rapid on road charging for this new breed of heavy-duty vehicles. They’re planning a pilot system for 2021 that will have one megawatt capacity, charging at a thousand amps. And by 2022 they reckon they’ll have a three-megawatt system at three thousand amps, with liquid cooled cables, connectors and inlets.**

**But won’t this massive increase in electric truck charging bring yet more pressure to bear on the electricity grid?**

**Well companies like ABB and others have unsurprisingly given quite a lot of thought to this question too. What they found is that if we were simply to rely on the current grid to supply these eye watering voltages and currents then they would certainly require pretty major upgrades with megavolt switchgear and much larger final leg transformers.**

**But, yet again, here’s where energy storage comes into play. If large scale energy storage and load management systems are installed at the charging points, then the need for root and branch conversion of the grid would be vastly reduced. And because these trucks will essentially represent a fleet of mobile batteries that’ll dwarf the scale of stationary batteries, they could be fitted with vehicle to grid software technology so they can be fully integrated with electricity grids, providing frequency regulation to support grid stability.**

**This new generation of zero emission heavy duty vehicles looks set to have a revolutionary and hugely disruptive impact on the road freight industry. The cost of implementing new infrastructure will be pretty enormous, but so will be the investment opportunities for the commercial enterprises who choose to take the plunge into this brave new world. And building out and maintaining that new infrastructure will mean long term job security for millions of people all over the world. Most importantly though, we need to stop burning fossil fuels and bring our carbon dioxide emissions right down as close to zero as possible within a only a very few short years if we’re to maintain any chance at all of keeping global atmospheric warming below two degrees Celsius above pre-industrial levels. And road freight is certainly a sector that looks like it can play its part in that transition.**

**Leave your thoughts in the comments section below, but that’s it for this week.**

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**As always, thanks very much for watching, have a great week, and remember to Just Have a Think.
See you next week**