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Addressing some popular myths around electric truck batteries

Today there are many assumptions made regarding the use of batteries in electric vehicles. And with governments and manufacturers worldwide making new commitments on electric vehicle production and sales, there is increased focus on cost and sustainability issues.

Here's my take on some of the more popular myths surrounding batteries, how they are produced, charged, recycled and reused.

Electric batteries are more expensive and have limited energy density

Lead-acid batteries are still the most available and inexpensive alternative on the market. But lithium-ion batteries are quickly gaining traction as they become cheaper. Lithium-ion batteries have one of the highest energy densities of any battery today, and capacity has increased as the cost has come down. They have therefore become the leading candidate for use in electric vehicles

Lithium Sulphur and solid state batteries are also showing great potential for several reasons. Lithium Sulphur technology is a part of the roadmap of future battery cells evolving from todays technology. State of the technology art is 300 Wh/kg and the outlook for Lithium Sulphur points at 500 Wh/kg.

Solid state batteries meanwhile have an energy density that is twice as much as a normal battery. Solid state batteries also avoid the use of dangerous or toxic materials found in commercial batteries, such as organic electrolytes.

Last but not least, olid electrolytes are nonflammable, which makes solid-state batteries safer. The technology is believed to allow for faster recharge, while higher voltage and longer cycle life is also possible.

While the advancements in electric battery technology point towards lower cost, better range and availability in the future, it is important to note that today’s battery technology and options are already competitive in many different applications.

The limited availability of green energy makes the charging of electric vehicles not environmentally friendly

It is true that a lot of money is still being invested in fossil fuels in many territories. Yet clean energy is growing much faster. And decreasing cost has a huge amount to do with this. Grid parity has been achieved in many parts of the world. In 2014, parity for solar power systems was achieved in at least nineteen countries, while wind power reached grid parity in some places in Europe in the mid-2000s. The cost of renewable energy in general has tumbled over the past year, to the point where solar and wind mills can now compete on cost with oil, coal and gas-fired power plants.

One of the important elements that will make the charging of electric trucks even cleaner is a growing commitment from governments around the world to make wind and solar a bigger part of the energy mix. Latin American countries have for instance set a collective target of 70% renewable energy use by 2030, more than double what the European Union is planning.

The shift to renewables is also enabling energy importing countries to focus on harnessing clean indigenous energy sources by freeing up resources that would have otherwise gone into oil and gas imports.

Nevertheless, hurdles remain thanks to issues like periodic supply and storing renewable sources efficiently. But even here progress is being made with batteries and hydroelectric dams that are functioning as storage facilities.

The adoption of clean energy worldwide is not feasible making electromobility not really a greener option

One common assumption is that the countries with the largest populations still maintain a fossil fuel-fired philosophy. Yet China is now one of the largest users of electric vehicles. It is also the world's leading nation in electricity production from renewable energy sources. In 2017, China was responsible for over 40% of global renewable capacity growth. This was largely driven by concerns over air pollution and capacity targets outlined in the Chinese government's five-year plan to 2020.

In India, the electric grid is being strengthened by open tenders. Many Japanese stakeholders have invested in solar power, and this area of major growth has led the Indian government to set ambitious targets for the output of solar and wind power by 2022.

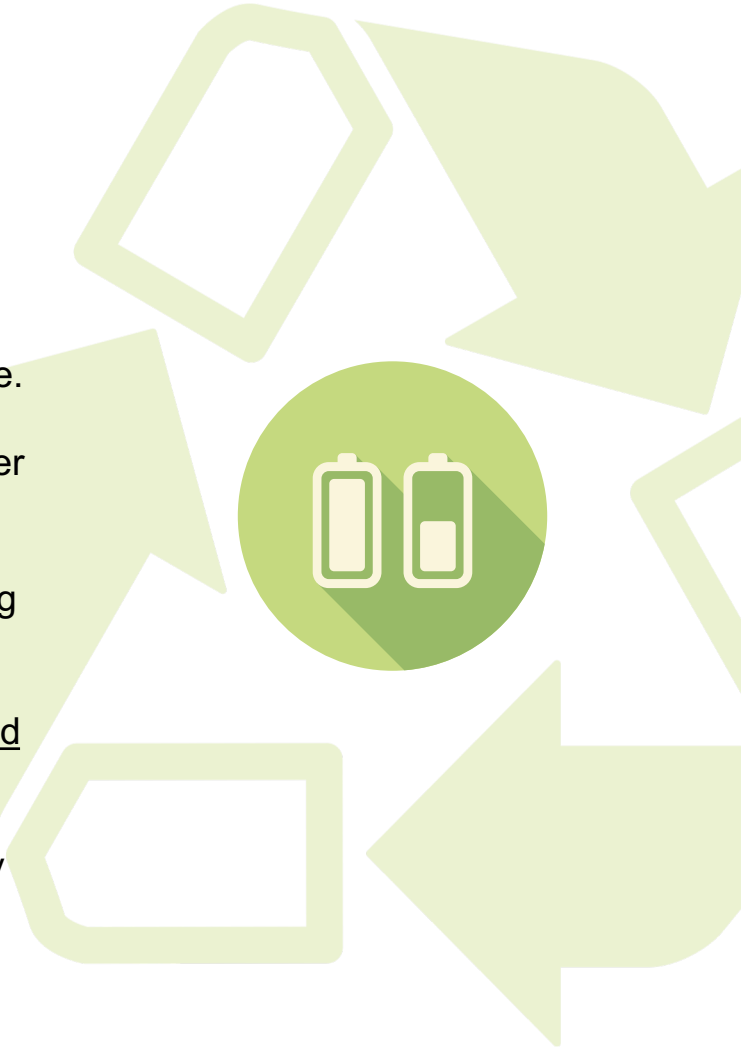
Cobalt is the only alternative we have as a raw material for electric truck batteries

The most expensive metal of the most recent lithium-ion development is cobalt, a hard lustrous grey material that is also used to manufacture magnets and high-strength alloys. There is no doubt that cobalt mining is something to be concerned about, and finding an alternative to that sourced from the Democratic Republic of Congo is desirable. Many large OEMs like Volvo are already addressing this issue through purchasing agreements and choice of suppliers.

But not all lithium-ion batteries actually need cobalt. Lithium ion iron phosphate batteries (LFP), for example are all cobalt-free. However their energy density is currently lower than that of lithium nickel manganese cobalt oxide (NMC) or lithium nickel cobalt aluminum oxide (NCA). This can make LFP batteries somewhat limited in electric vehicles where the electric range has highest priority. On the other hand, LFP batteries are fundamentally very stable and can be competitive in price and cycle life. The choice of battery chemistry is therefore a matter of optimizing the system towards a specific vehicle and application.

Battery recycling is easy and widespread

In order to minimize the environmental impact of any automotive component the general rule is to reuse, remanufacture and recycle. Recycling therefore should be a natural part of the battery lifecycle and there is legislation around the world, including the Battery Directive in Europe, which outlines a producer's responsibility when it comes to this



Today mainly the recycling of lead acid batteries is established and widely available as it is the easiest and most profitable battery to recycle. Given the growing popularity of lithium-ion batteries the expectation would have been the quick development of a recycling industry. However the recycling of these type of batteries remain undeveloped due to the high cost of the process which includes sorting batteries chemistries, shredding, separation of metallic and non-metallic materials, neutralizing hazardous substances, smelting, and purification of the recovered metals. The current rate of recycling rate for lithium-ion batteries is 50% although Finnish clean-energy company Fortum claims to have achieved a recycling rate of over 80%.

Until better techniques emerge, recycling of lithium-ion batteries is likely to remain limited. Which means that the key to avoiding a battery wasteland is trying to get the most out of each battery and finding secondary use for them once they are not suitable for use in vehicles. This brings me to the next point.

All batteries end up in landfill sooner or later

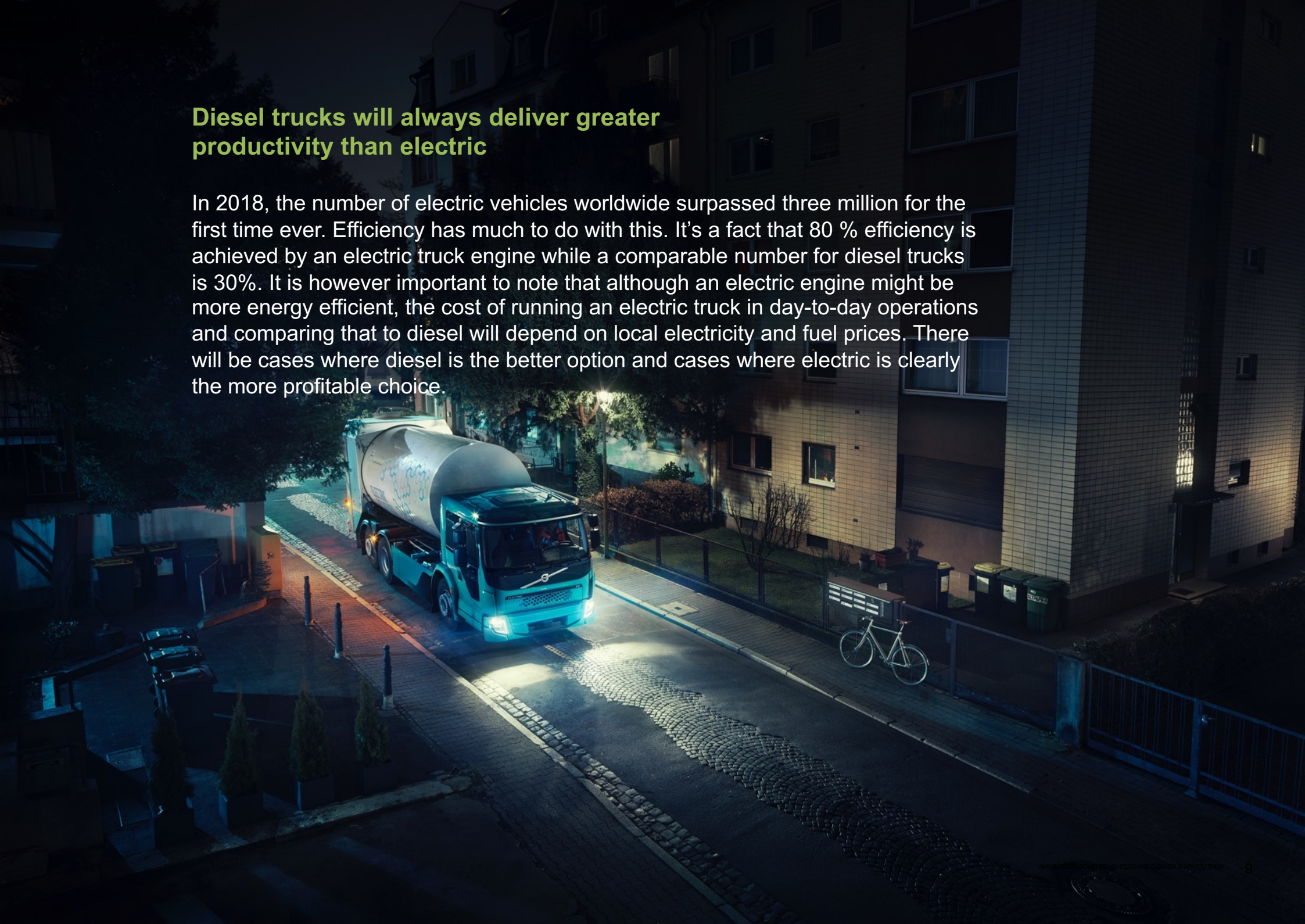
The difficulty of recycling most batteries doesn't mean that every battery will end-up in a landfill once it has served its primary purpose. In fact, the first second and third life of a battery may well be in vehicle usage. Once the capacity of a battery reaches a certain threshold it can be operated on a route where a shorter range is sufficient or moved to a vehicle with lighter operations. When batteries are removed from electric vehicles, they are likely to retain around 70%–80% of their original capacity. They can therefore, play an important role in supporting the electric grid.

Lithium-ion batteries provide an opportunity for reuse in stationary storage applications after their vehicle use phase. For example, they are currently enjoying a new lease of life powering street lighting in Japan, being used as home energy storage in the Netherlands, and as solar energy storage in Cameroon.

While all this is naturally positive from a global sustainability point of view, the second life scenario is not as profitable it is sometimes seen as. This is because the power of the old battery decreases in value in comparison with a new battery over a longer period. While reusing is good for the circular economy, it is not a significant profit driver for the trucking industry.

Diesel trucks will always deliver greater productivity than electric

In 2018, the number of electric vehicles worldwide surpassed three million for the first time ever. Efficiency has much to do with this. It's a fact that 80 % efficiency is achieved by an electric truck engine while a comparable number for diesel trucks is 30%. It is however important to note that although an electric engine might be more energy efficient, the cost of running an electric truck in day-to-day operations and comparing that to diesel will depend on local electricity and fuel prices. There will be cases where diesel is the better option and cases where electric is clearly the more profitable choice.



Diesel vehicles will still be more profitable to run than electric in the next twenty years

Lithium-ion batteries and manufacturing techniques are improving as the electric vehicle market grows. Energy density of lithium ion batteries continues to steadily increase while the cost comes down with Bloomberg predicting that crossover point — when electric vehicles become cheaper than their combustion-engine equivalents — could be as soon as 2022.

Longer battery lifetimes, decreasing cost and higher capacity will mean longer service life and more scope for longer haul journeys for electric trucks. There is no distinct time when the total cost of ownership will be lower for electric vehicles than for diesel, it's a sliding scale. Lower battery price, electricity price, long workhours and charging infrastructure work in favor of electrification while high fuel price works against it. Moreover a greater legislative and societal push for cleaner transport might mean that the change will happen sooner than we think.

These are just some of the common misconceptions around electric truck batteries and green credentials of electromobility. As electric vehicles continue to gain momentum, this debate is likely to continue, creating new points of contention and discussion. What can be said today though is that electric trucks are here to stay and that in combination with greater deployment of renewables and decarbonisation of the electricity grid, they offer a great pathway to reducing our greenhouse emissions.

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