Looking beyond the tailpipe

Andy Eastlake, Zemo Partnership's CEO, argues that net zero transport plans need to look beyond tailpipe emissions and consider the production, distribution, and disposal of vehicles.

The headline news on 'Transport Day' at COP26 in Glasgow last November revolved around the UK's announcement that all vehicles sold for operation on UK roads after 2040 will produce zero emissions at the tailpipe. That news followed the UK's earlier commitment to phase out all cars and vans with tailpipe emissions from 2035 and those without 'significant zero emissions range' from 2030.

The targets are in place and now fleet operators, vehicle owners and all the various stakeholders involved must work together to make this transition happen.

But as responsible local authorities, fleet operators or, indeed, anyone with a role to play in transport's journey down the road to zero, we need to be aware not just of the emissions produced from the tailpipes of the vehicles we operate but of the impacts from their production, distribution, and ultimate disposal.

A study recently published by Zemo Partnership recommended that Government policy should increase its focus on the well-to-wheel greenhouse gas emissions and overall energy efficiency performance of new fuels for transport. The report acknowledged that while electric, hydrogen, and renewable fuels (produced from waste-based feedstocks) can all radically cut emissions compared with their petrol or diesel-powered counterparts, there are major variations in their effectiveness and efficiency in terms of cutting emissions depending on choices made over the full life cycle.

The study warned that a focus just on mitigating tailpipe emissions can risk neglecting the full impacts and the overall energy consumption of the system. With limited biogenic resources and renewable electricity supplies, the report says that it's critical that we adopt energy efficient solutions to maximise the full system benefits wherever this is possible.

What does this mean for vehicle operators? In the context of electric vehicles, it means considering questions like: What's the energy efficiency of the vehicle I'm thinking of buying? How much range do I realistically need for my operations? Can I manage with a smaller battery and avoid the upstream impacts of carrying around a larger battery than I need? What proportion of the components in my vehicle are reusable or recyclable at the end of its life?

This line of thinking has wider implications for policymakers when considering support for one powertrain solution or another.

Hydrogen is seen as a potential enabling technology for vehicle uses, particularly for heavier and longer-range vehicles for which battery electric technology is not yet viable. The recent Zemo study focused, in particular, on the life-cycle impacts of a range of hydrogen pathways for fuelling trucks, buses, vans and cars. It showed results for the most promising hydrogen vehicle powertrain architectures using battery electric, diesel, and renewable fuels for comparison, and found that there's a wide range of outcomes depending on the choices we make.

The study looked, for example, at hydrogen produced through electrolysis, biomass gasification with carbon capture and storage (CCS), and methane reformation with CCS (all potentially very low carbon and GHG solutions) as well as from fossil fuels without CCS mitigation. It found that there is potential for cutting well-to-wheel emissions through the use of hydrogen but that this was by no means a certainty and is predicated on the production of low carbon hydrogen (ideally derived through renewably-powered electrolysis).

Significantly, Zemo's work showed that the well-to-wheel energy efficiency of hydrogen vehicles is lower than diesel internal combustion (IC) or battery electric vehicles and those using renewable fuels in IC engines. In the case of HGVs powered by hydrogen fuel cells – widely mooted as a potential heavy duty vehicle solution because of the technical challenges to battery electrification – the well-to-wheel energy efficiency was calculated to be four to six times worse than that for comparable battery electric vehicles.

Consequently, we concluded that hydrogen vehicles will need to demonstrate considerable complementary benefits, such as longer range, better payload or lower operating costs, to compensate for their lower well-to-wheel energy efficiency than competing powertrain solutions.

Hopefully it's clear from this short contribution that reducing the impact of our vehicles in terms of climate change is not necessarily a simple decision and that if we're to understand the right criteria to deliver on the necessary targets that have been set, we need to raise our eyes and look well beyond the tailpipe.