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Thinking in Terms of Larger Systems

I have been driving a Battery-electric car (BEV) since 2015; it's my personal research project. My wife and my daughter have had electric cars for two years now. They're great fun to drive, particularly in city traffic. Fortunately, we have good charging facilities available.

In 2021, the number of electric cars – plug-in hybrids (PHEVs) and BEVs combined – reached the one million mark. E-vehicles currently make up around 25 % of new registrations in Germany. And the range of models available is constantly growing; electric mobility is a central part of the strategy of the German automotive industry. Across the development departments, engineers are working intensively on improvements to the electric drive system. Every year new electric powertrains are produced with increased efficiency, higher torque, smaller size, smarter control units, greater reliability and reduced costs. A large proportion of the projects at the Research Institute for Automotive Engineering and Powertrain Systems Stuttgart (FKFS) concern electric mobility. The car of the future is electric, automated and connected.

So is everything going well? Unfortunately, the take-off of electric vehicles is being held back, on the one hand by rising raw material prices and supply chain interruptions and on the other by the sluggish expansion of the charging network. Despite huge efforts, the number of charging stations is growing more slowly than the number of electric vehicles. It is important that we do not lag behind in this area in the future.

But is that the question we should really be looking at? Should we not be taking a different direction in the debate? Perhaps we should be asking where the energy comes from. At the ATZlive congress "Powertrains and Energy Systems of Tomorrow," which took place in Berlin (Germany) in May, the keynote speakers and discussion panel members called for a fully systemic approach to fuels and transport in the future. The demand for electric power in Germany cannot currently be fully covered by wind and solar farms. The CEO of IAV, Matthias Kratzsch, said that the efficiency of the energy system plays a much bigger role than optimizations within the drive system: "For us, it's more important to think in terms of larger systems." In his presentation, Martin Rothbart from AVL looked at the total carbon footprints of three drive concepts – HEVs (with e-fuels and biofuels), BEVs and hydrogen fuel cell cars – on the route to carbon-neutral mobility. His summary was as follows: "The life cycle analyses of the different powertrain concepts are all within the same range, but the battery electric vehicles have a slight advantage."

We need to focus on the complete system. The overall demand for energy will fall, but the demand for electricity will rise. Because of their efficiency, electric vehicles can make effective use of energy. As a researcher, I was always in favor of technology neutrality and, as a mechatronics engineer, I took a holistic approach. And I will continue to enjoy driving electric cars.