The convenient truth about solar mobility

To protect the climate and to reduce the dependency of foreign oil, several sustainable drive concepts are discussed. Often the differences, the advantages and disadvantages between the different solutions are not known very well. So here are three truths about sustainable mobility:

1. Efficiency
Electric motors have an efficiency of 85 to 95 %.
Combustion engines in cars have an efficiency of about 5 to 20 %.
Electric drives are the most efficient drives on the market

2. "Energy farming" and land use
If you have an area of one ha = 10.000 square meter (100 by 100 meter), you my use it for "energy farming" to get the energy for:
21.500 km driving diesel vehicles with pure plant oil of seeds
60.000 km driving diesel vehicles with biomass-to-liquid (BtL) using the whole plant
67.000 km driving ICE-vehicles with biogas using the whole plant
3.200.000 km driving electric vehicles with solar power from photovoltaic plants
… and much much more driving electric vehicles with wind power
Electric vehicles powered by solar energy need the smallest area per kilometre to power efficient and sustainable cars.

3. The fuel-cell question
Hydrogen is not a primary source of energy. Thus fuel cells plus hydrogen storage compete against batteries as a energy storage device. The drive system is in both cases electric.
If you compare two identic vehicles, one with batteries, the other wutg hydrogen-fuel cell, the fuel cell vehicle needs 4 (four!!) times the electric energy per kilometre or in other words, four times the solar area to run the same distance. The overall efficiency of multiple energy conversions (electricity to hydrogen, then to compressed or liquid hydrogen and than back to electricity for driving the vehicle) results in higher losses compared to storing electricity in batteries.
The storage efficiency of batteries is two to three times better than storing energy via hydrogen and using fuel-cells to make electricity.

4. Reduction of fossil fuel consumption by 60% immediately
A recent study of the bsm/DGS shows that in case all small vehicles would be electric and all medium sized cars would be plug-in hybrid vehicles (vehicles, who run the first 60-100 km with electricity, then switch to combustion engines), and leave all big cars as they are, the fuel consumption in Germany would be reduced by 60% to 40%. The raise of electricity consumption would be only by 5-10%.
(study "Plug-In vehicles", author: Tomi Engel, german language).
It can be done with existing technology for electric and hybrid cars.

5) Powerfull Batteries are available now
Todays lithium-batteries would allow ranges for electric cars of more than 500 km per charge. If users need less range, i.e. only 100 km per day, the batteries could be reduced in weight and price. Lithium batteries are still the most expensive part of electric vehicles.

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