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Gasoline-powered serial hybrid cars cause lower life cycle carbon emissions than battery cars CHRISTOPH J. MEINRENKEN, KLAUS S. LACKNER, Columbia University — Battery cars powered by grid electricity promise reduced life cycle green house gas (GHG) emissions from the automotive sector. Such scenarios usually point to the much higher emissions from conventional, internal combustion engine cars. However, today's commercially available serial hybrid technology achieves the well known efficiency gains from regenerative braking, lack of gearbox, and light weighting - even if the electricity is generated onboard, from conventional fuels. Here, we analyze emissions for commercially available, state-of-the-art battery cars (e.g. Nissan Leaf) and those of commercially available serial hybrid cars (e.g., GM Volt, at same size and performance). Crucially, we find that serial hybrid cars driven on (fossil) gasoline cause fewer life cycle GHG emissions (126g CO₂e per km) than battery cars driven on current US grid electricity (142g CO₂e per km). We attribute this novel finding to the significant incremental life cycle emissions from battery cars from losses during grid transmission, battery dis-/charging, and larger batteries. We discuss crucial implications for strategic policy decisions towards a low carbon automotive sector as well as relative land intensity when powering cars by biofuel vs. bioelectricity.

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