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Electrification of the transportation sector offers limited country-wide greenhouse gas reductions CHRISTOPH J. MEINRENKEN, KLAUS S. LACKNER, Columbia University — Compared with conventional propulsion, plug-in and hybrid vehicles may offer reductions in greenhouse gas (GHG) emissions, regional air/noise pollution, petroleum dependence, and ownership cost. Comparing only plugins and hybrids amongst themselves, and focusing on GHG, relative merits of different options have been shown to be more nuanced, depending on grid-carbon-intensity, range and thus battery manufacturing and weight, and trip patterns. We present a life-cycle framework to compare GHG emissions for three drivetrains (plugin-electricity-only, gasoline-only-hybrid, and plugin-hybrid) across driving ranges and grid-carbon-intensities, for passenger cars, vans, buses, or trucks (well-to-wheel plus storage manufacturing). Parameter and model uncertainties are quantified via sensitivity analyses. We find that owing to the interplay of range, GHG/km, and portions of country-wide kms accessible to electrification, GHG reductions achievable from plugins (whether electricity-only or hybrids) are limited even when assuming low-carbon future grids. Furthermore, for policy makers considering GHG from electricity and transportation sectors combined, plugin technology may in fact increase GHG compared to gasoline-only-hybrids, regardless of grid-carbon-intensity.

Christoph J. Meinrenken
Columbia University

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