

Systemic Technology Assessment in Electric Mobility

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ABSTRACT

Under the hood of the vast majority of modern passenger cars still purrs internal combustion power, for good reason: the exceptionally high energy density of liquid hydrocarbon fuels enables truly luxurious levels of usability and comfort at the awe-inspiring reliability and affordability that comes from over 100 years of technological maturation. However rather recently increased social awareness towards the sustainability issues of oil as fuel triggered a race for a substitute. The advent of modern (Li-ion) battery chemistries gave electricity a fighting chance; the energy systems group of LAV analyzes its potentials: what is the resulting energy demand, is the technology usable and are there CO₂ savings?

METHODOLOGY

different vehicle classes

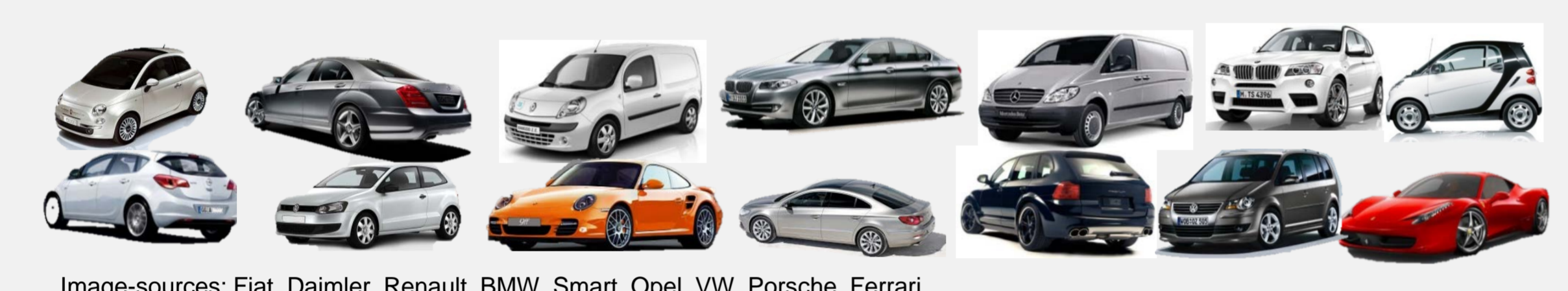
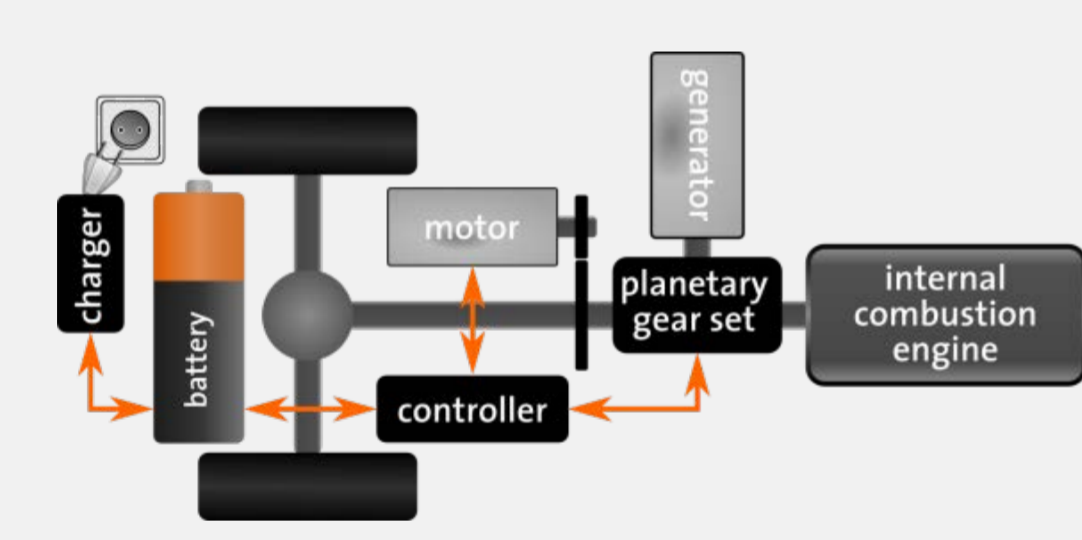


Image-sources: Fiat, Daimler, Renault, BMW, Smart, Opel, VW, Porsche, Ferrari

Fleet = heterogeneous mixture of shapes and sizes

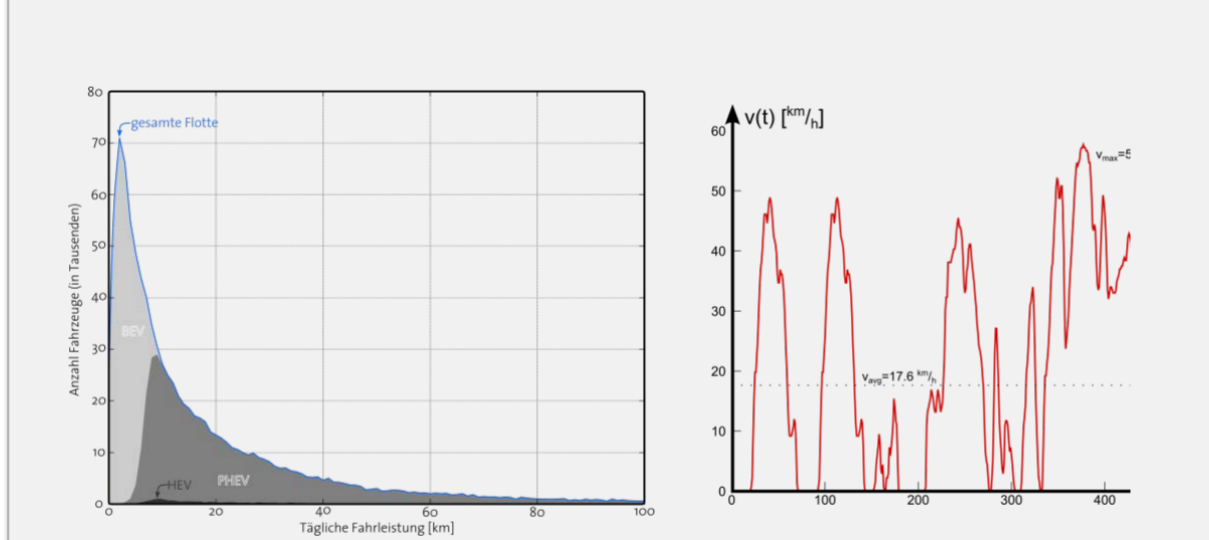
- Classification in market segments (assumed similar within)
- Powertrain technology considered separate from vehicle

technology options



7 basic technology options: conventional, hybrid, battery electric, fuel-cell electric and corresponding plug-in configurations

driver demand / behavior

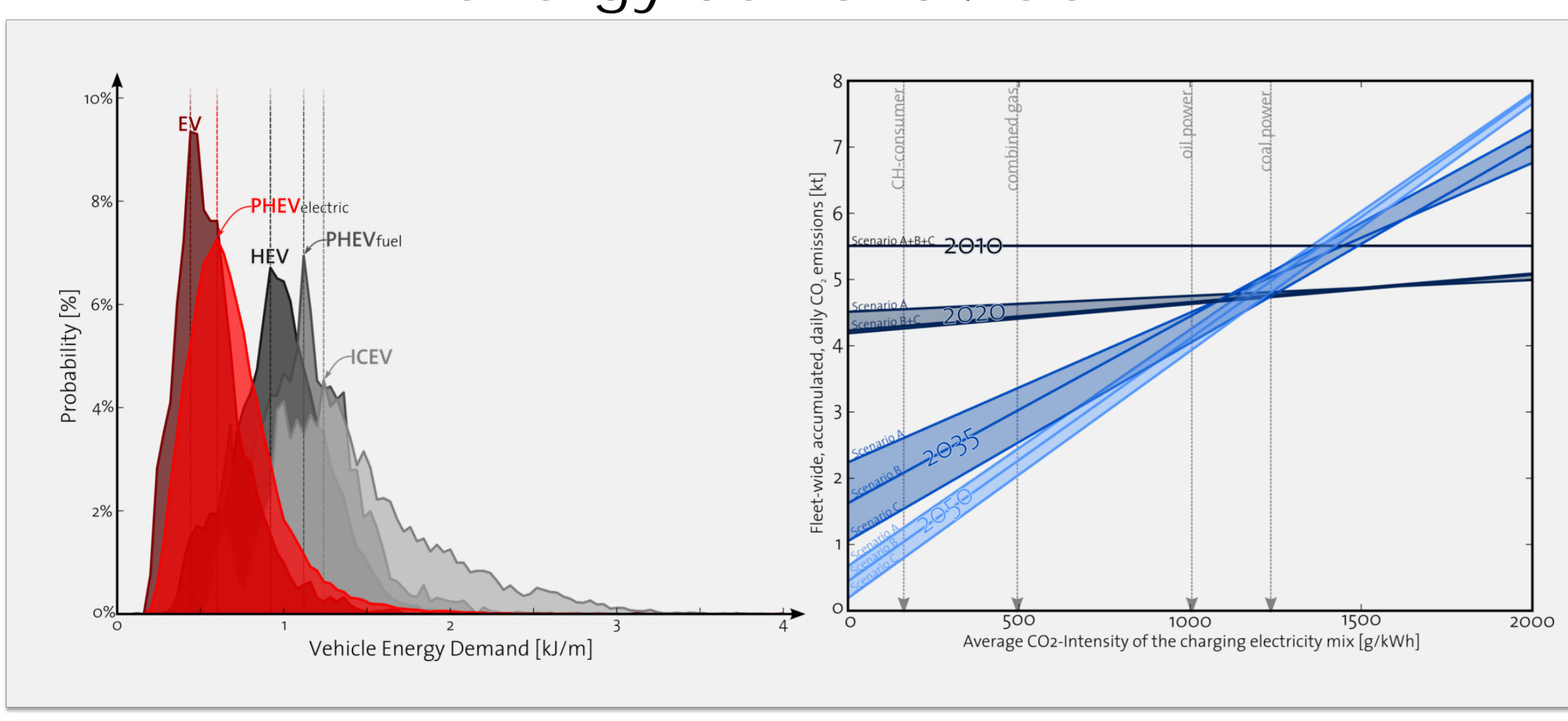


Driver behavior:

- transportation demand in consecutive kilometers → range
- instantaneous speed profile

simulation / configuration optimization


energy demand / CO₂



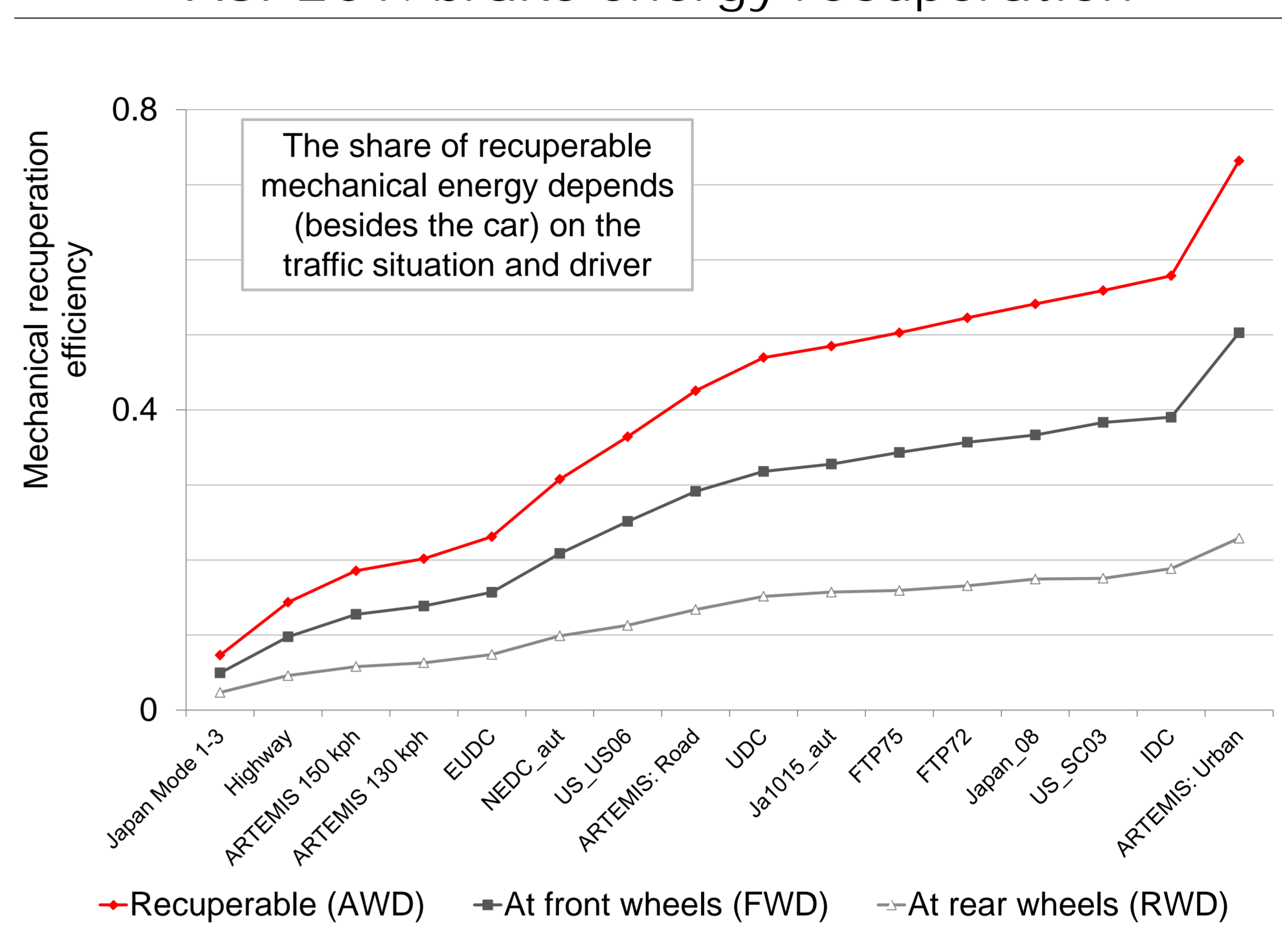
About us

Energy Systems Group @ LAV, Aerothermochemistry and Comb. Syst. Lab. Institute for Energy Technology ETH Zürich Prof. Konstantinos Boulouchos

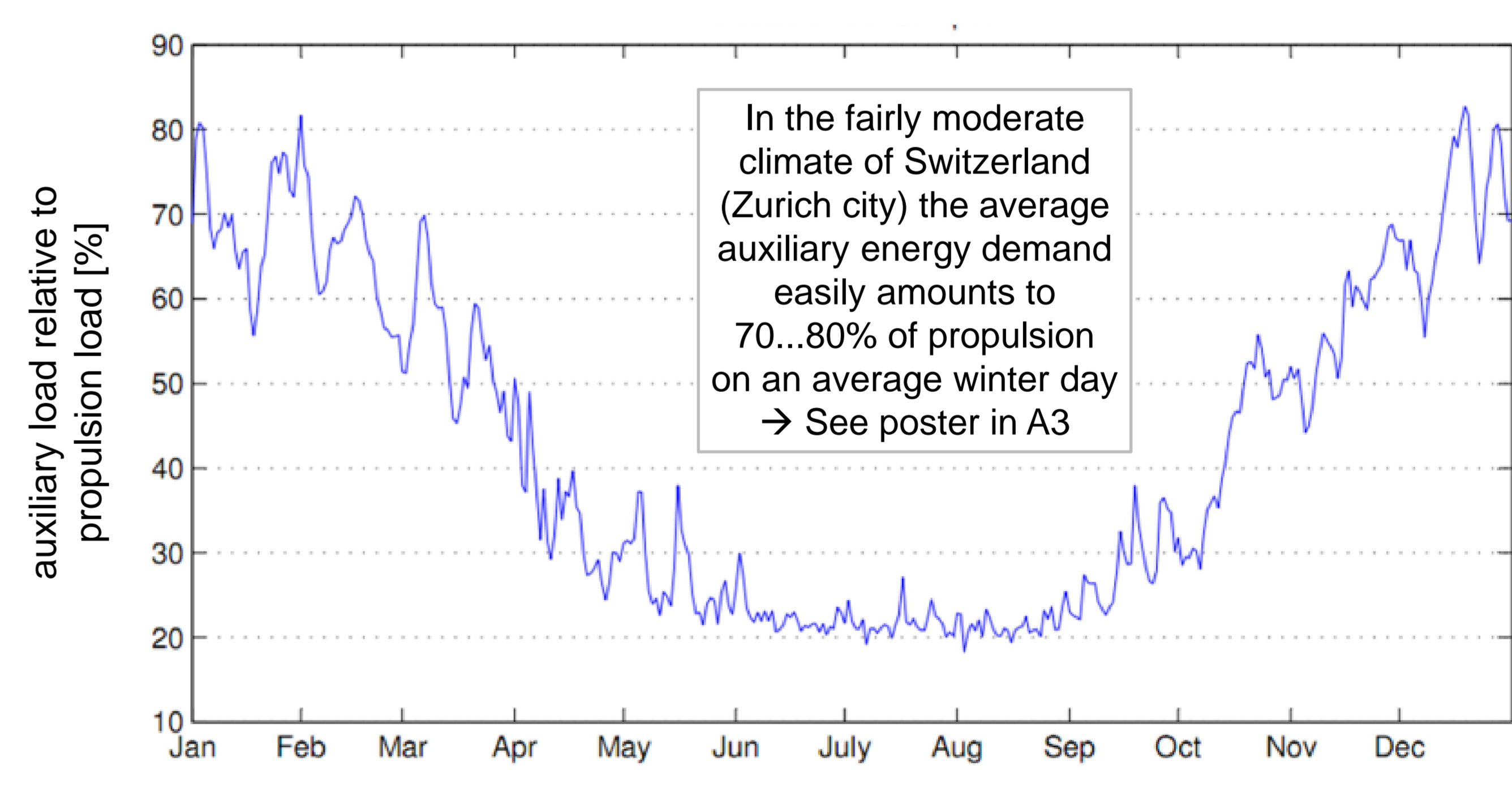
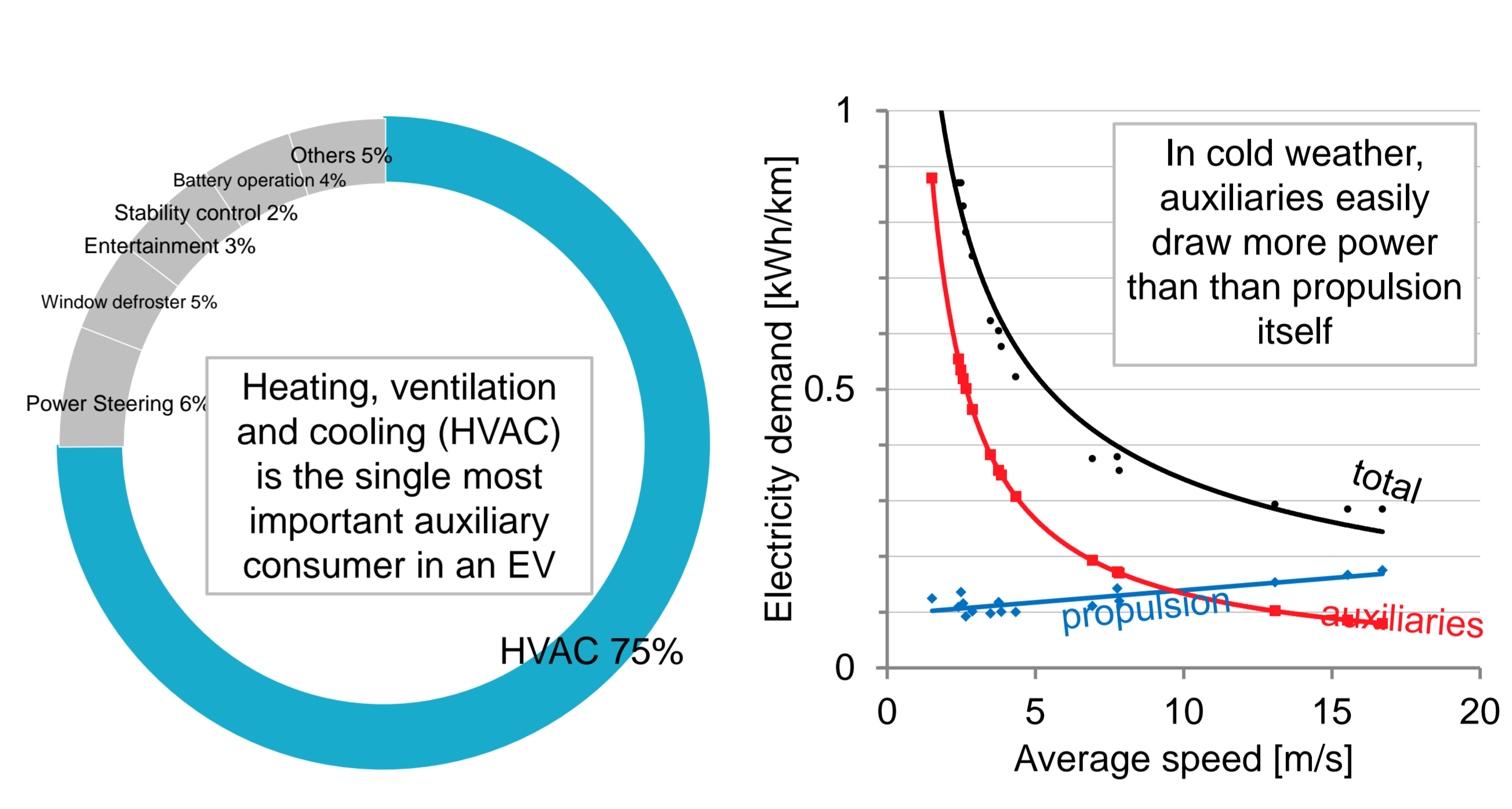
LAV's energy systems group specializes in the technology assessment of energy conversion technologies and the analysis of interconnected energy ecosystems, including mobile systems and their supporting infrastructure(s). Further activities revolve around stationary power generation, in particular decentralized, biogenic CHP plants.



ASPECT: brake energy recuperation



ASPECT: non-propulsive energy demand



OUTLOOK: expansion to heavy-duty vehicles

- Road freight → w/ variable auxiliary load: e.g. garbage collectors
- Passenger transportation → electric and hybrid-electric busses

