

Motivation | Problem Statement

- What are required fast-charging capacities along Austria's highway network for long-distance travel with BEV passenger cars and where are these located under different decarbonization scenarios?
- Future charging infrastructure demand affected by different decarbonization scenarios for the transport sector (electrification share, technological improvements, shift to other travel modes, ...)

- Battery-electric vehicles are currently luxury item that are used in higher-income level classes
- Unexplored impact of different public charging infrastructure roll-out strategies in two dimensions: on BEV adoption in different income levels and on neighbouring regions (spillover effect)

passenger car fleets

commercial fleets

- Cost differences in the installation of charging infrastructure and charging by country and electricity market zone indicate potential for "charging tourism"
- Unknown magnitudes of potential charging infrastructure capacity allocations being affected by these differences

- Future impact of charging demand of battery-electric commercial fleet and potential for demand-side flexibility
- Quantification of large-scale charging demand of battery-electric fleet at hourly temporal and NUTS-2 level under the consideration of transport flows within the countries and transit traffic in Austria

Research Question

RQ1

What are required fast-charging capacities along Austria's highway network for battery-electric passenger cars under different decarbonization scenarios and where are these located ?

RQ2

To what extent do the speed and spatial distribution of public infrastructure expansion influence BEV adoption rates among various income groups and across neighboring regions?

RQ3

What magnitude of charging infrastructure capacities is affected by geographically varying grid connection costs and electricity prices in the cost-optimal planning of charging infrastructure allocation for battery-electric trucks along the Scandinavian-Mediterranean corridor?

RQ4

What is the expected charging demand of the commercial BEV fleet spatio-temporally distributed in Austria in 2040?

Contribution

"Minimum-Cost Fast-Charging Infrastructure Planning for Electric Vehicles along the Austrian High-Level Road Network." *Energies* 15.6 (2022): 2147.

Co-Authors: Sebastian Zwickl-Bernhard, Hans Auer

"Density and speed in the local public charging infrastructure roll-out: Accelerating electrification of passenger car stock in different income classes and in neighbouring regions"

Co-Authors: Sebastian Zwickl-Bernhard, Marcus Otti, Hans Auer

"Charging tourism: Geographically varying charging costs as determinants for cost-optimal mega-watt charging infrastructure planning for battery-electric trucks"

Co-Authors: Steffen Bakker, Sebastian Zwickl-Bernhard, Jonas Martin, Marcus Otti, Hans Auer

"The value of flexibility of commercial electric vehicle fleets in the redispatch of congested transmission grids." *Energy* 316 (2025): 134385.

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