Energy savings from policy measures promoting modal shift to e-bikes

The Austrian experience

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Background

- Austria had an EEOS between 2015 and 2020
- At the start of the EEOS:
  - All kinds of stakeholders wanted standardised methods for “their measures”
  - Policy level was interested in covering different measures and sectors with standardised methods
- Methods for mobility are generally a challenge (except for vehicle exchange)
- What is the net energy savings effect of using e-bikes?

Bottom-up method e-bikes | Starting point

- Builds on a pre-existing method vehicle exchange (cars)
- Needs additional information
  - Average mileage of e-bikes
  - Average specific energy consumption of e-bikes
  - Potential of e-bikes to replace car-driven mobility

Energy savings from e-bikes | formula

- An e-bike is purchased in addition or as a replacement of a car

$$FE_{tot} = n \cdot ((fec_{ref} - fecef_f) \cdot f_{rep} - fec_{eff} \cdot (1 - frep)) \cdot MI$$

FE_{tot}	Total final energy savings [kWh/a]
n	Number of e-bikes [-]
fec_{ref}	Average final energy consumption of reference vehicle (car) [kWh/100km]
fec_{eff}	Average final energy consumption of an e-bike [kWh/100km]
f_{rep}	Factor of replaced mileage from car to e-bike [%]
MI	Average annual mileage of an e-bike [100km/a]

Energy savings from e-bikes | default values

- Basis: studies (e-bikes) and statistics

Parameter	Value	Unit
fec_{eff} Average final energy consumption of an e-bike	1.0	kWh/100km
fec_{ref} Average final energy consumption of car (stock)	59.4	kWh/100km
MI Average mileage		
Private e-bike	1,400	km/a
Company e-bike	Company specific	
f_{rep} Factor of replaced mileage from car to e-bike		
Private e-bike	34.5	%
Company e-bike	Company specific	

Final energy savings per private e-bike
273 kWh/a

Experiences/observations

- Standardised method
  - was available for the whole period 2015-2020
  - does not take into account rebound effects
  - mainly used by obligated parties and by some municipalities
- Instrument: mainly subsidies on purchase of e-bikes
- Total reported savings of 20.8 MWh/a → tiny share of total savings 2015-2020
- → reported measures cannot be used to determine future potential

Approach for determining future potential

- Case analysed in Austria: Use of e-bikes replaces cars in everyday commute
  - Clearly defined case
  - Data available
- Input data
  - Average specific final energy consumption of cars and e-bikes per km
  - Annual total commute kilometres with cars (0-2; 0-5; 0-10; >10)
  - Potential of e-bikes to replace car kilometres
  - Assumption: journeys between 0 and 5 kilometres are mainly replaced with walking and bikes
  - E-bikes have a major effect for journeys between 5 and 10 kilometres

Scenarios for future potential

Parameter	Switch rate	Total annual energy savings (GWh)
0-2 km | switch to walking	5 %	3
	10 %	5
	20 %	10
2-5 km | switch to walking and bikes	5 %	13
	10 %	27
	20 %	53
5-10 km | switch to e-bikes	5 %	31
	10 %	62
	20 %	124

20 % scenario for e-bikes: savings (124 GWh) are 0.04% of total Austrian energy consumption

Conclusions

- Bottom-up standardised method for e-bikes rarely used. Some possible reasons
  - Other more attractive measures
  - Administrative burden
  - Cost efficiency of measure to achieve individual EEOS target
- Future savings potential
  - Summing up bottom-up savings of individual measures will in most cases not deliver a good estimation
  - Calculation of future savings potential needs good balance between sound data basis and plausible assumptions and scenarios

Thank you

Get in touch for more information!

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